MNES Assessment Report

Chalumbin Wind Farm Project

Prepared for:
Epuron Projects Pty Ltd

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1.0 Introduction

1.1 Proposed Action

Epuron Projects Pty Ltd (Epuron) proposes to develop the Chalumbin Wind Farm Project (the Project) at a location approximately 15 km southwest of Ravenshoe in Far North Queensland within the Tablelands Regional Council Local Government Area (LGA), see **Figure 1-1**. The Project is a proposed wind farm that consists of up to 95 wind turbine generators (WTGs) and associated infrastructure. A detailed project description is presented in **Section 3.0**.

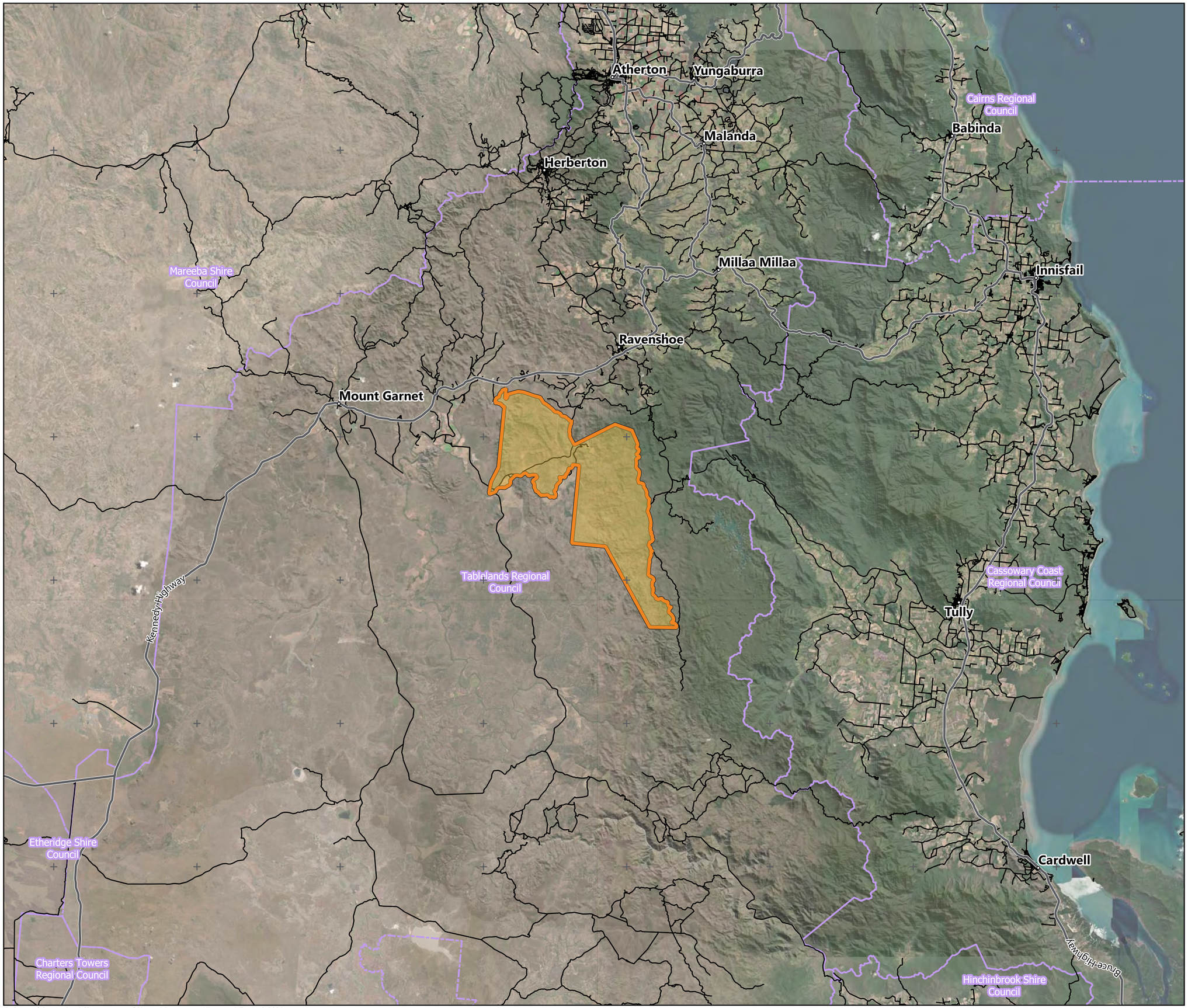
The Project is proposed to have a maximum nameplate wind farm generation capacity of 665 MW (depending on final turbine specification). The Project will generate around 2,170 GWh of renewable electricity per year, which is equivalent to supplying power to around 350,000 Queensland homes. The Project will connect to the existing 275 kV Chalumbin to Worree transmission line, which is part of the Powerlink network in the central north of the Project area.

Key elements of the Project include:

- WTGs and hardstands;
- Substations, potential battery energy storage system and grid support equipment such as synchronous condensers or reactive plant at the Project substation;
- Medium voltage overhead and underground powerlines and communication cables;
- High voltage overhead powerlines;
- Permanent meteorological monitoring masts;
- Access tracks;
- Potential concrete batching plants;
- Temporary construction compounds, laydown and stockpile areas;
- Temporary site offices, workshops, warehouses and amenities; and
- Permanent site offices for asset management and operation and maintenance facilities.

The Project area (which encompasses the land parcels within which infrastructure is proposed) is a large area that covers a total of 31,802.2 ha plus adjoining road reserves, as described in **Section 3.2**. The Project footprint (i.e. maximum area of disturbance) is a much smaller area within these land parcels, and is a total of 1,250.26 ha (3.93 % of the Project area). The Project footprint is sufficiently wide to allow the micro-siting of infrastructure to respond to site-specific constraints.

Construction of the Project is expected to commence in late 2022, subject to timely approvals and commercial agreements. The construction phase is expected to last for a period of 18-24 months, with approximately 250 to 350 personnel employed at the peak construction period. The workforce will likely reside in Ravenshoe and other surrounding townships, or a dedicated construction accommodation facility. The operational life of the Project is expected to be 30 years, at which point the Project owner will assess the infrastructure and may choose to extend the life of the existing plant, or re-power the site with new equipment. Alternatively, the owner may choose to decommission the site and rehabilitate the land in accordance with land agreements in place at that point in time.



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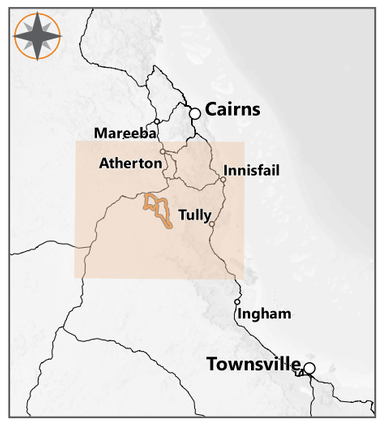
Chalumbin Wind Farm

Project Location

Figure 1.1

- Project Area
- Town
- MajorRoad
- Road
- LocalGovernmentBoundary

Date: 2021-06-03
Author: TOD
Reviewed: CC
Project: EPU-004



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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

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1.2 Purpose of this Report

Attexo Group Pty Ltd (Attexo) has been engaged by Epuron to prepare this report which identifies and assesses environmental values prescribed as Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). The purpose of this report is to describe the Project and Project area, present the findings of desktop and field-based ecological assessments in the Project area, present an assessment of potential impacts to MNES as a result of Project activities, and describe proposed avoidance, minimisation and mitigation measures.

This report has been prepared specifically to support a referral to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) relating to the Project's potential impacts on MNES under the EPBC Act.

1.3 Consultation

The following consultation has been undertaken and forms part of an ongoing stakeholder engagement strategy for the Project:

- Regular engagement and negotiation of land agreements has been ongoing with involved landowners;
- A pre-referral meeting was held with representatives of the Department of Agriculture, Water and the Environment (DAWE) in May 2021;
- A pre-lodgment meeting was held with Queensland State Government representatives in May 2021;
- Engagement with the traditional owner group (the Jirrbal People) has been ongoing, including entering into a Cultural Heritage Management Agreement and an Indigenous Land Use Agreement;
- Ongoing discussions with the Tablelands Regional Council and other key stakeholders such as the Wet Tropics Management Authority; and
- Creation and maintenance of a regularly-updated Project website (https://epuron.com.au/wind/chalumbin/).

2.0 Regulatory Framework

2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage Matters of National Environmental Significance (MNES), many of which are also internationally important. If a proposed development or other action is likely to have a significant impact on a protected matter, then it must be referred for assessment under the EPBC Act. Protected matters under the EPBC Act are:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (as listed under the Ramsar Convention)
- Listed threatened ecological communicates (TECs) and listed threatened species;
- Migratory species protected under international agreements;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- The environment, where nuclear actions are involved;
- A water resource, in relation to coal seam gas and large coal mining developments;
- The environment, where actions are proposed on or will affect Commonwealth land; and
- The environment, where Commonwealth agencies are proposing to undertake the action.

This report has been prepared to support referral of the Project under the EPBC Act. The report outlines those MNES which have potential to occur in the Project area and how impacts to those MNES will be avoided, minimised and mitigated. It also discusses the potential for significant residual impacts to occur to MNES based on applying the significant impact guidelines and provides an indication of the likely feasibility of being able to offset any significant residual impacts.

The following sections provide a summary of the relevant EPBC Act impact assessment and referral guidelines that have been applied.

2.1.1 Significant Impact Guidelines

Under the EPBC Act an action will require approval from the minister if the action has, will have, or is likely to have a significant residual impact on MNES. The *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (DoE 2013) provide detailed criteria to determine whether or not a referral may be required and if the proposed action may have a significant residual impact on MNES. Thresholds provided in the Significant Impact Guidelines vary according to the threat status of the MNES.

The significant impact guidelines have been applied to the impact assessments undertaken for the Wet Tropics World Heritage Area, as well as listed threatened and migratory species known or considered likely to occur in the Project area, to determine whether the Project is likely to have a significant residual impact on MNES.

2.1.2 Significant Impact Guidelines for the Southern Cassowary

Guidance on the assessment of impacts to southern cassowary is addressed within the *Significant Impact Guidelines for the endangered southern cassowary* (*Casuarius casuarius johnsonii*) *Wet Tropics Population* (DEWHA 2010a). These guidelines provide advice on the level and types of impact likely to be significant for the Wet Tropics southern cassowary population, having regard for the biology, ecology and threats to the species. Indicative thresholds are provided for impacts considered likely to have a significant effect on the species.

Key landscape values for cassowary are identified as feeding habitat (cassowaries feed primarily on fleshy fruits of rainforest trees); breeding habitat (rainforest or woodland mosaics with rainforest elements); water (access to fresh water required many times a day); resting habitat (quiet and dark during the night); and corridors for movement.

Significant impact judgements must be made on a case-by-case basis and will depend on the:

- Intensity, duration, magnitude and geographic extent of the impact;
- Sensitivity, value and quality of the environment on and around the site;
- Cumulative effects of on-site, off-site, direct and indirect impacts; and
- Presence of this species and other MNES.

There is a real chance or possibility of a significant impact if the action will result in any one of the impacts listed in **Table 2.1**. Actions are less likely to be significant in habitat patches which are very small, highly isolated and greatly fragmented.

Table 2.1 Significant Impact Thresholds for the Southern Cassowary

Threat	For actions within potential cassowary habitat, plus a 100 m buffer	Watercourses within, adjacent to or linking areas of potential cassowary habitat, plus a 50 m buffer from the bank	Potential cassowary corridors as identified in Map 2 of the Significant Impact Guidelines
Habitat removal.	Clearing > 1500 m^2 for any purpose other than a single dwelling on an existing lot. Forestry operations (including selecting logging) that open the canopy by > 10% or remove cassowary food trees. Subdivision of land that results in clearing and/or intensification of use.	Any clearing.	Clearing that reduces corridor width; number of corridor links; or any corridor patch area to < 5 ha.
Habitat degradation caused by exotic plants or animals; increased accessibility; fire behaviour	Any action that reduces habitat quality	Any action that changes water quality or flow	Any action that reduces cassowary movement

Threat	For actions within potential cassowary habitat, plus a 100 m buffer	Watercourses within, adjacent to or linking areas of potential cassowary habitat, plus a 50 m buffer from the bank	Potential cassowary corridors as identified in Map 2 of the Significant Impact Guidelines
change; microclimate change.			
Fragmentation and isolation of habitat and populations caused by roads; fencing; drainage channels; powerlines; service infrastructure and subdivision of land.	Any action that reduces patch area to < 5 ha; separates patches by > 100 m; reduces patch quality; or separates or perforates existing patches.	Any action that reduces access to water (for example fencing that reduces connectivity within or between riparian corridors, and roads that reduce connectivity between or within riparian corridors); or any action that reduces movement along waterways.	Any action that reduces corridor width; number of corridor links; or any corridor patch area to < 5 m.
Roads and traffic: Traffic conflict points; Traffic volume such as road upgrades or traffic-producing development; Any increase in vehicle speed limits; Proliferation of roadside weeds; Any road or vehicle track developments with proposed speeds > 60 km/hr (without adequate and proven traffic calming measures) in places where cassowary road deaths have occurred; through known cassowary crossing points; within local or regional movement corridors; in the eight key areas where the cassowary is seriously threatened; or through National Parks or conservation areas.	Any action that increases traffic conflict; traffic volume; or traffic speed to > 60 km/hr.	Any road, trail or other access point, construction or upgrade.	Any road, trail or other access point construction or upgrade with a design speed > 60 km/hr.

The cassowary guidelines suggest mitigation measures for avoiding and minimising impacts to the cassowary and for managing cassowary habitat. If an action may have a significant impact on the cassowary, that action should be referred to DAWE to comply with obligations under the EPBC Act.

2.1.3 EPBC Act Referral Guideline for the Endangered Northern Quoll

The *EPBC Act referral guideline for the endangered northern quoll (Dasyurus hallucatus)* (DoE 2016) is intended to assist proponents by outlining likely habitats critical to the survival of the northern quoll and populations important for its long-term survival. It outlines survey and mitigation expectations and clarifies what is likely to be constitute a significant impact on the northern quoll.

Habitat critical to the survival of the northern quoll usually comprises:

- Offshore islands where the species is known to exist;
- Rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines; and
- Structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs.

Dispersal and foraging habitat associated with or connecting populations important for the long-term survival of the northern quoll is also considered habitat critical to its survival.

Populations important to the survival of the northern quoll are defined as:

- High density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present;
- Occurring in habitat that is free of cane toads upon arrival; and
- Subject to ongoing conservation or research actions, i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation.

A high density population may be characterised by numerous camera triggers of multiple individuals across multiple cameras and/or traps across the site. A low density population may be characterised by infrequent captures of one or two individuals confined to one or two cameras and/or traps or where trapping has not identified northern quoll but latrine evidence remains.

The northern quoll referral guideline recommends proponents undertake a reconnaissance survey of potential habitat early in the Project development phase. If the reconnaissance survey indicates that there is evidence of northern quolls or habitat critical to the survival of the species in the area, and significant impacts cannot be avoided and/or the population of northern quoll within the area is likely to be a population important for the survival of the species, then further targeted are recommended. These targeted surveys will inform significant impact decision making and any potential offset calculations (DoE 2016).

Actions which are likely to have a significant impact on the northern quoll are those that:

- Result in the loss of habitat critical to the survival of the species;
- Decrease the size of a population important for the long-term survival of the northern quoll and therefore interfere with the recovery of the species;
- Introduce inappropriate fire regimes or grazing activities that substantially degrade habitat critical to the survival of the northern quoll or decrease the size of a population important for the long-term survival of the species;

- Fragment a population important for the long-term survival into two or more populations; or
- Result in invasive species or increases in them that are harmful to the northern quoll becoming established in its habitat, namely cane toads, feral cats, red foxes or exotic grasses which increase fire risk.

The northern quoll referral guideline lists mitigation measures for avoiding and mitigating impacts to the northern quoll. If an action may have a significant impact on the northern quoll, that action should be referred to DAWE to comply with obligations under the EPBC Act.

2.1.4 EPBC Act Referral Guideline for 14 Birds Listed as Migratory

The *Draft referral guideline for 14 birds listed as migratory under the EPBC Act* (DoE 2015a) provides information to assist proponents in assessing the likelihood of a significant impact on one or more of the following bird species listed as migratory under the EPBC Act:

- White-throated needletail, *Hirundapus caudacutus*;
- Fork-tailed swift, *Apus pacificus*;
- Oriental cuckoo, *Cuculus saturates*;
- Black-faced monarch, *Monarcha melanopsis*;
- Black-winged monarch, *Monarcha frater*;
- Satin flycatcher, *Myiagra cyanoleuca*;
- Spectacled monarch, *Symposiachrus trivirgatus*;
- Rufous fantail, *Rhipidura rufifrons*;
- Oriental reed-warbler, *Acrocephalus orientalis*;
- Barn swallow, *Hirundo rustica*;
- Red-rumped swallow, *Cecropis daurica*;
- Grey wagtail, *Motacilla cinerea*;
- Yellow wagtail, *Motacilla flava*; and
- Osprey, *Pandion cristatus*.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify, destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

The referral guideline describes what is considered to be important habitat for each of these migratory species, as well as the invasive species harmful to each. The referral guideline also defines what constitutes an ecologically

significant proportion of each species' population, based on published estimates of area occupied and recorded densities.

For actions proposed within the distribution of these species and in important habitats, bird surveys should be undertaken following the appropriate guidance. It is not considered that surveys for Oriental reed-warbler, barn or red-rumped swallow, or grey or yellow wagtails will yield useful results due to the small number of these birds visiting Australia, their non-threatened status, their large global populations and the improbability of a significant proportion of their population being present at a site for changes to that site to have any significance to the conservation status of the species (DoE 2015a). However, any records of these species encountered during other surveys should be forwarded to DAWE for inclusion in the Atlas of Living Australia in order to build a greater understanding of their patterns of occurrence.

A more targeted form of survey is recommended where an action involves large structures such as tall buildings, wind turbines and overhead power lines. Surveys in these instances should include timed counts of all bird species and involve in collision risk modelling (whereby flight heights are documented and related back to the dimensions of the proposed structures). Proponents of such actions should demonstrate that current best practice has been used to estimate impacts and to reduce and/or mitigate them.

2.1.5 EPBC Act Referral Guidelines for the Vulnerable Koala

Guidance on the assessment of impacts to koala (*Phascolarctos cinereus*) is addressed within the *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory* (DoE 2014). The guidelines provide a 'koala habitat assessment tool' to assist in determining the sensitivity, value and quality of land potentially impacted under development proposals. The assessment tool is to be used to evaluate a 'habitat score' and to determine whether habitat in the Project area may be considered 'critical to the survival of the koala' and therefore critical to the long-term survival and recovery of the species. A habitat score of five is the trigger at which a site may be described as supporting critical habitat. The score is based on koala occurrences, vegetation structure and composition, habitat connectivity, key existing threats and the recovery value of the area. The scoring system is designed to be conservative, to ensure that all proposed actions that may have a significant impact on the species are identified as such at the referral stage.

The koala guidelines state that an action proposing to clear > 20 ha of habitat containing known koala food trees in an area with a habitat score of 8 is automatically recommended for referral to DAWE. Where an action does not meet these criteria and the impacts of the action are uncertain, the guidelines provide further points to consider when assessing the potential impact of an action, including:

- The score calculated for the impact area (higher score = greater risk of significant impact);
- Amount of koala habitat being cleared (more habitat cleared = greater risk of significant impact);
- Method of clearing, i.e. clear-felling has a greater risk of significant impact than selective felling with understorey and koala food tree retention;
- The density of abundance of koala (relative high density or abundance for the region = greater risk of significant impact); and
- Level of fragmentation caused by the clearing (greater degree of fragmentation = greater risk of significant impact).

The extent and nature of proposed development activities and koala habitat will determine whether the Project should be referred to DAWE to comply with obligations under the EPBC Act for potential impacts to koala.

2.1.6 EPBC Act Environmental Offsets Policy

Environmental offsets are required to be delivered in accordance with the *EPBC Act Environmental Offsets Policy* (DSEWPC 2012a). The Environmental Offsets Policy outlines the Australian Government's approach to the use of environmental offsets under the EPBC Act. Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act. The mitigation hierarchy requires that avoidance, minimisation and mitigation measures are the primary strategies for managing the potential significant impacts of a proposed action. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any significant residual impact.

Where significant residual impacts are found to occur to MNES, and environmental offsets are required, an offsets package should be provided. An offsets package is a suite of actions that a proponent undertakes in order to compensate for the significant residual impacts to the identified MNES. It can comprise a combination of direct offsets and other compensatory measures. Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted, in order to deliver a conservation gain.

To support any offset assessments that may be required for the Project, it is important to evaluate the specific MNES attributes that occur within the proposed disturbance area (e.g. foraging versus breeding habitat versus traverse areas) and the habitat quality of the mapped habitat areas. This information is required to inform offset calculations.

2.2 Queensland Framework

Whilst Queensland legislative requirements are not directly applicable to MNES, many of the associated survey and reporting requirements have informed the overall approach to the impact assessment process and are therefore included here for context.

2.2.1 *Planning Act 2016*

In Queensland, wind farms require a development permit under the *Planning Act 2016* for a Material Change of Use (MCU) for a windfarm and for Operational Works for clearing regulated vegetation (OPW). The MCU requires assessment under *State Code 23 – Wind Farm Development* and the OPW requires assessment under *State Code 16 – Native Vegetation Clearing*. The material for the development permit is provided in one comprehensive package and is submitted to the State Assessment and Referral Agency (SARA), as assessment manager.

An ecological assessment that addresses prescribed matters at a State level will be required to support the development application for the Project. The presence of matters of state environmental significance (MSES) within the proposed impact area will need to be identified, and determination made as to whether the proposed action would result in a 'significant' residual impact to MSES. If a significant residual impact is considered likely to occur to MSES, environmental offsets will be conditioned through the development approval in accordance with the *Environmental Offsets Act 2014* (EO Act).

The State assessment is not undertaken through the bilateral agreement and therefore the Project will be assessed and approved separately by the State to an approval under the EPBC Act. The State assessment of the Project will take place in parallel with the assessment of the Project under the EPBC Act.

Bird utilisation surveys (BUS) area a mandatory requirement for proposed wind farms in Queensland under State Code 23 and need to be completed over two seasons. The assessment of birds and bats forms a major part of ecological impact assessments for a wind farm project, due to the potential for collisions with wind turbines. The

location and migratory paths of bird and bat populations or species may influence the turbine footprint and layout of a wind farm development.

In accordance with State Code 23, field surveys should as a minimum aim to:

- Identify bird and bat habitats and habitat components, and validate the results of the desktop review;
- Undertake bird utilisation surveys and modelling to identify species at risk of collision or displacement (particularly listed threatened species); and
- Undertake bat surveys to identify any species in the area.

Bird utilisation surveys aim to identify the avian species on site, the numbers present, the height that birds fly and the utilisation across the site. Utilisation studies often include a description of bird behaviour, which usually refers to activities such as feeding, resting or moving, as these can aid the understanding of potential impacts of a wind farm development. Data is quantitative and is collected at pre-determined fixed points. The surveys are conducted during relevant seasons with regards to the species being studies and the location of the site, and would normally involve sampling of different relevant habitats on the site. Data is usually recorded in a way that allows a collision risk model to be formulated to estimate the potential collision risk of a species.

BUS and associated results will be assessed in respect to MNES species such as migratory birds and any other listed bird species that have potential to be impacted by turbine strike.

2.2.2 *Vegetation Management Act 1999*

The purpose of the *Vegetation Management Act 1999* (VM Act) is to regulate the clearing of native vegetation in a way that conserves remnant vegetation in declared areas, ensures clearing does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes.

Under the VM Act regional ecosystems (REs) are assigned three statuses which are:

- Endangered;
- Of Concern; or
- Least Concern.

These statuses are taken from the RE description database, and respective definitions are provided in the Act. Within this report, the definition of a RE follows that described by Sattler and Williams (1999), i.e. a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil.

Clearing of regulated vegetation associated with the Project will not meet the definitions of "exempt clearing work" or "accepted development" under the Planning Regulation. Therefore, an OPW development permit will be required for the clearing of regulated vegetation. Prior to the lodgement of the OPW application, a relevant purpose determination must be obtained under s22A of the VM Act from Department of Resources (DoR).

To support the OPW application field ecology surveys have been undertaken to validate the regulated vegetation mapping across the Project area. Numerous discrepancies were identified through this process and therefore the ground-truthed vegetation communities are used as the basis of any impact assessment.

2.2.3 Nature Conservation Act 1992

The objective of the *Nature Conservation Act 1992* (NC Act) is the conservation of nature; the Act provides for the gazettal of protected areas including nature refuges, prescribes classes of wildlife and sets out restrictions on the taking or harm to native wildlife without a valid permit. Threatened flora and fauna species have been assessed in terms of those with potential to occur in the Project area.

As the focus of this report is on species listed under the EPBC Act, those which are also listed under NC Act are noted. State only listed species will be addressed in subsequent reports as part of the State specific assessment process.

The NC Act also provides the mechanism for proponents to obtain permits to tamper with animal breeding places and to clear NC Act-listed Endangered, Vulnerable or Near Threatened plants.

2.2.4 Environmental Offsets Act 2014

In Queensland there is an offsets framework governed by a range of legislation, policies and guidelines to support a determination as to when environmental offsets are required, and how they are to be delivered. A summary of the framework and guiding principles that apply is summarised below.

The Queensland Offsets Framework includes:

- *Environmental Offsets Act 2014* (EO Act);
- *Environmental Offsets Regulation 2014* (EO Regulation);
- Queensland Environmental Offsets Policy (QEOP) (version 1.9); and
- Significant Residual Impact Guideline – for prescribed activities under Planning Act (EHP 2014).

Under the Queensland Environmental Offsets Framework an environmental offset is required when a significant residual impact occurs to a MSES. MSES are prescribed in Schedule 2 of the EO Regulation and include:

- Endangered and vulnerable flora and fauna species under the NC Act and their habitats;
- Special least concern fauna species under the NC Act and their habitats;
- Endangered and of concern REs under the VM Act;
- Essential habitat (mapped by the Department of Environment and Science (DES));
- REs that intersect with wetlands and watercourses;
- Connectivity values;
- Wetlands of high ecological significance;
- Protected areas (including nature refuges);
- Declared fish habitat areas and waterways providing for fish passage; and
- Legally secured offset areas.

2.2.5 *Biosecurity Act 2014*

The *Biosecurity Act 2014* provides a legislative framework to manage pest flora and fauna, diseases and environmental contaminants, to address the impacts they have on the economy, environment, agriculture, tourism and society. The Act prohibits or restricts the introduction and spread of declared plant and animal pests within Queensland.

Field ecology surveys have identified the presence of pest plants and animals, including classifications under the Act. Weeds listed as weeds of national environmental significance (WoNS) are also noted.

2.2.6 Fisheries Act 1994

Development that has potential to impact on fish passage may require an approval under the Planning Act. Waterway barrier works may inhibit the free movement of fish along waterways and onto floodplains, injure fish and affect fish health and habitat. Waterways for the purposes of the *Fisheries Act 1994* are defined by the Queensland Government mapping layer *Queensland Waterways for Waterway Barrier Works*. It is recognised this layer may not always be accurate on the ground; therefore, the responsibility for ensuring appropriate procedures are employed rests with the proponent. Waterways are colour-coded based on level of risk. Streams higher in the catchment generally have reduced habitat area and steeper slopes supporting smaller populations of fish, therefore these are of lower risk than larger streams lower in the catchment.

Where access tracks for the Project may need to cross waterways a waterway barrier work permit may be required if the proposed works do not meet the *Acceptable development requirements for operational work that is constructing or raising waterway barrier works* (DAF 2018). An operational works permit for waterway barrier work includes activities such as the construction of dams and weirs, culverts, bridges, bed level crossings, causeways or bunds.

3.0 Project Description

3.1 Site Selection

The Epuron team has been measuring and modelling the wind resource across far north Queensland over numerous years and identified mountain ranges within the Tablelands Region as an area of high potential wind resource. Epuron then undertook a process of identifying sites within this region with compatible existing land use, low population density and good potential for connection into the National Electricity Grid (e.g. locations of significant grid capacity and ease of access to the network). Additional considerations included avoidance of the Wet Tropics World Heritage Area, interested landowners/stakeholders and low potential for noise and visual impact.

Epuron identified the Chalumbin Project area and commenced landholder engagement. Once initial landholder agreements were in place, Epuron commenced wind monitoring which has been ongoing at the site for over 12 months with favourable results. Wind speeds to date show particularly high night-time wind speeds which will be complementary to the wider Queensland energy mix. Given these findings, Epuron has now commenced the planning process including engagement with key stakeholders such as the Tablelands Regional Council and commissioning various technical studies and engineering design. Key to this has been obtaining a comprehensive understanding of the ecological values within the Project area, and ensuring that the ecological values have guided Project design through a rigorous environmental constraints mapping process.

3.2 Project Area Description

The Project area is located across two properties: Glen Gordon (1SP284234 and 31SP288862) is a freehold property and Wooroora (1CWL3298) is a leasehold property. Both properties are primarily used for grazing and there are several easements intersecting them associated with roads and high-voltage electrical infrastructure.

Surrounding properties are used for grazing and conservation purposes, with National Parks and Timber Reserve abutting the northern and eastern boundaries of Wooroora. The Kennedy Highway is within 600 m of the Project area (approximately 3.7 km northwest of the Project area) whilst Tully Falls Road is within 5 km of the Wooroora eastern boundary.

The Project area is predominantly characterised by remnant vegetation with existing impacts generally limited to agricultural activities and electrical infrastructure.

The primary natural feature that is associated with the Project area is Blunder Creek (see **Plate 3-1**); a stream order four waterway on the Wooroora property that becomes a stream order 5 waterway on the Glen Gordon property as it runs east to west towards the Herbert River. The riparian vegetation associated with this waterway, and the waterway itself, provide habitat for a range of native species. Having permanent water available in various stretches of the creek, this waterway will also likely provide refuge habitat for wildlife during drier periods. The majority of infrastructure associated with the Project will avoid direct and indirect impacts on Blunder Creek.

Another natural feature within the Project area is Arthurs Seat, a large granite rock formation in the northwest of the Glen Gordon property. This site is reported to have importance as a local natural and cultural landmark. The Project footprint has been designed to avoid this feature.

Plate 3-1 Blunder Creek

3.2.1 Bioregion

The Project area is located along the boundary between the Wet Tropics bioregion (to the east) and the Einasleigh Uplands bioregion (to the west). The eastern and southern parts of the Project area are within the Kirrima-Hinchinbrook sub-bioregion (7.6) and the north-western part is within the Herberton-Wairuna sub-bioregion (9.6) (**Figure 3-1**).

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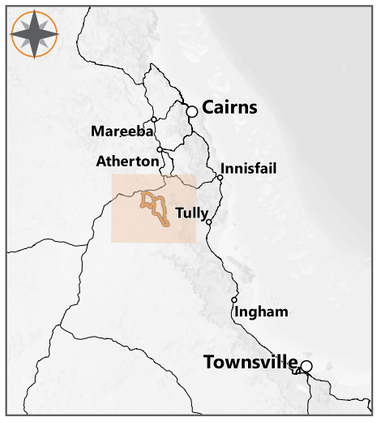
Bioregion and Sub-bioregion

Figure 3.1

- Project Area
- Project Footprint
- Town
- Peak
- Major Road
- Road
- Biogeographic Region
- Biogeographic Subregion

Date: 2021-06-14
Author: TOD
Reviewed: CC
Project: EPU-004



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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

3.2.2 Vegetation

Vegetation within the Project area is generally of remnant status and dominated by various communities associated with woodlands or open forests. Some areas have been cleared for grazing, generally within close proximity to the homesteads. The most common vegetation community within the Project area is Regional Ecosystem (RE) 9.12.2, a woodland community dominated by a mix of *Corymbia citriodora, C. intermedia* and *Eucalyptus portuensis* that occurs on the slopes and ridges of hills across both Wooroora and Glen Gordon (**Plate 3-2**). Within the Einasleigh Uplands bioregion portion of the Project area, the equivalent vegetation community (RE 7.12.34) is the second most dominant. At the tops of many of these hills, scattered rocky scarps and rocky granite pavements contain shrubland and closed forest communities of *Acacia* spp. and *Lophostemon suaveolens* associated with RE 7.12.65k (**Plate 3-3**). Other communities that occur across these hills include the *Eucalyptus reducta* dominated RE 7.12.21, *Eucalyptus resinifera* and *Corymbia intermedia* woodland associated with RE 7.12.52, and occasional patches of vine thicket.

The most common communities within the low-lying areas of the Project Area are RE 9.5.5a, a mixed woodland of *Eucalyptus crebra*, *Corymbia clarksoniana* and *C. citriodora* (**Plate 3-4**), and RE 9.3.16, a *Eucalyptus tereticornis* and *E. platyphylla* woodland occurring on alluvial flats.

Plate 3-2 *Corymbia citriodora* woodland on ridgeline

Plate 3-3 Rocky pavement shrub complex

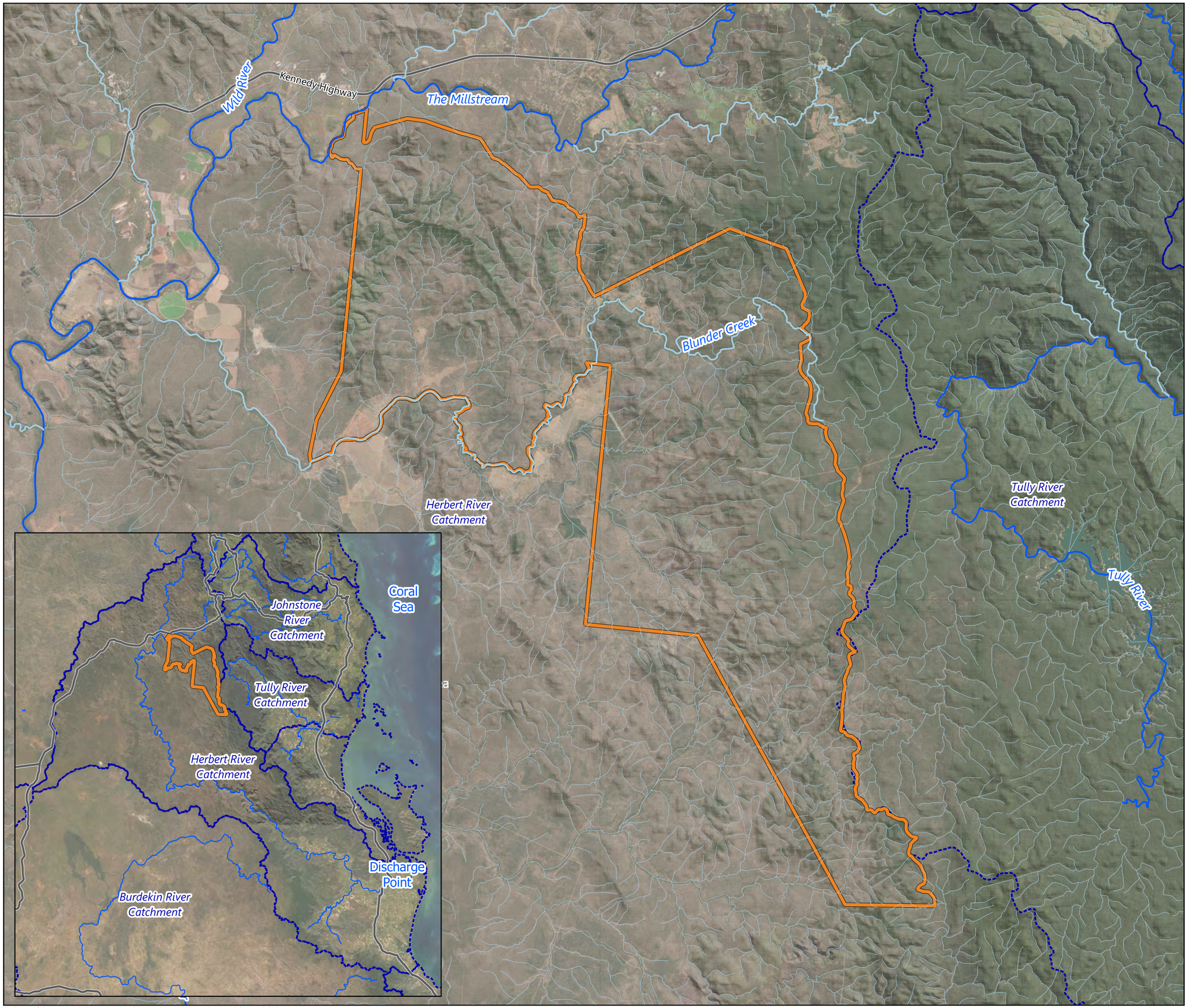
Plate 3-4 Mixed Eucalypt woodland

3.2.3 Hydrology

The Project area is located on the north-eastern edge of the Herbert River catchment, the largest catchment of the Wet Tropics region (**Figure 3-2**). The Herbert River flows in a generally south-eastern direction intersecting 15 major tributaries before discharging into the Coral Sea near Lucinda, Queensland. The Herbert River catchment averages rainfall of 1,222 mm per year, and discharges approximately 5,081 GL annually into the ocean (DES 2019*)*. The upper section of the catchment has primarily been developed for grazing, with the central section predominantly reserved for conservation, and the lower floodplains dominated by sugarcane farming (DES 2019). The Herbert River is a contributor of both dissolved inorganic nitrogen and fine sediments being released into the Great Barrier Reef Marine Park and is therefore managed under the Reef 2050 Water Quality Improvement Plan to reduce the amounts of fine sediments, nutrients (nitrogen and phosphorus) and pesticides flowing to the Great Barrier Reef (DES 2019).

Blunder Creek is the largest waterway to traverse the Project area with a catchment of 142 km^2 (Heiner & Grundy 1994). Blunder Creek flows east to west across both Wooroora and Glen Gordon before joining the Herbert River approximately 9 km to the west. Blunder Creek is identified as a stream order 4 where it traverses the Wooroora property and becomes a stream order 5 waterway within Glen Gordon. There is a series of stream orders 1, 2 and 3 across the site, including within the Project footprint. Waterways include creeks with a soft substrate bottom, and rocky gullies with distinct water holes and densely vegetated riparian vegetation. A number of farm dams also occur within the Project area.

The majority of the lower order waterways within the Project area were not running or were holding stagnant water at the time of the dry-season flora surveys (October 2020). During the wet-season fauna surveys (January-March 2021), all waterways were at the upper limit of their capacity with scattered flooding events. Based on conversations with landholders, this seasonal and episodic inundation is considered typical for the area.



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Hydrology

Figure 3.2

- Project Area
- Major Road
- River
- Creek/Watercourse
- Catchment Boundary

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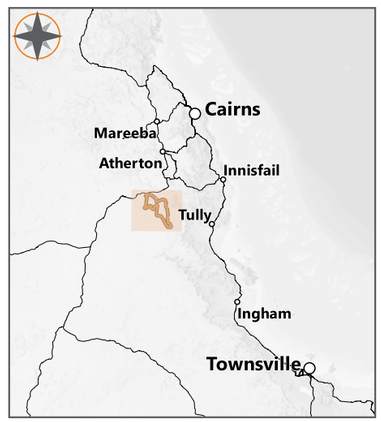
Project: EPU-004



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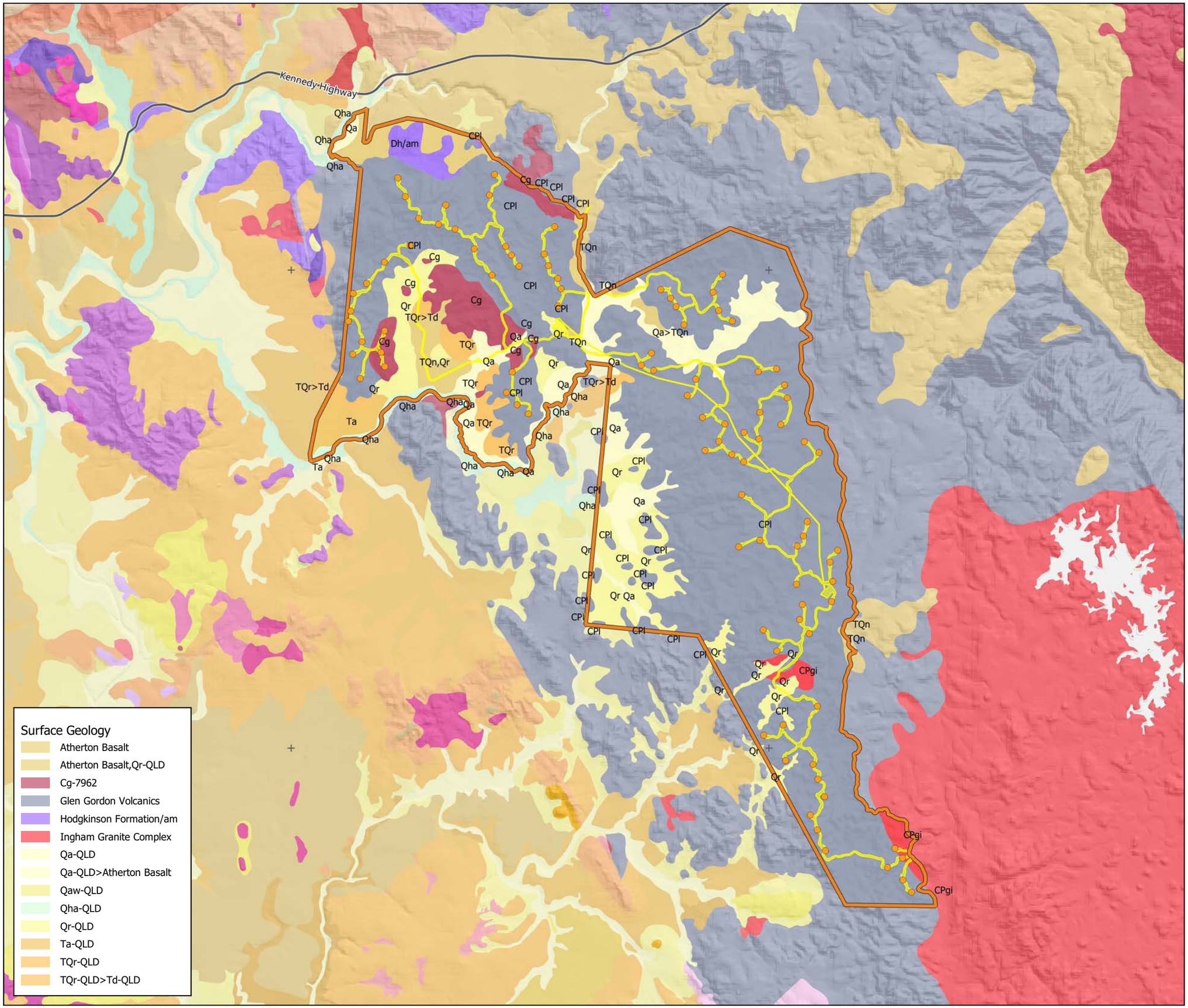
Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

3.2.4 Soils and Geology

The Project area displays characteristics associated with both the Wet Tropics and Einasleigh Uplands bioregions, with a mix of soils and REs. The higher hills and ranges within the landscape are predominantly granite and occasionally rhyolite formations associated with Land Zone 12. Soils within this land zone are mainly tenosols on steeper slopes with chromosols and sodosols on lower slopes and gently undulating areas (Wilson and Taylor 2012). The proposed wind turbines are exclusively located on these formations (**Figure 3-3**).

Lower areas within the Project area range from the imperfectly or poorly drained soils in the north, to the non-sodic soils on alluvia that dominate the central and southern extent. Glen Gordon is defined by broad areas of weakly to moderately pedal yellow and grey soils formed after sediments from the Glen Gordon acid volcanics covered a basaltic plain. The soils have a pale or bleached A2 horizon grading to a D horizon of heavy clay over decomposing basalt (Heiner & Grundy 1994). Organic carbon and total nitrogen levels in these soils are generally low, and carbon/nitrogen ratios generally tends to be high (Heiner & Grundy 1994). By contrast, Wooroora has a much broader coverage of soils associated with alluvia. This is generally described as an acidic duplex humic gley formed from quaternary alluvium with a thin organic surface and grey or gleyed B horizon formed by seasonal swamps. The higher organic carbon and nitrogen levels in these soils also reflect the surface texture and the generally lower position in the landscape (Heiner & Grundy 1994). Some infrastructure, such as access roads, will be located within these lower areas (**Figure 3-3**).



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Surface Geology

Figure 3.3

- Project Area
- Wind Turbine
- Project Footprint
- Major Road

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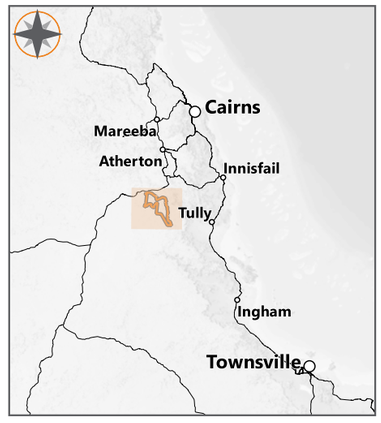

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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
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3.2.5 Elevation

The Project area is located on the southern edge of the Atherton Tablelands, a fertile plateau forming part of the northern extent of the Great Dividing Range in Queensland. This plateau sits at an average of 600 m Australian Height Datum (AHD), rising to 800 m AHD in the west and reaching over 1000 m AHD on the tops of the remnants of shield volcanoes (Whitehead 2003). Landscape formations across the Atherton Tablelands are derived from a range of lithologies but the most important are rhyolite, granite and fine-grained sedimentary rocks (Heiner & Grundy 1994).

The Project area is defined by a taller series of hills forming ridgelines, connected by numerous saddles or knolls, that extend along the eastern edge of the Wooroora property, and across the north of Wooroora and Glen Gordon (**Plate 3-5**). These ridges form the boundary of the local watershed formation, draining southwest through low plains and alluvial areas towards the Herbert River. The majority of the hills are associated with emergent granite formations rising to approximately 990 m AHD in the north of Glen Gordon, with the alluvial plains in the south of Wooroora being the lowest point within the Project Area at approximately 671 m AHD.

The proposed wind turbine locations are predominantly situated on the eastern and northern ridgelines described above, or occasionally located on other isolated scattered hills within the properties, with elevations ranging from 730 m to 990 m (**Figure 3-4**).

Plate 3-5 Glen Gordon ridgeline

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Elevation

Figure 3.4

- Project Area
- Wind Turbine
- Project Footprint
- 100m Contour
- Major Road
- River
- Creek

Elevation

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1300

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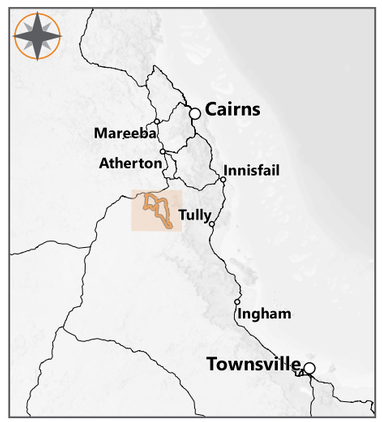

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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

3.3 Project Components

Key project components are shown in **Figure 3-5** will include:

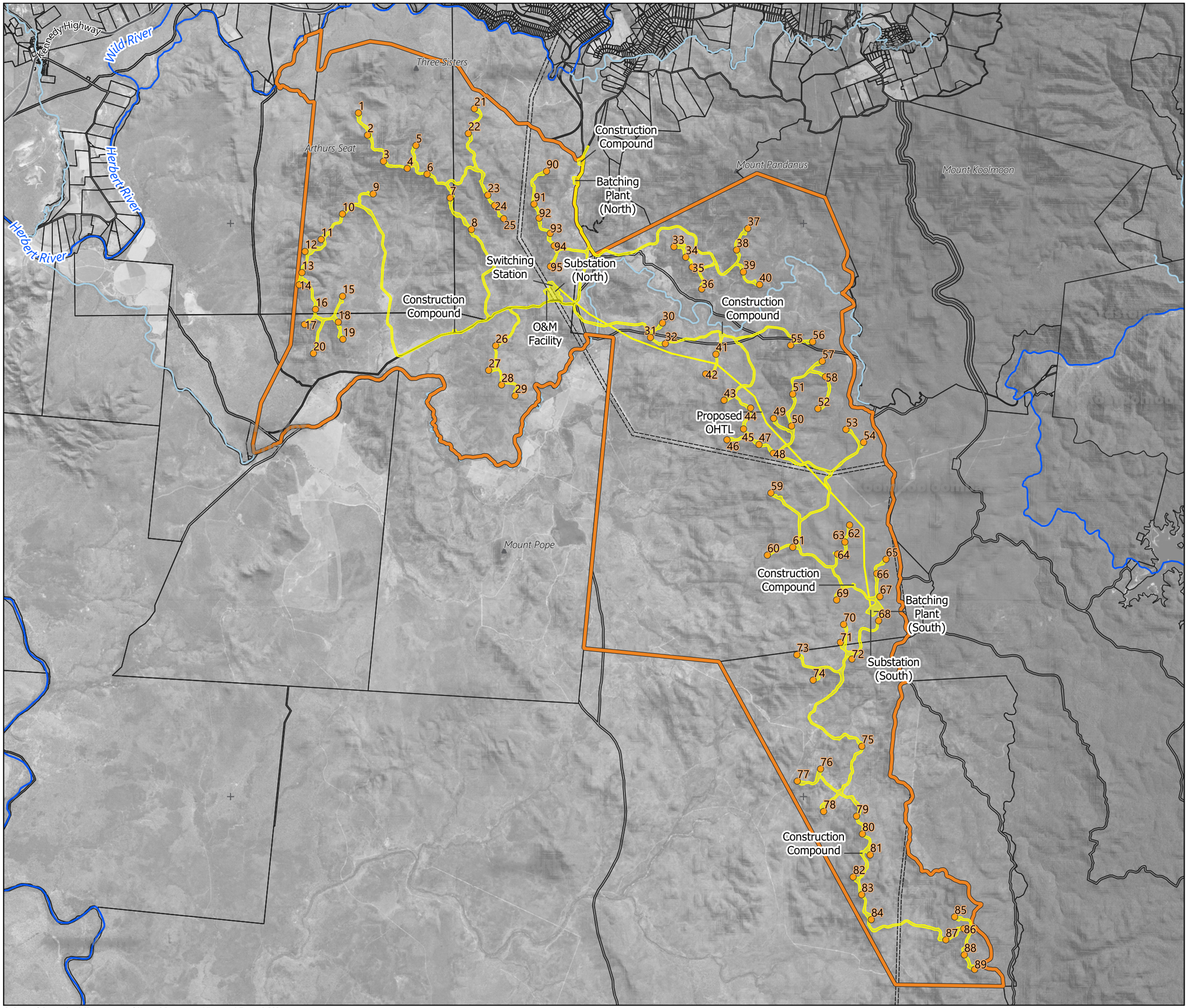
- 95 wind turbines are proposed, comprising turbines each up to 7 MW with a total potential total nameplate wind farm generating capacity of 665 MW or 2,170 GWh/annum. Turbine towers will be up to 160 m tall and turbine blades may be as long as 90 m. Each turbine will require a handstand area of 1 ha to 1.5 ha to allow for the turbine foundation, laydown of components and area for crane use. This area will also encompass firebreaks around the turbine foundation.
- A new Powerlink connection substation adjacent to the existing 275 kV Powerlink line in the central north of the Project area. This may be collocated with a combination of other electrical infrastructure such as a battery energy storage system (BESS), statcom, cap banks and/or synchronous condenser. Collectively, the footprint of these items is expected to be approximately 2 ha.
- Two wind farm collector substations (one adjoining the Powerlink switching yard and one towards the east of the Project area) which will bring together the ≤66 kV powerlines from the surrounding wind turbine locations. Here, main transformers will convert the electricity to high voltage (≤275 kV). For the transformers, the heaviest infrastructure on the Project, special foundations are installed to ensure the safety and durability of the substation.
- Medium-voltage (≤66 kV) overhead and underground powerlines – wind turbines generate at low voltage (approx. 3 kV) and have a transformer to convert into medium voltage (≤66 kV). The turbines are then connected in strings of 4-5 turbines per string, and the string is typically buried alongside wind farm access tracks. In order to reduce electrical losses, and to simplify construction, once a few strings are running in parallel they are converted to overhead and run toward the central collector substation where the power is collected and converted to high voltage (≤275 kV). Underground powerlines will be constructed running in parallel with access tracks.
- High voltage (≤275 kV) overhead powerlines – overhead line is proposed from the substation to the connection switchyard and into the wider grid. This high voltage powerline corridor is proposed to be 40 m wide, accounting for easement width requirements and incorporating firebreaks around poles (once detailed design is undertaken).
- Permanent wind monitoring masts – up to 3 are expected to be installed. These masts are proposed to be located within the supplied Project footprint. The base of each mast will consist of a concrete foundation and will be installed for approximately 30 years.
- Unsealed access tracks – access tracks are required to each turbine and supporting infrastructure such as the substation. Initial road design estimates a total of 146 km of access tracks are required. Where possible existing cleared tracks will be used and upgraded where needed to minimise vegetation clearing and fragmentation. New tracks will also be placed in cleared areas where possible and clearing widths minimised. Watercourse crossings are generally expected to be at bed level, aside from one or two major watercourse crossings. Due to the steep, complex terrain across the Project area clearing widths will vary based on earthworks required at key locations. Widths may vary from 60 m up to over 100 m, dependent on the complexity of then terrain and the ability to safely construct the required earthworks. On average the clearance width is 70 m.
- Temporary and permanent site entrance – the proposed main access to the Project is from the north off Wooroora Road, south of Ravenshoe;
- New fencing with grids and gates (within the Project footprint);
- Two concrete batching plants are proposed to be located within the Project footprint. These areas will either be rehabilitated post-construction, or used for alternative long-term infrastructure as they are only required during construction phase;

- A temporary construction compound/laydown and stockpile area will be located in the north of the Project area near the site entrance in an existing cleared area. This area will be rehabilitated post-construction. Additional laydown is provided for at each turbine location (included in the 1-1.5 ha pad described above). Another satellite construction compound is proposed in the east of the Project area;
- Temporary site offices, workshops, warehouses and amenities (located in the construction compound/laydown areas); and
- Permanent site offices for asset management and operation and maintenance facilities.

Construction activities associated with the Project will broadly consist of:

- Site establishment and preparation, including access tracks and internal electrical reticulation;
- Turbine installation using cranes;
- Permanent meteorological mast installation;
- Medium voltage underground cabling interconnecting wind turbine sites;
- Construction of substation and control room and battery energy storage system;
- Construction of overhead powerlines for reticulation;
- Construction of the operations and maintenance facility;
- Connection of the wind farm to the existing 275 kV overhead powerline; and
- Testing and commissioning of the wind farm.

The Project layout and main components are illustrated in **Figure 3-5**.



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Project Layout

Figure 3.5

- Project Area
- Wind Turbine
- Project Footprint
- Major Road
- River
- Creek
- Lot Type Parcel
- Easement

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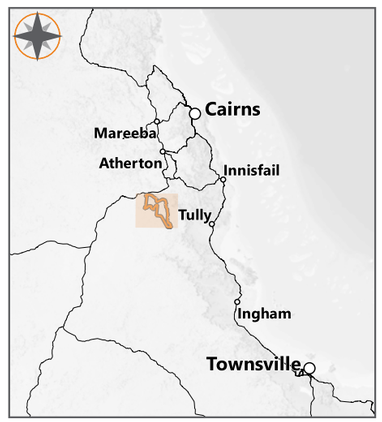
Author: TOD
Reviewed: CC
Project: EPU-004



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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

3.4 Project Stages

The activities associated with each key Project stage are summarised in the following sections.

3.4.1 Construction

Construction is expected to commence in late 2022, subject to approvals and commercial considerations. The construction phase is expected to last for a period of approximately 18-24 months, with approximately 250 to 350 staff employed during the peak construction period. The workforce will likely reside in Ravanshoe and other surrounding townships, or a dedicated construction accommodation facility.

Activities during the early stages of construction consist primarily of site establishment, contractor engagement, vegetation clearing, commencement of building compounds and laydown areas, and construction of internal site roads. During this time, detailed design of foundations and any remaining geotechnical work will be undertaken. Wind turbine components will typically arrive on site around six to nine months into construction. The main focus up until this time is the construction of access tracks, reticulation and building the substation. Depending on specific geotechnical conditions, some rock blasting may be necessary to support construction activities.

Wind turbine installation begins with construction of the foundation (typically a reinforced gravity foundation of approximately 800 m^3 of concrete). Once the concrete has cured, the tower is installed in sections which are lifted on top of one another. The nacelle (which weighs up to 400 t, including the drive train, generator and gearbox) is then lifted into position.

After this point, the blades are mounted on the hub (alternatively they are arranged at ground level and lifted as a single unit). Once the wind farm has been fully constructed and tested and registered as a generator on the National Electricity Market, it can be connected to the transmission network. Powerlink will be coordinated with for the establishment of a connection switchyard, cutting into the existing 275 kV transmission line and creating a configuration to allow the wind farm to connect through.

The wind farm contractor will then connect the final reticulation into the switchyard. At energisation, the wind farm is subject to testing. Once its performance is confirmed by the Australian Energy Market Operator (AEMO) and Powerlink, a number of hold point tests are undertaken at increasing output. The wind farm must prove its ability to meet the agreed performance standards under its connection agreement before it can move to the next hold point and increase its output.

3.4.2 Operations

The operational life of the wind farm is expected to be 30 years. Approximately 10 to 15 full-time jobs will be generated during operation, typically ten technicians along with a Project Manager, administration and other support roles. This will include environmental roles on an as-needed basis to assist in operational monitoring.

3.4.3 Decommissioning

Infrastructure may be repowered with new equipment for a further 30-year operating life, or decommissioned, with the site rehabilitated to facilitate continuation of the current land use (agriculture) or alternative land use. If decommissioned, all above-ground infrastructure will be removed and the land will be rehabilitated in line with development permit conditions and specific landowner agreements. Some infrastructure may remain in-situ depending on landowner preferences.

4.0 Methodology

4.1 Desktop Assessment

A desktop assessment has been undertaken to develop an understanding of the environmental values, landscape features, vegetation communities and threatened species that are known or have the potential to occur within the Project area and the surrounding landscape. The search area was defined as the approximate boundary of the Project area (encompassing proposed wind turbine locations and all support infrastructure) with a 10 km buffer. The following data sources were reviewed:

- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) to identify potential MNES. Search results from May 2021 are included in Appendix A.
- DAWE's Species Profiles and Threats database (SPRAT);
- Queensland Department of Environment and Science (DES) WildNet database to identify previously recorded flora and fauna species, including non-native species. Search results from May 2021 are included in Appendix A.
- DES mapping for essential habitat, protected plants trigger areas, wetlands, watercourses and drainage features;
- Queensland Department of Resources (DoR) regulated vegetation mapping (including remnant, high-value regrowth and non-remnant vegetation);
- Queensland State Planning Policy mapping for information on Matters of State Environmental Significance (MSES);
- eBird records of threatened and/or migratory birds;
- Atlas of Living Australia (ALA) database;
- High-resolution satellite imagery; and
- Published ecological information on threatened flora and fauna species where available.

Initial desktop searches were undertaken in September 2020 to inform field survey requirements; the desktop searches have been repeated as part of the EPBC Referral reporting in order to account for potential updates to government datasets and recent threatened species records.

4.2 Field Assessment

4.2.1 Survey Teams, Timing and Conditions

A summary of the surveys undertaken to date, including the timing of the surveys and the team members involved, is presented in **Table 4.1**.

Table 4.1 Summary of Survey Timing and Teams

Survey	Timing	Survey Team	Years of Experience
Protected plants survey at proposed meteorological monitoring mast location	23 September 2020	Dr Paul Williams	> 20 years

Survey	Timing	Survey Team	Years of Experience
Spring vegetation surveys	20-29 October 2020	Dr Paul Williams	> 25 years
		Darren Maxwell	> 25 years
		Nicholas Heard	8 years
		Corey Callahan	8 years
Fauna reconnaissance survey	20-21 October 2020	Terry Reis	> 25 years
		Nikki O'Donnell	> 20 years
Wet season fauna surveys	19-31 January 2021	Terry Reis	> 25 years
		Dr Bruce Thomson	> 30 years
		Ben Nottidge	> 15 years
		Rhys Sharry	3 years
		Janelle Vander	3 years
		Alex Wright	1 years
Additional protected plants surveys in new areas of Project footprint	16-19 March 2021	Dr Paul Williams	> 25 years
		Selina Carruthers	1 year
Supplemental wet season fauna surveys	23-31 March 2021	Ben Nottidge	> 15 years
		Nikki O'Donnell	> 20 years
		Rhys Sharry	3 years
Protected plants surveys at additional two meteorological monitoring masts	30 March 2021	Darren Maxwell	> 25 years

Weather conditions leading up to and during these surveys are summarised in **Table 4.2**. Rainfall was measured at the Ravenshoe Alert gauge (weather station 31200) approximately 10 km from the Project area while temperature was measured at the Walkamin Research Station (weather station 31108) approximately 70 km from the Project area.

The Project area received significant rainfall in the weeks immediately prior to the start of the wet season fauna surveys, associated with Tropical Cyclone Imogen. Heavy rainfall also occurred leading up to the supplemental wet season fauna surveys in March 2021, with the result that both survey events can be considered as indicative of wet season conditions.

Table 4.2 Weather Conditions Indicative of the Project Area Prior to the Surveys (BOM, 2021)

	Sep 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	Mar 2021
Rainfall (mm)	35 (22.1)	19 (46.6)	22 (52.8)	75 (138.4)	43[1] (243)	293 (287)	143 (272.4)
Mean minimum temperature (ºC)	16 (14.8)	16.7 (16.7)	18.2 (18.5)	20.5 (19.8)	20.7 (20.3)	20.6 (20.5)	19.5 (19.6)
Mean maximum temperature (ºC)	26.6 (27.2)	29.6 (29.3)	31.2 (30.6)	31.6 (30.8)	28.9 (30)	29.2 (29.3)	29 (28.2)

Numbers in brackets represent the relevant meteorological averages between years 1968 – 2021

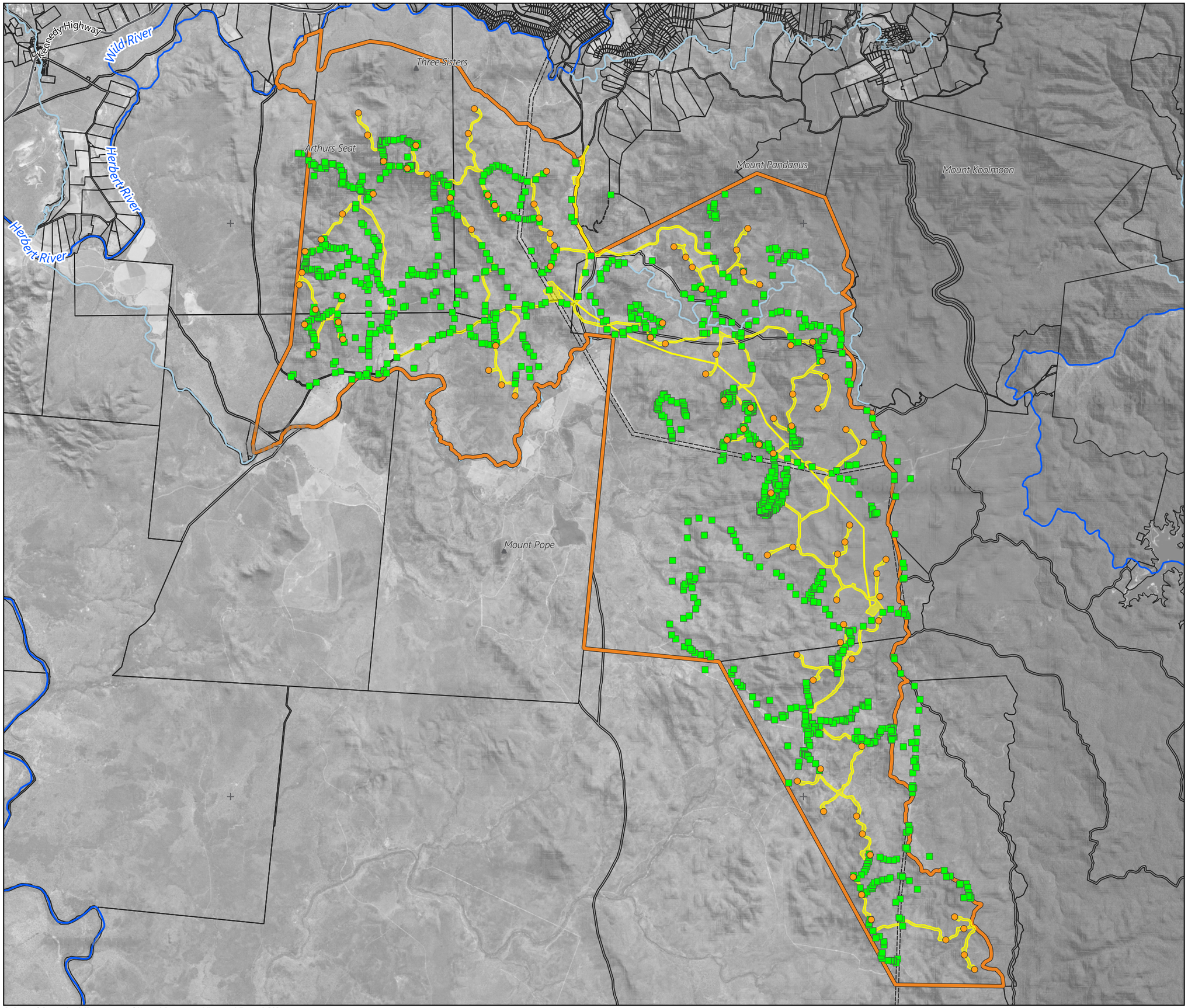
4.2.2 Flora Surveys

4.2.2.1 Vegetation Community Surveys

Indicative flora survey sites were selected across the Project area based on the results of the desktop assessment. Site selection was determined using high-quality satellite imagery, RE mapping (remnant and non-remnant vegetation) and the proposed Project footprint at the time. The purpose of these surveys was to assess the location, extent and condition of vegetation across the Project area according to the Queensland RE framework and criteria for threatened ecological communities (TECs) listed under the EPBC Act, where applicable, and to identify preferred habitat types for threatened flora species.

Flora surveys were undertaken throughout the Project area, as mapped in **Figure 4-1**.

[1] The volume of rainfall recorded at Ravenshoe Alert station for January 2021 appears to have been incorrectly recorded as it would not suggest the cyclonic conditions experienced on site, nor is it comparable with rainfall data recorded over the same period at nearby weather stations: Innot Hot Springs to the west (363.4mm), Woodleigh Station to the west (381.6 mm), Greenhaven to the northeast (653.8 mm) and Sutties Creek to the east (653 mm)



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Flora survey sites

Figure 4.1

- Project Area
- Wind Turbine
- Project Footprint
- Flora Survey Site
- Major Road River
- Creek
- Lot Type Parcel
- Easement

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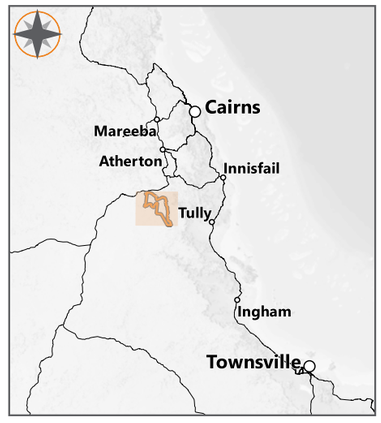
Author: TOD
Reviewed: CC
Project: EPU-004



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Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

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Vegetation surveys were undertaken on foot, with quaternary sites undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* version 5.1 (Neldner at al 2020). Quaternary sites are intended to provide a rapid means of assessing vegetation structure, floristic composition and status, with the following information collected for each site:

- Vegetation structure (height range, median height, estimated cover for each stratum) and floristic composition (dominant and common native species within each stratum);
- Vegetation status, i.e. remnant or regrowth and the RE classification;
- Brief condition assessment, including assessment of disturbance factors;
- Recorded fauna habitat and other ecological features and signs of fauna presence;
- Presence of weed species; and
- Geology and landscape attributes.

Surveys also included an assessment of the diagnostic characteristics for TECs where these were highlighted in the desktop assessment as potentially occurring. Subsequent to the field surveys, vegetation mapping was undertaken based on the results of the vegetation surveys and interpretation of high-resolution orthophotos.

4.2.2.2 Protected Plants Surveys

A number of specific protected plants surveys have been carried out at discrete locations within the Project area within high-risk trigger areas (as mapped under the NC Act). All high-risk trigger mapping within the Project area relates to threatened flora species associated with the habitat type "rocky pavement shrub complex" which has been mapped along ridgelines in both properties. These ridgelines were therefore the focus of the protected plants surveys.

Where a threatened flora species (or possible threatened flora species) was recorded, a direct count (or estimate, in high-density populations) was undertaken, the population extent was mapped, and a specimen was collected for submission to the Queensland Herbarium.

September 2020

A protected plants survey was undertaken in September 2020 at the location of a proposed meteorological monitoring mast on the Wooroora property. The survey was planned in accordance with the requirements set out in the Flora Survey Guidelines – Protected Plants (DES, 2020). The survey extent was defined in accordance with the guidelines and the Queensland *Nature Conservation (Plants) Regulation 2020* as the proposed disturbance area buffered by 100 m. The survey area (including the buffer) totalled approximately 11 ha and is shown in **Figure 4-2**.

The protected plants survey was conducted in accordance with the Flora Survey Guidelines, specifically *Section 6.2.2 - timed 30 minute meander surveys.* A pre-inspection of the site found the entire area was covered by a single habitat: eucalypt forest (mapped as RE 7.12.27c). Four separate 30 minute meanders were undertaken across the survey area.

March 2021

Protected plants surveys were undertaken at five further sites in March 2021 in accordance with the Flora Survey Guidelines – Protected Plants (DES, 2020). In each location, the survey area comprised the proposed disturbance area plus a buffer of 100 m. The number of meanders in each location was determined by the area of each habitat type, as per the Guidelines. Survey areas and the meanders within them are shown in **Figure 4-2**.

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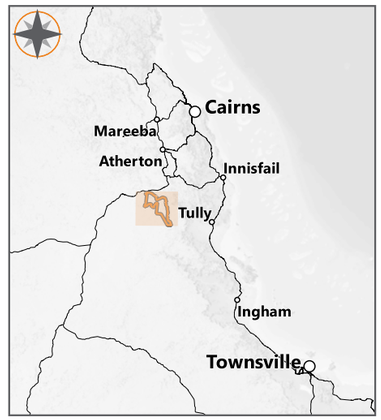
Protected Plants surveys

Figure 4.2

- Project Area
- Wind Turbine
- Project Footprint
- Protected Plant Survey Area
- Survey Site
- Major Road
- River
- Creek
- Lot Type Parcel
- Easement

Date: 2021-06-15
Author: TOD
Reviewed: CC
Project: EPU-004



0 1 2 3 4 5 km

1:125000 @ A3

Data Source(s):
Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
Queensland Imagery Whole Of State
Satellite Public Basemap Service

C:\Users\Tim ODonnell\Attexo Group\Attexo - Documents\Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\EPU-004_050[A1].qgz

4.2.2.3 Flora Survey Limitations

Rainfall in the two months leading into the spring vegetation community survey was below average for the time of year, potentially resulting in reduced biomass of non-woody species and limited reproductive material to facilitate the identification of grasses and other understorey plants. However, these conditions had not affected established perennial woody species and the shrubs that were the target of the protected plants surveys were readily identified on site. The accuracy of the vegetation community determination and detection of woody threatened species was not compromised.

4.2.3 Fauna Surveys

4.2.3.1 Overview

Wet season fauna surveys were undertaken by three teams of two people between 18 January and 1 February 2020, in accordance with the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al 2018) which identifies the optimal times of year for the Wet Tropics and Einasleigh Uplands bioregions as early wet season (November to January) and early dry season (May to July). Vertebrate activity is typically high during the early wet season as animals start to move around in response to the building humidity.

Supplementary spotlighting for amphibians was undertaken by a team of two people between 26 and 31 March 2020, immediately after a significant rainfall event. As per the Survey guidelines for Australia's threatened frogs (DEWHA, 2010), the optimum timing for surveying for a number of the target threatened frog species (such as *Litoria nannotis* and *Pseudophryne covacevichae*) is during periods of peak activity from September to March, after but not during heavy rainfall. The camera traps that had been deployed in January were also collected at this time.

Fauna surveys were designed to meet the requirements of the Queensland State Code 23 for Wind Farm Development (DILGP, 2017) and survey guidelines for conservation significant species with potential to occur, as detailed in the following documents:

- Queensland Terrestrial Vertebrate Fauna Survey Guidelines (Eyre et al 2018);
- Survey guidelines for Australia's threatened mammals (DSEWPC 2011a);
- Survey guidelines for Australia's threatened reptiles (DSEWPC 2011b);
- Survey guidelines for Australia's threatened bats (DEWHA 2010b);
- Survey guidelines for Australia's threatened birds (DEWHA 2010c);
- Survey guidelines for Australia's threatened frogs (DEWHA 2010d); and
- Victorian Approved Survey Standards: Greater Glider (DSE 2011).

4.2.3.2 Fauna Survey Methods

Fauna surveys comprised a combination of habitat assessments and targeted survey techniques as described in the following sections. Fauna surveys were undertaken at various sites across the Project area as shown in **Figure 4-3**. Much of the survey effort was focused on proposed access roads and turbine locations as these disturbance areas represent the highest risk for direct impacts on threatened fauna species. Preferred habitat for potentially occurring MNES fauna was also targeted to the extent that wet weather access permitted (see **Section 4.2.3.3** relating to fauna survey limitations). Survey sites are shown in **Figure 4-3** and a summary of survey effort for MNES species known or

considered likely to occur is provided in **Table 4.3**. Opportunistic records of all fauna species were taken during all survey types, including during travel to and between survey sites.