

# BOWMANS CREEK WIND FARM

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## AMENDMENT REPORT

*for Epuron Projects Pty Ltd*

*8 October 2021*



## DOCUMENT CONTROL

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<b>Our Reference</b>	211008 Bowmans Creek Amendment Report



# EXECUTIVE SUMMARY

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## EXECUTIVE SUMMARY

### Background

Epuron Projects Pty Ltd (the Proponent) is seeking approval for the construction, operation, maintenance and decommissioning of the Bowmans Creek Wind Farm (the Project), which is generally located at Bowmans Creek, approximately 10 kilometres (km) east of Muswellbrook and 120 km north-west of the Port of Newcastle in NSW.

The Environmental Impact Statement prepared over the Project was exhibited between 31 March 2021 and 11 May 2021. Following an analysis of submissions received, consultation with affected landowners and further detailed design a request to amend the Project was lodged with the Planning Secretary on 8 September 2021.

### Project Amendments

The amendments sought to the Project layout, have been specifically designed to result in a net decrease in the area to be disturbed and an overall improvement in environmental and community outcomes. The proposed amendments entail:

- Deletion of four Wind Turbine Generators, re-siting of three others and minor adjustments of several more (micro siting up to 100m);
- Removal and relocation of site access tracks (net 15 km reduction);
- A 10 km net lineal reduction in underground power reticulation;
- A 14 km net lineal reduction in overhead power reticulation; and
- An overall reduction of the Project footprint of approximately 98 ha.

### Document Purpose and Structure

This Amendment Report has been prepared by James Bailey & Associates to support applications for both State Significant Development Consent for the Project (SSD 10315) under Division 4.7 of Part 4 of the *Environmental Planning & Assessment Act 1979*; and an Environment Protection and Biodiversity Conservation Approval (Referral 2020/8631) under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*.

The amendment Report has been prepared generally in accordance with the *State Significant Development Guidelines – Preparing an Amendment Report* (DPIE, 2021c) and the *NSW Wind Energy Framework* (DPE, 2016).

### Impacts, Management and Mitigation

#### *Landscape and Visual*

A Landscape and Visual Impact Assessment (LVIA) was undertaken for the Project as exhibited, by Green Bean Design Pty Ltd (GBD). This is included in full as Appendix H of the EIS. The LVIA was prepared in accordance with the *Wind Energy Visual Assessment Bulletin for State Significant Wind Energy Development* (DPIE, 2016c) and the SEARs. A LVIA Supplementary Assessment (GBD, 2021) has been completed to assess the revised visual impacts associated with the Project contractions and amendments. This is included in **Appendix D1** of this report.

The assessment of the proposed amendments has determined no increase in the overall impacts identified in the original LVIA, while a number of Non-Associated dwellings will benefit through changes to performance objectives resulting from an increase in distance between dwellings and wind turbines, as well as a decrease in the number of multiple wind turbine 60 degree sectors.

The Civil Aviation and Safety Authority (CASA) and the Department of Defence (DoD) have indicated their preference for obstacle lighting to be installed on some of the Wind Turbine Generators. A draft Obstacle Lighting Plan has been prepared, which includes lighting of 31 of the 56 wind turbine generators.

A desktop review of the draft Obstacle Lighting Plan has been undertaken by GBD to assess the potential visual impacts associated with lighting of the 31 towers. The review identified two Non-Associated dwellings (P22-1 and P22-4) that will be less than 2 km from two wind turbines with obstacle lighting. These two dwellings P22-1 and P22-4 are subject to an offer of a Neighbour Agreement.

Mitigation measures to reduce visual impacts from obstacle lighting include:

- Reducing obstacle lighting intensity from medium (2000 candela) to low intensity (minimum 200 candela);
- Establishing protocols that minimise the amount of time that the obstacle lights are energised; and
- The preparation of a Night Lighting Management Plan in consultation with CASA and DoD with the objective of ensuring a safe level of lighting whilst minimising light spill to neighbouring residents.

### ***Noise and Vibration***

A Noise and Vibration Impact Assessment was undertaken for the Project by Sonus Pty Ltd. **Appendix D2** of this report contains a supplementary noise assessment in consideration of the amendments to the Project layout.

Based on the predictions of the Noise and Vibration Impact Assessment, the maximum equivalent noise levels generated by the wind turbines under conditions most conducive to noise propagation (such as temperature inversions) will comply with the criteria established by the Secretary's Environmental Assessment Requirements at all Non-Associated dwellings (excepting P22-1 by 1 dBA).

Should an Agreement with P22-1 not be gained, a curtailment strategy will be implemented (where relevant operating turbine(s) will operate in a "sound optimised" mode at the wind speeds where the predictions indicate that the criteria will be exceeded) to achieve compliance with criteria at P22-1.

The amendments to the Project have resulted in a minor reduction in predicted operational noise impacts at some residences and will not affect construction noise as predicted in the EIS. As such no additional noise mitigation measures are proposed for the Project.

### ***Biodiversity***

A Biodiversity Development Assessment Report (BDAR) was prepared for the Project, by Cumberland Ecology. This was presented as Appendix L to the EIS. The BDAR has subsequently been updated to incorporate the proposed amendments and contractions to the Project. The updated BDAR is included in **Appendix D3**.

The amendments to the Project have resulted in a forecast reduction in disturbance of native vegetation from 324 to 278 ha.

The revised Biodiversity Assessment Report confirms that, with the implementation of the proposed avoidance, management and offsetting measures proposed, it is likely that the biodiversity values of the locality that have been identified will be maintained or improve in the long term and as such the Project is considered to meet the no net loss standard required under the BAM.

Specific measures developed to manage the risks to the maintenance of biodiversity in the locality include:

- A commitment to maximise avoidance of threatened ecological communities, threatened species and habitat with higher conservation value during detailed design and micro-siting;
- Implementation of strict protocols to protect soil, water and native vegetation during construction and operation;
- Monitoring collision and avoidance impacts by avifauna and bats during operation; and

- Offsetting residual loss of native vegetation and habitat via use of biodiversity credits in accordance with the BAM.

### ***Aboriginal & European Heritage***

Aboriginal and Cultural Heritage and Historic Heritage Impact Assessment Reports were undertaken for the Project by Ozark Environment and Heritage Management Pty Ltd. **Appendix D4** and **D5** of this report contains supplementary assessment reports in consideration of the amendments to the Project layout.

The amendments to the Project have resulted in a material contraction of the area to be disturbed (from 515 ha to 417 ha). The Project as exhibited in the EIS was determined not to have a significant impact on Aboriginal or historic heritage. With due diligence during final project element design and the micro-siting of the various Project components the amended Project will have even less impact.

An Aboriginal Cultural Heritage Management Plan and Historic Heritage Management Plan will be prepared for the Project in accordance with the relevant guidelines.

### **Merit Evaluation**

The Project offers several strategic and long-term benefits to the state of NSW and its people, including:

- The supply of cost-effective renewable energy that will assist electricity retailers to fulfil their obligations under state and federal renewable energy targets;
- Provide replacement energy generation capacity into the NSW electricity grid that will assist in meeting load demand as a result of retiring thermal generators and assist in providing a clean, reliable generation mix;
- Provide an opportunity for regional investment in the renewable energy sector in the Upper Hunter Valley of NSW as is promoted strategically by the relevant NSW and local government planning Instruments.

The Project offers several specific benefits to the local community via the direct injection of funds into the local economy through:

- The provision of jobs during construction and operation;
- Use of local services in both the construction and operation phases; and
- Ongoing landowner payments and financial contributions to the local community being re-injected into the local economy.

The Project's social and environmental impacts have been avoided or minimised as far as practicable by implementing all reasonable and feasible management and mitigation measures. As a consequence, the socio-economic benefits of the Project will outweigh its social and environmental impacts.

The Project addresses the principles of Ecologically Sustainable Development, has been assessed in accordance with the *Environmental Planning & Assessment Act 1979*, its "objects" and as required by the Secretary's Environmental Assessment Requirements.

This assessment has determined that it is open for the Minister to conclude that the Project is in the public interest and as such should be approved under the *Environmental Planning & Assessment Act 1979*.

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Appendix B	UPDATED STATUTORY COMPLIANCE TABLE
Appendix C	UPDATED MITIGATION MEASURES TABLE
Appendix D	SUPPORTING INFORMATION INCLUDING TECHNICAL REPORTS
Appendix E	SCHEDULE OF LANDS
Appendix F	ASSESSED ASSOCIATED, NEIGHBOUR AND NON-ASSOCIATED DWELLINGS

# 1. INTRODUCTION

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*This Amendment Report has been prepared by James Bailey & Associates (JBA) on behalf of Epuron Projects Pty Ltd (the Proponent) in relation to the Bowmans Creek Wind Farm Development Application currently under assessment (The Project). This document details the amendments that are proposed to the Project in response to issues raised in submissions and to improve its overall design.*

*This document should be read in conjunction with the Submissions Report, which has been prepared to respond to issues raised in submissions during the public exhibition of the Bowmans Creek Wind Farm Environmental Impact Statement March 2021 (EIS).*

## 1.1 BACKGROUND

The Proponent is seeking approval for the construction, operation, maintenance and decommissioning of the Project which is generally located at Bowmans Creek, approximately 10 km east of Muswellbrook and 120 km north-west of the Port of Newcastle in NSW (**Figure 1**).

The EIS was prepared in consideration of the *Preparing an Environmental Impact Statement Guideline* (DPE, and the *NSW Wind Energy Framework* (DPE, 2019) and supported applications for both State Significant Development Consent (SSD) under Division 4.7 of Part 4 of the *Environmental Planning & Assessment Act 1979* (**SSD 10315**); and an Environment Protection and Biodiversity Conservation Approval under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (**Referral 2020/8631**).

The EIS was placed on public exhibition between 31 March 2021 and 11 May 2021. During this period 166 submissions were received from stakeholders, including 19 from government agencies and 148 from members of the public. A Submissions Report (James Bailey & Associates (JBA), 2021) has been prepared to respond to the issues raised by these stakeholders.

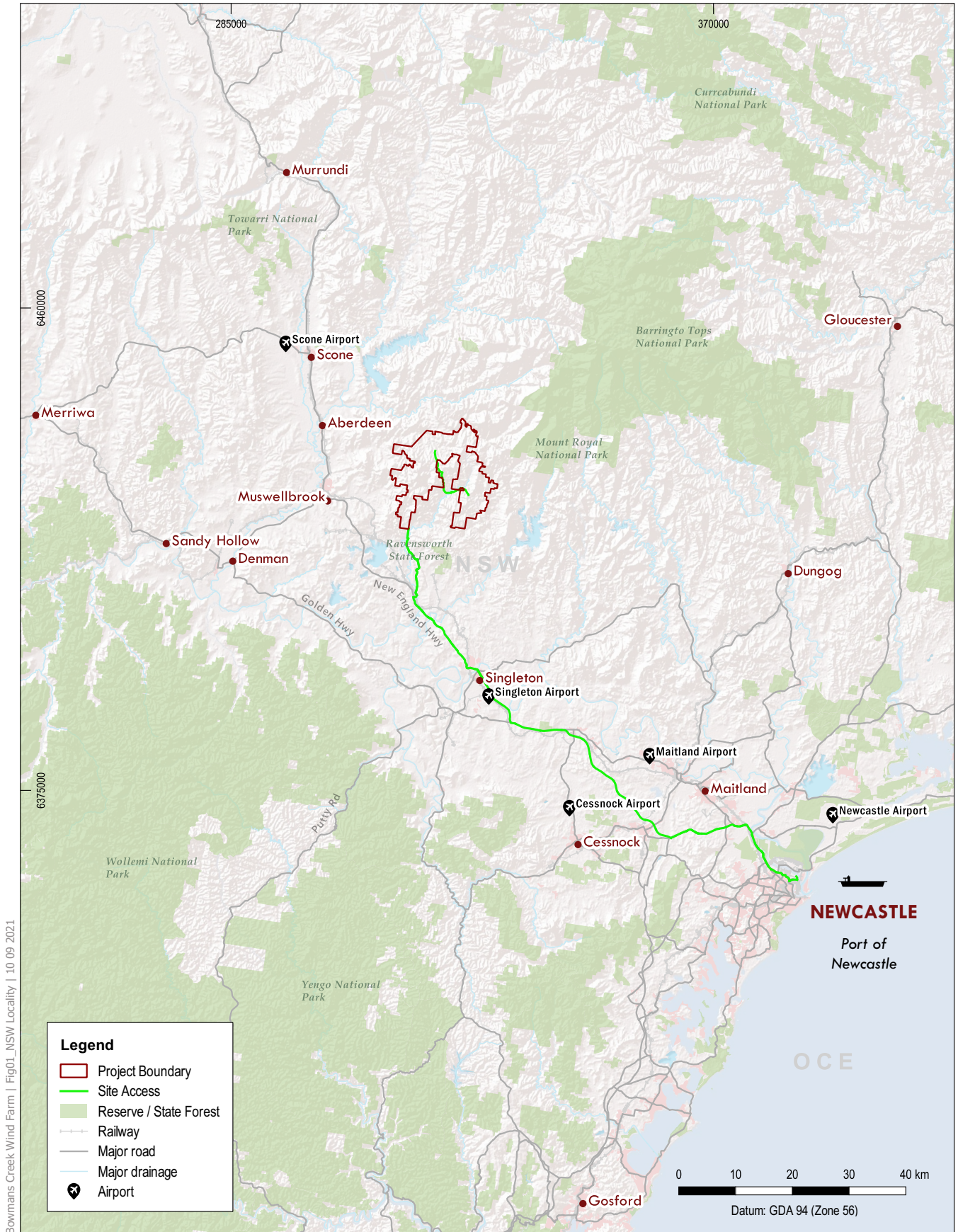
In addition to this, in response to submissions and further detailed planning, several refinements are proposed to the project layout. This includes removing four wind turbine generators (WTGs), relocating three others as well as removing a section of access tracks and power reticulation infrastructure along with the minor repositioning of other lineal infrastructure, to reduce ecological, visual and other impacts.

Under Section 55 of Division 1 of Part 6 of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation), an application can be amended or varied, with the agreement of the Planning Secretary, at any time before it is determined. A request to amend the Project was lodged with the Planning Secretary on 8 September 2021.

This Amendment Report has been prepared generally in accordance with the *'State Significant Development Guidelines – Preparing an Amendment Report'* (Guidelines). As required by the Guidelines, an updated Project Description (in its entirety) is included in **Appendix A**, the updated Statutory Compliance Table is included in **Appendix B**, Updated Mitigation Measures are included in **Appendix C** and additional supporting information is provided in **Appendix D**.



Source: Airports courtesy of Oz runways (Airservices Aust), Oz Runways, WAC Chart, 9 October 2019; World Shaded Relief © Esri



Bowmans Creek Wind Farm | Fig01\_NSW Locality | 10 09 2021

BOWMANS CREEK WIND FARM



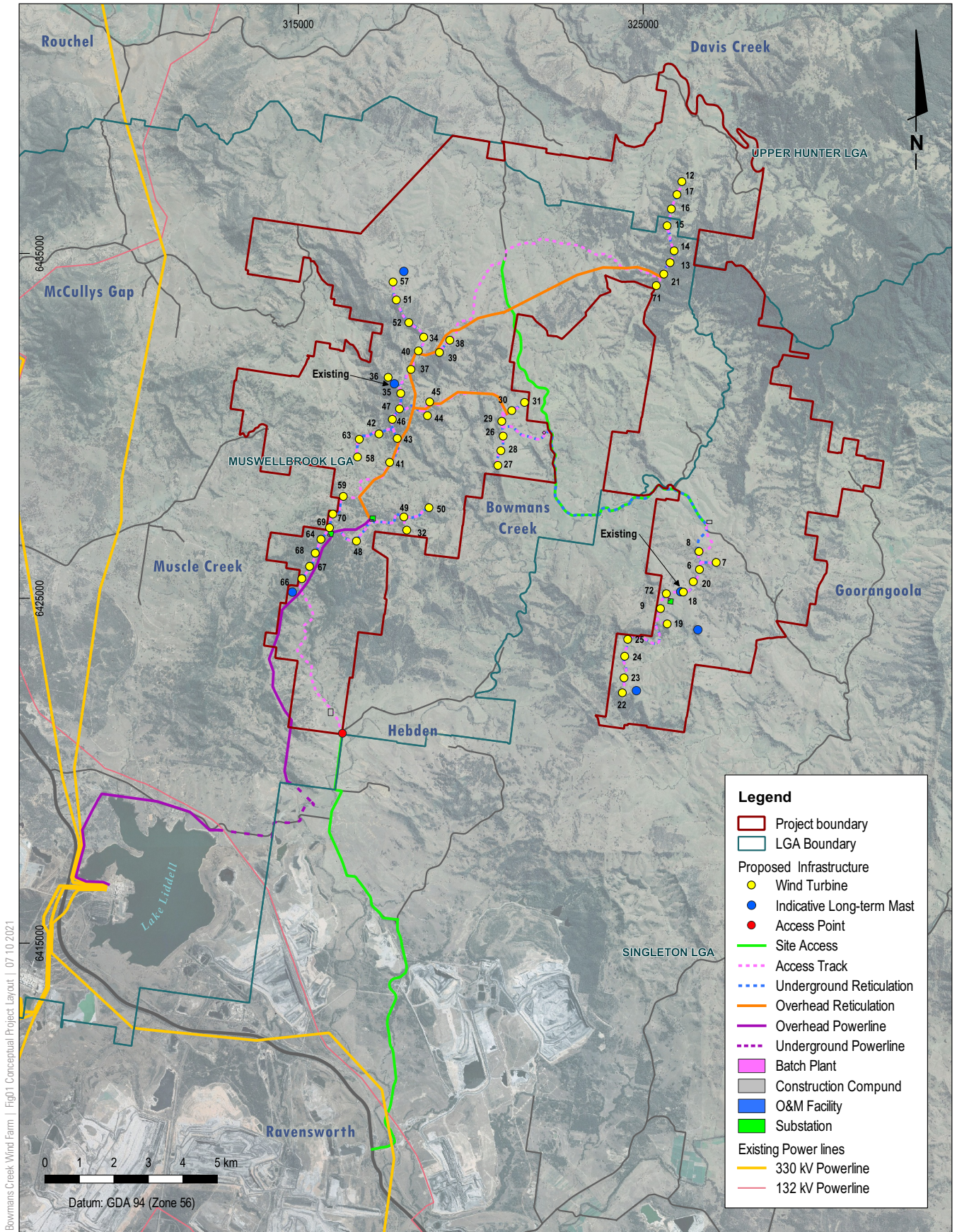
## 1.2 PROJECT AMENDMENTS

A number of amendments are proposed to the Project layout, which will result in a net decrease in the area to be disturbed and an overall improved environmental and community outcome. The proposed amendments include:

- Deletion of WTG 10, 33, 60, 61;
- Re-siting of WTG 8, 9 and 32;
- Minor adjustments of several WTGs (micro siting up to 100m);
- Removal and relocation of site access tracks (net 15.4 km reduction);
- A 10.4 km net lineal reduction in underground power reticulation;
- A 13.5 km net lineal reduction in overhead power reticulation; and
- An overall reduction of the Project footprint by approximately 97.6 ha.

A detailed description of the proposed amendments is included in **Section 3** below and illustrated in **Figure 2**.





BOWMANS CREEK WIND FARM

Conceptual Project Layout

FIGURE 2



## 2. STRATEGIC CONTEXT

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*This section provides an overview of any changes to the existing environment, the environmental monitoring program in place, existing land use and/or land ownership, as a result of the proposed amendments to the Project. It also provides a discussion on any amendments to the key issues in the strategic context that are relevant to the assessment and evaluation of the merits of the Project. Section 2 of the EIS details the strategic context for the Project as initially proposed.*

### 2.1 GENERAL

The Project is in the Upper Hunter Valley Region, primarily on private freehold land in the Hunter River catchment. The region currently accommodates significant power generation by way of thermal coal mines and two operating coal fired power stations.

In November 2020, the entirety of the Hunter Region was identified as one of four Renewable Energy Zones to be established in NSW to support the NSW Government's Electricity Infrastructure Roadmap. The renewable energy sector is emerging with one solar, one pumped hydro and one wind farm project either in the assessment process or approved for construction.

The Project will not impact conservation areas or tourism facilities. Where impacts to land of high scenic value were identified, adequate mitigation measures for residual impacts have been committed to by the Proponent.

The Project will not impact Strategic Agricultural Land, State Forests, mineral resources, trigonometry stations, or existing or approved wind farms.

In consideration of the proposed closure of the Liddell Power Station prior to or within the early operational life of the Project, over 1,680 MW of generational capacity will be lost from the existing NSW electricity supply system. The 347 MW from the Project's 56 turbines, when fully operational will have the potential to replace part of this shortfall.

There is adequate capacity in the adjacent transmission network for the Project. The further proposed upgrades by TransGrid to the NSW electricity transmission system will ensure that there will not only be capacity for the Project but for multiple other projects to be progressed.

### 2.2 NATURAL ENVIRONMENT AND EXISTING LAND USE

There have been no material changes to the natural environment or existing land use, as described in Section 2.1 and Section 2.3 of the EIS respectively.

The Project is located within the bioregions of the Sydney Basin and NSW North Coast, with the topography ranging between 135 metres (m) Australian Height Datum (AHD) in the valley floors up to 786m AHD in the escarpments and steeper slopes. Bowmans Creek is the major drainage line within the Project Boundary and delivers water to the Goorangoola Creek to the south. Prevailing winds are from the south-east in summer, north-west in winter and from both directions in spring and autumn.

The area within the Project Boundary remains unchanged at 16,720 hectares (ha). However, the area to be directly disturbed by the Project has reduced from 515 ha to 417 ha (from 3% of this area to less than 2.5%). Much of the land within the Project Boundary is privately owned freehold land, across multiple agricultural properties, which is predominantly used for beef cattle grazing. The contractions to the Project have ensured that all discrete Crown Land parcels are now avoided with only paper roads and watercourses bisected by lineal infrastructure associated with the Project.

The land is comprised of a series of ridges, valleys and gullies. The extent of wooded areas varies from property to property depending on the individual land management practices of existing and previous land managers/owners. Historically, extensive land clearing has occurred within the landscape for agricultural uses as well as the development of open cut coal mines.

AGL Macquarie's Liddell and Bayswater Power Stations are located 10 km south-west of the Project Boundary. There are also three operating coal mines: Muswellbrook Coal Mine located 7km west of the Project Boundary; Liddell Coal Mine located approximately 7km south of the Project; and Mount Owen Continued Operations, which is located 8km south of the Project Boundary. Two quarries: SCE (Hebden) Quarry and East Quarry are also located 3km and 2km south respectively from the Project Boundary. The Queensland-Hunter Gas Pipeline (Q-H Pipeline), which is approved but not yet constructed, also encroaches into the southern section of the Project Boundary.

All town centres are located at significant distances from the Project. The Muswellbrook town centre is located 12 km west of the Project Boundary. The Singleton town centre is located 25 km south-east of the Project Boundary. The Scone town centre is located 22 km north-west of the Project Boundary.

## 2.3 EXISTING MONITORING PROGRAM

Section 2.2 of the EIS provides an outline of the monitoring program in place for the Project. Two wind masts and four SoDARs have been installed to measure wind speed, wind direction, air pressure and temperature. These continue to be utilised to inform the detailed siting of the wind turbines and layout for the Project. Approval is sought for the continued use of the two temporary wind masts and the installation of a further four wind monitoring masts as part of the Project.

## 2.4 LAND OWNERSHIP

The refinements of the Project will result in some changes to land that will be utilised and/or accessed. The majority of the land within the Project Boundary is freehold land, as illustrated on **Figure 3** and listed in **Appendix E**.

Although initially proposed as part of the Project, all discrete Crown Land parcels will now be avoided. Local public roads will be utilised for access and some unformed Crown Roads (paper roads) will be crossed by access tracks and power lines.

Section 2.4.2 of the EIS describes the private landholders within the vicinity of the Project as:

- **Associated (Host) Landholders:** owners and occupiers of land proposed to host WTGs or related infrastructure, and owners and occupiers of land required for access during construction and/or operation;
- **Neighbour Landholders (Neighbours):** are private landholders with a dwelling less than 3 km from a proposed WTG location. Neighbour Agreements have been offered to these landholders where required, to address specific issues raised by individual landowners or to mitigate the impacts identified in Specialist Assessment Reports; and
- **Non-Associated Landholders:** are private landholders where the residence is greater than 3 km from the closest WTG, the landholder is not associated with hosting Project infrastructure, or a neighbour agreement as described above is not in place with the landholder.
- **A Neighbour Benefit Program** has also been developed to share the benefits of the Project with Non-Associated Landholders. The Neighbour Benefit Program consists of an electricity grant/rebate offer, which will be open to all eligible dwellings on a voluntary basis. This was initially being offered to landholders within 3 – 4.4 km of the closest proposed WTG location, where no other agreement exists, however following the receipt of a number of submissions from private landholders, the Neighbour Benefit Program will now be extended to landholders located up to 5 km from a WTG.

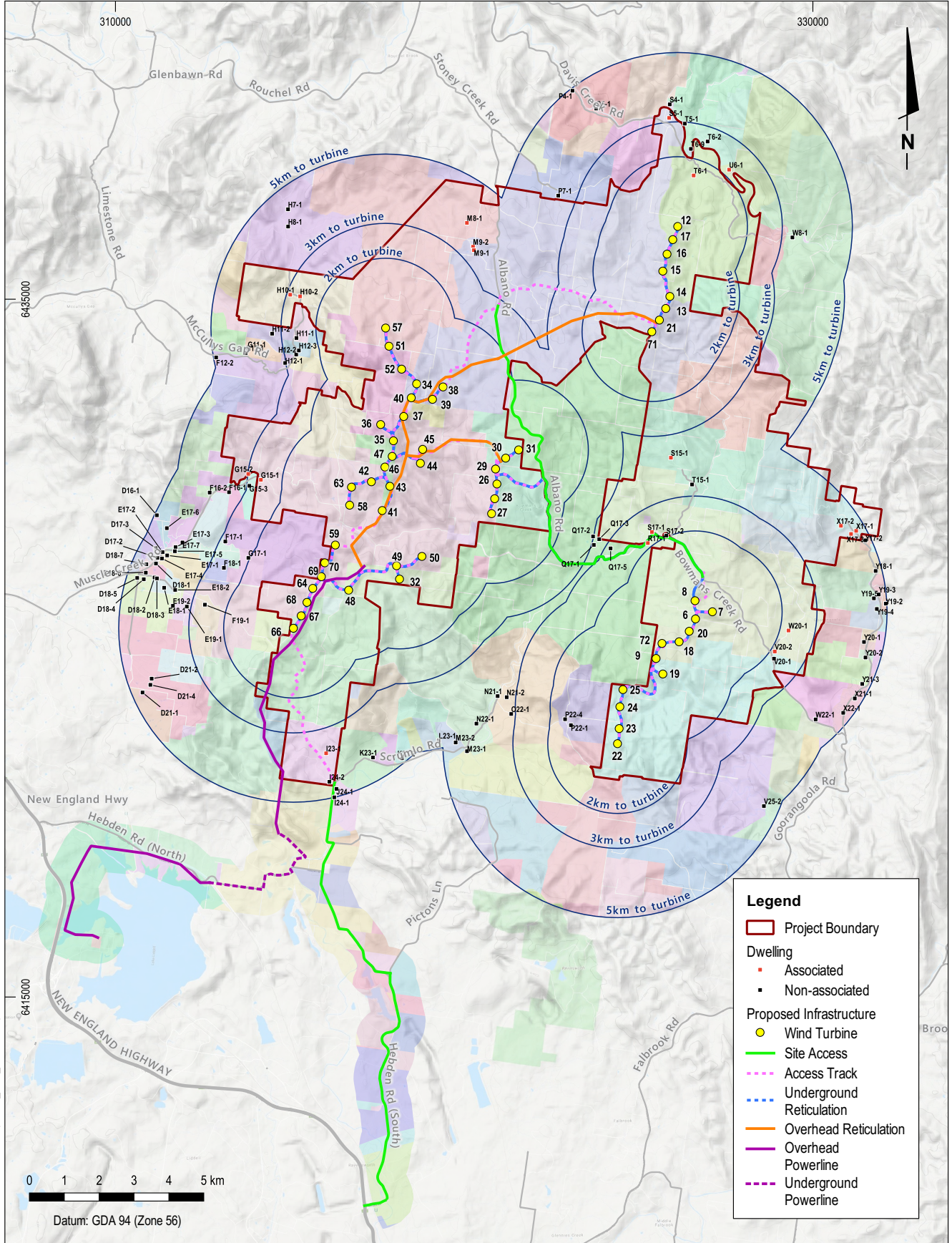
**Table 1** includes a summary of the number of landholders located within 5 km of a WTG. There are a total of 93 landholders with one or more dwellings within 5 km of a WTG. Of these 93, 69 landholders have dwellings that are greater than 3km but less than 5 km from a WTG. There are 9 of these who are Associated Landholders. There are 27 dwellings that are within 3 km of a WTG, with 10 of these Associated Host Landholders. **Appendix F** includes a list of all the dwellings within 5 km of a WTG with the distance to the closest WTG for each noted.

Agreements have been offered to Associated and Neighbour Landholders listed in **Appendix F** as described above.

**Table 1** Number of Landholders within 5 km of a WTG

Landholder Category	No. Landholders < 3km	No. Landholders 3 km – 5 km	Total
Associated Host Landholders	10	9	19
Neighbour Landholders	14	-	14
Neighbour Benefit Program	-	60	60
<b>TOTAL</b>	<b>24</b>	<b>69</b>	<b>93</b>





Bowmans Creek Wind Farm | Fig04\_Land\_Ownership | 08.10.2021

BOWMANS CREEK WIND FARM

## 2.5 GOVERNMENT PLANS, POLICIES AND GUIDELINES

The *NSW Climate Change Policy Framework* (OEH, 2016) outlines the NSW Government's role in reducing and managing the impacts of climate change. As a renewable energy development, the Project will assist NSW in managing these impacts.

The *Hunter Regional Plan* (DPIE 2036) outlines the NSW Government's land use planning priorities for the Hunter Region over the next 20 years and provides direction for regional planning decisions. The Hunter Regional Plan forecasts that the region's mining and energy industries will be affected by changing global and national policies. The further development of the region's alternative energy resources as proposed by the Project will enable the Upper Hunter to respond to new and emerging opportunities.

The Project also falls within one of four 'Renewable Energy Zones' where the NSW Government has committed to supporting the development of renewable energy projects.

The Hunter Region has the solar, wind and geothermal resources required for the development of large-scale renewable energy projects. As such, the Hunter Region has the potential to become a major renewable energy hub.

Land within the Project Boundary is zoned 'RU1 – Primary Production' (where electricity generation is permissible with consent) in each of the Upper Hunter, Muswellbrook and Singleton LGA's.

Upper Hunter Shire Council's sustainable development policies encourage and support renewable energy and a diverse economy. The Hunter Regional Plan recognises the Local Government Area as part of the 'Upper Hunter Green Energy Precinct' that has the potential to support renewable energy projects that will assist in the State's direction to grow and diversify the energy sector. The Upper Hunter Shire Council has prepared a 'Climate Emergency Declaration' which commits it to being carbon neutral by 2030. It's stated aim is to source an increasing proportion of its energy from renewable sources.

Muswellbrook Shire Council's environmental sustainability goals include support for state and federal climate change initiatives. Policies include the encouragement of renewable energy, shifting to alternate renewable energies such as wind, as well as diversification of future employment opportunities.

Singleton Shire Council's policies indicate that in order to minimise impacts on employment rates from downturns in the mining industry steps need to be taken to grow other industries in the Local Government Area, so as to better balance the local industry base. Their policies aim to promote increased use of renewable energy sources and to be at the forefront of alternate energy initiatives in partnership with industry resulting in the creation of an alternate energy hub at Singleton.

## 2.6 AUSTRALIAN RENEWABLES INDUSTRY

The Australian Energy Market Operator released its main system planning document, the '*Integrated System Plan*' in July 2020.

The July 2020 Integrated System Plan states the factors that underline the need for the Project. The most important are:

- Electricity demand in the National Electricity Market is expected to remain generally constant throughout the period to 2040. While there is projected to be underlying growth in consumption across the NEM, this will be offset via continued investment in distributed photovoltaic and extension of the NSW Energy Saving Scheme.
- While overall grid consumption is being held constant, new generation capacity is needed to replace retiring plants. To fill that gap, AEMO forecasts that Australia should invest in a further 26-50 GW of new large-scale variable renewable energy beyond existing, committed and anticipated projects; and

- An optimal split of new solar and wind variable renewable energy would minimise the need for dispatchable storage and generation and therefore keep costs down for consumers.

A change in Government policy settings, coupled with innovation and technological advancements is driving the growth and diversification of the Hunter Region's energy industries with a focus on both energy efficiency and the generation of renewable energy.

With the scheduled closure of Liddell and Bayswater Power Stations in 2022 and 2035 respectively, a successful transition from a heavy reliance on fossil fuels to the generation of more clean energy will contribute to the Upper Hunter's continued socio-economic wellbeing and the achievement of the NSW Governments policies and guidelines in relation to reducing and managing the impacts of climate change.



## 3. PROJECT AMENDMENTS

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### 3.1 AMENDED PROJECT DESCRIPTION

#### 3.1.1 Overview

The Project will involve the construction, operation, maintenance and decommissioning of the Bowmans Creek Wind Farm. The Project as amended, will include:

- 56 WTGs (reduced from 60) consisting of:
  - A three-blade rotor and nacelle mounted onto a tubular tower;
  - Crane hardstand area; and
  - Laydown area;
- Electrical infrastructure:
  - Up to two collector substations and associated transmission line to transmit the generated electricity into the existing high voltage network; and
  - Connections between the WTGs and the collector substation/s, which will include a combination of underground cables and overhead powerlines;
- Ancillary infrastructure;
  - Office and Maintenance (O&M) Facility;
  - Storage facilities and laydown areas;
  - Unsealed access tracks;
  - Ongoing use of two temporary wind monitoring masts and the installation of up to four other permanent monitoring masts; and
  - Temporary construction facilities (including concrete batching plant and rock crushing facilities);
- Minor upgrades to the road network to facilitate delivery of oversize over mass (OSOM) loads (such as WTG components) to the site and to facilitate the construction of a transmission line; and
- Administrative activities (including boundary adjustments and subdivisions).

The proposed amendments to the Project include the deletion or relocation of several WTGs as well as the relocation or reduction of access tracks and the underground/ overhead reticulation. These changes will result in an overall reduction in the project disturbance footprint of approximately 98 ha.

The Project Boundary includes the majority of the key components of the Project. Additional Project components that are external to the Project Boundary include road upgrades (see Section 3.6 of the EIS) and a transmission line that connects the Project to the NSW electricity grid via the TransGrid Liddell Switching Station. There are no amendments proposed to these components of the Project. The proposed amendments all fall within the Project Boundary. **Figure 2** illustrates these project components, including the amended project layout.

**Table 2** below provides an overview of the proposed amendments in comparison to the original project described in the EIS (refer to Section 3 of the EIS). An updated consolidated Detailed Project Description incorporating the proposed amendments is included in **Appendix A**.

**Table 2 Comparison of EIS Project to Amended Project**

Element	Original Project	Amended Project
<b>Project Area</b>		
Within Project Boundary (ha)	~16,720	~16,720
Disturbance Footprint (ha)	~515	~ 417
Survey Area	Encompasses an area of 1,192.5 ha. Figure 2 in Appendix A illustrates the Survey Area utilised for field assessments	
<b>Project Layout &amp; Design</b>		
Wind Turbine Generator	60	56
Site Access Tracks (km)	67	51.6
Overhead Reticulation (km)	30	16.5
Underground Reticulation (km)	50	39.6
Overhead Transmission Line (km) to Liddell Substation	16.5	16.5
Underground Transmission Line (km) to Liddell Substation	4.5	4.5
Electrical Reticulation Infrastructure	<ul style="list-style-type: none"> <li>• Transmission Line to Liddell Substation (up to 330 kV voltage)</li> <li>• Two substations</li> <li>• Underground and overhead 22kV or 33kV electrical reticulation cabling from WTG sites to substations</li> </ul>	
Ancillary Infrastructure	<ul style="list-style-type: none"> <li>• O&amp;M Facility and associated communications equipment</li> <li>• Laydown areas</li> <li>• Two wind monitoring masts (temporary)</li> <li>• Up to four permanent monitoring masts</li> </ul>	
Temporary Construction Facilities	<ul style="list-style-type: none"> <li>• 2 construction compounds</li> <li>• 3 batching plant locations</li> <li>• Mobile crushing plants</li> </ul>	
Public Infrastructure Works	<ul style="list-style-type: none"> <li>• Upgrades to Hebden Road, Scrumlo Road and Albano/Bowmans Creek Road</li> <li>• Temporary road and infrastructure works from Newcastle Port to site entry</li> <li>• Connection to the electrical transmission network at Liddell substation</li> <li>• Associated communications or other public infrastructure relocations</li> </ul>	
<b>Project Schedule and Resources</b>		
Construction Timeline and Hours	<ul style="list-style-type: none"> <li>• Approximately 18 months</li> <li>• Generally, 7 am to 6 pm (weekdays) and 8 am to 1 pm (Saturday) for standard construction work (additional activities may be subject to an 'Out of Hours Protocol')</li> <li>• Blasting only between 9 am and 5 pm (weekdays) and 9 am to 1 pm (Saturdays). No blasting will occur on Sundays or public holidays.</li> </ul>	
Operational Hours	24 hours per day, 7 days a week	

Element	Original Project	Amended Project
Project Term	In perpetuity. The life cycle of an individual WTG is approximately 25 years.	
Workforce (full time equivalent personnel)	<ul style="list-style-type: none"> <li>Up to 156 construction personnel</li> <li>Up to 15 operational personnel</li> </ul>	
Capital Investment	~\$569 million	

### 3.1.2 Project Disturbance

Section 3.1.3 of the EIS provides indicative disturbance parameters used to calculate the maximum area of disturbance for the Project. These indicative disturbance parameters are reproduced in **Table 3** below. These parameters remain substantially the same for the amended Project. **Table 4** provides a summary of the indicative worst-case areas to be disturbed for the Project components (based on these parameters) for the amended Project in comparison to the EIS. The amended Project will result in a worst-case total area of disturbance of 417 ha compared to 515 ha initially proposed in the EIS. This represents a reduction of 98 ha or a 19 % decrease in the overall worst-case area to be disturbed.

**Table 3** Indicative Disturbance Parameters

Components	Indicative Disturbance
<b>Project Boundary</b>	
WTG footing and pad	30 m x 70 m
Access tracks	Variable (7 m – 50 m)
Underground reticulation	2 m (1 m from centre)
Overhead reticulation	29 m (14.5 m from centre)
O&M Facility / Substation / Batching plant / Construction compound	Polygon + 2 m
<b>External to Project Boundary</b>	
Road upgrades	Polygon + 2 m
Transmission line (overhead)	60 m (30 m from centre)
Transmission line (underground)	12 m (6 m from centre)

**Table 4 Comparison of Indicative Disturbance Between EIS Project and Amended Project**

Components	Indicative Disturbance Parameters (Area)	EIS Layout		Amended Layout	
		Indicative Disturbance Parameters (Length)	Total Disturbance Area (ha)	Indicative Disturbance Parameters (Length)	Total Disturbance Area (ha)
WTG Footing and Pad	30 m x 70 m	-	13	-	12.4
Access Tracks	Variable (7 m – 50 m)	67 km	295	51.6 km	240.2
Underground Reticulation	2 m (1 m from centre)	50 km	2	39.6 km	1.7
Overhead Reticulation	29 m (14.5 m from centre)	30 km	83	16.5 km	35
O&M Facility / Substation / Batching plant / Construction Compound	Polygon + 2 m	-	12	-	14.4
Transmission Line (overhead)	60 m (30 m from centre)	16.5 km	103	16.5 km	96.4
Transmission Line (underground)	12 m (6 m from centre)	4.5 km	Included in overhead portion	4.5 km	5.4
Road Upgrades	Polygon + 2 m	-	7	-	12
<b>TOTAL</b>			<b>515 ha</b>		<b>417</b>

## 3.2 PROJECT COMPONENTS

**Appendix A** provides a description of the amended Project including details of the WTG design, hardstand areas, operation and maintenance, and refurbishment as well as ancillary infrastructure, and other activities, as initially proposed in the EIS. There are no modifications proposed to any of these components of the Project. However, a number of WTGs are proposed to be relocated (or removed) for the amended Project along with the realignment of some access tracks and a section of overhead reticulation. These amendments are intended to:

- Avoid and where they can't be avoided, minimise adverse environmental impacts;
- Respond to and address stakeholder concerns;
- Maximise production of renewable energy within the constraints at hand; and
- Address practical limitations affecting the construction and operation of the wind farm.

As described in Section 3.3.2 of the EIS, 'micro-siting' of the WTGs may also be required for a number of WTGs during the detailed design and construction phase of the Project. As part of the process of determining the amendments to the Project some micro-siting has also been undertaken.

**Figure 4** to **Figure 7** provides an amplified aerial view of the amended layout of the WTGs for the northern, eastern, western, and southern quadrants of the Project Boundary. The amendments are discussed in more detail below.

### 3.2.1 Project Layout - Eastern

In the Eastern section of the Project Boundary, a number of modifications are proposed, as illustrated on **Figure 4**, including:

- Deletion of WTG 10;
- Re-siting of WTG 8, WTG 9 and the associated access track;
- Micro-siting of WTG 6 & 7 (within 100m);
- Realignment of the access track between WTG 19 and WTG 72 as well as WTG 19 to WTG 25; and
- Removal of access track from Albano Road to WTG 10.

### 3.2.2 Project Layout – Western

In the Western section of the Project Boundary, a number of modifications are required, as illustrated on **Figure 5**, including:

- Deletion of WTG 33, WTG 60 and WTG 61 and the associated access tracks;
- Re-siting of WTG 32;
- Micro-siting of WTG 49, WTG 27, WTG 28, WTG 26, WTG 29, WTG 30, WTG 31;
- Removal of access tracks connecting WTG 50 to WTG 28;
- Re-aligning of the access track and overhead reticulation from WTG 45 to WTG 30;
- Re-siting of O&M Facility; and
- Re-aligning overhead reticulation from WTG 59 to substation 1b.

### **3.2.3 Project Layout – Southern**

**Figure 6** shows the project components located in the southern section of the Project Boundary. This includes the location of the Site Access Point and Construction Compound 1. There are no changes proposed to these facilities or the associated access tracks.

### **3.2.4 Project Layout - Northern**

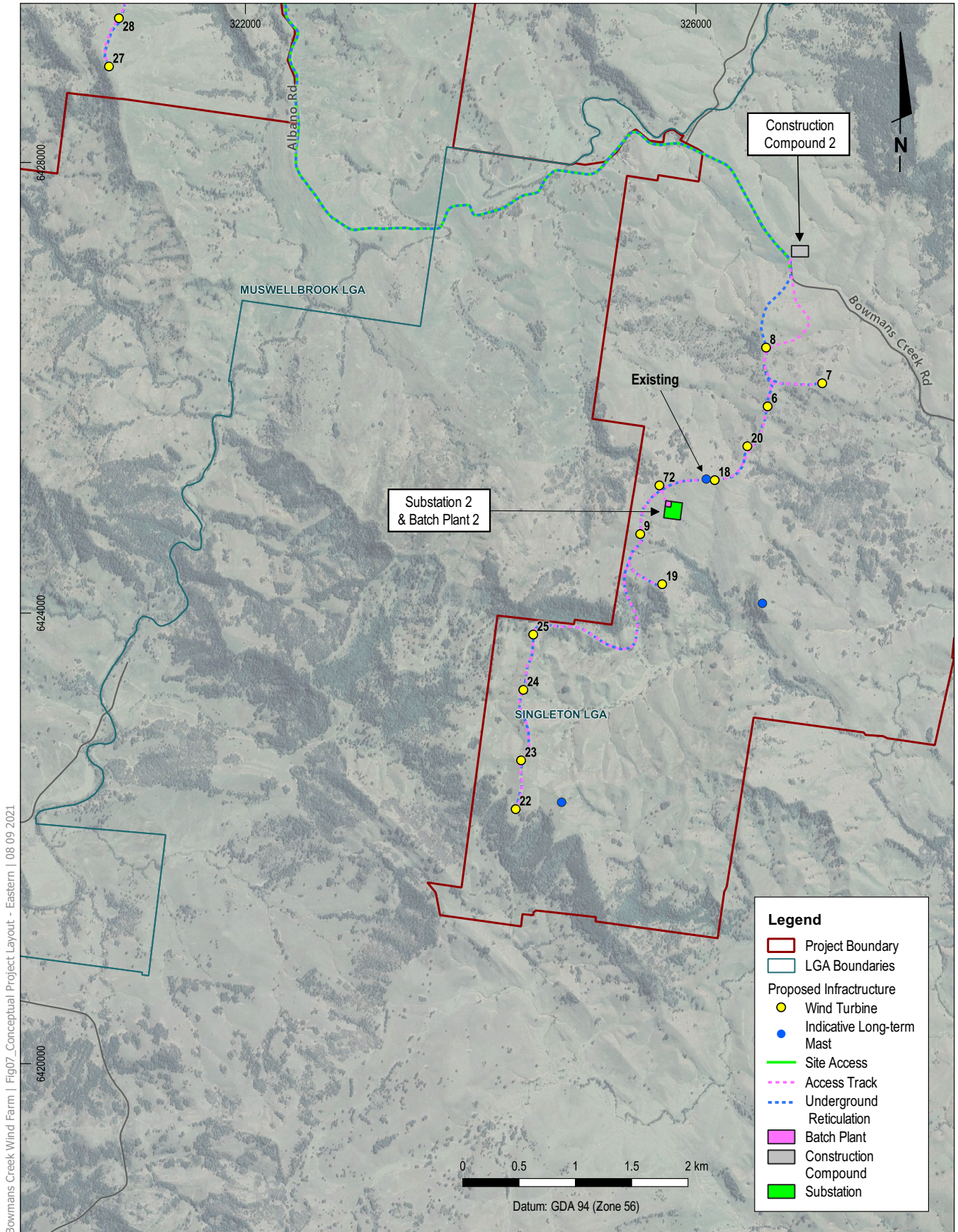
The Project layout within the Northern section of the Project is shown on **Figure 7**. A number of turbines have been micro-sited in this section, including WTG 71, WTG 21, WTG 13 and WTG 14. Further micro siting at detailed design may also be necessary.

The north-east overhead and underground power reticulation and associated access tracks have been removed between WTG 21 and Albano Road.

The underground and overhead power reticulation has also been realigned between WTG 21 west to WTG 39.



Source: Aerial ©2019 Google

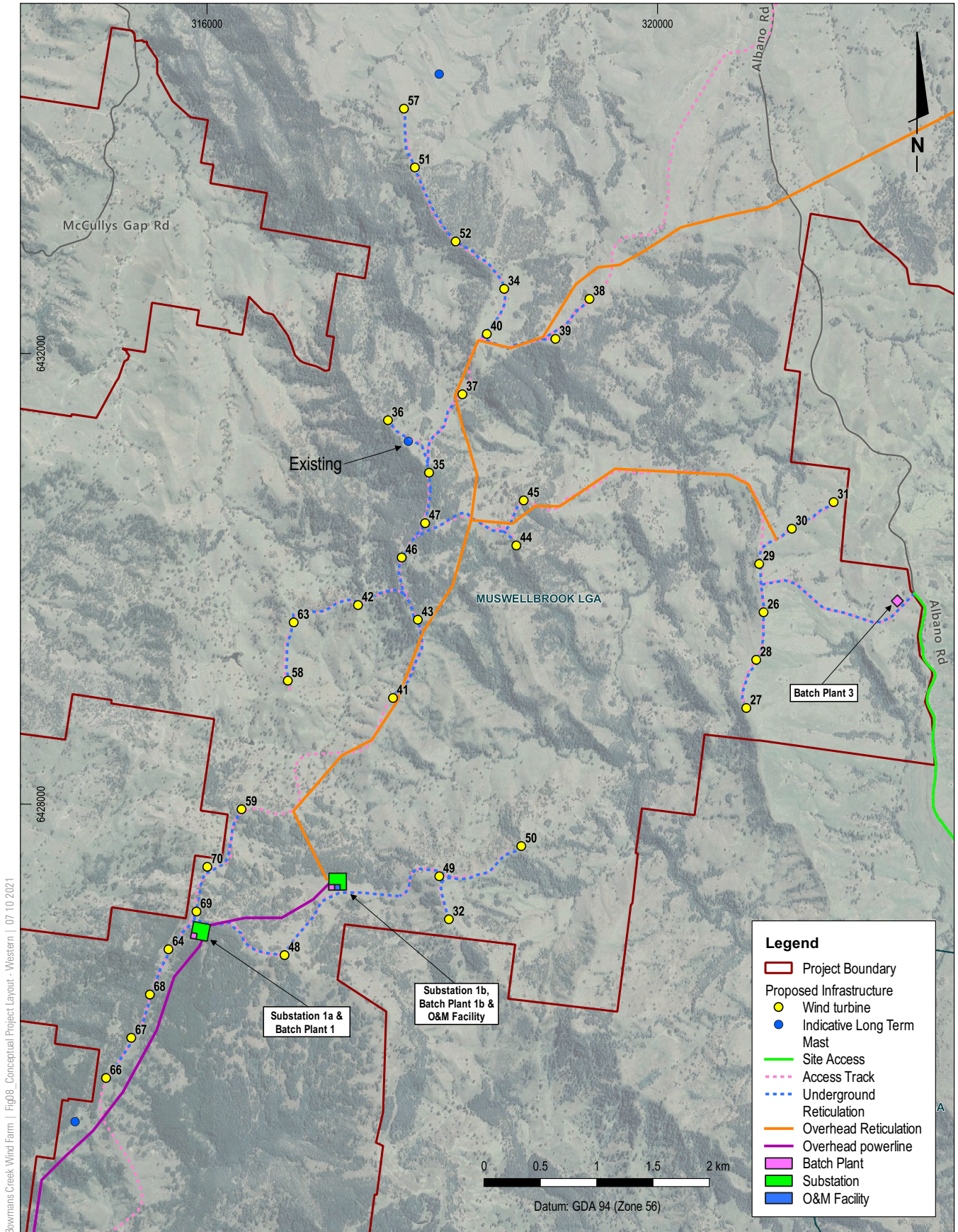


BOWMANS CREEK WIND FARM

Conceptual Project Layout - Eastern

FIGURE 4



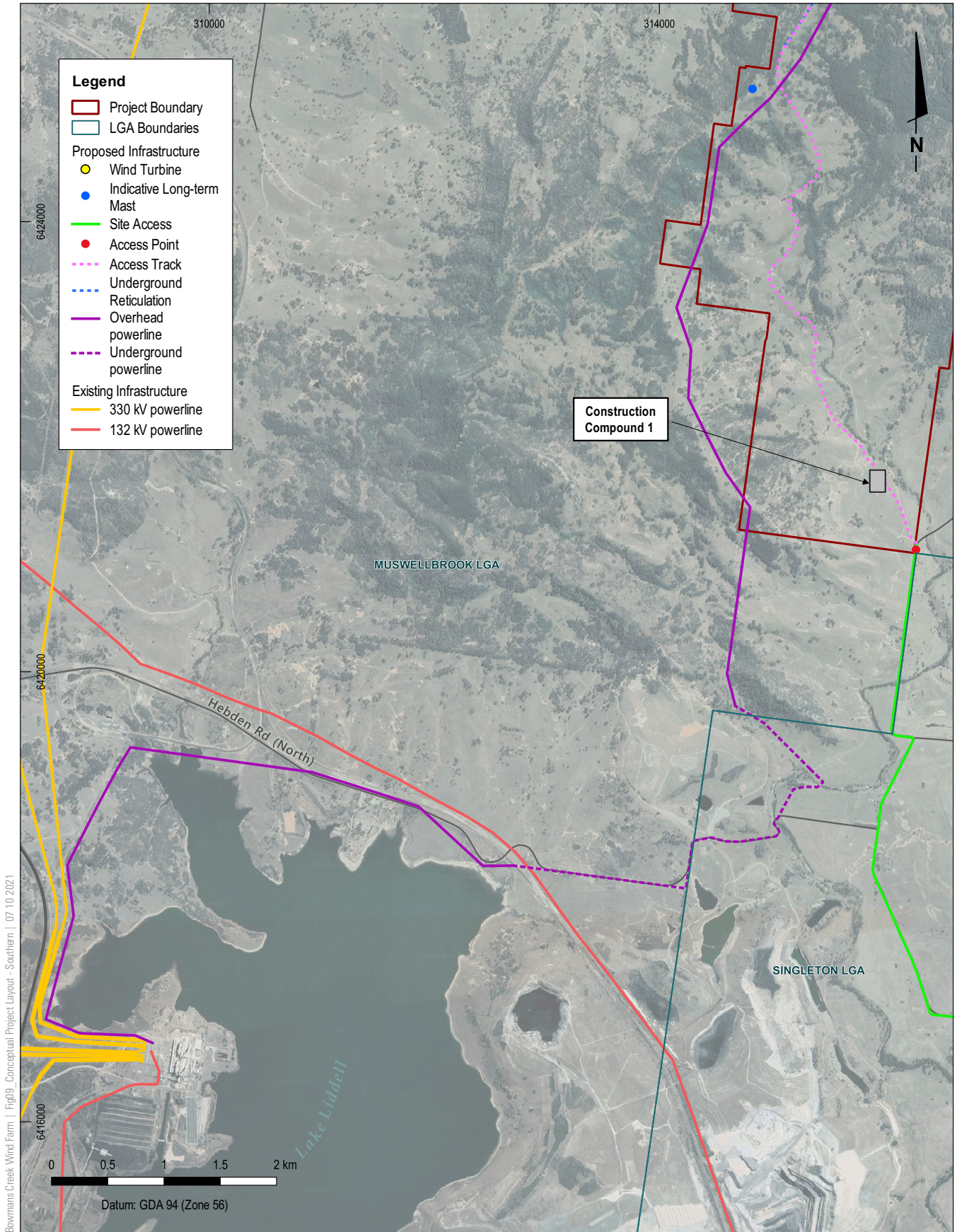


BOWMANS CREEK WIND FARM

Conceptual Project Layout - Western



Source: Aerial ©2019 Google

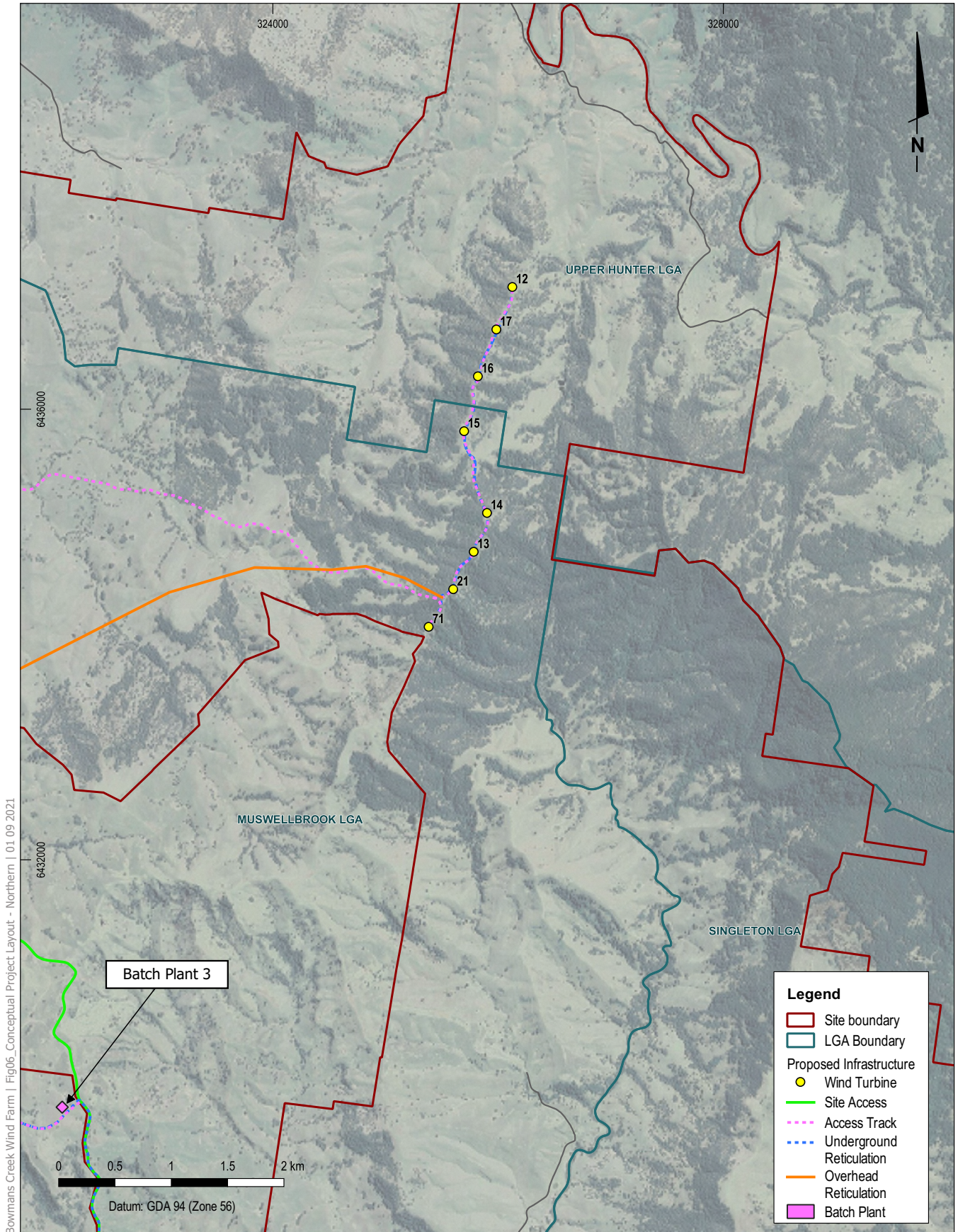


Bowmans Creek Wind Farm | Fig09: Conceptual Project Layout - Southern | 07 10 2021

BOWMANS CREEK WIND FARM



Source: Aerial ©2019 Google



BOWMANS CREEK WIND FARM

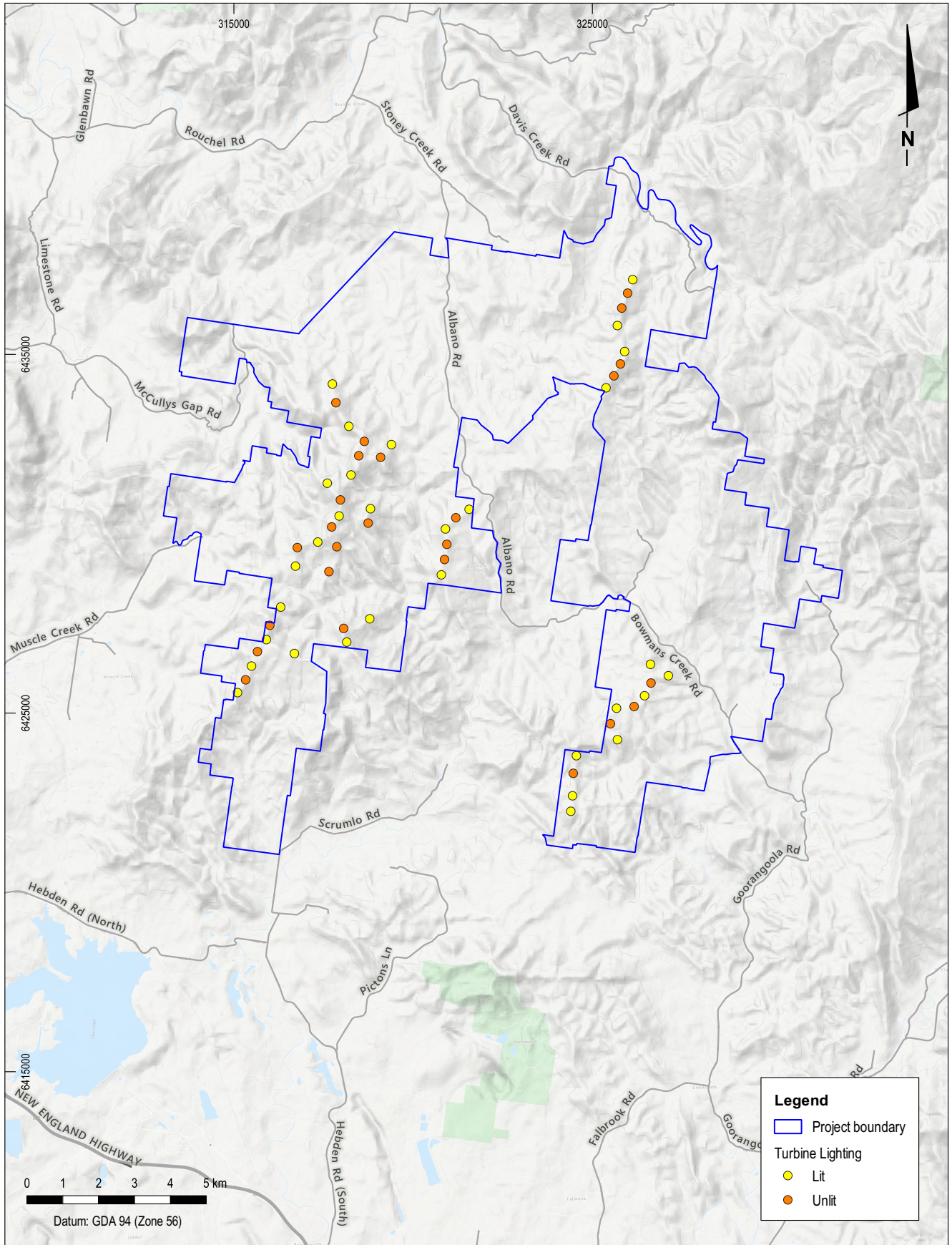
### **3.3 REQUIREMENT FOR OBSTACLE LIGHTING**

As a result of discussions held with CASA and DoD following the exhibition of the EIS, the Proponent expects that obstacle lighting may need to be installed.

A draft obstacle lighting layout plan which involves lighting at 31 of the 56 proposed turbine locations has been provided to CASA and DoD for review, as is illustrated in **Figure 8** below.



Source: Cadastre courtesy of the Spatial Collaboration Portal (accessed September 2021); Terrain



BOWMANS CREEK WIND FARM

Draft Lighting Plan

FIGURE 8

## 4. STATUTORY CONTEXT

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*This section identifies the relevant statutory requirements for assessing and evaluating the proposed amendments to the project.*

### 4.1 STATUTORY REQUIREMENTS

Section 4 of the EIS includes a description of the relevant state, local and federal legislation and policies relevant to the development of the Project. There have been no material changes to the statutory context since the EIS was exhibited. An amendment to the Environmental Planning and Assessment Regulation 2000 made on 1 July 2021 has facilitated the implementation of the Rapid Assessment Framework Policy and Guidelines for SSD Applications. This process is not scheduled to be fully implemented until December 2023. These proposed process changes do not trigger any new statutory requirements for the Project.

The Project constitutes State Significant Development in accordance with Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* and as such will require approval under Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979*.

Section 4.38 of the *Environmental Planning and Assessment Act 1979* states that development consent cannot be granted to a development that is wholly prohibited by an Environmental Planning Instrument. Clause 34 of the *State Environmental Planning Policy (Infrastructure) 2007* states that development for the purpose of electricity generating works may be carried out on any land in a prescribed rural, industrial or special use zone. The Project is located entirely on land zoned as RU1 – Primary Production which is a 'prescribed rural zone' for the purpose of Clause 34 of the *State Environmental Planning Policy (Infrastructure) 2007*. Therefore, the Project is permissible (with development consent) on the land on which it is proposed.

Under Section 55 of Division 1 of Part 6 of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation), an application can be amended or varied, with the agreement of the Planning Secretary, at any time before it is determined. This Amendment Report has been prepared generally in accordance with the *State Significant Development Guidelines – Preparing an Amendment Report* (DPIE, 2021c)

**Table B1** in **Appendix B** provides an updated Statutory Compliance Table. This table identifies the relevant statutory requirements for the Project (including any amendments) and indicates if they have been addressed in EIS and/or this Amendment Report.

## 5. STAKEHOLDER ENGAGEMENT

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### 5.1 COMMUNITY ENGAGEMENT

The Proponent has prepared and continues to implement a Stakeholder Engagement Plan (SEP) over the Project. The SEP has been developed consistent with NSW Government Policy and has been integrated into the various stages of the NSW planning approval's process. The SEP ensures that stakeholders are afforded multiple opportunities to comment and provide feedback on the Project during both structured and non-structured consultation processes.

Community engagement involves a combination of individual meetings and telephone calls, distribution of newsletters, letters and press releases, as well as hosting Community Information Sessions and the Bowmans Creek Community Consultative Committee (CCC).

During the exhibition period of the EIS the Proponent held two community open day sessions to both explain the finding contained within it and to understand any residual concerns that local residents held in relation to the Project. One of these was held at McCully's Gap Hall on the 15th April 2021 and the other at Hebden Hall on 16th April 2021.

The Bowmans Creek Community Consultative Committee (CCC) last met on the 14 April 2021 where the author of the EIS presented an overview of the document.

It has primarily been further face to face meetings that have occurred with both Near Neighbours and Associated Landholders that have resulted in the contractions and refinements of various elements of the Project that have culminated in the Project contractions.

Further details of community consultation undertaken since the EIS was exhibited is provided in Section 3.3.2 of the Submissions Report.

The proposed amendments will be presented to the CCC in early October 2021. Following this a newsletter will be distributed to the mailing list, which outlines the proposed contractions and other minor amendments to the Project.

### 5.2 REGULATORY AUTHORITIES

The proposed amendments to the Project have been discussed with DPIE, BCD, CASA and DoD. Details of this consultation is provided in Section 3.3.1 of the Submissions Report.

Consultation with regulatory authorities will be ongoing, as required, throughout the approvals assessment process.



## 6. ASSESSMENT OF IMPACTS

### 6.1 VISUAL IMPACT ASSESSMENT

A Landscape and Visual Impact Assessment (LVIA) was undertaken for the Project as exhibited, by Green Bean Design Pty Ltd (GBD) and included in full in Appendix H of the EIS. The LVIA was prepared in accordance with the *Wind Energy Visual Assessment Bulletin for State Significant Wind Energy Development* (DPIE, 2016c) (Visual Bulletin) and the SEARs. A LVIA Amended Report (GBD, 2021) has been completed to assess the revised visual impacts associated with the Project contractions and amendments. This is included in **Appendix D1**.

A summary of the key changes to the impact assessment findings, as well as management measures committed to by the Proponent are provided below.

#### 6.1.1 Impact Assessment

##### *Visual Performance Objectives*

The assessment of compliance with the Wind Bulletin Visual Performance Objectives for all Non-Associated dwellings located up to 4.4 km from a WTG has been updated to reflect the amended project. This is provided in Table A2 in the LVIA Amended Report (**Appendix D1**).

Figures 5 and 8, in **Appendix D1**, plot wind turbine visibility and the location of Non-Associated dwellings in relation to the 3 km black line and 4.4 km blue line thresholds derived from the Visual Bulletin.

A desktop review of the proposed amendments by GBD has concluded that there will be no increase in the overall impacts identified in the original LVIA. There are 15 Non-Associated dwellings that will benefit through changes to performance objectives, through an increase in distance between dwellings and wind turbines as well as a decrease in the number of multiple wind turbine 60 degree sectors visible. **Table 5** provides a summary of the changes to Sensitivity Levels, Visual Influence Zones and Multiple Wind Turbine Tool Assessment.

**Table 5** Summary of Visual Assessment Changes

Dwelling ID	Distance from Dwelling to Closest WTG (visible or not visible)	Change to Sensitivity Level	Change to Visual Influence Zone	Change to Multiple Wind Turbine Tool Assessment
F16-1	3.41 km Turbine 59	Level 2 unchanged	VIZ 2 unchanged	Unchanged
F16-2	3.82 km Turbine 70	Level 2 unchanged	VIZ 2 unchanged	Unchanged
F17-1	2.84 km Turbine 64	Level 2 unchanged	VIZ 2 unchanged	Unchanged
F18-1	2.58 km Turbine 68	Level 2 unchanged	VIZ 2 unchanged	Unchanged
G15-3	2.93 km Turbine 63	Changes from Level 1 to Level 2 due to relocation of turbines to > 2km from dwelling	Changes from VIZ 1 to VIZ2	Unchanged

Dwelling ID	Distance from Dwelling to Closest WTG (visible or not visible)	Change to Sensitivity Level	Change to Visual Influence Zone	Change to Multiple Wind Turbine Tool Assessment
G17-1	2.04 km Turbine 64	Changes from Level 1 to Level 2 due to confirmation of turbine distance at > 2km from dwelling	Changes from VIZ 1 to VIZ 2	Unchanged
L23-1	4.77 km Turbine 22	Level 2 unchanged	VIZ 2 unchanged	Changes from 2 60 degree sectors to 1 60 degree sector
M23-2 (M23-1)	4.64 km Turbine 22 (M23-1 at 4.32km)	Level 2 unchanged	VIZ 2 unchanged	Unchanged
N21-1	3.52 km Turbine 23 (N21-2 at 3.26km)	Level 2 unchanged	VIZ 2 unchanged	Unchanged
N22-1	4.10 km Turbine 22	Level 2 unchanged	VIZ 2 unchanged	Unchanged
O22-1	3.12 km Turbine 24	Level 2 unchanged	VIZ 2 unchanged	Unchanged
Q17-3 (Q17-1 and Q17-2)	3.2 km Turbine 27 (Q17-1 at 3.14km) (Q17-2 at 2.98km)	Level 2 unchanged	VIZ 2 unchanged	Changes from 4 60 degree sectors to 2 60 degree sectors
Q17-5	2.85 km Turbine 8	Level 2	VIZ 2	2 60 degree sectors
S17-2	2.04 km Turbine 8	Changes from Level 1 to Level 2 due to relocation of turbines to > 2km from dwelling	Changes from VIZ 1 to VIZ 2	Changes from 3 60 degree sectors to 2 60 degree sectors
T15-1	3.34 km Turbine 8	Level 2 unchanged	VIZ 2 unchanged	Unchanged

In summary the proposed WTG layout changes will result in 3 dwellings having a reduction in the number of 60 degree sectors with visible wind turbines and 3 dwellings being recategorised as VIZ 2 locations (from VIZ 1) due to an increase in distance between dwelling and closest wind turbine.

### **Visual Performance Evaluation - Scenic Locations / Public View Points**

No key public view locations were identified within 4.4 km of the WTGs. However, the assessment of scenic locations was undertaken for 16 public view-points and scenic locations to at least 8 km. Key public view locations beyond 4.4 km from the wind turbine locations which have been assessed as part of this Project are shown on Figure 28 and assessment findings are summarised in Table 19 of the EIS.



Photomontages taken from the following two locations have been reproduced in **Appendix D1** (as not to scale figures) to illustrate the change in view due to the deletion of WTG 60 and WTG 61:

- Inglewood Road, Muscle Creek PM1(A) BO1; and
- Eastbrook Links Muswellbrook PM2 BO14.

As can be seen from these figures the improvements to each visual catchment are minor in nature due to a number of factors including the distance to each turbine and the number of turbines in each view.

### **6.1.2 Obstacle Lighting**

As discussed in **Section 3.3**, CASA and DoD have indicated their preference for obstacle lighting to be installed on some of the WTG's. A draft Obstacle Lighting Plan has been prepared, which includes lighting of 31 of the 56 WTGs, as illustrated in **Figure 8**.

Further to the Aviation Hazard Lighting Assessment included in the LVIA (Appendix H of the EIS), a desktop review of the draft Obstacle Lighting Plan has been undertaken by GBD to assess the potential visual impacts associated with lighting the 31 towers. The review identified two Non-Associated dwellings (P22-1 and P22-4) that will be less than 2 km from two wind turbines with obstacle lighting. These two dwellings are subject to the offer of a Neighbour Agreement.

Mitigation measures to reduce visual impacts from obstacle lighting include:

- Reducing obstacle lighting intensity from medium (2000 candela) to low intensity (minimum 200 candela); and
- Establishing protocols that minimise the amount of time that the obstacle lights are energised. This might be on the basis of a photoelectric switch to energise the lights on the occurrence of low light conditions and not later than a fixed time (say 2300 h) or whenever the 'Restricted Area' is active (or when night flying is not likely to be conducted).

The abovementioned measures will be implemented if endorsed by CASA and DoD.

### **6.1.3 Mitigation and Management**

As outlined in Section 7.1.4 of the EIS, the following management and mitigation measures will be implemented to reduce potential visual impacts from the Project:

- Screening and other mitigation to Non-Associated dwellings as outlined in Table A2 in **Appendix D1**;
- During the detail design process, the following will be undertaken where reasonable and feasible:
  - Refinement in the design and layout to assist in the mitigation of bulk and height of proposed structures; and
  - A review of materials and colour finishes for selected components including the use of non-reflective finishes on structures.
- During construction, where reasonable and feasible:
  - Minimise tree removal and protect mature trees;
  - Avoid temporary light spill beyond the construction site where temporary lighting is required; and
  - Progressively rehabilitate disturbed areas.

- During operations, where reasonable and feasible:
  - Implementation of night lighting impact reduction techniques as detailed in a Night Lighting Management Plan to be prepared in consultation with CASA and DoD;
  - Ongoing maintenance and repair of constructed elements;
  - Replacement of damaged or missing constructed elements; and
  - Long term maintenance (and replacement as necessary) of vegetation within the Project Boundary to maintain visual filtering and screening of external views, as and where appropriate.
- Recolouring: white to off white colour (consistent with other Australian wind farms).

## 6.2 NOISE AND VIBRATION

A Noise and Vibration Impact Assessment (NIA) was undertaken for the Project (as exhibited), by Sonus Pty Ltd (Sonus) in accordance with the *Wind Energy Noise Assessment Bulletin for State Significant Wind Energy Development* (DPIE, 2016b) (Noise Bulletin) and Guidelines and Policies referred to in the SEARs. The NIA was presented in Appendix I of the EIS.

A supplementary report was prepared by Sonus to review the likely change to noise from the Project for the amended WTG locations and to provide further details on the predicted noise impacts from construction activities at the nearest dwellings. This report is included in **Appendix D2**.

### 6.2.1 Impact Assessment

#### *Closest WTG to Residences in Immediate Vicinity of the Wind Farm*

The separation distance to the closest WTG from the residence in the immediate vicinity of the wind farm is provided in **Table 6** below for the EIS and for the amended WTG locations; along with the predicted noise level from the EIS.

**Table 6 Dwelling Separation Distances from Closest WTG**

Residence ID	EIS			Amended WTG Locations		
	Closest WTG to Residence	Distance to closest WTG (m)	Highest Predicted Noise Level (dB(A))	Closest WTG to Residence	Distance to closest WTG (m)	Change in distance to closest WTG when compared to EIS
P22-1	23	1,381	36	23	1,388	7 m Further away
T6-1*	12	1,533	32	12	1,536	3 m Further away
P22-4	23	1,569	34	23	1,575	6 m Further away
S17-2	9	1,705	34	8	2,042	337 m Further away
G17-1	64	2,041	34	64	2,042	1 m Further away
V20-2*	7	2,148	31	7	2,122	26 m Closer
R17-1*	8	1,942	32	8	2,139	197 m Further away
U6-1*	12	2,197	28	12	2,199	2 m Further away
V20-1	7	2,246	31	7	2,221	25 m Closer

Residence ID	EIS			Amended WTG Locations		
	Closest WTG to Residence	Distance to closest WTG (m)	Highest Predicted Noise Level (dB(A))	Closest WTG to Residence	Distance to closest WTG (m)	Change in distance to closest WTG when compared to EIS
W20-1*	7	2,279	30	7	2,248	31 m Closer
T6-9	12	2,256	28	12	2,262	6 m Further away
S17-1*	8	2,116	32	8	2,331	215 m Further away
H12-3	57	2,570	29	57	2,570	No Change
H11-1	57	2,574	29	57	2,574	No Change
F18-1	68	2,580	31	68	2,580	No Change
T6-2	12	2,582	26	12	2,587	5 m Further away
G15-1*	60	1,696	34	63	2,606	910 m Further away
H10-2*	57	2,616	25	57	2,617	1 m Further away
F19-1	66	2,626	28	66	2,626	No Change
H12-2	51	2,672	29	51	2,672	No Change
F17-1	60	2,827	30	64	2,845	18 m Further away
H10-1*	57	2,898	25	57	2,898	No Change
G15-3	60	1,958	32	63	2,929	971 m Further away
T5-1	12	2,954	24	12	2,962	8 m Further away

\* Associated dwelling

Based on the above table, the closest WTG will remain the same or move further away from the residences in the immediate vicinity of the Project; except for residences V20-1, V20-2 and W20-1, where the closest WTG will move between 25 and 31 m closer.

### **Noise from the Amended Wind Farm Layout**

The noise from the WTGs depends on a range of factors, including the separation distance between the WTGs and the receiver.

As all of the assessment assumptions of the Sonus Assessment remain unchanged (with the exception of the WTG locations), the noise from the WTG's will likely reduce where the closest WTG is moved further from the residence.

For residences V20-1, V20-2 and W20-1, there is a marginal reduction in distance to the closest WTG (no more than 31m closer to the residences), but the change to the noise from this reduction in distance will be insignificant (less than 1 dB(A)).

When considering the above in combination with the noise predictions made as part of the EIS, the amended WTG locations are not expected to change the outcomes of the Sonus Assessment. That is, the noise levels generated by the WTGs under conditions most conducive to noise propagation will comply with the relevant noise criteria at all locations, except for P22-1 which marginally exceeds the criteria.



As noted in the Sonus Assessment, the noise criteria will be achieved at P22-1 by the implementation of a curtailment strategy whereby the relevant operating turbine(s) will operate in a "sound optimised" mode (at the wind speeds where the predictions indicate that the criteria will be exceeded) to achieve compliance with criteria in the absence of the reaching a Near Neighbour Agreement.

### **6.2.2 Mitigation and Management**

A written agreement will be sought with residence P22-1 prior to the commencement of construction to provide appropriate mitigation measures. If an agreement with residence P22-1 cannot be obtained, the Noise Bulletin criteria will be achieved by operating WTG T23 in a *Sound Optimised Mode So2* at integer wind speeds of gm/s.

Both a Construction and Operational Noise Management Plan will be implemented over the Project. Further, the procurement process will include a requirement for the final WTGs to be free of excessive levels of tonality.

## **6.3 BIODIVERSITY**

### **6.3.1 Background**

A Biodiversity Development Assessment Report (BDAR) was undertaken for the Project (as exhibited) by Cumberland Ecology. This was presented as Appendix L to the EIS. The BDAR has subsequently been updated to incorporate the proposed amendments and contractions to the Project. The updated BDAR is included in **Appendix D3** to this report.

The native vegetation that occurs across the Disturbance Area and wider Survey Area varies from patches of dry rainforest, open forest and woodland to derived native grassland (native-dominated grassland created from the clearing of forest or woodland). Some areas within the farming properties have been historically subject to pasture improvement, with areas of heavy grazing dominated by exotic pasture species.

The purpose of the BDAR attached, is to document the findings of an assessment undertaken for the amended Project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the Biodiversity Assessment Method (BAM).

A summary of the updated BDAR is presented below including key impact assessment findings, as well as revised management measures committed to by the Proponent. As per the requirements of the BAM, the BDAR defines the 'Subject Land' and 'Assessment Area' in addition to the 'Disturbance Area' and 'Survey Area'. These parameters are described below and are illustrated within the BDAR in **Appendix D3**.

### **6.3.2 Methodology**

The 'Survey Area' as defined for the preparation of this BDAR incorporates all areas considered for the development during in the EIS and the Project as amended by this Amendment Report, including conservative buffers around all Project components (including turbine locations to allow for micro-siting). It encompasses all areas of native vegetation that may be disturbed by the Project.

Within the Survey Area, a 'Disturbance Area' has been defined for the purposes of relevant BAM calculations. This incorporates areas subject to direct physical works for the amended project layout, including vegetation clearing, buffers for work zones around all proposed structures and infrastructure (including turbines, access roads, substations and powerlines) and areas of minor upgrades to existing roads. For the purposes of this assessment, the Disturbance Area comprises both the construction footprint and the operational footprint of the Project.

The proposed upgrades to existing roads comprise discrete areas within an existing public road corridor rather than works along the entire road corridor. The Project comprises a Wind Farm and therefore can be assessed as a linear development (see Section 3.9 of BDAR, Ref: BSM – 379). However, as linear developments require a continuous boundary and cannot comprise discrete development areas, as per advice received from the Biodiversity and Conservation Division (BCD) – Hunter Regional team, the discrete road polygons have been 'joined up' to create a continuous 'Subject Land' around a centreline for assessment as a linear development in accordance with the BAM (see Section 3.9 of BDAR, Ref: BSM – 852).

The Subject Land and Disturbance Area are largely the same across most of the Project. The only parts of the Subject Land that are excluded from the Disturbance Area comprise the sections of the existing public road that do not require any upgrades for the proposed transport route but were 'joined up' for the purposes of creating a continuous centreline for assessment buffers around a linear development in accordance with the requirements of the BAM.

The Subject Land covers a total area of ~444 ha while the Disturbance Area covers a total of ~417 ha. The Survey Area covers a total area of ~1,193 ha. The Survey Area, Subject Land and Disturbance Area are shown in Figure 4 of the BDAR (**Appendix D3**).

As the project comprises an SSD and the BDAR was significantly progressed under BAM 2017 as of 22 October 2020, this BDAR has been prepared in accordance with BAM 2017.

The preparation of this BDAR relied upon the database search and literature review conducted for the BDAR included in the EIS and the field work undertaken between September 2019 and February 2021 plus an additional field assessment conducted in August 2021 following consultation with BCD.

Updates to the BAM-C data between the submission of the EIS and the construct of the amended project layout Disturbance Area, resulted in two additional candidate flora credit species needing to be considered, notably *Prasophyllum petilum*/*Prasophyllum sp Wybong*. As the survey period for these species and other potential threatened flora species lie outside the delivery timeframe for the Assessment Report, no surveys were conducted, and consistent with the BAM, these species have been considered for assumed presence. (See Section 6.3 of the BDAR).

A strategy of assumption of presence with an allowance to subsequently submit a modification to reduce/remove species credit liability following the conduct of appropriate targeted surveys was discussed at a meeting with BCD on 17 June 2021. In accordance with the precedent set for prior SSD projects (as raised by BCD) presence has been assumed for several threatened flora species following detailed review of field data and TBDC profiles with justification provided in instances where species presence is not assumed (Section 6.3). Targeted surveys for the assumed species as well as other potential candidate species will be conducted, once detailed infrastructure micro-siting has been concluded, with a modification for any change in credit liability to be submitted accordingly.

Section 7.5.2 of the EIS provides a more detailed summary of the methodology utilised for the preparation of both BDARs. Additional detail is provided in the most recent BDAR prepared over the Project included as **Appendix D3** to this report.

### **6.3.3 Impact Assessment**

#### ***Landscape Features***

No important wetlands listed in the *Directory of Important Wetlands in Australia 2005* are present in the updated BDAR Disturbance Area, with the closest being the Barrington Tops Swamps located 30 km north-east. The main fauna corridor occurs in the north-eastern parts of the Survey Area. The vegetation in this corridor lies at the western extent of a band of dense vegetation that extends generally eastwards towards Mount Royal National Park. On a wider regional level, with the exception to the vegetation corridor in the north-east, the Survey Area has patchy or 'stepping-stone' connectivity to the north, west and east due to widespread clearing across large expanses of agricultural lands.

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the Survey Area. A small cliff in an area known as Yellow Rock (see Section 2.1 of the BDAR) is not located within the Disturbance Area but is present in the Survey Area in close proximity to a section of proposed underground reticulation.

No areas of outstanding biodiversity value have been mapped within the Survey Area.

### Native Vegetation

The native vegetation extent (including Derived Native Grassland (DNG)) within the Disturbance Area is shown in **Figure 9** and occupies 283 ha, which represents approximately 64% of the Disturbance Area. **Figure 10** to **Figure 13** provide insets (see **Figure 9** for locations) to illustrate additional detail, including: Eastern and Northern Areas; Western Areas; and transmission line and road widening areas.

The native vegetation extent comprises predominantly remnant vegetation, with some scattered occurrences of planted vegetation within the public road corridor and Crown land. The remaining areas is comprised of exotic/cleared areas, dams and water (Lake Liddell).

Identification of the Plant Community Types (PCTs) occurring within the Disturbance Area and wider Survey Area was guided by the results of the field surveys. The data collected during surveys of the Survey Area was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification Database.

The analysis determined that the native vegetation within the Survey Area aligns with 18 PCTs (15 of which occur in the Disturbance Area), as shown in **Table 7**. Previously all of the 18 PCTs identified fell within the Disturbance Area. Discussion on the justification for PCT selection and condition stage is included in the BDAR in **Appendix D3**. This section also includes a vegetation integrity assessment.

**Table 7 Plant Community Types within the Disturbance Area**

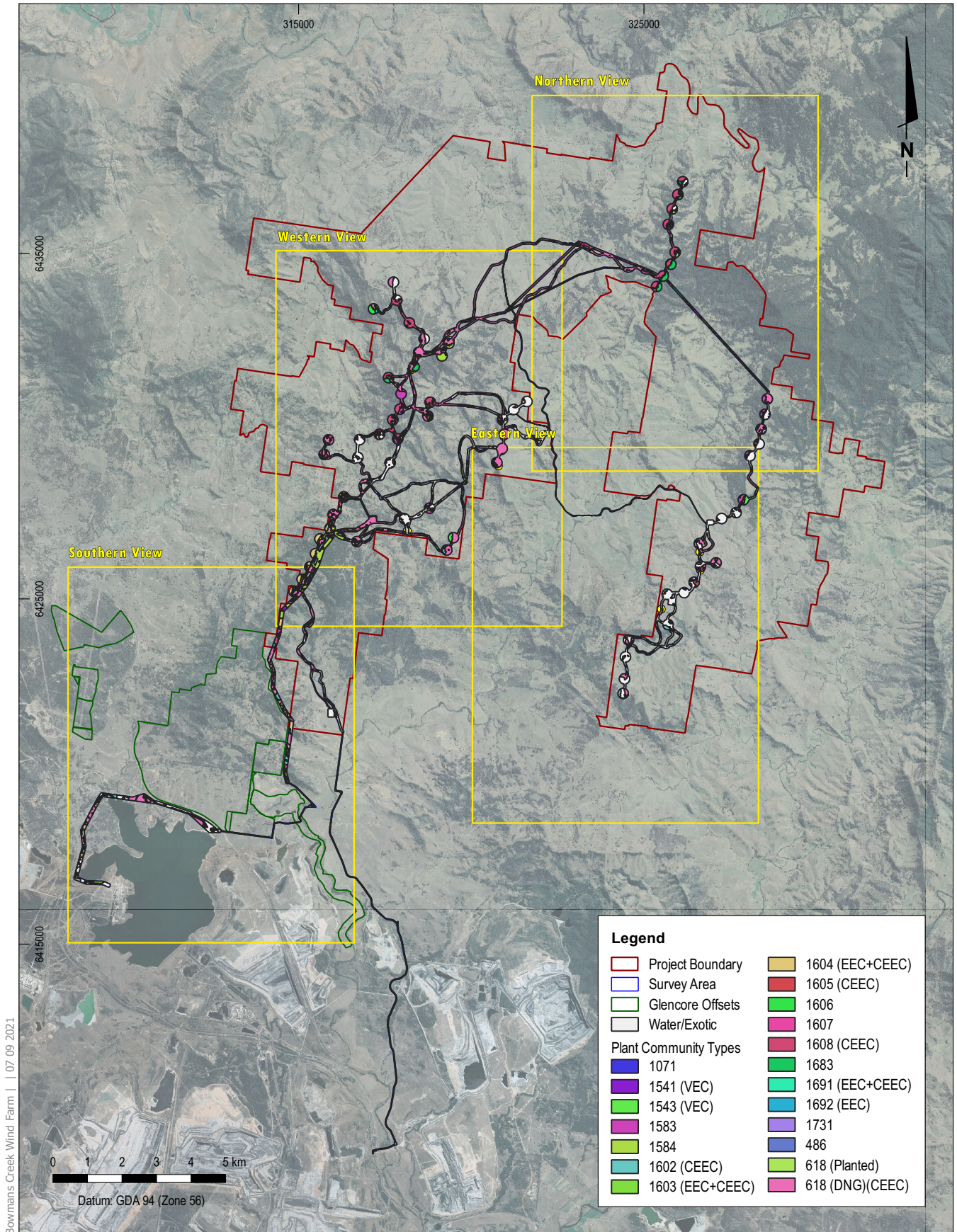
PCT	PCT Name	BC Act Status	EPBC Act Status	Survey Area (ha)	Disturbance Area
486	River Oak moist riparian tall open forest of the upper Hunter Valley, including Liverpool Range	-	-	5.86	1.05
1541	Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River	VEC – Lower Hunter Valley Dry Rainforest	-	1.84	1.40
1543	Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	VEC – Lower Hunter Valley Dry Rainforest	-	4.89	0.00
1583	Thin-leaved Stringybark - Grey Gum - Broad-leaved Apple shrub - grass tall open forest on ranges of the lower North Coast	-	-	29.84	4.80
1584	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	-	-	71.45	27.86



PCT	PCT Name	BC Act Status	EPBC Act Status	Survey Area (ha)	Disturbance Area
1683	Silvertop Stringybark - Tussock Grass grassy open forest of the Northern Tablelands escarpment and Barrington Tops	-	-	23.84	1.72
1602	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	-	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	26.55	7.79
1604	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	EEC – Central Hunter Grey Box – Ironbark Woodland	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	32.14	11.66
1605	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	-	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	1.37	0.00
1606	White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter	-	-	14.69	0.00
1607	Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	-	-	13.31	1.70
1608	Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter	CEEC – White Box - Yellow Box - Blakely's Red Gum Woodland and DNG (Woodland form)*	CEEC – White Box - Yellow Box - Blakely's Red Gum Woodland and DNG (Woodland form)	123.48	36.95
618 (DNG)	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley (derived native grassland)	CEEC – White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and DNG only*	CEEC – White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and DNG only	436.27	178.59
1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	EEC – Central Hunter Grey Box – Ironbark Woodland	CEEC – Central Hunter Valley Eucalypt Forest and Woodland	2.60	1.48

PCT	PCT Name	BC Act Status	EPBC Act Status	Survey Area (ha)	Disturbance Area
1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	EEC – Central Hunter Grey Box – Ironbark Woodland	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	2.69	1.93
1692	Bull Oak grassy woodland of the central Hunter Valley	EEC – Central Hunter Grey Box – Ironbark Woodland	-	0.24	0.07
1731	Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	-	-	1.46	0.88
1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	-	-	0.70	0.40
618 (Planted)	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the UHV (Planted form)	-	-	5.01	2.03





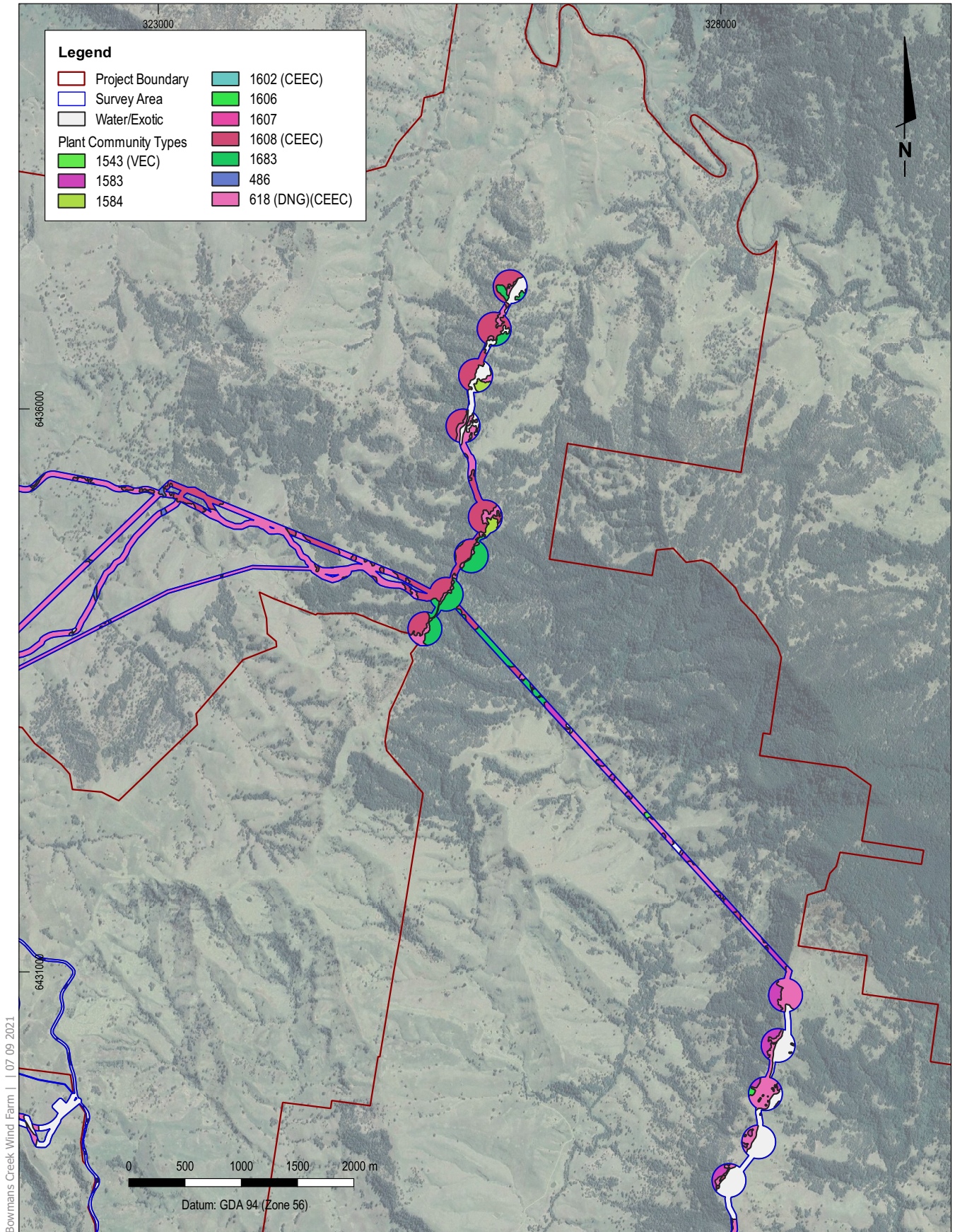
BOWMANS CREEK WIND FARM

Vegetation Communities

FIGURE 9



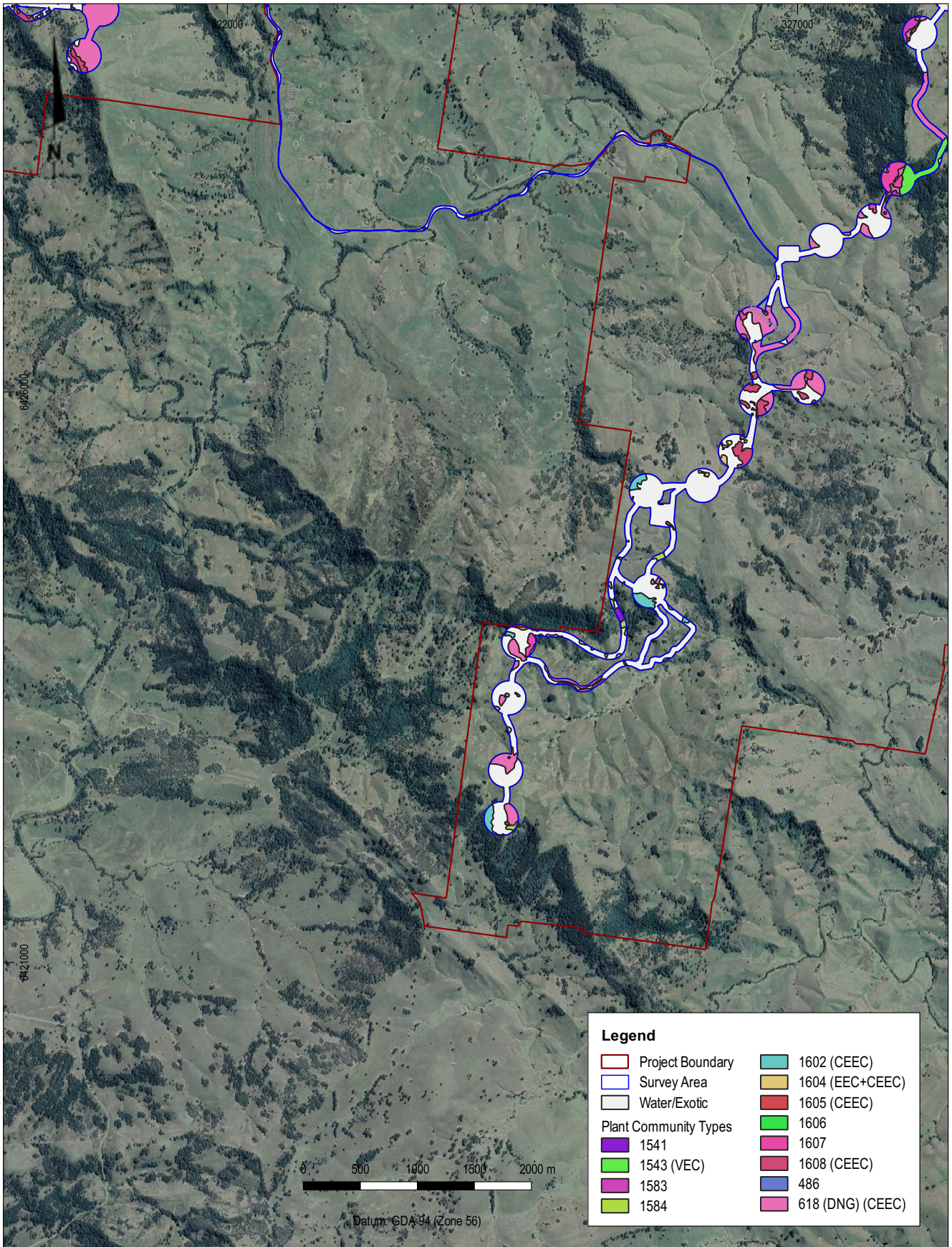
Source: Plant Community Types courtesy of Cumberland Ecology (2020); Aerial ©2019 Google



BOWMANS CREEK WIND FARM



Source: Plant Community Types courtesy of Cumberland Ecology (2020); Aerial ©2019 Google

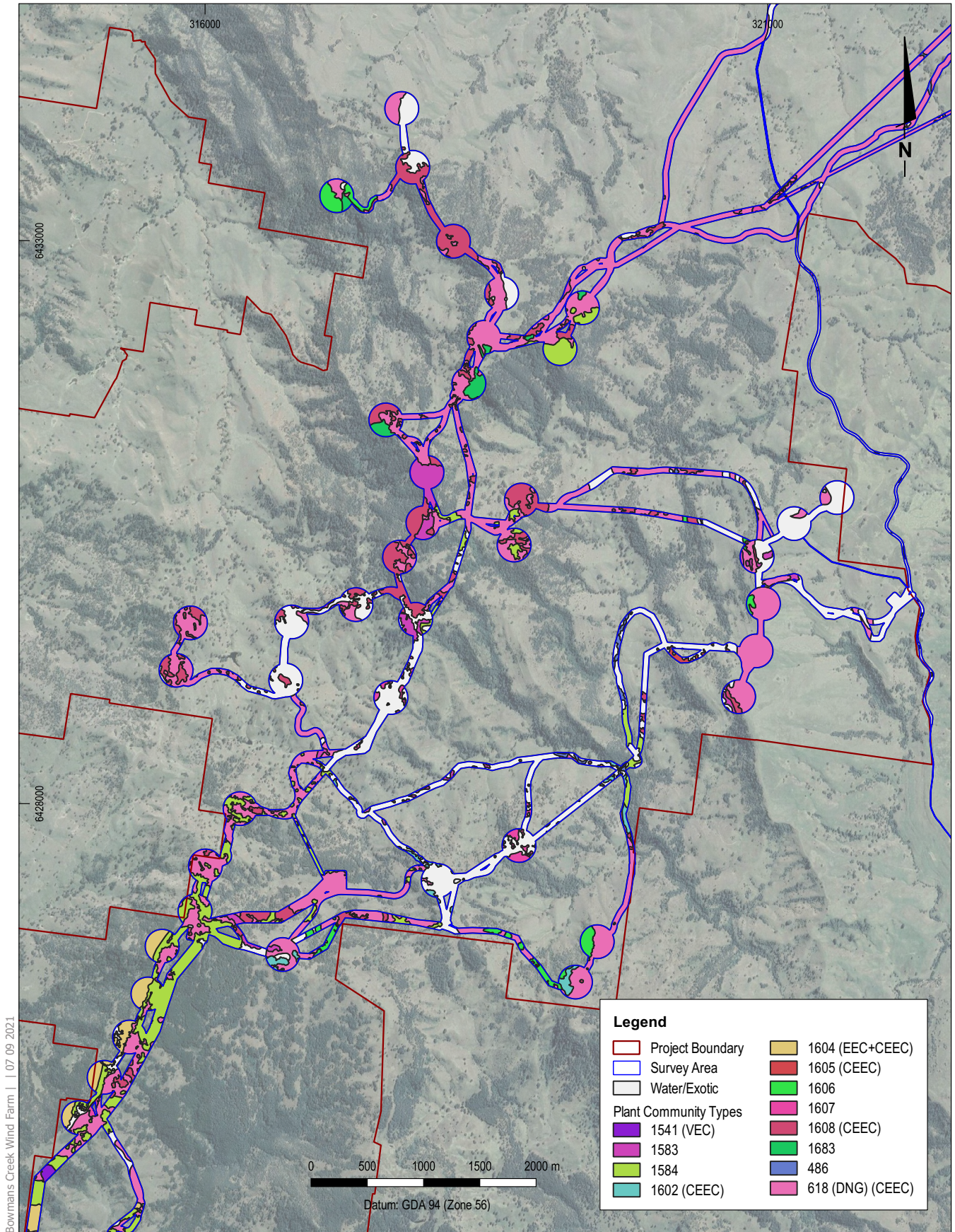


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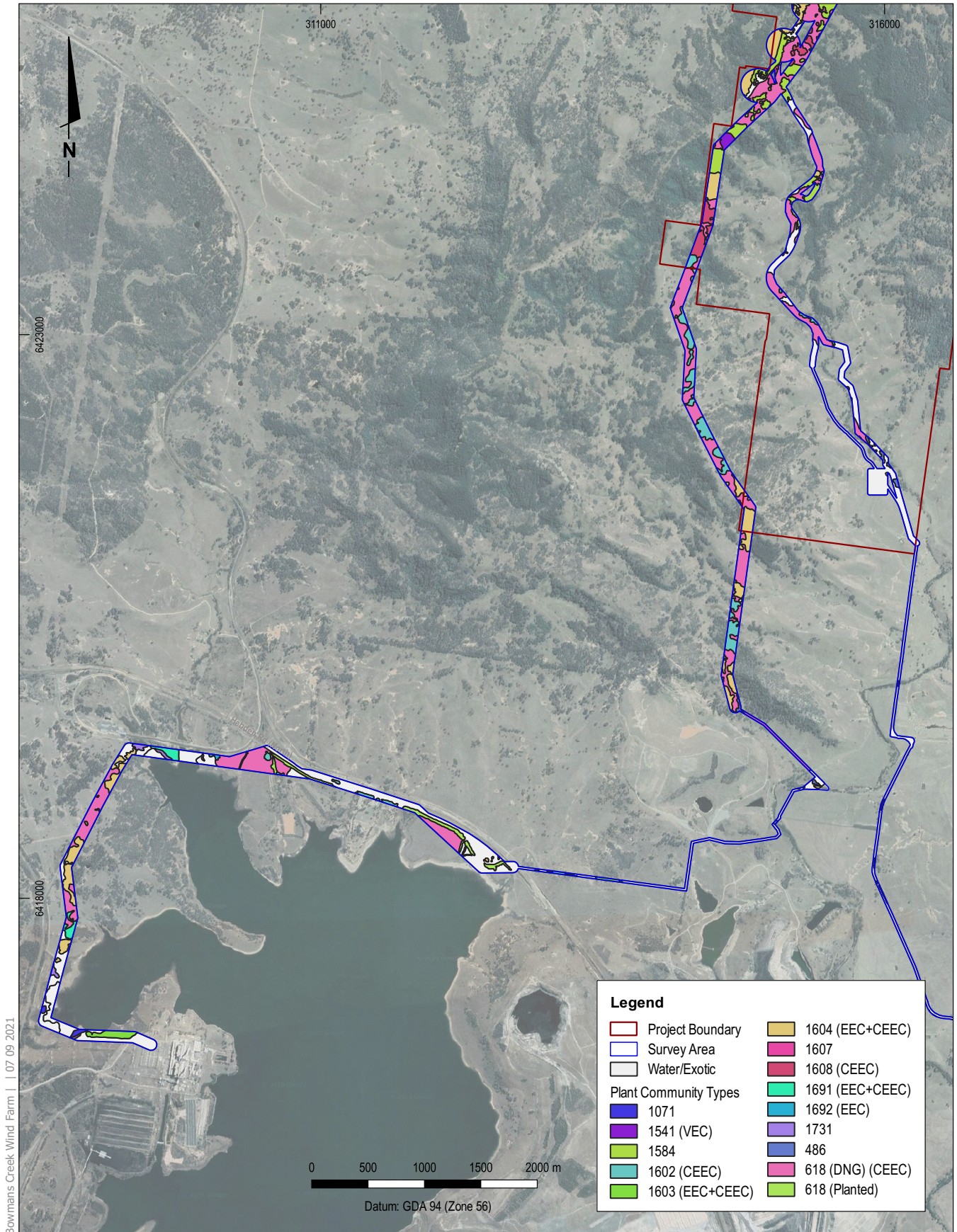
Source: Plant Community Types courtesy of Cumberland Ecology (2020); Aerial ©2019 Google



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Source: Plant Community Types courtesy of Cumberland Ecology (2020); Aerial ©2019 Google



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## ***Threatened Species***

### **Credit Species**

BAM-C generated a combined list of 56 ecosystem credit species and 78 species credit species across the four IBRA subregions. These totals include 20 dual credit species which are considered as ecosystem credit species for their foraging habitat and as species credit species for their breeding habitat.

Ecosystem credit species and species credit species are assessed further in Section 6.2 and Section 6.3 of the BDAR in **Appendix D3** respectively.

A total of two candidate species credit species were assessed as occurring in the Disturbance Area, including: Large-eared Pied Bat and Brush-tailed Phascogale. The Brush-tailed Phascogale was assumed present based on the presence of suitable habitat. The Large-eared Pied Bat was recorded on ultrasonic bat detectors at two locations. Additionally, the Square-tailed Kite was recorded within the Disturbance Area but has been assessed as an ecosystem credit species for foraging habitat only due to the lack of breeding habitat. No candidate threatened flora species were recorded. However, the following flora species have been conservatively assumed to be present until further targeted surveys can be conducted at micro-siting stages:

- *Acacia bynoeana* (Bynoe's Wattle);
- *Aperula asthenes* (Trailing Woodruff);
- *Cynanchum elegans* (White-flowered Wax Plant);
- *Diuris tricolour* (Pine Donkey orchid);
- *Grevillea parviflora subsp. parviflora* (Small-flower Grevillea);
- *Monotaxis macrophylla* (Large-leaved Monotaxis);
- *Ozothamnus tessellatus*;
- *Pomaderris queenslandica* (Scant Pomaderris);
- *Prasophyllum petilum* (Tarengo Leek Orchid);
- *Prostanthera cineolifera* (Singleton Mint Bush);
- *Pterostylis chaetophora*;
- *Pterostylis gibbosa* (Illawarra Greenhood);
- *Rutidosia heterogama* (Heath Wrinklewort);
- *Senna acclinis* (Rainforest Cassia); and
- *Thesium australe* (Austral Toadflax).

In relation to non-candidate species, the following threatened bat species were recorded: Eastern Coastal Freetail-bat, Large Bent-winged Bat and Yellow-bellied sheath-tailed bat.

The following ecosystem credit species were recorded during the bird surveys: Brown Treecreeper, Dusky Wood Swallow, Little Lorikeet, Scarlet Robin, Speckled Warbler and Spotted Harrier. The locations of threatened fauna species are shown in Figure 45 of the BDAR.

### Aquatic Species

The majority of the higher order streams within the Survey Area overlap with areas mapped as Key Fish Habitat for the SC, MSC and UHSC. As all WTGs are proposed to be built on ridges and hillslopes away from these water sources, any potential impacts on Key Fish Habitat are likely to be limited to construction of access tracks and supporting infrastructure. The amended Project is considered unlikely to significantly impact upon matters listed under the *Fish Management Act 1994* (FM Act) and no further assessments are considered warranted.

### ***Prescribed Impacts***

Prescribed impacts as identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017* (additional to the clearing of native vegetation and associated habitat) which are relevant to the Project include:

- Connectivity of different areas of habitat that facilitates movement across a species' range;
- Vehicle strikes,
- WTG strikes;
- Barrier effect; and
- Habitat removal for protected species.

### Habitat Connectivity

The fragmented or stepping-stone movement corridors within the Disturbance Area is likely to provide connectivity for ecosystem species, such as the Grey-headed Flying-fox, microchiropteran bats and avifauna.

Habitat connectivity will be reduced by the long-term removal of approximately 133 ha of woody vegetation within vegetation zones 1 – 12 and vegetation zone 14 which form part of fragmented or stepping-stone habitats.

As the Project is linear in nature and involves relatively narrow clearance corridors, it does not result in large consolidated areas of clearing. As much of the Disturbance Area occurs in cleared grasslands or open woodlands with widespread tree cover, fragmentation in terms of habitat use by fauna is likely to be minimal. The reduction of this area of habitat is not considered to significantly impact the movement of mobile fauna species.

### Vehicle Strike

Current vehicular usage across most of the Disturbance Area and Survey Area is limited to occasional usage by landowners for agricultural purposes.

Regular usage for the maintenance of WTGs will increase the number of vehicles that will be accessing the Disturbance Area. However, as the tracks are windy, step and unsealed, vehicle speeds will remain such that fauna vehicle strikes have a low likelihood of occurrence.

### WTG Blade Strike / Barotrauma

Data relating to bird and bat collision mortality from Australian wind farms is limited. Studies of collisions at multiple wind farms across eastern Australia range from 0.9 – 1.7 birds per turbine per year (Hull et al., 2013).

While bat collision mortality rate data within Australia is more limited studies to date have recorded ranges of 0.67 - 1.86 bats per turbine per year (Brett Lane & Associates, 2011, Woolnorth Wind Farm Holdings Pty Ltd, 2019). However, studies of data collected from operational wind farm monitoring (i.e. carcass searches) for the Rye Park Wind Farm found an average mortality of 0.71 birds and 0.55 bats per turbine per year (REF).

Overall, studies of wind farms to date indicate that strike risk or collision risk is highly variable and dependent on both the species and the habitat in which the turbines are located. Factors that influence strike risk mortality include:

- Siting near wetlands or other critical habitats;
- Location along migratory flight paths;
- Adverse weather conditions and poor visibility;
- Flight characteristics of the species;
- Flocking behaviour; and
- Height and spacing of turbines.

The Subject Land is not sited near any wetlands or other critical habitat. Furthermore, no migratory flight paths have been recorded or mapped within the Subject Land and no flocking behaviour was recorded/observed during surveys conducted across the Survey Area. The proposed height of turbines for the Project is generally higher than that proposed for most operational wind farms within Australia and a limited proportion of bird and bat species recorded within the Subject Land regularly fly within the specified Rotor Swept Area (RSA) heights. The spacing between 'adjacent' turbines ranges from a minimum of 364 m to a maximum of 916 m, with an average distance of 539 m between turbines thereby allowing passage of fauna between turbines. Thus, the predicted strike rate for bird and bat species for the Project is considered to be within the average to lower end of ranges recorded to date for operational Australian wind farms.

As the Subject Land occurs in a mixed agricultural and mining landscape with no operational wind farms in the region, the project is not considered to contribute to cumulative strike risk on local bird and bat populations at the current time. If further wind farms are approved for the region, cumulative impacts will be assessed as part of an Adaptive Bird and Bat Monitoring Program during the operation of the Project.

A summary of the collision risk for bird and bat species is provided in **Table 8** and **Table 9** respectively.

**Table 8 Bird Strike Risk**

Bird Species	BC Act Status	EPBC Act Status	Collision Risk Rating
Australian Hobby	Protected	Not listed	Negligible
Australian Magpie	Protected	Not listed	Negligible
Australian Raven	Protected	Not listed	Negligible
Australian Wood Duck	Protected	Not listed	Negligible
Barn Owl	Protected	Not listed	Negligible
Black Falcon	Vulnerable	Not listed	Negligible
Black shouldered Kite	Protected	Not listed	Negligible
Brown Falcon	Protected	Not listed	Negligible
Brown Goshawk	Protected	Not listed	Negligible
Cattle egret	Protected	Marine	Negligible
Channel-billed Cuckoo	Protected	Not listed	Negligible
Collared Sparrow Hawk	Protected	Not listed	Negligible
Dollar bird	Protected	Not listed	Negligible

Bird Species	BC Act Status	EPBC Act Status	Collision Risk Rating
Dusky Woodswallow	Vulnerable	Not listed	Negligible
Eastern Osprey	Vulnerable	Migratory	Negligible
Fairy Martin	Protected	Not listed	Negligible
Fork-tailed Swift	Protected	Migratory	Negligible
Galah	Protected	Not listed	Negligible
Glossy Black Cockatoo	Vulnerable	Not listed	Negligible
Grey Goshawk	Protected	Not listed	Negligible
Little Corella	Protected	Not listed	Negligible
Little Eagle	Vulnerable	Not listed	Negligible
Little Raven	Protected	Not listed	Negligible
Nankeen Kestrel	Protected	Not listed	Negligible
Pacific Black Duck	Protected	Not listed	Negligible
Pelican	Protected	Not listed	Negligible
Peregrine Falcon	Protected	Not listed	Negligible
Pied Cormorant	Protected	Not listed	Negligible
Pied Currawong	Protected	Not listed	Negligible
Powerful Owl	Vulnerable	Not listed	Negligible
Rainbow bee-eater	Protected	Marine	Negligible
Rainbow Lorikeet	Protected	Not listed	Negligible
Regent Honeyeater	Critically Endangered	Critically Endangered	Low
Rufous Whistler	Protected	Not listed	Negligible
Silvereve	Protected	Not listed	Negligible
Southern Boobook	Protected	Not listed	Negligible
Spangled Drongo	Protected	Not listed	Negligible
Spotted Harrier	Vulnerable	Not listed	Low
Square-tailed Kite	Vulnerable	Not listed	Negligible
Straw necked ibis	Protected	Not listed	Negligible
Sulphur-crested Cockatoo	Protected	Not listed	Negligible
Swift Parrot	Critically Endangered	Critically Endangered	Low
Tawny frog mouth	Protected	Not listed	Negligible
Torresian Crow	Protected	Not listed	Negligible
Wedge-tailed Eagle	Protected	Not listed	Moderate
Welcome Swallow	Protected	Not listed	Negligible
White bellied sea eagle	Vulnerable	Not listed	Negligible



Bird Species	BC Act Status	EPBC Act Status	Collision Risk Rating
White-faced Heron	Protected	Not listed	Negligible
White-throated Needletail	Vulnerable	Migratory	Negligible
Yellow-tailed Black Cockatoo	Protected	Not listed	Negligible

**Table 9 Bat Strike Risk**

Bat Species	BC Act Status	EPBC Act Status	Collision Risk Rating
White-striped freetail bat ( <i>Austronomus australis</i> )	Protected	Not listed	Low
Large-eared pied bat ( <i>Chalinolobus dwyeri</i> )	Vulnerable	Vulnerable - BC Act	Low
Gould's wattled bat ( <i>Chalinolobus gouldii</i> )	Protected	Not listed	Negligible
Chocolate wattled bat ( <i>Chalinolobus morio</i> )	Protected	Not listed	Negligible
Large bentwing bat ( <i>Miniopterus orianae oceanensis</i> )	Vulnerable	Not listed	Low
Yellow-bellied sheathtail bat ( <i>Saccolaimus flaviventris</i> )	Vulnerable	Not listed	Negligible

### Habitat Removal

The primary habitat feature for protected species that will be removed/impacted comprises hollows within trees. Hollows potentially provide roosting habitat for threatened and non-threatened fauna species such as microbats, parrots, owls and arboreal mammals.

Hollow Bearing Trees (HBTs) were recorded across the Survey Area and occur in all vegetation zones / PCTs as well as within isolated scattered trees within grassland areas. In general, the majority of hollows were of small to medium hollow entrance size and are most likely to be utilised by small to medium birds and microchiropteran bats, rather than owls and gliders. The impact of HBT removal is assessed within the BAM-C via the plot data collected for each vegetation zone. This data adds to the value of the habitat to be removed, thereby requiring a greater number of credits to be retired.

### Barrier Effect

The long-term risk of barrier effects is largely confined to the sections of WTG clusters. No large flocks utilising habitual flight paths were observed during surveys. The relative paucity of migratory birds indicates that the Survey Area is unlikely to comprise a habitual flight path for migratory bird species. The Survey Area has patchy or "stepping-stone" connectivity to the north, west and east due to widespread clearing across agricultural lands. Connectivity to the south is further reduced by the presence of hostile barriers such as the New England Highway (NEH) and multiple open cut mines.

Although parts of the Survey Area in the north-west have connectivity to vegetation that extends into Mount Royal National Park to the east, the vegetation within the Survey Area largely comprises the western-most extent of the connected vegetation and therefore is unlikely to comprise part of a major regional corridor due to extent of cleared lands to the west.

### ***Impacts on Serious and Irreversible Impact Entities***

The Serious & Irreversible Impact (SII) entity, White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland or Box Gum Woodland Threatened Ecological Community (TEC) will be impacted by the Project. This community is represented by two PCTs - PCT 1608 and PCT 618 (DNG form only).

The location of Box Gum Woodland in relation to the Disturbance Area is shown in **Figure 10** to **Figure 13**. The extent of clearing is likely to be reduced as the Disturbance Area is refined at the detailed design stages. Nonetheless, as a conservative estimate, approximately 216 ha of Box Gum Woodland, in the form of approximately 37 ha of woodland and 179 ha of DNG, has been conservatively assessed as directly impacted by removal as a result of the Project.

A detailed review is presented in the BDAR in **Appendix D3**. It concluded that the Project is unlikely to result in a SII to this or any other TEC.

### ***Avoidance and Disturbance Minimisation***

Based on the requirement for WTGs to be placed on the ridge top and the presence of TECs and threatened species across the Survey Area, including on ridgetops, opportunities to avoid all impacts are limited. The linear layout of WTGs along ridgelines, required for the wind farm to function at an economically feasible capacity has limited the extent to which WTGs can be moved to avoid impacts.

However, a number of amendments have been able to be made to the location of several components of the amended Project which have resulted in avoidance or minimisation of impacts on native vegetation and habitat, including:

- Designing location of turbines to maximise avoidance of threatened ecological communities, in particular communities listed under both BC Act and EPBC Act;
- Designing access in consideration of current tracks, roads and creek crossings present within the Survey Area where possible, to avoid additional vegetation clearance for access;
- Placement of WTGs in cleared or treeless areas, wherever possible, to minimise tree clearance and hollow loss;
- For WTGs in woodland areas, siting WTGs in naturally lower density areas or areas where disturbance (e.g. from grazing) has previously taken place, wherever possible;
- Hollow-bearing tree clearance has been avoided, where possible to date and will be further avoided where practical during detailed design and micro-siting;
- Placement of construction compounds, substations and rock crushing facilities outside areas of native vegetation, where possible;
- A commitment to the removal of canopy only and retention of understorey where possible for the installation of the external overhead powerlines;
- Placement of underground reticulation within the access track footprint where possible to allow for temporary rather than permanent disturbance; and
- Where possible, utilisation of existing creek crossings to minimise impacts on hydrological processes.

**Table 10** below compares the disturbance areas between the amended Project and the conceptual EIS project layout. Section 3.10 of the BDAR contains discussion on the Project amendments that will reduce environmental impacts from the Project.

Habitat connectivity, vehicle strike and WTG strike/barotrauma have been identified as prescribed impacts for the Project. In determining the location and design of the Disturbance Area, the Project has sought to avoid and minimise these prescribed impacts by:

- Retaining areas of native vegetation, including mature canopy trees where feasible;
- Maximising WTG spacing to allow greater opportunity for birds and bats to pass between WTG and reduce collision risk;
- Maintenance of a buffer between all WTGs and nearby hollow-bearing trees (where practical) to minimise the likelihood of bird and bat strike during operation; and
- Speed limits specified across access tracks to reduce risk of vehicle strike to fauna.

**Table 10 Comparison of Disturbance Areas between Amended Project and EIS Layouts**

Zone	PCT #	PCT Name	Amended Project Disturbance Area (ha)	EIS Disturbance Area (ha)
1	486	River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	1.05	4.03
2	1541	Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River	1.40	0.77
3	1543	Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	0.00	0.27
4	1583	Thin-leaved Stringybark - Grey Gum - Broad-leaved Apple shrub - grass tall open forest on ranges of the lower North Coast	4.80	9.99
5	1584	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	27.86	33.19
6	1683	Silvertop Stringybark - Tussock Grass grassy open forest of the Northern Tablelands escarpment and Barrington Tops	1.72	6.24
7	1602	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	7.79	12.00
8	1604	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	11.66	11.43
9	1605	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	0.00	1.29
10	1606	White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter	0.00	5.85
11	1607	Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	1.70	3.20
12	1608	Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter	36.95	38.82

Zone	PCT #	PCT Name	Amended Project Disturbance Area (ha)	EIS Disturbance Area (ha)
13	618	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	178.59	195.6
14	1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	1.48	1.48
15	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	1.93	1.93
16	1692	Bull Oak grassy woodland of the central Hunter Valley	0.07	0.07
17	1731	Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley	0.88	0.88
18	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	0.40	0.40
19	618	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	2.03	2.03
-	-	Exotic Grassland	132.30	180.29
-	-	Dam/Water	4.73	5.09
-	-	<b>TOTAL AREA</b>	<b>417.34</b>	<b>509.78</b>

\* In some cases, totals may not equate due to rounding to two decimal places

### Direct Impact Summary

The primary and direct impact resulting from the Project is the loss of vegetation and associated habitat within the indicative Disturbance Area (shown in **Appendix D3**) of up to 417 ha. **Table 11** and **Table 12** identify the indicative impacts to vegetation and threatened species habitat within the Disturbance Area by Interim Biogeographic Regionalisation for Australia (IBRA Sub-regions). Impacts to 15 PCT's (including two condition states for PCT 618) total up to 281 ha, a reduction of 50 ha in clearance of native vegetation when compared to the EIS Project.

**Table 11** Plant Community Type Vegetation Impacts

Vegetation Zone	PCT Name	Disturbance Area by IBRA Sub-Region (ha)				
		Total	Hunter	Upper Hunter	Tomalla	Ellerston
1	486: River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	1.05	0.13	0.16	0.13	0.63
2	1541: Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River	1.40		0.63		0.77



Vegetation Zone	PCT Name	Disturbance Area by IBRA Sub-Region (ha)				
		Total	Hunter	Upper Hunter	Tomalla	Ellerston
4	1583: Thin-leaved Stringybark - Grey Gum - Broad-leaved Apple shrub - grass tall open forest on ranges of the lower North Coast	4.80			4.80	
5	1584: White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	27.86		1.27	9.73	16.86
6	1683: Silvertop Stringybark - Tussock Grass grassy open forest of the Northern Tablelands escarpment and Barrington Tops	1.72			1.72	
7	1602: Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	7.79	1.55	0.32	0.19	5.73
8	1604: Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	11.66	6.16	0.09		5.41
11	1607: Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	1.70		0.03	1.21	0.46
12	1608: Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter	36.95		1.36	25.53	10.06
13	618: White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	178.59	14.09	6.38	101.33	56.79
14	1691: Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	1.48	1.48			
15	1603: Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	1.93	1.93			
16	1692: Bull Oak grassy woodland of the central Hunter Valley	0.07	0.07			
17	1731: Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley	0.88	0.88			

Vegetation Zone	PCT Name	Disturbance Area by IBRA Sub-Region (ha)				
		Total	Hunter	Upper Hunter	Tomalla	Ellerston
18	1071: Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	0.40	0.40			
19	618: White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	2.03	2.03			
-	Exotic Grassland	132.30	23.51	43.60	47.47	17.54
-	Dam/Water	4.73	4.10	0.10	0.17	0.20
	<b>TOTAL</b>	<b>417.34</b>	<b>56.33</b>	<b>53.94</b>	<b>192.28</b>	<b>114.45</b>

*\*In some cases, totals may not equate due to rounding*

**Table 12 Threatened Species Impacts**

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Disturbance Area (ha)				
				Total	Hunter	Upper Hunter	Tomalla	Ellerston
<i>Chalinolobus dwyeri</i>	Large Eared Pied Bat	Vulnerable	Vulnerable	2.04	-	0.01	2.03	-
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Vulnerable	-	32.92	10.52	0.85	16.40	5.15
<i>Acacia bynoeana</i>	Bynoe's Wattle	Endangered	Vulnerable	6.16	6.16	-	-	-
<i>Asperula asthenes</i>	Trailing Woodruff	Vulnerable	Vulnerable	1.93	1.93	-	-	-
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Endangered	Endangered	42.76	8.09	1.9	9.73	23.04
<i>Diuris tricolor</i>	Pine Donkey Orchid	Vulnerable	-	9.57	9.57	-	-	-
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	Vulnerable	Vulnerable	8.18	8.09	0.09	-	-
<i>Monotaxis macrophylla</i>	Large-leafed Monotaxis	Endangered	-	8.09	8.09	-	-	-
<i>Ozothamnus tessellatus</i>	-	Vulnerable	Vulnerable	6.16	6.16	-	-	-
<i>Pomaderris queenslandica</i>	Scant Pomaderris	Endangered	-	39.19	1.93	-	26.74	10.52
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	Endangered	Endangered	7.64	7.64	-	-	-
<i>Prostanthera cineolifera</i>	Singleton Mint Bush	Vulnerable	Vulnerable	6.16	6.16	-	-	-
<i>Pterostylis chaetophora</i>	-	Vulnerable	-	11.53	11.12	0.41	-	-
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Endangered	Endangered	1.93	1.93	-	-	-
<i>Rutidosia heterogama</i>	Heath Wrinklewort	Vulnerable	Vulnerable	6.25	6.16	0.09	-	-
<i>Senna acclinis</i>	Rainforest Cassia	Endangered	-	0.63	-	0.63	-	-
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	13.59	8.09	0.09	-	5.41

\*In some cases, totals may not equate due to rounding

### ***Indirect Impacts***

As the Disturbance Area occurs within highly modified agricultural lands, essential supplies land and parts of a public road corridor, the indirect impacts of the Project are not considered to be significant. The BDAR in **Appendix D3** outlines the indirect impacts to native vegetation and habitat.

### **6.3.4 Mitigation and Management**

With the implementation of the proposed avoidance, management and offsetting measures described below, the Project is considered likely to maintain or improve biodiversity values in the long term and will meet the no net loss standard required under the BAM.

The Proponent has committed to meeting the following range of measures for the Project to mitigate the residual impacts that are unable to be avoided.

#### ***Habitat Connectivity***

The following mitigation measures are proposed to limit any impacts on habitat connectivity:

- Delineation of clearing limits;
- Pre-clearance survey;
- Staging of clearing; and
- Habitat feature salvage.

Felled logs / other features from cleared areas that are suitable for habitat enhancement may be provided to the landholder for their habitat enhancement works, if requested.

#### ***Vehicle Strike***

The following mitigation measures are proposed to limit impacts due to vehicle strike:

- Security measures to limit access to the track network to authorised personnel and relevant landowners;
- Installation of appropriate signage notifying vehicles of potential fauna presence;
- Speed limits to restrict the speed of vehicles travelling along the access tracks; and
- Consideration of implementation of measures identified in ongoing research (Australian or international studies) that reduce risks of bird/bat strike at wind farms such as use of "Identi-flight" cameras (or similar).

#### ***Detailed Design Surveys***

During the detailed design stage, additional survey will be undertaken to confirm the presence of any potential threatened flora species so that access track (and other relevant infrastructure components) alignments can be adjusted to minimise any impacts to threatened flora.

#### ***Native Vegetation and Habitat***

**Table 13** provides a summary of mitigation measures for impacts to native vegetation and habitat.



**Table 13 Mitigation Measures for Impacts to Native Vegetation and Habitat**

Mitigation Measure	Proposed Techniques	Timing	Frequency	Risk and Consequences of Residual Impacts
Further threatened flora searches	Searches conducted in all areas of appropriate habitat in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016)	Detailed design phase	At least one survey period for each species. Further surveys as required during refinement of design	Potential loss of local populations of threatened flora species, if present
Weed management	Appropriate weed control activities will be undertaken in accordance with the Hunter Regional Strategic Weed Management Plan 2017 – 2022 (LLS, 2017) (or latest version)	Construction	Prior to construction, following vegetation clearing	Spread of weeds throughout the Survey Area and surrounding land
Delineation of clearing limits	Clearing limits marked on trees fencing or an equivalent boundary marker Disturbance, including stockpiling, restricted to clearing limits	Construction	Once	Unnecessary damage to trees or vegetation to be retained
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared Pre-clearing surveys will be undertaken within one week of clearing. Habitat features will be marked	Construction	Once	Increased and unnecessary mortality of native fauna
Staging of clearing	Clearing will be conducted in a two-stage process Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations	Construction	Once	Increased and unnecessary mortality of native fauna
Sedimentation control	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom, 2004).	Construction	Throughout construction period	Sedimentation into retained and adjoining vegetation
Vegetation Restoration Management Plan	Restoration of native vegetation and habitat disturbed during construction	Post- construction	Following completion of the construction phase	Loss of habitat

### Project Ecological Offsets

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigation, and all residual impacts are offset by retirement of the required number of biodiversity credits.

The biodiversity credit requirement in relation to each IBRA Sub-region for the Project is summarised in **Table 14**.

**Table 14** Project Ecological Offset Credit Summary by IBRA Sub-region

Entity	Status	Credits				
		Hunter	Upper Hunter	Tomalla	Ellerston	Total
PCT 486	Not a TEC	3	4	3	16	26
PCT 1541	VEC – BC Act only		21		26	47
PCT 1583	Not a TEC			157		157
PCT 1584	Not a TEC		38	288	499	825
PCT 1683	Not a TEC			59		59
PCT 1602	CEEC – EPBC Act only	49	10	6	175	240
PCT 1604	CEEC – EPBC Act EEC – BC Act	213	3		179	395
PCT 1607	Not a TEC		1	27	10	38
PCT 1608	CEEC – EPBC Act CEEC – BC Act		61	1138	448	1647
PCT 618 (DNG form)	CEEC – EPBC Act CEEC – BC Act	170	63	1002	561	1796
PCT 1691	CEEC – EPBC Act EEC – BC Act	52				52
PCT 1603	CEEC – EPBC Act EEC – BC Act	62				62
PCT 1692	EEC – BC Act only	1				1
PCT 1731	Not a TEC	10				10
PCT 1071	Not a TEC	12				12
PCT 618 (Planted form)	Not a TEC	83				83
<i>Chalinolobus dwyeri</i>	V – BC Act and EPBC Act			12		12
<i>Phascogale tapoatafa</i>	V – BC Act only	340	3	210	179	732
<i>Acacia bynoeana</i>	E – BC Act; V - EPBC Act	213				213
<i>Asperula asthenes</i>	V – BC Act and EPBC Act	62				62
<i>Cynanchum elegans</i>	E – BC Act and EPBC Act	275	77	384	875	1611

Entity	Status	Credits				
		Hunter	Upper Hunter	Tomalla	Ellerston	Total
<i>Diuris tricolor</i>	V- BC Act only	246	0	0	0	246
<i>Grevillea parviflora</i> <i>subsp. parviflora</i>	V – BC Act and EPBC Act	275	3	0	0	278
<i>Monotaxis macrophylla</i>	E – BC Act only	275	0	0	0	275
<i>Ozothamnus tessellatus</i>	V – BC Act and EPBC Act	160				160
<i>Pomaderris queenslandica</i>	E – BC Act only	62	0	941	371	1374
<i>Prasophyllum petilum</i>	E – BC Act and EPBC Act	265	0	0	0	265
<i>Prostanthera cineolifera</i>	V – BC Act and EPBC Act	213				213
<i>Pterostylis chaetophora</i>	V – BC Act only	383	14	0	0	397
<i>Pterostylis gibbosa</i>	E – BC Act and EPBC Act	62				62
<i>Rutidosis heterogama</i>	V – BC Act and EPBC Act	213	3			216
<i>Senna acclinis</i>	E – BC Act only		24			24
<i>Thesium australe</i>	V – BC Act and EPBC Act	207	2	0	134	343

CEEC – Critically Endangered Ecological Community, EEC - Endangered Ecological Community, VEC – Vulnerable Ecological Community, V- Vulnerable

Table 15 to Table 17 below illustrates the ecosystem credit liability by PCT and specie type, broken up into the different area definitions as required by the BAM.

**Table 15 Project Vegetation Offset Credit Summary by Area**

Vegetation Zone	PCT #	PCT Name	Condition	BC Act Status	EPBC Act Status	Total in Survey Area (ha)	Total in Subject Land (ha)	Total Impacted (Disturbance Area) (ha)	Ecosystem Credit Liability
1	486	River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	Moderate	Not listed	Not listed	5.86	1.10	1.05	26
2	1541	Whalebone Tree - Red Kamala dry subtropical rainforest of the lower Hunter River	Moderate	VEC - Lower Hunter Valley Dry Rainforest	Not listed	1.84	1.40	1.40	47
3	1543	Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	Moderate	VEC - Lower Hunter Valley Dry Rainforest	Not listed	4.89	0.00	0.00	-
4	1583	Thin-leaved Stringybark - Grey Gum - Broad-leaved Apple shrub - grass tall open forest on ranges of the lower North Coast	Moderate	Not listed	Not listed	29.84	4.80	4.80	157
5	1584	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	Moderate	Not listed	Not listed	71.45	27.86	27.86	825
6	1683	Silvertop Stringybark - Tussock Grass grassy open forest of the Northern Tablelands escarpment and Barrington Tops	Moderate	Not listed	Not listed	23.84	1.72	1.72	59



Vegetation Zone	PCT #	PCT Name	Condition	BC Act Status	EPBC Act Status	Total in Survey Area (ha)	Total in Subject Land (ha)	Total Impacted (Disturbance Area) (ha)	Ecosystem Credit Liability
7	1602	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	Moderate	Not listed	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	26.55	8.75	7.79	240
8	1604	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter	Moderate	EEC - Central Hunter Ironbark – Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	32.14	11.66	11.66	395
9	1605	Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Moderate	Not listed	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	1.37	0.00	0.00	-
10	1606	White Box - Narrow-leaved Ironbark - Blakely's Red Gum shrubby open forest of the central and upper Hunter	Moderate	Not listed	Not listed	14.69	0.00	0.00	-
11	1607	Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	Moderate	Not listed	Not listed	13.31	1.70	1.70	38

Vegetation Zone	PCT #	PCT Name	Condition	BC Act Status	EPBC Act Status	Total in Survey Area (ha)	Total in Subject Land (ha)	Total Impacted (Disturbance Area) (ha)	Ecosystem Credit Liability
12	1608	Grey Box - Grey Gum - Rough-barked Apple - Blakely's Red Gum grassy open forest of the central Hunter	Moderate	CEEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CEEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	123.48	36.95	36.95	1647
13	618	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	DNG	CEEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CEEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	436.27	180.16	178.59	1796
14	1691	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	Moderate	EEC - Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	2.60	1.48	1.48	52
15	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Moderate	EEC - Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	CEEC - Central Hunter Valley Eucalypt Forest and Woodland	2.69	1.93	1.93	62

Vegetation Zone	PCT #	PCT Name	Condition	BC Act Status	EPBC Act Status	Total in Survey Area (ha)	Total in Subject Land (ha)	Total Impacted (Disturbance Area) (ha)	Ecosystem Credit Liability
16	1692	Bull Oak grassy woodland of the central Hunter Valley	Moderate	EEC - Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	Not listed	0.24	0.07	0.07	1
17	1731	Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley	Poor	Not listed	Not listed	1.46	0.88	0.88	10
18	1071	Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Poor	Not listed	Not listed	0.70	0.40	0.40	12
19	618	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	Planted	Not listed	Not listed	5.01	2.03	2.03	83
-	-	Exotic Grassland	-	n/a	n/a	383.66	156.32	132.30	-
-	-	Dam/Water	-	n/a	n/a	8.84	4.72	4.73	-
		<b>Total Area</b>				<b>1190.73</b>	<b>443.93</b>	<b>417.34</b>	<b>5450</b>



**Table 16 Project Threatened Flora Specie Impact Summary**

Scientific Name	Common name	BC Act Status	EPBC Act Status	Assessment Status	Total Habitat in Survey Area (ha)	Total Impacted (ha)	Species Credit Liability
<i>Acacia bynoeana</i>	Bynoe's Wattle	Endangered	Vulnerable	Presence assumed	32.14	6.16	213
<i>Asperula asthenes</i>	Trailing Woodruff	Vulnerable	Vulnerable	Presence assumed	2.69	1.93	62
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Endangered	Endangered	Presence assumed	108.12	42.85	1611
<i>Diuris tricolor</i>	Pine Donkey Orchid	Vulnerable	Not listed	Presence assumed	37.43	9.57	246
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	Vulnerable	Vulnerable	Presence assumed	34.83	8.18	278
<i>Monotaxis macrophylla</i>	Large-leafed Monotaxis	Endangered	Not listed	Presence assumed	34.83	8.09	275
<i>Ozothamnus tessellatus</i>	-	Vulnerable	Vulnerable	Presence assumed	32.14	6.16	160
<i>Pomaderris queenslandica</i>	Scant Pomaderris	Endangered	Not listed	Presence assumed	139.48	39.19	1374
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	Endangered	Endangered	Presence assumed	34.74	7.64	265
<i>Prostanthera cineolifera</i>	Singleton Mint Bush	Vulnerable	Vulnerable	Presence assumed	32.14	6.16	213
<i>Pterostylis chaetophora</i>	-	Vulnerable	Not listed	Presence assumed	63.98	11.56	397
<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Endangered	Endangered	Presence assumed	2.69	1.93	62
<i>Rutidosia heterogama</i>	Heath Wrinklewort	Vulnerable	Vulnerable	Presence assumed	32.14	6.25	216
<i>Senna acclinis</i>	Rainforest Cassia	Endangered	Not listed	Presence assumed	1.84	0.63	24
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	Presence assumed	34.83	13.59	343
	<b>Totals</b>				<b>624.02</b>	<b>169.89</b>	<b>5739</b>

**Table 17**      **Threatened Fauna Specie Impact Summary**

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Assessment Status	Total Habitat in Survey Area (ha)	Total Impacted (ha)	Species Credit Liability
<i>Chalinolobus dwyeri</i>	Large Eared Pied Bat	Vulnerable	Vulnerable	Recorded	29.84	0.18	12
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Vulnerable	Not listed	Assumed	68.97	20.82	732

### ***Revised Offset Calculations***

Revised offset calculations to that presented above, utilising additional survey effort and the final project layout (with further micro-siting) will include requisite credit calculations for any impacted threatened PCTs, flora and fauna species. The calculations will be undertaken in accordance with conditions of development consent in consultation with the relevant regulators.

### ***Adaptive Management of Uncertain Impacts***

The primary uncertain impact for the Project is the extent of blade strike/barotrauma risk to birds and bats. The adaptive management strategy for this uncertain impact is the preparation of a Bird and Bat Adaptive Management Plan (BBAMP). The Bird and Bat Adaptive Management Plan, as a minimum, will include:

- Ongoing bird and bat monitoring in accordance with the Best Practise Guidelines for implementation of Wind Energy Projects to assess the impact of the project on local and potential migratory bird and bat populations;
- A decision-making framework setting out thresholds and specific actions in relation to impacts to bird/bat populations identified by the monitoring surveys;
- Identification of mitigation measures and implementation timeframes, such as switching off/slowing down of specific turbines at specific timeframes or use of deterrents to reduce potential mortalities if identified during monitoring surveys; and
- Consideration of implementation of measures identified in ongoing research (Australian or international studies) that reduce risks of bird/bat strike at wind farms such as use of "Identiflight" cameras or painting single turbine blades black.

### ***Management Plan***

A Biodiversity Management Plan (BMP) and BBAMP will be prepared at the appropriate time for the Project. The BMP will contain a Vegetation Rehabilitation Plan and a Vehicle Strike Management Plan (or these will be prepared as separate documents).

## **6.3.5 Matters of National Environmental Significance**

Appendix A of the Amendment Report BDAR, provides a consolidated assessment of Matters of National Environmental Significance (MNES) entities that were considered for the project in accordance with the requirements and recommendations of the Biodiversity Conservation Division (BCD) of DPIE, presented in a letter dated 24/05/2021.

The MNES considered for this project were derived from a variety of different data sources. These include:

- A Protected Matters Search Tool (PMST) search was conducted for the submitted Referral (conducted as a search of a 20km radius around a central point of the development as originally proposed);
- MNES entities identified by DAWE in the Referral Decision Brief;
- Field survey data;
- BioNet Atlas searches conducted as part of the BDAR process (conducted as a 15km buffer from the boundary of the amended Project layout); and
- Species lists as generated by the BAM calculator (Version 1.3.0.0, updated: 22/10/2020 and Version 4.5 of BAM data, updated 10/06/2021).

The PMST search and 'Likelihood of Occurrence' assessment conducted for the referral are provided at the end of Appendix A of the BDAR. It should be noted that there were no changes to listed MNES between when the PMST search was completed and the referral decision was made. The full list of threatened ecological communities, threatened species and migratory species considered for the referral and this BDAR are summarised in Table 36 of Appendix A of the BDAR. Further details of assessments conducted for retention or removal of MNES is provided in the Referral Likelihood of Occurrence at the end of Appendix A of the BDAR as well as Section 6.2 – Section 6.5 of the BDAR.

The impacts to MNES comprise a mix of direct, indirect and prescribed impacts.

Direct impacts to MNES include clearing of vegetation and associated habitats and are included within the assessments for PCTs and species credit species in Section 8.1 of the BDAR.

Indirect impacts include factors such as edge effects, light spill, dust and weed incursion and are outlined in Section 8.1.2 of the BDAR.

Prescribed impacts primarily comprise impacts associated with turbines such as collision risk, blade strike and barotrauma. Prescribed impacts, including cumulative impacts of wind farms are detailed in Section 6.5, Section 6.7, Section 8.2 and Section 8.3 of the BDAR.

A range of mitigation measures have been developed for this project to mitigate the impacts that are unable to be avoided on biodiversity values, including MNES entities. These include a range of measures to be undertaken before and during construction to limit the impact of the project.

Measures to avoid and minimise impacts, including impacts to MNES are presented in Chapter 7 of the BDAR, with the measures to mitigate and offset impacts presented in Section 8.5 to Section 8.8.

In accordance with the BAM, the offset liability is proposed to be met either through the purchase and retirement of credits or payment to the Biodiversity Conservation Fund. At the present stage, establishment of Stewardship sites to generate requisite credits is not proposed.

In accordance with the bilateral agreement, variation rules will not be applied to MNES entities, and all credits will be retired on a like-for-like basis. Details of like-for-like credit requirements are provided in Table 35 of the BDAR attached as **Appendix D3** to this Report.

## **6.4 ABORIGINAL CULTURAL HERITAGE**

An Aboriginal and Cultural Heritage Assessment Report (ACHAR) was undertaken for the Project (as exhibited) by Ozark Environment and Heritage Management Pty Ltd (Ozark). The final version is presented in Appendix B of the Submissions Report, noting that there were no changes between the draft and final version presented in Appendix M of the EIS, as no amendments were requested during the last phase of the consultation process.

A further assessment has been undertaken by OzArk to identify and assess any additional Aboriginal Cultural Heritage constraints and/or impacts in areas outside of the EIS Survey Boundary, as a result of proposed amendments to the Project. This is included in **Appendix D4** of this report.

The assessment of the additional areas not surveyed for the EIS was completed at a desktop level only. However, as extensive areas near and around the additional proposed disturbance areas were surveyed for the EIS, the archaeological characteristics of the additional areas can be confidently predicted.



### 6.4.1 Predictive Modelling

The survey for the EIS consisted of a substantial survey effort that extensively sampled the landforms of the Survey Boundary.

All the additional areas not surveyed for the EIS are in:

- Survey Unit 1 landforms;
- Landforms where no sites were recorded during the survey for the EIS;
- Topographies generally consisting of slopes steeper than 10 degrees;
- Landforms distant to permanent or semi-permanent water; and
- Landforms that have undergone disturbances from vegetation clearing and long-term grazing.

The survey for the EIS comprehensively sampled the landforms of Survey Unit 1 within which the major additional areas are located. This Survey Unit consists of slopes, sometimes very steep, narrow localised ridges, and V-shaped valleys. The landforms are largely cleared and have been grazed for many years. While remnant vegetation is located on the steepest slopes, this does not consist of old-growth vegetation but areas that have probably been cleared, or at least logged, in the past. Waterways are best described as headwaters and would generally only hold water on a seasonal basis. Waterways in Survey Unit 1 lack creek flats, terraces, or other areas suitable for Aboriginal occupation.

The extensive survey within Survey Unit 1 failed to record any Aboriginal objects in these landforms. This was entirely due to the nature of the landforms being generally too steep for camping activities and distant to reliable sources of water. The nature of the area’s ridges is that they are not extensive to provide a ‘pathway’ through the landscape. The ridges are localised and while there may be a stretch for several hundred metres of ridge landforms, these landforms terminate in a steep V-shaped valley before the next ridge system begins.

Representatives from the Aboriginal community whom assisted the survey said that the landforms of Survey Area 1 were very unlikely to have been extensively used by their ancestors and noted that the Project Area was between topographies more commonly used in the past, namely the more defined ridge systems in Mount Royal National Park and the flat valley floor of the Hunter Valley.

The archaeological potential of each additional area not surveyed for the EIS is shown in **Table 18**.

**Table 18 Archaeological Potential of the Unsurveyed Areas**

Proposed Impact	Length	Landform Type	Likelihood to Contain Aboriginal Objects
Road widening along portion of Albano Road in north	11.6 km	Slopes. No waterway crossings	Very low likelihood to contain Aboriginal objects as the area is either side of Albano Road in moderately steep landforms.
Realigned access track in north from WTG 38 to WTG 21	~ 4.5 km	Undulating moderately steep. No level areas. Some crossings of minor waterways	Very low likelihood to contain Aboriginal objects due to the nature of the landforms. While the alignment crosses a minor waterway, it is in a V-shaped valley and unlikely to have landforms conducive to Aboriginal occupation. Culturally modified trees will not be recorded due to widespread clearing.
Corridor for realigned overhead electricity reticulation in north from WTG 38 to WTG 21	~ 3.6 km	Undulating moderately steep. No level areas. Some crossings of minor waterways	Very low likelihood to contain Aboriginal objects due to the nature of the landforms. While the alignment crosses a minor waterway, it is in a V-shaped valley and unlikely to have landforms conducive to Aboriginal occupation. Culturally modified trees will not be recorded due to widespread clearing.

Proposed Impact	Length	Landform Type	Likelihood to Contain Aboriginal Objects
Realigned access track in centre of Project Boundary from WTG 45 to WTG 30	~ 2.2 km	Minor ridge and slopes. One crossing of a minor waterway	Very low likelihood to contain Aboriginal objects due to the nature of the landforms. While the alignment crosses a minor waterway, it is in a V-shaped valley and unlikely to have landforms conducive to Aboriginal occupation. Culturally modified trees will not be recorded due to widespread clearing.
Corridor for overhead electricity reticulation in centre of Project Boundary near WTG 59 to WTG 48	650 m	Steep V-shaped valley	Very low likelihood to contain Aboriginal objects due to the steep nature of the landforms. While there is remnant vegetation in this area, it is unlikely that the area will contain culturally modified trees due to the steep nature of the landforms. The waterway crossing has no associated creek flats or terraces.
Realigned access track from WTG 48 to WTG 49 in the centre of the Project Boundary	760 m	Ridge, steep slopes. No waterway crossings	Very low likelihood to contain Aboriginal objects due to the steep nature of the landforms. The termination of the ridge, both to the east and to the west was surveyed for the EIS and no sites were recorded. Culturally modified trees will not be recorded due to widespread clearing.
Realigned section of the access track to the north of the O&M facility	1.3 km	Slopes	Very low likelihood to contain Aboriginal objects due to the sloping nature of the landforms. Identical landforms on the eastern side of the valley were surveyed for the EIS and no sites were recorded, even in flatter landforms near Cedar Creek. Culturally modified trees will not be recorded due to widespread clearing.
Realigned portions of the access track in the east between WTG 25 to WTG 72, and WTG 8 to WTG 9	3 km	Slopes and minor ridges	Very low likelihood to contain Aboriginal objects due to the sloping nature of the landforms. Identical landforms to the east were surveyed for the EIS and no sites were recorded. While there is remnant vegetation in the west of this area, it is unlikely that the area will contain culturally modified trees due to the steep nature of the landforms.

Given the knowledge gained for the survey that has taken place, the observed landform characteristics of the additional areas seen from digital elevation models (Figure 1-2 to Figure 1-6 in the ACHAR Technical Report, **Appendix D4**), and the views of the Aboriginal community, it is assessed that the additional areas have a very low potential to contain Aboriginal objects.

### 6.4.2 Impact Assessment

The changes to the Survey Boundary for the amended Project have resulted in some small changes to the likely impacts arising from the amended Project and, therefore, the management required to ensure that Aboriginal cultural values are appropriately considered.

In summary, the ACHAR considered 16 sites. Of these, the amended Project is likely to harm five sites, although it will only partially impact three sites and there is a high likelihood that a further two sites will be avoided through micro-siting components associated with the electricity transmission line (ETL). One site, ANT 22 is within the Survey Boundary but harm to the site will be avoided through management. Including ANT 22, the amended Project will avoid 11 known sites.

This is a decrease of impact as three sites that were identified in the ACHAR as likely to be harmed (LID<sub>34</sub>, ANT<sub>4</sub>, and Liddell Power Station-IF<sub>2</sub>) are now outside the Survey Boundary and will not be harmed by the amended Project. Further, one site that was listed in the ACHAR as likely to be totally destroyed (Hunter Gas Project PAD) is now considered as likely to be only partially destroyed as it will only be impacted where ground disturbing components of the ETL will be sited, leaving all other areas of the potential archaeological deposit (PAD) intact.

The impact assessment for the amended Project is shown in **Table 19** below.

**Table 19 Amended Project Aboriginal Cultural Heritage Impact Assessment**

AHIMS ID	Site Name	Type of Harm in the EIS (Total / Partial/ None)	Type of Harm in the Amended Project (Total / Partial/ None)	Amended Project Consequence of Harm (Total/Partial/ No Loss of Value)	Likelihood of Avoidance by the Amended Project
37-3-1592	LID <sub>34</sub>	Total	None	No loss of value	Will be avoided
37-3-1593	LID <sub>35</sub>	None	None	No loss of value	Will be avoided
37-3-1594	Coalhole Creek OS-01	Total	Total	Total loss of value	High likelihood for avoidance through micro-siting ETL components
37-3-1595	Bowmans Tributary OS-01	None	None	No loss of value	Will be avoided
37-3-1596	Bowmans Tributary IF-01	None	None	No loss of value	Will be avoided
37-2-2021	ANT <sub>4</sub>	Partial	None	No loss of value	Will be avoided
37-2-2029	Hunter Gas Project PAD	Total	Partial	Partial loss of value	Only portions directly impacted by ETL components will be harmed
37-2-2072	ANT <sub>22</sub>	None	None	No loss of value	Within the Survey Boundary but will be avoided through management
37-2-6043	Hillcrest OS-01	None	None	No loss of value	Will be avoided
37-2-6044	Hillcrest OS-02	None	None	No loss of value	Will be avoided
37-3-1587	Albano Road OS-01	None	None	No loss of value	Will be avoided
37-3-1588	Albano Road OS-02	Partial	Partial	Partial loss of value	Low likelihood for complete avoidance
37-3-1589	Albano Road OS-03	Partial	Partial	Partial loss of value	Low likelihood for complete avoidance
37-3-1590	Albano Road IF-01	None	None	No loss of value	None

AHIMS ID	Site Name	Type of Harm in the EIS (Total / Partial/ None)	Type of Harm in the Amended Project (Total / Partial/ None)	Amended Project Consequence of Harm (Total/Partial/ No Loss of Value)	Likelihood of Avoidance by the Amended Project
37-2-6263	Liddell Power Station-IF1	Total	Total	Total loss of value	High likelihood for avoidance through micro-siting ETL components
TBC	Liddell Power Station-IF2	Total	None	No loss of value	None

### 6.4.3 Mitigation and Management

The amended Project has redefined the management required at several sites. The new management recommendations are shown in **Table 20** and this table supersedes Table 9-3 in the ACHAR.

The management recommendations for Group 1 and 2 sites as set out in the ACHAR (Section 9.3) remain valid.

In summary, impacts associated with the amended Project are:

- Eleven sites will be avoided by the amended Project (including ANT 22);
- Five sites have potential to be harmed by the amended Project. These sites consist of:
  - Two sites that have potential to be avoided during the ETL design;
  - One site that may only be partially harmed by the ETL construction; and
  - Two sites that will only be partially harmed by works along Albano Road.

**Table 20 Aboriginal Cultural Heritage Site Impact and Management Strategy**

AHIMS ID	Site Name	Site Description	Overall Significance of Site	Management Measure	Management Strategy
<b>Sites Outside of the Project Boundary</b>					
37-2-6043	Hillcrest OS-01	Artefact scatter: six artefacts	Low (low-density artefact scatter)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Site is distant to the Survey Boundary, therefore no management required.
37-2-6044	Hillcrest OS-02	Artefact scatter: two artefacts	Low (low-density artefact scatter)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Site is distant to the Survey Boundary, therefore no management required.



AHIMS ID	Site Name	Site Description	Overall Significance of Site	Management Measure	Management Strategy
37-3-1592	LID34	Artefact scatter: five artefacts	Low (isolated find)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Temporarily fence site with high visibility fencing for the duration of works in the area if it is considered that it may be impacted (the site is located approximately 50 m south of the Survey Boundary)
37-3-1593	LID35	Isolated artefact	Low (isolated find)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Temporarily fence site with high visibility fencing for the duration of works in the area
37-3-1587	Albano Road OS-01	Artefact scatter: three artefacts	Low (low-density artefact scatter)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Temporarily fence site with high visibility fencing for the duration of works in the area
37-3-1590	Albano Road IF-01	Isolated artefact	Low (isolated find)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Temporarily fence site with high visibility fencing for the duration of works in the area
37-3-1595	Bowmans Tributary OS-01	Artefact scatter: 21 artefacts PAD present at site	Low-Moderate (low-density artefact scatter with some potential for subsurface deposits)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Site is distant to the Survey Boundary, therefore no management required.
37-3-1596	Bowmans Tributary IF-01	Isolated artefact	Low (low-density artefact scatter)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Site is distant to the Survey Boundary, therefore no management required.
37-2-2021	ANT 4	Artefact scatter: 20 artefacts	Low (low-density artefact scatter)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Site is distant to the Survey Boundary, therefore no management required.
37-2-6541	Liddell Power Station-IF2	Isolated find	Low (isolated find)	Will not be impacted	Outside of the Survey Boundary. Will not be impacted. Temporarily fence site with high visibility fencing for the duration of works in the area.

AHIMS ID	Site Name	Site Description	Overall Significance of Site	Management Measure	Management Strategy
<b>Transmission Line</b>					
37-3-1594	Coalhole Creek OS-01	Artefact scatter: 34 artefacts	Low (low-density artefact scatter)	Avoid with project design Group 1	<p>Within the Survey Boundary but with a high chance for avoidance if spanned by the ETL.</p> <p>If able to be avoided, temporarily fence site with high visibility fencing for the duration of works in the area.</p> <p>If cannot be avoided, manage as a Group 1 site (surface artefact collection).</p>
37-2-2029	Hunter Gas Project PAD	PAD	Low (assessed that there is a low potential for subsurface deposits)	Partial Harm Group 2	<p>Within the Survey Boundary but with a high chance for avoidance if spanned by the ETL.</p> <p>Works within the PAD extent should be avoided.</p> <p>If able to be avoided, temporarily fence the PAD extent with high visibility fencing for the duration of works in the area.</p> <p>If works are required within the PAD area shown on ACHAR Figure 6 30, limited test excavation will be required prior to the works commencing to determine the nature of the PAD. Excavation should only take place at the locations where ground disturbing impacts are proposed.</p>
37-2-2072	ANT 22	Ceremonial Ring	Low (very few or no tangible features). High cultural value as a potential ceremonial area	Avoid with project design	<p>Within the Survey Boundary but will be avoided by the amended Project.</p> <p>Installation of electricity poles and access tracks within 50 m of the site should be avoided. It is acceptable for the electricity wires to be overhead within this 50 m buffer.</p> <p>Any felling of trees that are necessary within this buffer should be hand cleared and machinery should not enter the 50 m exclusion zone (i.e. any timber will have to be left where it falls, or, preferably, manually dragged out of the buffer area).</p>

AHIMS ID	Site Name	Site Description	Overall Significance of Site	Management Measure	Management Strategy
37-2-6263	Liddell Power Station-IF1	Isolated Find	Low (isolated find)	Avoid with project design	<p>Within the Survey Boundary but with a high chance for avoidance if spanned by the ETL.</p> <p>If able to be avoided, temporarily fence site with high visibility fencing for the duration of works in the area.</p> <p>If cannot be avoided, manage as a Group 1 site.</p>
<b>Transport Route</b>					
37-3-1588	Albano Road OS-02	Artefact scatter: 13 artefacts	Low-Moderate (low-density artefact scatter with some potential for subsurface deposits)	Partial harm Group 2	<p>Low probability for avoidance.</p> <p>Those portions of the site outside of the Survey Boundary will not be harmed by the Project and will be conserved in the landscape (see ACHAR Figure 6 18). Harm will be avoided by fencing off the boundary of the Survey Boundary in these areas and ensuring that areas beyond the Survey Boundary are a no-go zone for all activities associated with the Project including vehicle movements and lay-down areas</p>
37-3-1589	Albano Road OS-03	Artefact scatter: three artefacts	Low-Moderate (low-density artefact scatter with some potential for subsurface deposits)	Partial harm Group 2	<p>Low probability for avoidance.</p> <p>Those portions of the site outside of the Survey Boundary will not be harmed by the Project and will be conserved in the landscape (see ACHAR Figure 6 20). Harm will be avoided by fencing off the boundary of the Survey Boundary in these areas and ensuring that areas beyond the Survey Boundary are a no-go zone for all activities associated with the Project including vehicle movements and lay-down areas</p>

### ***Additional Management Recommendation***

In summary, the following recommendations are made, which supersede those presented in Section 10 of the ACHAR:

- Before works commence, the portions of the Survey Boundary not surveyed will require survey by an archaeologist and members of the Aboriginal community (See Section 4.2.3 of the ACHAR Technical Report). This includes the section of Albano Road, which was driven during the field assessment, but did not include a pedestrian survey at the time of field assessments;

- As many sites as is possible should be avoided in the final design of the ETL and access tracks. Further details on these potential avoidance measures are provided in Section 4.2.1 of the ACHAR Technical Report;
- Those sites that can be avoided should be protected from inadvertent damage during the works by temporarily fencing the site as set out in Section 4.2.4 of the ACHAR Technical Report; and
- Those sites that are not able to be avoided should be managed by the procedures set out in Section 4.2.5 of the ACHAR Technical Report and **Table 20**.

An Aboriginal and Cultural Heritage and Management Plan (ACHMP) will be prepared for the Project in accordance with conditions of consent. The ACHMP will quantify the exact sites to be impacted, the methods by which they will be managed and the fate of any artefacts that are recovered prior to the works. The ACHMP will also provide a protocol for unanticipated finds and the discovery of human skeletal material. The ACHMP will include the mitigation measures identified in the ACHAR and be prepared in consultation with the RAPs and relevant regulators.

## 6.5 HISTORIC HERITAGE

An Historic Impact Statement (HIS) was undertaken for the Project (as exhibited) by Ozark Environment and Heritage Management Pty Ltd (Ozark). It is presented as Appendix N of the EIS.

A further assessment was undertaken by OzArk to identify and assess any additional Historic Heritage constraints and/or impacts in areas outside of the EIS Survey Boundary, as a result of proposed amendments to the Project. This is included in **Appendix D5**.

The HIS is the EIS should be consulted for all information dealing with the environmental and archaeological context, survey results, and controls for the avoidance and minimisation of harm to historic heritage values associated with the Project.

### 6.5.1 Predictive Modelling

The assessment of the additional areas not surveyed for the EIS has been completed at a desktop level only. However, as extensive landforms near and around the additional areas were surveyed for the EIS, the potential for the additional areas to contain items of heritage significance can be confidently predicted.

All the additional areas not surveyed for the EIS are in:

- Sloping or minor ridge line landforms. Slopes are generally steeper than 10 degrees;
- Landforms distant to permanent or semi-permanent water; and
- Landforms that have undergone disturbances from vegetation clearing and long-term grazing.

The survey for the HIS comprehensively sampled similar landforms of the Project Boundary within which the additional areas are located. This region consists of slopes, sometimes very steep, narrow localised ridges, and V-shaped valleys. The landforms are largely cleared and have been grazed for many years. While remnant vegetation is located on the steepest slopes, this does not consist of old-growth vegetation but areas that have probably been cleared, or at least logged, in the past. Waterways are best described as headwaters and would generally only hold water on a seasonal basis. Waterways in this region generally lack creek flats, terraces, or other areas suitable for historic occupation.

The extensive survey within the Survey Boundary failed to record many historic sites in these slope and ridge landforms. This was entirely due to the nature of the landforms being generally too steep for occupation and distant to reliable sources of water.

The potential for each additional area not surveyed for the EIS to contain significant historic values is shown in **Table 21**.



**Table 21 Heritage Potential in the Unsurveyed Areas**

Proposed Impact	Length	Landform Type	Likelihood to Contain Significant Heritage Values
Road widening along portion of Albano Road in north	11.6 km	Slopes. No waterway crossings	Very low likelihood to contain historic objects as the area is either side of Albano Road in moderately steep landforms.
Realigned access track in north from WTG 38 to WTG 21	~ 4.5 km	Undulating moderately steep. No level areas. Some crossings of minor waterways	Very low likelihood to contain historic objects due to the nature of the landforms. While the alignment crosses a minor waterway, this landform was assessed for the HIS and historic site Hilliers Creek-HS01 was recorded associated with the waterway. There are no other waterways in this additional area.
Corridor for realigned overhead electricity reticulation in north from WTG 38 to WTG 21	~ 3.6 km	Undulating moderately steep. No level areas. Some crossings of minor waterways	Very low likelihood to contain historic objects due to the nature of the landforms. While the alignment crosses the same waterway associated with Hilliers Creek-HS01, aerial imagery shows no structures at this location within the overhead reticulation alignment.
Realigned access track in centre of Project Boundary from WTG 45 to WTG 30	~ 2.2 km	Minor ridge and slopes. One crossing of a minor waterway	Very low likelihood to contain historic objects due to the nature of the landforms. While the alignment crosses Fish Hole Creek, aerial imagery shows no structures at this location within the access track alignment.
Corridor for overhead electricity reticulation in centre of Project Boundary near WTG 59 to WTG 48	650 m	Steep V-shaped valley	Very low likelihood to contain historic objects due to the steep nature of the landforms. The waterway crossing has no associated creek flats or terraces, and aerial imagery shows no structures at this location within the overhead reticulation alignment.
Realigned access track from WTG 48 to WTG 49 in the centre of the Project Boundary	760 m	Ridge, steep slopes. No waterway crossings	Very low likelihood to contain historic objects due to the steep nature of the landforms. The termination of the ridge, both to the east and to the west was surveyed for the EIS and no historic items were recorded. Aerial imagery shows no structures within the access track alignment.
Realigned section of the access track to the north of the O&M facility	1.3 km	Slopes	Very low likelihood to contain historic objects due to the sloping nature of the landforms. Identical landforms on the eastern side of the valley were surveyed for the EIS and no historic sites were recorded, even in flatter landforms near Cedar Creek. Aerial imagery shows no structures within the access track alignment. Historic settlement is located in the gentler gradients to the east of Cedar Creek (Strathclyde House).
Realigned portions of the access track in the east between WTG 25 to WTG 72, and WTG 8 to WTG 9	3 km	Slopes and minor ridges	Very low likelihood to contain historic objects due to the sloping nature of the landforms. Identical landforms to the east were surveyed for the EIS and no historic sites were recorded. Aerial imagery shows no structures within the access track alignment.

Given the knowledge gained for the survey that has taken place, the observed landform characteristics of the additional areas seen from digital elevation models (Figure 1-2 to Figure 1-6 in the HIS Technical Report, **Appendix D5**), and the information gained from aerial imagery, it is assessed that the additional areas have a very low potential to contain items of historic heritage significance.

### 6.5.2 Impact Assessment

The changes to the Survey Boundary for the amended Project have not resulted in changes to the likely impacts arising from the amended Project.

The survey for the HIS consisted of a substantial survey effort that extensively sampled the landforms of the Survey Boundary. In the HIS (p. 29), the survey results are summarised and presented in **Table 22**.

Further, it was identified that the Project is located within a cultural landscape typified by small rural holdings containing a variety of structures such as homesteads that exemplify a long history of settlement over the past 150 years.

**Table 22 Recorded Historic Heritage Items and Project Impacts**

Site Name	Type	Impact	Comment
Rock Lily Gully (HS01)	Family burial plot	No	The site is located outside of proposed impacts and will be avoided. Recommendations will be made to avoid inadvertent damage to the site during construction of the Project.
Hilliers Creek (HS01)	Farm House ruin	No	The site is within the Survey Boundary and has a potential to be impacted. The site will be avoided by ensuring that it is spanned by the electricity line and that access tracks are kept away from the hut.

### 6.5.3 Mitigation and Management

The changes to the Survey Boundary for the amended Project have not resulted in changes to the likely impacts arising, and therefore the management required to ensure that historic values are appropriately considered have not altered from those presented in Section 7 of the HIS as summarised below.

#### *Existing Management Recommendations*

In summary, the HIS considered three items and the recommendation for each item is set out below.

#### Rock Lily Gully (HS01)

HS01 is located outside of the Survey Boundary, although there will be impacts from the construction of access tracks within 40 m of the graves. The following management recommendations are made regarding this place:

- The proponent will undertake to restore the fence surrounding the graves and install plantings to shield the graves from the nearby proposed access tracks; and
- The grave site at GDA Zone 56 316931E, 6428480N should be fenced with a high visibility barrier during construction of the Project to avoid inadvertent impacts.

### Hilliers Creek (HCo1)

HCo1 is located within the Survey Boundary and liable to be impacted. Although the assessment of heritage significance in Section 5.4.2 of the HIS concluded that the place does not have local or state heritage values, it is, nonetheless, highly desirable for the place to remain within the landscape. As such, the following management recommendations should be followed:

- The location of Hilliers Creek-HSo1 should be considered when the design of the overhead electricity reticulation line is finalised to ensure that the place is avoided by not constructing an electricity pole within 20 m of the place; and
- No access tracks for the construction of the overhead electricity reticulation line should be designed to be within 10 m of the place.

### Former Roman Catholic Church

The Former Roman Catholic Church will not be impacted, either physically or visually as demonstrated in the SOHI presented in Section 5.7 of the HIS.

As there is no proposed work within the defined heritage curtilage of the 'Former Roman Catholic Church' (Lot 1 DP1167323), there are no management recommendations beyond ensuring that there are no impacts within the lot containing this item including vehicle movement and the storage of materials.

### ***Additional Management Recommendation***

With reference to Section 7 of the HIS, the mitigation and management commitments for the Project are updated to now include the following:

- Before works commence, the portions of the Survey Boundary not surveyed will require survey by an archaeologist. See Section 4.2.1 of the HIS Technical Report for further details;
- All land-disturbing activities must be confined within the assessed Survey Boundary. Should project impacts change such that the area to be impacted is outside of the assessed Survey Boundary, then additional assessment may be required;
- The grave site (Rock Lily Gully-HSo1) at GDA Zone 56 316931E, 6428480N should be fenced with a high visibility barrier during construction of the Project to avoid inadvertent impacts. To mitigate visual impacts from the access roads, the proponent will restore the fence surrounding the graves and install plantings to shield the graves from the nearby proposed access tracks;
- The location of Hilliers Creek-HSo1 located at GDA Zone 56 323003E, 6435229N should be considered when the design of the overhead electricity reticulation line is finalised to ensure that the place is avoided. No access tracks for the construction of the overhead electricity reticulation line should be designed to be within 10 m of the farm house ruin. No electricity pole associated with the overhead electricity reticulation line should be designed to be within 20 m of the farm house ruin;
- There should be no impacts within Lot 1 DP1167323 that contains the 'Former Roman Catholic Church' (Item I156 on the Singleton LEP); and
- In terms of the cultural landscape surrounding the Survey Boundary, particularly along Albano (Bowmans Creek) Road, the proponent will commission a community-based heritage study that will document and archivally record any items held to be significant by the local community. This study will provide a record of the cultural landscape prior to any impacts associated with the Project commencing.

Procedures for the unexpected discovery of historic items and/or human skeletal material during the construction and/or use of the amended Project will be set out in an approved Historic Heritage Management Plan (HHMP) that will be developed following project approval. Normally, no construction work associated with the Project can commence until the HHMP has been approved by the Department of Planning, Industry and Environment.

## 7. JUSTIFICATION OF AMENDED PROJECT

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*The following section provides a project overview, describes the feasible alternatives to the Project (and its key components) that were considered, includes a brief description of the need for the Project and summarises the Project for which approval is sought.*

### 7.1 PROJECT DESIGN

#### 7.1.1 Overview

The Proponent is seeking approval under each of the EP&A Act and EPBC Act for the construction, operation, maintenance and decommissioning of the Project.

The Project is generally located at Bowmans Creek, approximately 10 km east of Muswellbrook and 120 km north-west of the Port of Newcastle in NSW.

The Project has an estimated capital investment value of \$569 M and involves up to 56 WTG sites with an indicative generation capacity of 347 MW. The Project also includes electrical infrastructure, other temporary and permanent ancillary infrastructure, local road network upgrades and the construction of a transmission line connecting to the existing Liddell Power Station substation.

The Project will generate up to 156 Full Time Equivalent (FTE) jobs during its 18-month construction period and up to 15 FTE jobs over its operational life.

The Project Boundary extends predominantly across two LGAs, being the MSC and SC LGAs. A small number of WTGs are also proposed in the UHSC.

The region is a significant power generating area accommodating active thermal coal mines and two operating coal fired power stations. The renewable energy sector is emerging with one solar, one pumped hydro and one wind farm project under consideration. Further, in November 2020, the Hunter Region was identified as one of four Renewable Energy Zones in NSW to support the NSW Government's Electricity Infrastructure Roadmap.

The Project is located primarily on private freehold land in the Hunter River catchment. Land within the Project Boundary is zoned RU1 – Primary Production (where electricity generation is permissible with consent). The dominant agricultural pursuit within 5 km of the Project Boundary is beef cattle grazing.

The Proponent is one of the most experienced wind energy development companies in NSW with 570 MW of approved wind energy projects currently operating in NSW, as well as being a significant developer of solar projects across Australia. The Proponent is a founding signatory to the Clean Energy Council's 'Best Practice Charter for Renewable Energy Developments' and commits to honouring the Charter for the Project.

#### 7.1.2 Alternatives Considered

The "Do Nothing" approach would lead to a missed opportunity for the state of NSW, Federal Government of Australia and its people in relation to:

- Provision of additional generation capacity into the NSW grid to assist in meeting load demand as a result of retiring thermal generators;
- Reducing greenhouse gas emissions and contributing to cleaner electricity generation under the Federal Paris Agreement commitment;
- Supply of renewable energy to assist in meeting State targets under the 'Net Zero Plan Stage 1 2020-2030'; and

Providing an opportunity for regional investment as the renewable energy sector grows in NSW and the Hunter Valley.



Additionally, the 'Do Nothing' approach (or not carrying out the Project) will create missed opportunities for the environment and local community including:

- Reducing a significant amount of greenhouse gas emissions through the avoidance of carbon dioxide from coal fired power stations;
- Direct injection of funds into the local economy through the provision of jobs, use of local services, ongoing landowner payments and contributions under the VPA;
- The production of 347 MW of clean, renewable energy, equivalent to the consumption of around 145,000 homes (greater than the total existing houses in the LGAs); and
- Improvements to the local road network.

The Project design has been further refined since the EIS was exhibited between the 31 March 2021 and 11 May 2021. The amendments sought in this report have occurred in response to community and regulatory engagement, findings from additional ecological field studies (to avoid sensitive features) and preliminary engineering design following ground-truthing of topographic features and geotechnical conditions.

### 7.1.3 Project Need

The primary need for the Project is to contribute efficient, low-cost electricity to the National Energy Market (NEM).

The NEM operator, Australian Energy Market Operator (AEMO) released its main system planning document, the *Integrated System Plan* (AEMO, 2020) (ISP) in July 2020. This document is updated each two years and is described as "an actionable roadmap for eastern Australia's power system to optimise consumer benefits."

Through a detailed technical, regulatory and economic analysis of the current electricity system and drawing on extensive consultation with industry participants, the ISP develops a number of scenarios for how electricity demand may be met in the NEM in the period to 2040.

The July 2020 ISP describes several factors which underline the need for the Project. The key elements are:

- Electricity demand in the National Electricity Market is expected to remain generally constant throughout the period to 2040. While there is projected to be underlying growth in consumption across the NEM, this will be offset via continued investment in distributed photovoltaic and extension of the NSW Energy Saving Scheme.
- While overall grid consumption is being held constant, new generation capacity is needed to replace retiring plants. To fill that gap, AEMO forecasts that Australia should invest in a further 26-50 GW of new large-scale variable renewable energy beyond existing, committed and anticipated projects; and
- An optimal split of new solar and wind variable renewable energy would minimise the need for dispatchable storage and generation and therefore keep costs down for consumers.

Therefore, there is a very high level of confidence that there is a need for the Project and that an appropriate technology (wind energy) has been selected.

As well as its contribution to energy demand, the Project meets other needs relating to the continuing development of the regional and State economy and to the achievement of the NSW Government's target for net-zero emissions by 2050.

NSW is currently a net importer of electricity, having to rely on both Queensland and Victoria for its peak power demand. This will be further exacerbated by the pending closure of Liddell Power Station in 2022 and Bayswater Power Station in 2035.

The Hunter Region is the leading regional economy in NSW and currently accounts for 44% of NSW power generation. The main industries in the Upper Hunter Valley are currently coal mining and fossil fuel power generation followed by the agricultural pursuits of the equine, viticulture and livestock grazing industries.

A change in Government policy settings, coupled with innovation and technological advancements, is driving the growth and diversification of the Hunter Region's energy industries with a focus on both energy efficiency and the generation of renewable energy. In the Upper Hunter Valley in particular, with the scheduled closure of Liddell and Bayswater power stations in 2022 and 2035 respectively, a successful transformation in the energy sector will be critical to the Upper Hunter's socio-economic wellbeing.

As well as assisting in the diversification and transformation of the Hunter Region, the Project will assist local, state and the Australian governments in meeting sustainability commitments as described below.

### ***Internal and National Policies***

Australia's current Nationally Determined Contribution (NDC) commits it to reducing GHG emissions to 26-28% below 2005 levels by 2030. To satisfy its NDC, Australia will need to reduce its annual GHG emissions to between 263 and 272 Mt of CO<sub>2</sub>-e. Australia's total emissions for 2018 were 383 Mt of CO<sub>2</sub>-e. Material reductions in GHG emissions are required over the next decade to achieve the target under Australia's NDC.

The Project will contribute to achieving the Australian government's key policy, the RET which aims at increasing electricity generation from sustainable or renewable energy sources and will therefore assist in fulfilling Australia's international commitments.

### ***NSW Policies***

The *NSW Climate Change Policy Framework* (Office of Environment and Heritage, 2016) outlines the NSW Government's role in reducing and managing the impacts of climate change. The Framework sets the aspirational long-term objective of achieving net-zero emissions by 2050. The '*Net Zero Plan Stage 1: 2020-2030*' outlines four priorities over the next decade to achieve this objective. The Project is entirely consistent with and will contribute to these priorities particularly within the Upper Hunter Valley:

- An emission reduction technology that will grow the economy, create jobs and reduce the cost of living;
- Empower consumers and businesses to make sustainable choices;
- Providing the next wave of emissions reduction innovation to ensure economic prosperity from decarbonisation beyond 2030; and
- Assist the NSW Government in "*leading by example*".

The *Hunter Regional Plan 2036* (DPE, 2016d) (HR Plan) outlines the NSW Government's land use planning priorities for the Hunter Region over the next 20 years. The Project will assist in meeting the following goals from the HR Plan:

- Become the leading regional economy in Australia through the provision of employment, VPA and associated economic benefits of the Project;
- In addition to the existing coal and energy exports from the Hunter, continue to support the growth and diversification of the regional economy and employment base.
- Provide alternative energy resources to enable the Upper Hunter to take advantage of new and emerging opportunities; and
- Enable opportunities for renewable energy industry.

Promote new opportunities arising from the closure of coal-fired power stations that enable long term sustainable economic and employment growth in the region.

### **Local Government**

The Project is consistent with the UHSC's key sustainable development policies and strategies and will assist to:

- Encourage and support sustainable development and "to encourage a diverse economy whilst promoting and preserving agriculture";
- Attract a range of new opportunities in industries such as renewable energy production and to attract a skilled workforce to support this economic growth;
- Develop rural areas to accommodate renewable energy generation and distribution infrastructure. The HR Plan recognises the UHSC as part of the Upper Hunter Green Energy Precinct which has the potential to support renewable energy projects that will assist in the State-level direction to grow and diversify the energy sector;
- Fulfil UHSC's "Climate Emergency" declaration and commitment to be carbon neutral by 2030; and
- Support the renewable energy sector throughout the region.

The Project is consistent with MSC's key policies and strategies and will assist in:

- Diversifying the local economy to reduce volatility caused by a high reliance on the resources sector;
- Supporting state and federal climate change initiatives;
- Creating an opportunity for the development of new power generation facilities, including wind as a potential cost-effective replacement energy source as the contributions of the mining and power generation industries to the local economy reduce over the next 10 years.

The Project is consistent with SC's key policies and strategies and will assist in:

- Retaining options for alternative land use strategies so that flexibility to allow economic, social and environmental change can be accommodated; and
- Promoting increased use of renewable energy sources and partner with industry to create Singleton as an alternate energy hub.

#### **7.1.4 Project for Which Approval is Sought**

Consideration of the feasible alternatives considered and the need for the Project has culminated in the Project for which approval is sought, which conceptually comprises:

- Up to 56 WTG sites;
- Electricity infrastructure;
- Ancillary infrastructure;
- Minor upgrades to the road network to facilitate delivery of OSOM loads to the site; and
- Administrative activities (including boundary adjustments and subdivisions).

## **7.2 STRATEGIC CONTEXT**

*The following section provides a summary of the strategic context within which the Project is proposed. It demonstrates the suitability of the site including its compatibility with adjacent existing and proposed land use including rural villages, subdivisions, land of high scenic value, conservation areas, Strategic Agricultural Land, State Forests, mineral resources, trigonometric stations, tourism facilities, other renewable developments and the existing electricity transmission network.*

### **7.2.1 Existing and Future Land Use Conflict**

Existing land uses within and immediately external to the Project Boundary include agricultural cattle grazing and rural dwellings. There are neither extractive industries nor any existing mining tenements held under the *Mining Act 1992* within the Project Boundary. Other industry in the vicinity is discussed at Section 2.3 of the EIS.

Muswellbrook is the closest township located over 15 km to the west of the Project Boundary and Singleton over 25 km to the south-east.

The majority of land within the Project Boundary is privately owned, cleared agricultural land with small areas of remnant bushland.

The two predominant land classes within the Project Boundary are: Class 5 which is generally used for grazing; and Class 7 land which is generally not suitable for agriculture due to steep gradients, rockiness and/or erodible soils (OEH, 2012). It is acknowledged that within this large-scale mapping, some areas are currently utilised for grazing activities.

Whilst there will be minor direct impacts to agricultural activity during the life of the Project, this represents 0.01% of the total agricultural activity in the region. The impacts proposed will not impact the capability of the land in perpetuity and when the Project is decommissioned, the land will be able to be returned to its former agricultural productivity. The minor impacts to foregone agricultural productivity will be borne by the Associated Landholders, for which they will be compensated. The regional economic activity impacts of foregone agriculture are therefore materially less than those of the construction and operation of the Project.

There are a number of rural communities within 5 km of the Project Boundary including Bowmans Creek, Davis Creek, Goorangoola, Greenlands, Hebden, McCullys Gap, Muscle Creek and Rouchel Brook. All communities consist of rural dwellings on larger properties with the exception of the rural villages of Muscle Creek; and McCullys Gap.

No known subdivisions are proposed within 4 km of the closest WTG.

The Project will not impact subdivisions as none are proposed and due to SC and MSC zoning restrictions, limited opportunities for this exists in the vicinity of the Project. Where potential land use conflicts with rural villages and rural dwellings were identified, adequate mitigation measures for residual impacts have been committed to by the Proponent as described in Section 8 of the EIS.

### **7.2.2 Land of High Scenic Value**

There are no National Parks or State Forests within or immediately adjoining the Project Boundary. Mount Royal National Park is the closest and is located at least 13 km to the north-east of T12.

Key recreation areas are at a significant distance from the Project with Lake St Clair over 10 km from T7, Glenbawn Dam 13 km north-west of T12 and the Lake Liddell Recreation Area over 8 km from T67.

No RMS signposted Tourist routes are located within 20 km of the Project Boundary.

No areas of significant conservation value occur within the Project Boundary.

The Main Northern Rail Line is 4 km south of the Project Boundary with this section of line being an integral part of the Hunter Valley Coal Chain. It also facilitates freight as well as regional passenger trains. The NEH is located south and is the main road that connects Muswellbrook and Singleton in a north-south direction.

The Project will not impact conservation areas or tourism facilities. Where impacts to land of high scenic value were identified, adequate mitigation measures for residual impacts have been committed to by the Proponent as described in Section 8 of the EIS.



### 7.2.3 Other Industries

There are several approved coal mines within 10 km of the Project Boundary including Muswellbrook Coal Mine to the north-west, and Liddell Mine and Mount Owen Complex to the south. Two existing quarries occur to the south of the Project Boundary with another proposed (however there is no publicly available information on the latter).

A Trigonometry Station (see Section 4.4.8 of the EIS) is located within crown land within the Project Boundary. Project infrastructure is proposed within the reserve on which the station is located however no direct impact will occur to it.

There is no mapped SAL or CIC located within the Project Boundary. The Project will not extract any water from streams or groundwater aquifers.

No existing or approved wind farms are located in proximity to the Project, with the closest wind farm being the Upper Hunter Energy Park at over 35 km to the north-west. Although there is enormous potential for the expansion of renewable energy projects in the Upper Hunter Valley and government policy is in place to support this, there are currently none in operation.

The closest State Forest is Ravensworth State Forest located adjacent to the Mt Owen Complex, approximately 6 km to the south of the Project Boundary.

The Project will not impact SAL, state forests, mineral resources, trigonometry stations, or existing or approved wind farms.

### 7.2.4 Existing Electricity Transmission Network

The Liddell Power Station is scheduled for closure in 2022 and Bayswater Power Station in 2035, as such 1,680 MW and 2,640 MW respectively, of electricity a year will be lost from the NSW generating system, respectively.

With these closures, and the potential increase in the NSW deficit of power generation to meet its needs identified in the *Electricity Statement of Opportunities* (AEMO, 2019) (ESOO), the Federal and State governments have committed to financially supporting an upgrade of the transmission lines between NSW and Queensland.

In November 2018, TransGrid published a report proposing options to expand the NSW and Queensland transmission transfer capacity. As part of this process, on 28 April 2020, the Australian Energy Regulator published a decision to support TransGrid's 'QNI Minor Upgrade Contingent Project' which will go some way towards expanding the transmission transfer capacity between the two states.

TransGrid's QNI minor upgrade project was identified as a priority investment in the Australian Energy Market Operator's 2018 ISP and the 2020 Integrated System Plan. TransGrid's upgrade is consistent with the preferred investment option identified through the 'Expanding NSW-QLD Transmission Transfer Capacity Regulatory Investment Test for Transmission (RIT-T)' process. This investment will benefit consumers and producers of electricity by deferring the need to build new generation and storage capacity in NSW, as well as allowing for more efficient sharing of generation across the NEM and supporting the ongoing energy market transition.

The two existing TransGrid 330 kilovolt Liddell to Tamworth transmission lines are located west of the Project Boundary approximately 3 km from the Project.

In consideration of the proposed closure of the Liddell Power Station prior to or within the early operational life of the Project, over 1,680 MW of generational capacity will be lost from the existing NSW system. The 347 MW from the Project's 56 WTGs will be able to partially replace this loss of generating capacity.

Adequate capacity exists in the adjacent transmission network for the Project. The further proposed upgrades by TransGrid to the NSW electricity transmission system will ensure that there will not only be capacity for the Project but for multiple other projects to be progressed.

## 7.3 REGULATORY CONTEXT

*This section addresses the relevant matters for consideration described in Section 4.15 of the EP&A Act, including: the objects of the Act, evaluation of the merits of the Project as a whole and how the principles of ESD have been incorporated in the design, construction, operation and decommissioning of the Project.*

### 7.3.1 Consistency with Objects of the EP&A Act

Section 1.3 of the EP&A Act lists the Objects of the Act, which are the outcomes that the legislation seeks to achieve. The following Objects are relevant to the Project and include a description of how these Objects are satisfied.

*"(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,"*

The Project will facilitate the development of land for the generation of relatively low-cost renewable energy, thereby satisfying the energy needs of the community. The Project has been designed to minimise land disturbance, particularly disturbance of native vegetation. As such, it represents the proper development and conservation of natural resources. The Project will generate additional employment within the region which will assist in sustaining the socio-economic viability of the three LGAs.

*"(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,"*

The Project is a sustainable development. This EIS provides the consent authority with a comprehensive assessment of the potential environmental, economic and social impacts and benefits of the Project.

The Project has been developed through a comprehensive planning, stakeholder engagement and environmental assessment process to ensure that the principles of ESD are addressed. The Project's form has been determined by careful consideration of a number of alternatives. The impacts of the Project have been predicted with certainty in a detailed assessment process outlined in this EIS. Management measures to address the impacts that will occur have been incorporated into the Project as required, thus addressing the Precautionary Principle.

The Project is consistent with the principles of ESD as discussed further in Section 9.3.2 of the EIS.

*"(c) to promote the orderly and economic use and development of land,"*

The Project will generate employment and economic stimulus during its construction and operations. Further, it has been designed to minimise disturbance to land, promote dual land use and increase the economic returns from the land that is part of the development.

The Project will generally stimulate the economy with regional spending for production related costs and with wages for labour which will also contribute to the regional economy.

Further, the Associated and Neighbour Landholder Agreements, Neighbour Benefit Program and proposed VPA with Councils will provide an ongoing regional economic stimulus from the use of the land greater than its current productive capacity.

*"(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,"*

The Project has been designed to minimise disturbance to native vegetation. The Project will still result in the loss of some CEEC, EEC and habitat for threatened species. In accordance with Part 6 of the BC Act, the Proponent has committed to establishing a biodiversity offset to compensate for clearing of native vegetation and impacts to threatened species.

In accordance with the BAM, to achieve a no net-loss of biodiversity values, Project impacts on biodiversity values were initially avoided, minimised and mitigated to the greatest extent possible. Beyond this, any residual impacts will be offset by the retirement of the required number of biodiversity credits for the 15 impacted PCTs, the threatened species.

Revised biodiversity offset calculations, utilising additional survey effort will be undertaken at the time of micro siting the final project layout with the requisite credit calculations for any impacted threatened flora species updated and relied upon for offsetting the residual impacts of the Project.

*"(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage)."*

The Project is a sustainable development and has been designed in consultation with the landowners and the keepers of the Cultural Heritage knowledge of the land. Aboriginal heritage values present at the site were assessed in consultation with Aboriginal stakeholders. Both the built and cultural heritage of the site will be carefully considered during the micro-siting of infrastructure with any residual impacts minimised during construction.

*"(j) to provide increased opportunity for community participation in environmental planning and assessment."*

Extensive engagement with the landowners and other local community (both individuals and stakeholder groups) has been undertaken to identify key issues relating to the Project. These issues have been comprehensively addressed in this EIS.

### **7.3.2 Consistency with Principles of ESD**

The objects of the EP&A Act adopt the principles of ESD in the application of the Act. These principles are articulated in Section 6(2)(a) of the Protection of the Environment Administration Act 1991 where it is stated that:

*"Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles ..."*

Each Principle which is relevant to the Project is discussed below.

#### ***Precautionary Principle***

*"That if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation."*

*In the application of the precautionary principle, public and private decisions should be guided by:*

- (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
- (ii) an assessment of the risk-weighted consequences of various options,"*

Adherence to the precautionary principle requires avoiding serious or irreversible environmental damage by properly assessing potential impacts and taking the necessary mitigation measures. The amended Project identifies, with certainty, the environmental impacts from the development of the Project, which has been designed to avoid serious or irreversible environmental damage.

To ensure this, actions involving unquantifiable and unacceptable environmental consequences have been avoided. Further environmental consequences have been assessed on a "worst-case scenario" basis, where if potential serious or irreversible damage was identified, an appropriate re-design of the Project was implemented to avoid those consequences. Additionally, the Proponent has adopted a risk-based approach to assessment to ensure certainty over the predicted impacts of the Project.

### ***Intergenerational Equity***

*"That the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations".*

The Project design, determined through extensive consultation and the examination of the alternatives, will operate to ensure that there is no significant effect on the environment as a result of the Project which will diminish the health, diversity or productivity of the locality for future generations. This will be reinforced by the commitments to environmental management systems and the management and mitigation measures proposed in this EIS.

The immediate cost of the environmental effects will be borne through the Project life and will not be left to be borne by future generations.

This has been achieved by further limiting the scale of the Project and excluding development where visual and noise impacts exceeded relevant Government Guideline expectations and agreements could not be reached with impacted residents. The Project will not result in "serious or irreversible" impact to biodiversity. Long term ecological conservation areas will be established under the NSW Biodiversity Assessment Method as a consequence of the Project to ensure no net loss of biodiversity occurs as a result of the Project.

### ***Biodiversity Conservation***

*"Conservation of biological diversity and ecological integrity – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration"*

The design of the Project excludes, where possible, areas of native vegetation and impacts to endangered species. In particular the proposed amendments to the Project have resulted in a reduction of 96 ha of native vegetation being disturbed. The biodiversity offset committed to by the Proponent and a commitment to further careful micro siting of the various elements of the Project at the time of detailed design just prior to construction, demonstrates adherence to this principle. These actions will ensure that the Project will not threaten the preservation of biodiversity and ecological integrity of the area and that the biodiversity and ecological value of the area is maintained and potentially improved in the longer term.

### ***Improved Valuation***

*"Improved valuation, pricing and incentive mechanisms—namely that environmental factors should be included in the valuation of assets and services, such as:*

- (iii) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
- (iv) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
- (v) environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems."*

The generation of waste has been considered in this EIS and appropriate management strategies identified for construction, operation and decommissioning. Most of the waste associated with the Project will be classified as general solid waste (non-putrescible). With the exception of some metal and plastic items, most general solid waste (non-putrescible) is capable of being reused or recycled.

A lifecycle assessment was undertaken which concluded that the proposed wind turbine generators will offset their energy expenditure in less than one year, assuming an average capacity factor for Australian wind farms. The proposed wind turbine generators will have an operational life of approximately 25 years. As such, the energy produced by a wind turbine generator over its lifespan will substantially outweigh the energy required for its construction.

Even with this principle applied in its entirety the economic and environmental benefits of the Project will far outweigh any residual environmental costs and temporary loss of agricultural activities.



## 7.4 STAKEHOLDER ENGAGEMENT INTEGRATION

### 7.4.1 Overview

Wind farms in NSW are limited to sites on elevated land with above average wind speeds that have good transmission line access. The Project is within the NSW Governments 'Wind Farm Map' within a high wind speed area that is in proximity to transmission line infrastructure.

Such sites are relatively rare, and often, these sites are located in the vicinity of rural dwellings and in some cases in the vicinity of small to medium sized regional communities. This can cause conflict where local community members feel impacted by the Project and yet do not see any direct benefits from the Project.

The limited number of appropriate wind farm sites means that this conflict is often unavoidable and cannot be eliminated by moving the wind farm to a different location.

Accordingly, community engagement is focused not only on the careful positioning of WTGs and other project elements to reduce direct impacts, but to also understand and mitigate the impacts of the Project whilst maximising the socio-economic benefits of the Project to the local community.

The Wind Energy Guideline outlines the expectation for early and meaningful consultation with the local community and other stakeholders to enable feedback that can be incorporated into the design of the Project. Extensive consultation has been undertaken over the Project resulting in many elements of it being carefully redesigned and any identified residual impacts further mitigated.

### 7.4.2 Stakeholder Engagement Plan

A SEP was prepared and implemented during the Scoping Report and revised for the EIS stage of the Project. The following key objectives were identified in the SEP relevant to the community:

- Maintain and further develop cooperative landowner and community relationships with both Associated and Non-Associated Landholders;
- Identify further key stakeholders, their potential issues and concerns and appropriate engagement opportunities so that their concerns and aspirations were heard and understood;
- Ensure the community continues to be fully informed about the Project, its likely impacts, its likely benefits, opportunities for input and the planning approval's process;
- Facilitate the development and implementation of response and feedback strategies to address identified stakeholder concerns;
- Ensure the community continues to be informed about the Project, its likely impacts, its likely benefits, opportunities for input and the planning approval's process;
- Provide multiple opportunities for dialogue in various forms to allow the community to receive information and provide feedback about the Project; and
- Where appropriate incorporate feedback into the Project design to address concerns and issues raised.

### 7.4.3 Issue Response

#### *Project Changes*

In response to further stakeholder engagement and feedback over the exhibition of the EIS, the scale of the Project has further contracted and the benefits of the Project, through the Proponents proposed near neighbour benefit program, have been broadened to include all neighbours within 5 km of a WTG.

#### **7.4.4 Ongoing Engagement**

The Proponent is committed to effective engagement with all identified stakeholders and will continue to implement a SEP through the approvals process and beyond.

### **7.5 PROJECT IMPACTS AND BENEFITS**

*This section describes the environmental and social costs of the Project. It also describes the socio-economic benefits with regard to electricity demand in NSW, the NEM, the Commonwealth RET and the greenhouse gas savings of the Project.*

#### **7.5.1 Environmental Impacts**

The EIS was conducted in accordance with the objects of the EP&A Act including the principles of ESD and leading practice environmental and social standards. The process included:

- Environmental Risk Assessment;
- Stakeholder engagement to identify issues to be addressed;
- The conduct of the appropriate technical assessments;
- Quantification of impacts with certainty (Section 7 of the EIS); and
- Application of and commitment to environmental management and mitigation measures for any residual issues (Section 8 of the EIS).

The same principles were applied to the assessment of the contractions to the Project as proposed in this Amendment Report.

#### ***Landscape and Visual***

Most dwellings within 4.4 km of wind turbines are considered compliant with the Visual Bulletin performance objectives including visual magnitude and multiple wind turbine effects. Where impacts do not meet all the visual performance objectives (generally against multiple wind turbine effect or visual magnitude) the Proponent has committed to a range of mitigations measures including neighbour agreements, relocation and/or removal of wind turbines.

Although the Bulletin performance objectives can be achieved for the majority of dwellings, vegetative screening will be offered at all dwellings within 4.4 km of wind turbines resulting from site specific assessments (e.g., where few wind turbines are visible, where no significant tree cover surrounds the dwellings or curtilages, existing vegetation indicates partial screening of the Project or there are views of blades only).

No key public view locations were identified within 4.4km of the turbines. However, the assessment of scenic locations has been undertaken for 16 public viewpoints and scenic locations to at least 8 km. Key public view locations, scenic areas or lookouts are located at considerable distance from the wind turbines (and generally beyond the 8 km threshold).

Where impacts do not meet all the visual performance objectives, residual impacts are possible. The Proponent has committed to offering additional mitigation to Non-Associated Landholders. In addition to vegetative screening, a neighbour agreement will be offered to affected landholders.

As part of the amended Project WTG 10, 33, 60 and 61 have been deleted from the project and WTG 8, 9 & 32 relocated such that the Project's impact on any proximate private receivers is now greatly reduced.

## **Noise**

The maximum equivalent noise levels generated by the wind turbines under conditions most conducive to noise propagation (such as temperature inversions) will comply with the criteria established by the SEARs at all non-Associated dwellings (excepting P22-1 by 1 dBA).

## **Aviation Safety**

The Project is located within 55 km of three registered airports; Cessnock Airport, Maitland Airport and Scone Airport. The Project will not penetrate any Obstacle Limitation Surfaces or PAN-OPS surfaces and is located beyond the required horizontal extent of each of the airports circling areas.

Four Aircraft Landing Areas (ALA) will be impacted by the Project of which three are located on land associated with the Project. Take-off and landing from each would not be impacted but the associated circuit may be.

Based on previous studies and subject to the results of consultation with the Aerial Agricultural Association of Australia and local aerial application operators, it is reasonable to conclude that safe aerial application operations will remain possible on properties within and neighbouring the Project Boundary.

Aerial firefighting and emergency aviation services organisations have formal risk management programs to assess the risks associated with their operations and implement applicable treatments to ensure an acceptable level of safety can be maintained.

The highest wind turbine, T46, is below the lowest safe altitude minimum obstacle clearance level by approximately 2,612 feet above mean sea level. Therefore, the Project will not affect the grid lowest safe altitude of 6,600 feet above mean sea level.

## **Traffic and Transport**

Oversize or overmass vehicle movements are scheduled to occur during month 11-16, during which time a peak of up to 131 one-way daily vehicle movements will occur. The delivery of wind turbines is likely to be grouped to minimise the impact on the road network along its journey and occur outside of peak times during periods accepted by TfNSW and the local Council.

It is estimated that in the AM peak, 66 vehicles will enter the site and 20 vehicles will leave the site. In the PM, 20 vehicles are estimated to enter the project site and 66 vehicles leave the site.

All vehicles will access the site from the NEH via Hebden Road north or south. Once light vehicles have entered Hebden Road from the NEH, they will access the operations and maintenance facility off Scrumlo Road before dispersing across the site on private tracks. "SIRA" analysis results and movement summaries indicates the NEH / Hebden Road intersection is not detrimentally impacted by the addition of Project construction traffic and therefore would not require any upgrades.

The interaction between school buses to light vehicle construction traffic will be low and will be a minor conflict. The interaction of heavy vehicle construction traffic and oversize or overmass vehicles will be coordinated with the operator of the local school bus company.

## **Biodiversity**

The native vegetation extent (including 180 ha of Derived Native Grassland and 103 ha of remnant woody vegetation) within the Disturbance Area occupies 283 ha, which represents approximately 64% of the Disturbance Area. This comprises predominantly remnant vegetation, with some scattered occurrences of planted vegetation within the public road corridor and Crown land.

Habitat connectivity will be reduced by the long-term removal of 133 ha of woody vegetation which forms part of fragmented or stepping-stone habitats.

Collision risk modelling indicates that most avian species have an avoidance rate of 98-99%. Based on the outcome of the Risk Assessment, the risk of blade strike/collision for most birds was rated as negligible.

Identification of the plant community types determined that the native vegetation within the Survey Area aligned with 18 PCTs (with one of the PCTs occurring in two condition states). Of these, 15 PCTs occur in the Disturbance Area.

The worst-case direct impact resulting from the amended Project is the loss of vegetation and associated habitat within an indicative Disturbance Area of up to 417 ha. This is a reduction of 98 ha (19%) from the disturbance footprint of 515 ha described in the EIS.

Based on the requirement for wind turbines to be placed on the ridge top and the presence of threatened ecological communities and threatened species across the Survey Area, including on ridgetops, opportunities to avoid all impacts are limited. The linear layout of wind turbines along ridgelines, required for the wind farm to function at an economically feasible capacity has limited the extent to which turbines can be moved to avoid impacts.

None-the-less, a number of amendments have been able to be made to the location of the Project infrastructure within the Disturbance Area which have resulted in avoidance or minimisation of impacts on native vegetation and habitat.

With the implementation of the proposed avoidance, management and offsetting measures, the Project is considered likely to maintain or improve biodiversity values in the long term and will meet the no net loss standard required under the BAM.

### ***Aboriginal Heritage***

There were 16 sites considered, however only nine sites (six newly recorded and three previously recorded) that are located within the Survey Boundary. For the 16 sites:

- Eleven sites will now be avoided by the amended Project (including ANT 22);
- Five sites have potential to be impacted by the Project, however:
  - Two sites have potential to be avoided during the Transmission Line design;
  - One site that may only be partially harmed by the Transmission construction; and
  - Two sites will only be partially harmed by works along Albano Road.

As part of the project detailed design phase there may be some flexibility to avoid harm to certain Aboriginal sites, particularly with regards to the design of the transmission line.

### ***Historic Heritage***

There are no Commonwealth or National heritage listed places within the Survey Boundary.

There are three places listed on an LEP that are outside the Survey Boundary. The Assessment concludes that there will be no impact on these listed items.

Although not listed on a Local Environment Plan, two historic heritage places were recorded during the survey. Although neither Rock Lily Gully (HS01) or Hilliers Creek (HCo1) satisfy the criteria to be considered to have local heritage values, the loss of either item would be regretful, and as such both items will be retained in the landscape.

### ***Telecommunications***

The only link potentially impacted by the Project is the 400MHz NSW Rural Fire Service link which intersects with the swept path of the proposed location of Turbine T70. In order to avoid impacts to this link a clearance distance of 160m either side of the ray line will be required. Any micro-siting of other close turbines for example T69 will maintain the specified clearance of 160 m.



Two Broadcasting sites were identified with ACMA ID 6361 located 27 kms from the nearest turbine and general coverage will not be impacted, however in some locations close to the wind farm it is used by residents for TV reception. The VAST satellite service would be available to dwellings with no terrestrial cover and some residents would already be using it. It is rare for satellite TV to be interfered with by wind turbines.

### 7.5.2 Social Impacts

The Social Impact Assessment (SIA) (Appendix Q of the EIS) considered the social impacts from the Project at both the regional and local levels. The significance of each social impact (mitigated) and opportunity for the regional was identified using a risk-based approach.

Residents within the regional area and tourists are likely to experience visual amenity impacts during the operations phase associated with visibility of WTGs from public viewpoints mainly associated with transport corridors. These impacts will be limited in extent due to the relatively short exposure time when passing the Project during travel. With the implementation of these management measures the residual social impact of the Project on residential amenity in the Regional Assessment Area is assessed as low.

The Project will generate revenue at the federal, state and local level. Benefits will primarily be accrued to the LGAs of the regional area through the generation of employment opportunities and supply arrangements with local businesses i.e., those required for construction materials/activities.

Over the 18-month construction phase, direct and indirect economic benefits will accrue to the LGA's of the regional area. These benefits will primarily be accrued through the generation of employment opportunities and supply arrangements with local businesses. It is anticipated that the majority of the construction workforce will likely already reside in the LGA's of the regional area, so additional demand on services will be unlikely.

To support local employment preparation for the Project will include:

- Prioritisation of construction phase employment within the three LGAs;
- Advertising employment opportunities within the three LGAs; and
- Seeking to provide apprenticeship and/or traineeship opportunities across the construction and operations phase of the Project, given the Project life of approximately 25 years provides continuity in employment.

The construction phase of the Project has the potential to impact on traffic volumes, road safety and access. These impacts are expected to occur during construction only, and mainly impact residents within the immediate area. As the Project has contracted slightly any traffic impacts in its construction phase will be less than those assessed in the EIS. At the time of construction, a Traffic Management Plan (TMP) will be prepared in consultation with the relevant regulators to mitigate any inconvenience to other road users.

The provision of accessible and transparent information to residents over the identified impacts of the Project, proposed management commitments and outcomes of future monitoring activities should also address community concerns regarding potential impacts to amenity and character. In this regard the Proponent will continue to:

- Support the continued operation of the Project CCC in accordance with the CCC Guidelines. The CCC provides a forum to share and discuss the environmental performance of the Project;
- Provision of regular community updates to residents on issues of interest such as Project construction and operation updates, visual management objectives and implementation timeline;
- Create opportunities to engage further with residents such as through community information days to provide an opportunity for residents to meet face-to-face with the Proponent, ask questions and clarify Project related technical information; and
- Reproduce and offer the supply of photomontages for any updates to Project layout.

The impact of the construction and operations phase of the Project on acoustic amenity determined that operational noise generated by the Project was compliant with the relevant noise criteria at all surrounding residential dwellings, with implementation of relevant mitigation. As such, the operation of the Project is not expected to impact on the acoustic amenity of properties within the Primary Assessment Area.

The Project is not predicted to have impacts to property values.

During consultation, a number of residents indicated that they were experiencing elevated levels of stress and anxiety due to the anticipated visual impacts of the Project. The primary strategy to manage stress and anxiety in relation to the Project is for the Proponent to continue to engage in and maintain transparent, evidence-based and ongoing dialogue with concerned landholders and other community members, based on the results of the assessment process.

There is no predicted indirect impact to local services from the operations workforce as the majority of employees are anticipated to be sourced locally.

To manage potential social impacts, the Proponent will establish a VPA with each of MSC, UHSC and SC (see Section 3.1.1 of the EIS). The VPA is proposed to be distributed via a Community Fund (or similar). An offer has been made to each LGA over the quantum of the VPA.

### **7.5.3 Minor Issues**

A risk assessment has confirmed that any other impacts associated with the contractions and other minor amendments to the Project are moderate or low, including bushfire, blade throw, shadow flicker, electric and magnetic fields, health, property values, greenhouse and life cycle, air quality, water sources, soils and agriculture, waste, hazardous materials, decommissioning and cumulative impacts.

The mitigation and management measures committed to over the Project will ensure that these issues have minimal impacts on the local community.

### **7.5.4 Environmental Management System**

A site Environmental Management System (EMS) will be developed and adopted for the Project.

The mitigation and management measures summarised in Section 8 of the EIS will be included in the Project Construction Environmental Management Plan (CEMP), Operations Environmental Management Plan (OEMP) and other management plans as required by conditions of Development Consent.

Strategies, programs and plans will include adaptive management strategies, contingency measures to address residual impacts and a program to monitor and report on the environmental performance of the Project.

### **7.5.5 Socio-economic Benefits**

#### ***Economics***

The Economic Impact Assessment (EIA) (Appendix O of the EIS) found that the Project will provide economic activity to the regional economy of Singleton, Muswellbrook and UHSC, during both the construction and operations phase.

### Construction

The Input-Output analysis identified that the peak construction year of the Project (Year 1) is estimated to make up to the following total contribution to the regional economy:

- \$114 M in annual direct and indirect output;
- \$48 M in annual direct and indirect value-added;
- \$17 M in annual direct and indirect household income; and
- 209 direct and indirect jobs.

The peak construction year of the Project (Year 1) is estimated to make up to the following total contribution to the NSW economy:

- \$218 M in annual direct and indirect output;
- \$99 M in annual direct and indirect value added;
- \$58 M in annual direct and indirect household income; and
- 494 direct and indirect jobs.

### Operations

The Project is estimated to make up to the following total annual contribution to the regional economy for a period of 25 years:

- \$65 M in annual direct and indirect regional output or business turnover;
- \$53 M in annual direct and indirect regional value-added;
- \$2 M in annual direct and indirect household income; and
- 30 direct and indirect jobs.

The Project is estimated to make up to the following total annual contribution to the NSW economy of 25 years:

- \$74 M in annual direct and indirect regional output or business turnover;
- \$57 M in annual direct and indirect regional value-added;
- \$6 M in annual direct and indirect household income; and
- 58 direct and indirect jobs.

While there will be impacts to agricultural activity over the life of the Project, this was estimated to be less than 0.01% of the total agricultural activity in the region. This economic impact will not impact the capability of the land in perpetuity. If the wind farm does ever become redundant, the land could be returned to its former rate of agricultural productivity.

The impacts to foregone agricultural productivity will be borne by the Associated Landholders, for which they will be compensated. The regional economic activity impacts of foregone agricultural activity are far less than those of the construction and operation of the Project.

### ***Social Benefits***

The 'EH's 2015 Community Attitudes Study' concluded that the environmental benefits were the dominant perceived advantage of renewable energy technologies, specifically the survey found that:

- Respondents generally supported the notion that Renewables were cleaner or created less 'pollution' or fewer greenhouse gases (52%);
- Respondents supported sustainability and reduced reliance on non-renewables such as coal (39%);
- Renewables would help "save the planet" for future generations (7%); and
- Others saw benefits in the preservation of the landscape and agricultural land (e.g., by not "digging up" the landscape (5%).

In the Hunter / Central Coast Region, 210 people were asked for their views about renewable technologies which are summarised as follows:

- 93% supported using renewables to generate electricity in NSW;
- 85% believed NSW should increase the use of renewables over the next five years;
- Most common perceived advantages of renewables were environmental benefits and lower cost 34%;
- Most common perceived disadvantages included:
  - Higher cost 36%;
  - Concerns about efficiency and reliability 14%; and
  - No disadvantages 40%.
- 65% were prepared to use renewables "provided I don't have to pay more for my electricity" and 30% were prepared to pay more to support them.

### ***Emissions Reductions***

Annual greenhouse gas savings of 813,700 carbon dioxide equivalent (from 1,030 gigawatt hours of generated electricity) is assumed for the Project.

Assuming an average wind farm capacity factor, The Project has the potential to provide sufficient renewable energy to support the annual electricity needs of approximately 145,000 households.

### ***Contribution to Security and Reliability of the National Electricity Market***

NSW participates in the NEM which is managed by the AEMO.

In 2020, the AEMO released its ISP, a road map for the next 20 years to facilitate the smooth transition of Australia's evolving power system to a more sustainable footing. According to the 2019 annual key planning document 'Electricity Statement of Opportunities', operational consumption on the NEM over the next 20 years is expected to remain flat. While there is projected to be underlying growth in consumption across the NEM, partly due to the uptake in electric vehicles, further improvements in energy efficiency, changes in consumer behaviour and more rooftop solar will balance out these projected increases.

In NSW, electricity is mainly supplied by coal-fired power stations. The closure of AGL Energy's Liddell Power Station by April 2022 will reduce the electricity generating capacity of NSW of 1,800 MW. AGL Energy has proposed several initiatives including further renewable power generation in the Upper Hunter Valley to lessen the effect of the Liddell closure. The Project will complement these initiatives.



The ESOO describes:

*"...following the gradual closure of Liddell, a combination of high summer demand and unplanned generator outages will leave NSW exposed to significant supply gaps and involuntary load shedding if no mitigation action is taken. In 2023-24, AEMO forecasts a risk to between 135,000 and 770,000 households in NSW being without power for three hours during an extreme heat event (that is, a 1-in-10 year peak demand event)"; and*

*A forecast reliability gap to meet the proposed refined standard of 375 MW from 2023-24 for NSW, increasing to 480 MW by 2028-29.*

In addition to the announced retirement of Liddell Power Station, the remaining coal-fired power stations are forecast to retire over the next 10-15 years. Without additional generation capacity being installed in NSW it is forecast by the network operator that reliability issues will occur by 2022-23 with a noticeable shortfall between supply and demand by 2028.

The ISP takes a wholistic and technology neutral approach when considering the future generation mix of the NEM at the lowest overall consumer expense. Modelling in the ISP shows that once the existing fleet of coal fired power plants reaches retirement age, the most cost-effective replacement generation source is renewables, primarily wind and solar PV. This Project will complement this.

## **7.6 PUBLIC INTEREST**

The Project offers several strategic and long-term benefits to the state of NSW and its people, including to:

- The supply of cost-effective renewable energy that will assist electricity retailers to fulfil their obligations under state and federal renewable energy targets;
- Provide replacement energy generation capacity into the NSW grid that will assist in meeting load demand as a result of retiring thermal generators and provide a clean, reliable generation mix;
- Provide an opportunity for regional investment in the renewable energy sector in the Upper Hunter Valley of NSW as is promoted by the relevant NSW Planning Instruments.

The Project offers several specific benefits to the environment and local community by direct injection of funds into the local economy through:

- The provision of jobs in construction and operation;
- Use of local services in both the construction and operation phases; and
- Ongoing landowner payments and financial contributions to the local community being re-injected into the local community.

The Project's social and environmental impacts have been avoided or minimised as far as practicable by implementing all reasonable and feasible management and mitigation measures. Consequently, the socio-economic benefits of the Project will outweigh its social and environmental impacts.

The Project addresses the principles of ESD, has been assessed in accordance with the EP&A Act, its "objects" and as required by the SEARs. This assessment has determined that it is open for the Minister to conclude that the Project is in the public interest and as such should be approved under the EP&A Act.

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## ABBREVIATIONS

Abbreviation	Description
AAAA	The Aerial Agricultural Association of Australia
Aboriginal Consultation Guidelines	<i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW, 2010a)
ABS State Suburbs	Australian Bureau of Statistics State Suburbs
CEC	Australia's Clean Energy Council
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHIA	Aboriginal and Cultural Heritage Impact Assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
AEMO	Australian Energy Market Operator
AGL Energy Limited	AGL Macquarie
AGL	above ground level
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AIA	Aviation Impact Assessment
AIP	<i>The NSW Aquifer Interference Policy</i>
ALAs	Aircraft Landing Areas
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ARTC	Australian Rail Track Corporation
ASDST	The Aboriginal Site Decision Support Tool
Assessing Vibration Guideline	<i>Vibration under the 'Assessing Vibration: A Technical Guideline</i> (DEC, 2006)
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016
BCD	Environment, Energy and Science – Biodiversity and Conservation Division
BCRC	Bowmans Creek Riparian Corridor
BDAR	Biodiversity Development Assessment Report
BFMCs	Bush Fire Management Committees
BFRMPs	Bush Fire Risk Management Plans
biomass	Pumped Hydro, Solar, Wind, Bioenergy
Biosecurity Act	<i>Biosecurity Act 2015</i>
BoM	Bureau of Meteorology
BOS	Biodiversity Offsets Scheme
BPMs	Bushfire Protection Measures
CAAP	The Civil Advisory Publication



Abbreviation	Description
CAAP 166	CAAP 166-01 v4.2 – Operations in the vicinity of non-controlled aerodromes (CAAP 166)
CAAP 92-1(1)	CAAP 92-1(1) Guidelines for aeroplane landing areas (CAAP 92-1(1))
CAO	Civil Aviation Orders
CAR	Civil Aviation Regulations 1988
CAS Regulations	The Civil Aviation Safety Regulations 1998
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations 1998
CCC	Community Consultative Committee
CCC Guideline	Community Consultative Committee Guideline State Significant Projects (DPIE, 2019)
CEFC	Clean Energy Finance Corporation
CEMP	Construction Environmental Management Plan
CIC	Critical Industry Clusters
CIV	Capital Investment Value
CLM Act	Crown Land Management Act 2016
CM Act	Coastal Management Act 2016
CO <sub>2</sub> -e	Carbon Dioxide Equivalent
Code of Practice	Code of Practice for the Investigation of Aboriginal Objects in 'SW' (DECCW, 2010)
Consultation Guideline's	Guide to investigating, assessing and reporting on Aboriginal cultural heritage in 'SW' (OEH, 2011)
COVID - 19	Coronavirus disease
DAWE	Federal Department of Agriculture, Water and the Environment (formerly Department of Energy and the Environment (DoEE))
dB(A)	A-weighted decibels
Delivery Program	Muswellbrook Shire Council Delivery Program 2017-2021
Disturbance Area	Areas subject to direct physical works and vegetation clearing, including buffers for work zones
DISER	Department of Industry, Science, Energy and Resources
DoD	Department of Defence
DoEE	Department of Energy and the Environment
Dol	Department of Industry (DoI)
DPIE	NSW Department of Planning, Industry and the Environment (formerly Department of Planning and Environment (DPE))
DPOP	Draft Delivery Program & Operations Plan 2020/2021
EC	Electrical Conductivity
EES	Environment, Energy and Science
EIA	Economic Impact Assessment
EIS	Environmental Impact Statement

Abbreviation	Description
EIS Guidelines	Draft <i>'Preparing an Environmental Impact Statement'</i> (DPE, 2019)
ELF	Extremely Low Frequency
EMFs	Electric and Magnetic Fields
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPA Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPBC Approval	Approval sought under Section 75 of the EPBC Act
EPBC Referral	Project EPBC Referral 2020/8631
EPHC	Environment Protection and Heritage Council
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ERF	Emissions Reduction Fund
ERP	Estimated Resident Population
ESCP	Erosion and Sediment Control Plan
ESOO	<i>Electricity Statement of Opportunities</i> (AEMO, 2019)
ESOO	<i>Electricity Statement of Opportunities</i> (AEMO, 2020)
ETL	Electricity Transmission Line
FM Act	<i>Fisheries Management Act 1994</i>
FTE	Full Time Equivalent
GHG	Greenhouse Gas Emissions
GWEC	Global Wind Energy Council
ha	Hectares
HCRCMA	Hunter-Central Rivers Catchment Management Authority region
Heritage Act	<i>Heritage Act 1977</i>
HIA	Historic Heritage Impact Assessment
HML	Higher Mass Limits
Hunter Unregulated WSP	Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009
ICAO	International Civil Aviation Organisation
ICNG	<i>Interim Construction Noise Guideline</i> (DECC, 2009)
ICNIRP Guidelines	<i>ICNIRP Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields</i> (ICNIRP, 2010)
IEA	International Energy Agency
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IO	Input-Output

Abbreviation	Description
IPCN	Independent Planning Commission NSW
ISP	Integrated System Plan
kg	Kilogram
Koala SEPP	<i>State Environmental Planning Policy (Koala Habitat Protection) 2019</i>
kv	Kilovolt
kV/m	Kilovolts Per Metre
LAeq	Equivalent Continuous Sound Pressure Level
LCO	Liddell Coal Operations
LCOE	Levelised Cost of Electricity
LEP	Local Environmental Plan
LGA	Local Government Areas
Liverpool Range BFM, 2009	Liverpool Range Bush Fire Risk Management Plan
LLS	Local Land Service
LSALT	Air Routes and Lowest Safe Altitude
L VIA	Landscape and Visual Impact Assessment
M	Million
MCC	Muswellbrook Coal Company
MEG	Mining, Exploration and Geoscience
mG	milliGauss
Micro-siting	Indicative turbine locations have accounted for known constraints. However, turbines may need to be relocated during detailed design or construction due to geotechnical, environmental and other technical requirements, up to 100 m from the specified GPS co-ordinates.
Mining SEPP	<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
MNES	Matters of National Environmental Significance
MOCO	Mount Owen Continued Operations
MOS	Manual of Standards
Mtpa	Million Tonnes Coal Per Annum
Muswellbrook BFM, 2011	<i>Muswellbrook Bush Fire Risk Management Plan (Muswellbrook BFM, 2011)</i>
Muswellbrook LEP	<i>Muswellbrook Local Environmental Plan 2009</i>
Muswellbrook LEP Review	<i>Muswellbrook Local Environmental Plan (LEP) 2009 Review: Draft Discussion Paper</i>
MW	Megawatts
MWh	Megawatt Hours
NASF Guideline D	<i>'National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft' (DITRDC, 2012)</i>
ND	Not dated

Abbreviation	Description
NDC	Nationally Determined Contribution
NEH	New England Highway
NEM	National Electricity Market
NGER Act	National Greenhouse and Energy Reporting Act 2007
NHMRC	The National Health and Medical Research Council
NIA	Noise and Vibration Impact Assessment
Noise Bulletin	<i>Wind Energy: Noise Assessment Bulletin</i> (DPE, 2016c)
North Coast WSP	Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016
NPfi	<i>Noise generated by ancillary infrastructure in accordance with the 'NSW Noise Policy for Industry'</i> (EPA, 2017)
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NT Act	<i>Native Title Act 1993</i>
O&M Facility	Operation and Maintenance Facility
OEM	Original Equipment Manufacturer
OEMP	Operation Environmental Management Plan
OLS	Obstacle Limitation Surfaces
OSOM	Oversize and Overmass
OS	Oversize
Ozark	Ozark Environment and Heritage Management Pty Ltd
PBP	<i>Planning for Bushfire Protection</i> (RFS, 2019a)
PCT	Plant Community Type
PHP	Pumped Hydro Project
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Primary AA	Primary Assessment Area
PSR	Primary Surveillance Radar
RAPs	Registered Aboriginal Parties
RAV	TfNSW Restricted Access Vehicles
RBL	Rating Background Level
Regional AA	Regional Assessment Area
Regional Plan	<i>Hunter Regional Plan 2036</i> (DPE, 2016d)
RET	Renewable Energy Target
RF Act	<i>Rural Fires Act 1997</i>
RFDS	Royal Flying Doctor Service
RIA	Radiocommunications Services Impact Assessment
RIA Study Area	Study Area using a 50 km radius used in the Telecommunications Assessment
RMS	Roads and Maritime Services



Abbreviation	Description
RN Policy	Traffic noise under the 'NSW Road Noise Policy' (DECCW, 2011)
Roads Act	<i>Roads Act 1993</i>
RSA	Rotor Swept Area
RSR	Route Surveillance Radar
RTS	Response to Submissions
SAII	Serious and Irreversible Impact
SAL	Strategic Agricultural Land
SAP	Sustainability Action Plan
SARPs	ICAO's Standards and Recommended Practices
Scoping Report	<i>Bowmans Creek Wind Farm Scoping Report</i> (Epuron, 2019)
SCS Plan	Singleton Community Strategic Plan
SEARs	Secretary's Environmental Assessment Requirements
SEP	Stakeholder Engagement Plan
SEPP 33	<i>State Environmental Planning Policy 33 – Hazardous and Offensive Development</i>
SEPPs	<i>State Environmental Planning Policies</i>
SHR	State Heritage Register
SIA	Social Impact Assessment
Singleton BFMC, 2011	<i>Singleton Bush Fire Risk Management Plan</i> (Singleton BFMC, 2011)
Singleton LEP	<i>Singleton Local Environmental Plan 2013</i>
SLU Strategy	<i>Singleton Land Use Strategy 2008</i>
SMA	Singleton Military Area
SoDAR	Sonic Detection and Ranging
SOHI	Statement of Heritage Impact
SOP	<i>Singleton Operational Plan 2019-2020</i>
SPLs	Sound Power Levels
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011</i>
SC	Singleton Council
SSD	State Significant Development
SSR	Secondary Surveillance Radar
Subject Land	The land subject to the BDAR assessment as required under the BAM
Survey Area	Areas which have been subject to detailed assessment related to the Project (comprises conservative survey buffers around the disturbance area and subject land)
Survey Unit 1	The hill and valley landforms in the north
Survey Unit 2	The lowland landforms in the south
TBDC	Threatened Biodiversity Database Collection
TEC	Threatened Ecological Community

Abbreviation	Description
TfNSW	Transport for NSW
Convention	Chicago Convention on International Civil Aviation
Project	Bowmans Creek Wind Farm (SSD 10315)
TMP	Traffic Management Plan
TSC Act	<i>Threatened Species Conservation Act 1995</i>
TTIA	Traffic and Transport Impact Assessment
UH LEP	<i>Upper Hunter Local Environmental Plan 2013</i>
UHCS Plan	<i>Upper Hunter Community Strategic Plan 2027</i>
UHLU Strategy	<i>Upper Hunter Land Use Strategy 2017</i>
UHSC	Upper Hunter Shire Council
UNFCCC	United Nations Framework Convention on Climate Change
VFR	Night Visual Flight Rules
Visual Bulletin	<i>Wind Energy: Visual Assessment Bulletin (DPE, 2016b)</i>
VPA	Voluntary Planning Agreement
WAL	Water Access Licence
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WHO	World Health Organisation
WHO Guidelines	World Health Organisation (WHO) Guidelines for Community Noise
Wind Energy Framework	<i>Wind Energy Guideline (Wind Guideline) (DPE, 2016a)</i> <i>Wind Energy: Visual Assessment Bulletin (Visual Bulletin) (DPE, 2016b)</i> <i>Wind Energy: Noise Assessment Bulletin (Noise Bulletin) (DPE, 2016c)</i> Standard Secretary's Environmental Assessment Requirement <i>Wind Energy Framework Q&amp;As</i>
Wind Framework	<i>NSW Wind Energy Framework</i>
Wind Guideline	<i>Wind Energy Guideline (DPE, 2016a)</i>
WM Act	<i>Water Management Act 2000</i>
WMT	Wind Monitoring Tower
WSP	Water Sharing Plan
WTGs	Wind Turbine Generators