








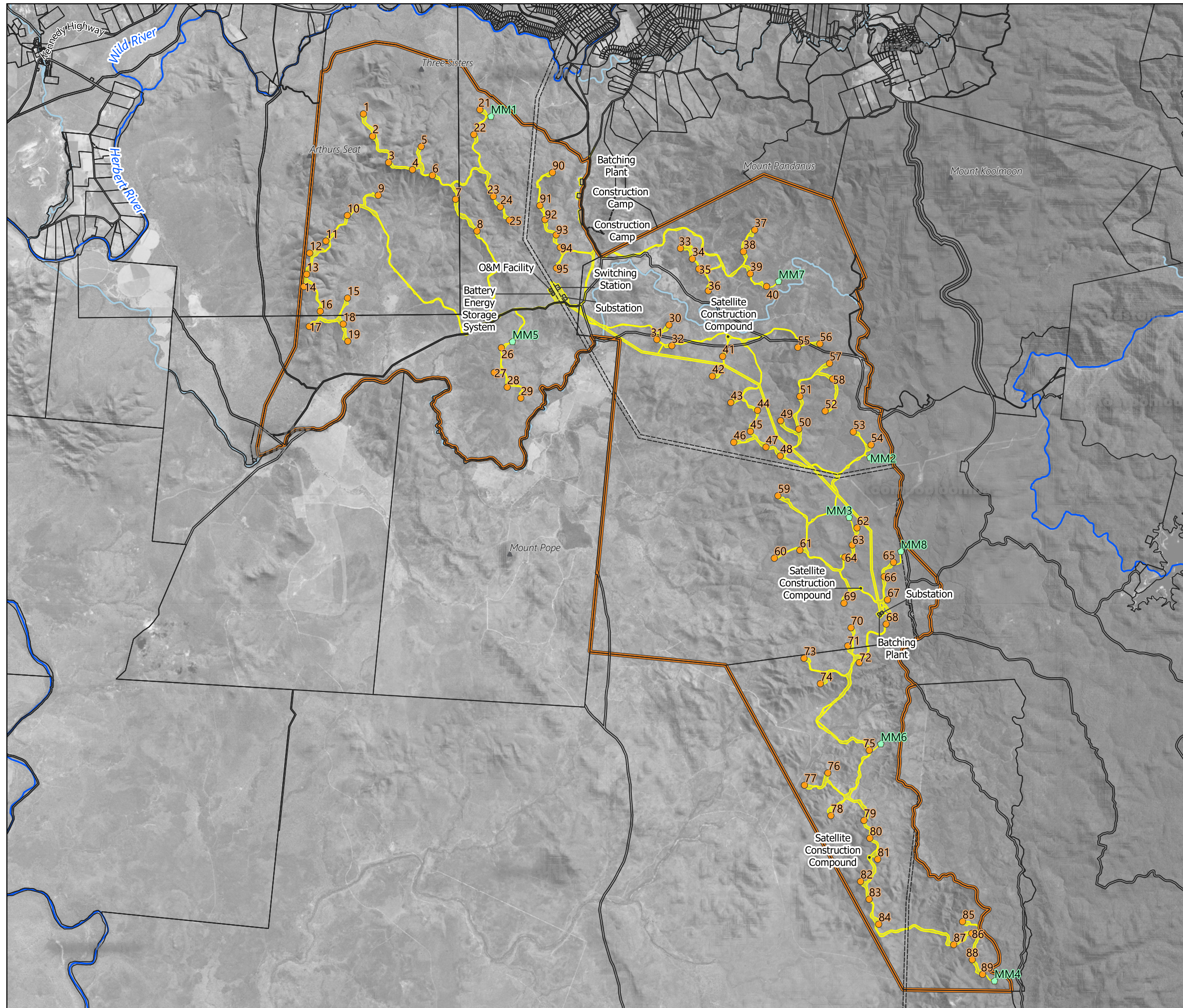


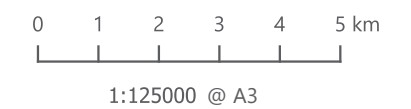
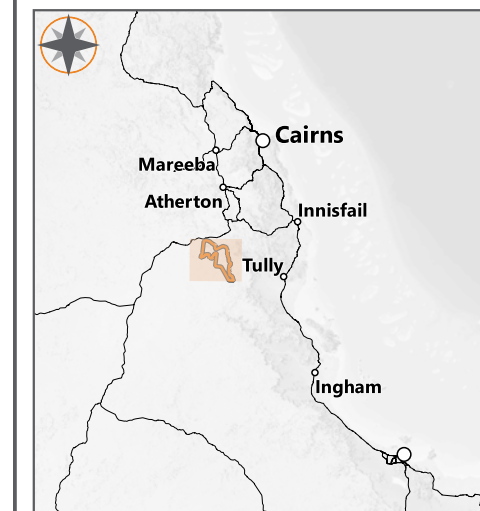
Chalumbin Wind Farm Project Layout

Figure 1.1

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



Date: 2021-12-02
 Author: TOD
 Reviewed: CC
 Project: EPU-004



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



2.0 Relevant Legislation

2.1 Commonwealth Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act is the Australian Government's central piece of environmental legislation that provides a legal framework to manage proposed actions that will or are likely to have an impact on Matters of National Environmental Significance (MNES) that includes nationally and internationally important flora, fauna, ecological communities and heritage places. Known MNES occur within the Project area including threatened flora, fauna and migratory species. A referral to the Department of Agriculture, Water and the Environment (DAWE) (EPBC 2021/8983) was submitted on 23 July 2021. On 10 August 2021 DAWE determined that the Project is a controlled action and will be assessed by Public Environment Report.

2.2 State Legislation

2.2.1 Planning Act 2016

Under the *Planning Act 2016*, wind farm development is assessable development (a material change of use for a wind farm). In accordance with Part 21, Division 2, Table 1 of the *Planning Regulation 2017*, the Project requires assessment and decision by the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), represented by the State Assessment and Referral Agency (SARA), as assessment manager. The Project will be assessed against State Code 23: Wind farm development (State Code 23).

The purpose of State Code 23 is to protect individuals, communities and the environment from adverse impacts resulting from the construction, operation and decommissioning of wind farm development. Table 23.2.1 of State Code 23 lists the relevant performance outcomes and acceptable outcomes (as applicable) with which the Project must demonstrate compliance. Offsets must be provided where there is an unavoidable residual impact on Matters of State Environmental Significance (MSES). Offsets must be provided in accordance with the *Environmental Offsets Act 2014*.

2.2.2 Vegetation Management Act 1999

Under the *Vegetation Management Act 1999*, Regional Ecosystems (REs) are assigned three statuses as follows:

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

The defining features of the statuses are provided in Division 7A of the Act. Sattler and Williams (1999) define RE as a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. For the purposes of regulating clearing activities associated with the Project, both the VM Act Status and Biodiversity Status (BD Status) of a RE is provided.

The purpose of the *Vegetation Management Act 1999* (VM Act) is to regulate the clearing of vegetation and to manage environmental impacts caused by clearing. The Project involves operational works, that is clearing Category B regulated vegetation, which is otherwise prohibited if not for a relevant purpose (*Planning Regulation 2017*). Under



the *Planning Act 2016* clearing of Category B regulated vegetation is Operational Works (OPW) and requires a development permit. A relevant purpose determination is required to support the lodgement of the OPW development permit; this was obtained by the proponent and evidence of this is provided in the Planning Report. The OPW component of the Project is assessed under State Code 16: Native vegetation clearing (State Code 16).

2.2.3 Nature Conservation Act 1992

The purpose of the *Nature Conservation Act 1992* is to conserve flora and fauna and their habitats, by gazetting of protected areas including nature refuges; prescribing the threat status of wildlife; and placing restrictions on the taking or harm to native wildlife without a valid permit. Field and desktop assessments in the EAR identified listed wildlife and associated habitat and likelihood of occurrence within the Project area, and habitat mapping was developed for these species.

2.2.3.1 Protected Plants Trigger Mapping

Under the *Nature Conservation Act 1992* (NC Act), plants listed as either Endangered, Vulnerable or Near Threatened (EVNT) are protected from illegal removal from the wild and illegal trade. If a proposed area to be cleared contains EVNT and there is no relevant exemption and is shown as 'high risk' on the protected plants flora survey trigger map (DES 2019), a flora survey of the clearing impact area and 100 m buffer is required prior to any clearing activities. If EVNT species are confirmed present in the clearing area or 100 m buffer, a clearing permit under the NC Act is required prior to clearing activities.

The clearing permit authorises clearing of land rather than the clearing of species present. Clearing that complies with the permit will not be subject to any further survey or approval requirements once clearing begins. Re-clearing or routine maintenance may be undertaken for up to 10 years from the first clearing, however, where a significant residual impact to EVNT is likely to occur an offset may be required. Where EVNT are not impacted (clearing avoids species) or detected in the clearing impact area, a clearing permit is not required but an exempt clearing notification must be submitted to the Department of Environment and Science (DES) within 1 year following the survey and at least 1 week prior to commencing clearing.

There are some areas of high-risk trigger mapping within the Project footprint, therefore targeted surveys are required and will be undertaken in accordance with the *Flora Guidelines – Protected Plants* (DES 2020). Where clearing cannot be avoided a clearing permit will be required. These surveys and associated permitting/notification processes will be undertaken closer to the time of construction to accord with the timeframe requirements of the NC Act.

2.2.4 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. Weeds and animal pests potentially pose threats to flora and fauna, and agricultural uses within the Project area.

The presence of weeds in the Project area and their proposed control are addressed in this VMP.



3.0 Existing Environment and Ecological Values

Vegetation community surveys were undertaken across the Project area in September 2020. Preliminary flora survey sites were identified based on the results of the desktop assessment, 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 communities 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. Subsequent to the field surveys, vegetation mapping was undertaken based on the results of the vegetation community surveys and interpretation of high-resolution orthophotos.

In addition, a number of targeted protected plants surveys have been carried out at discrete locations within the Project area within high-risk trigger areas. 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, which were undertaken in September 2020, March 2021 and June 2021.

A summary of the flora survey methods and results can be found in the EAR (Attexo 2021a) and key findings are described in the following sections.

3.1 Regional Ecosystems and Vegetation Communities

Quaternary surveys were undertaken to ground-truth RE mapping in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland v.5.1* (Nelder et al. 2020). Field surveys confirmed the occurrence of 25 REs within the Project footprint; these are described below in **Table 3.1** and shown in **Figure 3-1**. The Project area is largely remnant vegetation with approximately 4 % categorised as non-remnant. Four small patches of RE 7.3.8a were mapped within the southern part of the Project area based on DoR mapping, potentially corresponding to the TEC broad-leaf tea-tree (*Melaleuca viridiflora*) woodlands in high rainfall coastal north Queensland. Field surveys confirmed that two of these patches correspond with RE 7.3.8a; however, neither met the diagnostic characteristics of the TEC. Specifically, both patches of RE 7.3.8a had *Eucalyptus lockyeri* as the dominant canopy layer, rather than *Melaleuca viridiflora*. One of these patches of RE 7.3.8a is intersected by a proposed met mast.

Table 3.1 Ground-truthed Regional Ecosystems in the Project footprint

RE	Description	Status (VM Act)
7.3.8a	<i>Melaleuca viridiflora</i> open forest to open woodland. Includes areas of natural invasion onto former grasslands. Alluvial plains	Least concern
7.3.16	<i>Eucalyptus platyphylla</i> woodland to open forest on alluvial plains. Gently sloping to flat, moderately to poorly drained alluvial lowlands, foot slopes and piedmont fans.	Least concern
7.3.26	<i>Casuarina cunninghamiana</i> woodland to open forest on alluvium fringing streams.	Of concern
7.3.43	<i>Eucalyptus tereticornis</i> open forest to woodland on uplands on well-drained alluvium	Of concern
7.3.43a	<i>Eucalyptus tereticornis</i> open forest, tall open forest and woodland including communities ranging from those dominated by <i>E. tereticornis</i> to mixtures of that species with <i>Corymbia intermedia</i> , <i>E. drepanophylla</i> , <i>Lophostemon suaveolens</i> and <i>Allocasuarina torulosa</i> . Uplands on alluvium.	Of concern












RE	Description	Status (VM Act)
7.8.7	<i>Eucalyptus tereticornis</i> (forest red gum) open forest, and associated grasslands. Uplands and highlands on basaltic krasnozem and prairie soils, of the moist rainfall zone.	Of concern
7.8.10	<i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> (or <i>E. granitica</i>), <i>E. portuensis</i> , <i>Corymbia intermedia</i> woodland to open forest, or <i>E. moluccana</i> woodland to open forest, of uplands and highlands on basalt.	Of concern
7.8.18	<i>Corymbia intermedia</i> (pink bloodwood) and/or <i>Lophostemon suaveolens</i> (swamp mahogany) +/- <i>Allocasuarina torulosa</i> (forest sheoak) open forest to woodland. Basalt.	Of concern
7.8.19	<i>Corymbia clarksoniana</i> open forest to woodland on basalt.	Endangered
7.12.27a	<i>Eucalyptus reducta</i> medium open forest and woodland. Uplands and highlands on shallow granitic and rhyolitic soils, of the moist rainfall zone.	Least concern
7.12.27c	<i>Eucalyptus resinifera</i> and <i>Syncarpia glomulifera</i> open woodland. Uplands and highlands on shallow granitic and rhyolitic soils, of the moist rainfall zone.	Least concern
7.12.29a	<i>Corymbia intermedia</i> , <i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> open forest to low open forest and woodland with <i>Allocasuarina torulosa</i> , <i>A. littoralis</i> , <i>Lophostemon suaveolens</i> , <i>Acacia cincinnata</i> , <i>A. flavescens</i> , <i>Banksia aquilonia</i> and <i>Xanthorrhoea johnsonii</i> . Uplands, on granite and rhyolite.	Least concern
7.12.30a	<i>Corymbia citriodora</i> , <i>Eucalyptus portuensis</i> , <i>C. intermedia</i> , <i>Syncarpia glomulifera</i> woodland to low woodland to open forest with <i>Callitris intratropica</i> , <i>Acacia calyculata</i> and <i>Xanthorrhoea johnsonii</i> . Uplands and highlands, of the moist and dry rainfall zones.	Least concern
7.12.34	<i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite	Least concern
7.12.52	<i>Eucalyptus resinifera</i> , <i>Corymbia intermedia</i> , <i>Allocasuarina littoralis</i> , <i>Syncarpia glomulifera</i> , <i>E. drepanophylla</i> +/- <i>E. reducta</i> woodland on granite and rhyolite in the dry to moist rainfall zone	Of concern
7.12.57	Shrubland and low woodland mosaic with <i>Syncarpia glomulifera</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus portuensis</i> , <i>Allocasuarina littoralis</i> and <i>Xanthorrhoea johnsonii</i> on uplands and highlands on granite	Of concern
7.12.57a	Shrubland and low woodland mosaic with <i>Syncarpia glomulifera</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus portuensis</i> , <i>Allocasuarina littoralis</i> and <i>Xanthorrhoea johnsonii</i> . Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones.	Of concern
7.12.65	Rock pavement or areas of skeletal soil on granite and rhyolite of dry western or southern areas +/- shrublands to closed forests of <i>Acacia</i> spp. and/or <i>Lophostemon suaveolens</i> and/or <i>Allocasuarina littoralis</i> and/or <i>Eucalyptus lockyeri</i> subsp. <i>exuta</i> .	Least concern
7.12.65k	Granite and rhyolite rock outcrop, of dry western areas, associated with shrublands to closed forests of <i>Acacia</i> spp. and/or <i>Lophostemon</i> spp. and/or <i>Allocasuarina</i> spp. In the Mount Emerald area, shrubs may include <i>Acacia umbellata</i> , <i>Melaleuca borealis</i> , <i>Homoranthus porteri</i> , <i>Leptospermum neglectum</i> , <i>Melaleuca recurva</i> , <i>Melaleuca uxorum</i> , <i>Grevillea glossadenia</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus lockyeri</i> , <i>Sannantha angusta</i> , <i>Pseudanthus ligulatus</i> subsp. <i>ligulatus</i> , <i>Acacia aulacocarpa</i> , <i>Leptospermum amboinense</i> , <i>Xanthorrhoea johnsonii</i> and <i>Jacksonia thesioides</i> . Ground-cover species may include <i>Borya septentrionalis</i> , <i>Lepidosperma laterale</i> , <i>Eriachne</i> spp., <i>Cleistochloa subjuncea</i> , <i>Boronia occidentalis</i> , <i>Cheilanthes</i> spp., <i>Coronidium newcastlianum</i> , <i>Schizachyrium</i> spp., <i>Tripogon loliiiformis</i> , <i>Gonocarpus acanthocarpus</i> and <i>Eragrostis</i> spp. Dry western areas. Granite and rhyolite.	Least concern
7.12.66	<i>Lophostemon confertus</i> (brush box) low shrubland or low to medium closed forest. Exposed rocky slopes on granite and rhyolite.	Of concern



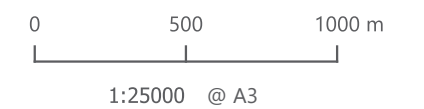
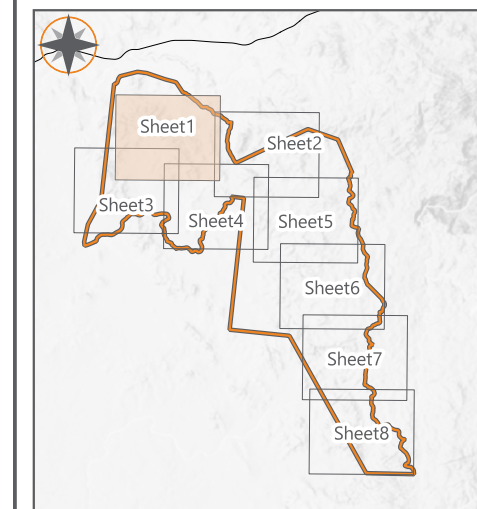
RE	Description	Status (VM Act)
9.5.5a	Mixed woodland to open forest of <i>Eucalyptus crebra</i> , <i>Corymbia clarksoniana</i> and <i>C. citriodora</i> subsp. <i>citriodora</i> +/- <i>E. portuensis</i> with a generally open sub-canopy of canopy species +/- <i>Callitris intratropica</i> and <i>Acacia</i> spp. The open shrub layer often contains juvenile canopy species, <i>Petalostigma pubescens</i> , <i>Acacia flavescens</i> and other <i>Acacia</i> spp. <i>Themeda triandra</i> is the dominant species in a dense grassy ground layer. Occurs on Tertiary plateaus and remnants.	Least concern
9.3.15	Fringing woodland to open forest containing any combination of <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> and <i>E. platyphylla</i> +/- <i>Lophostemon suaveolens</i> +/- <i>Nauclea orientalis</i> +/- <i>Corymbia tessellaris</i> +/- <i>C. clarksoniana</i> . There is often a low sub-canopy layer which can include canopy species and <i>Ficus</i> spp. The open shrub layer contains juvenile canopy species and can include mesic species such as <i>Euroschinus falcatus</i> , <i>Acacia mangium</i> and <i>Syzygium</i> sp. The ground layer is medium to dense grassy and contains <i>Imperata cylindrica</i> , <i>Crotalaria</i> sp., <i>Heteropogon contortus</i> , <i>Cyperus</i> spp. and <i>Paspalum</i> spp. Occurs on stream banks and channels in areas of higher rainfall in the central east of the bioregion.	Least concern
9.3.16	<i>Eucalyptus tereticornis</i> and/or <i>E. platyphylla</i> and/or <i>Corymbia clarksoniana</i> woodland on alluvial flats, levees and plains.	Least concern
9.12.2	<i>Eucalyptus portuensis</i> , <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , <i>E. granitica</i> or <i>E. crebra</i> , <i>C. intermedia</i> or <i>C. clarksoniana</i> mixed woodland on steep hills and ranges on igneous hills close to Wet Tropics boundary.	Least concern
9.12.4	Low open woodland to woodland of <i>Eucalyptus shirleyi</i> +/- <i>Corymbia peltate</i> +/- <i>Callitris intratropica</i> . The mid layer varies from absent to a mid-dense sub-canopy and/or shrub layer and the ground layer is dense and grassy. Occurs predominantly on sandy shallow soils derived from igneous rocks on rolling low hills to hills.	Least concern

Chalumbin Wind Farm Regional Ecosystems in the Project area

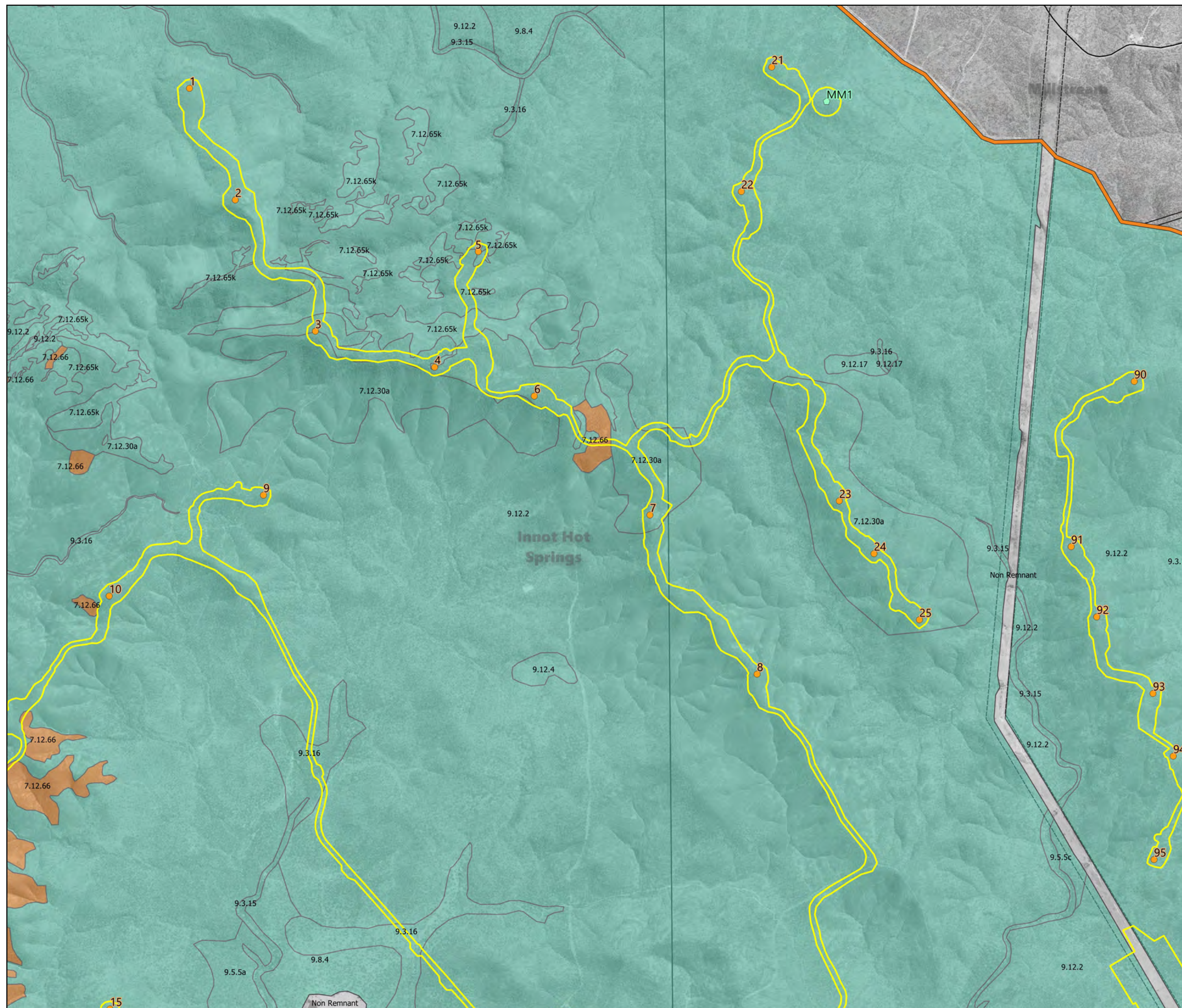
Figure 3.1 Sheet 1

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
 -  Lot Type Parcel
 -  Easement

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 Author: TOD
 Reviewed: CC
 Project: EPU-004






Data Source(s):
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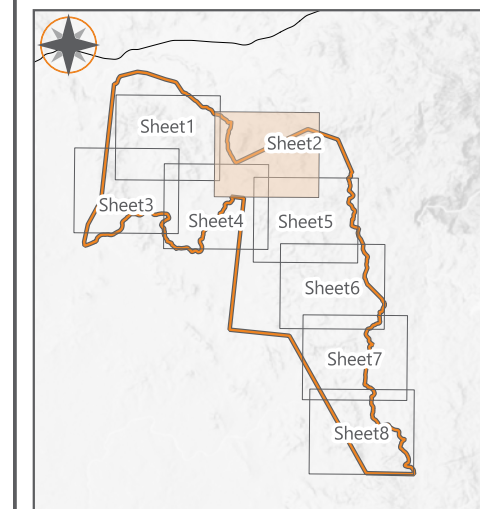


Chalumbin Wind Farm Regional Ecosystems in the Project area

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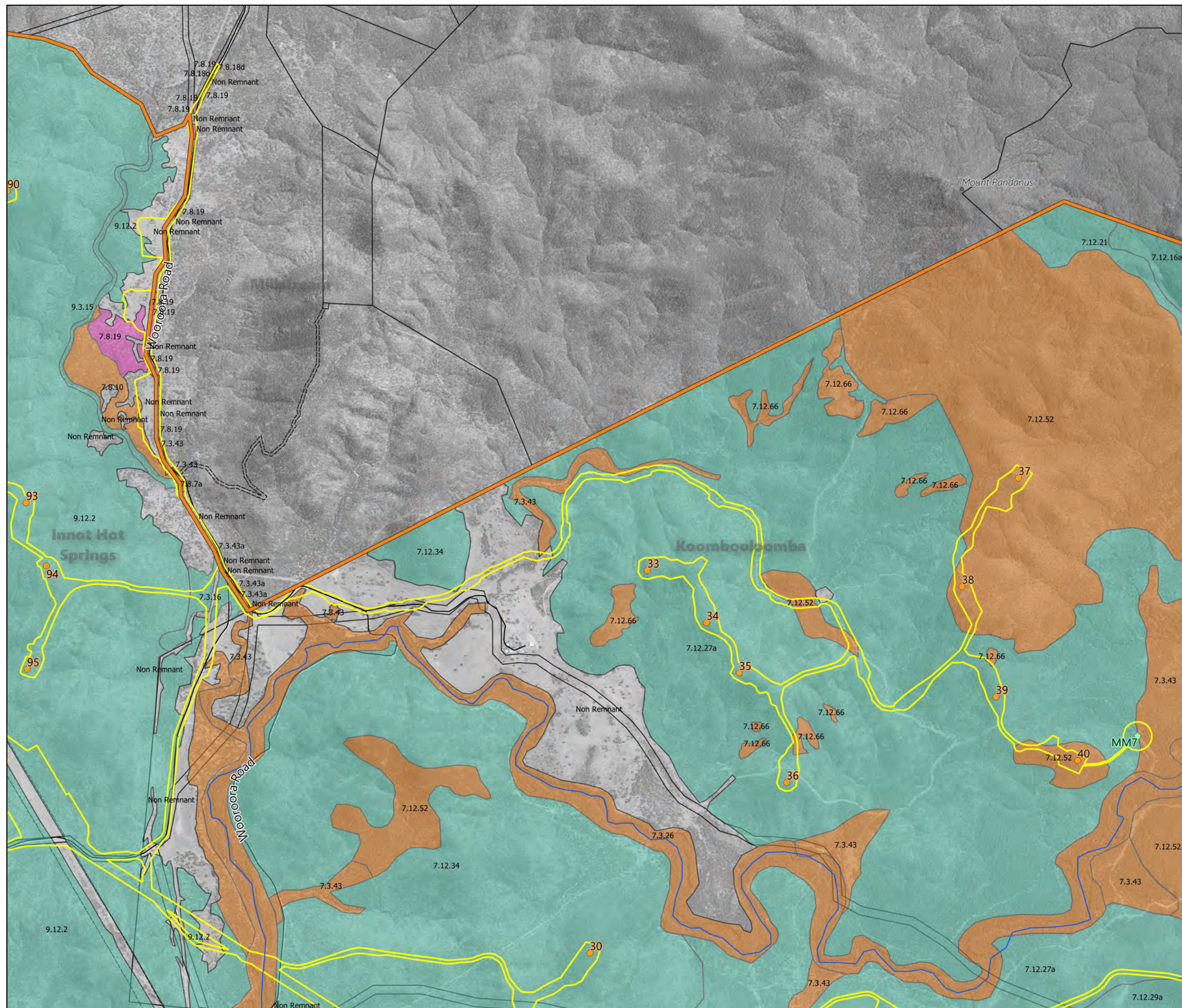
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 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Endangered Remnant
 -  Of Concern Remnant
 -  Least Concern Remnant
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 -  Creek
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



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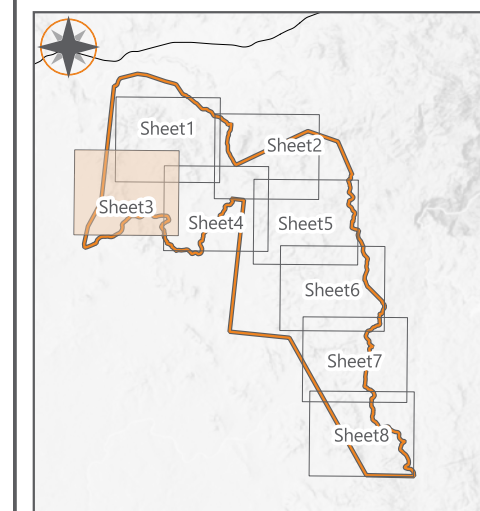


Chalumbin Wind Farm Regional Ecosystems in the Project area

Figure 3.1 Sheet 3

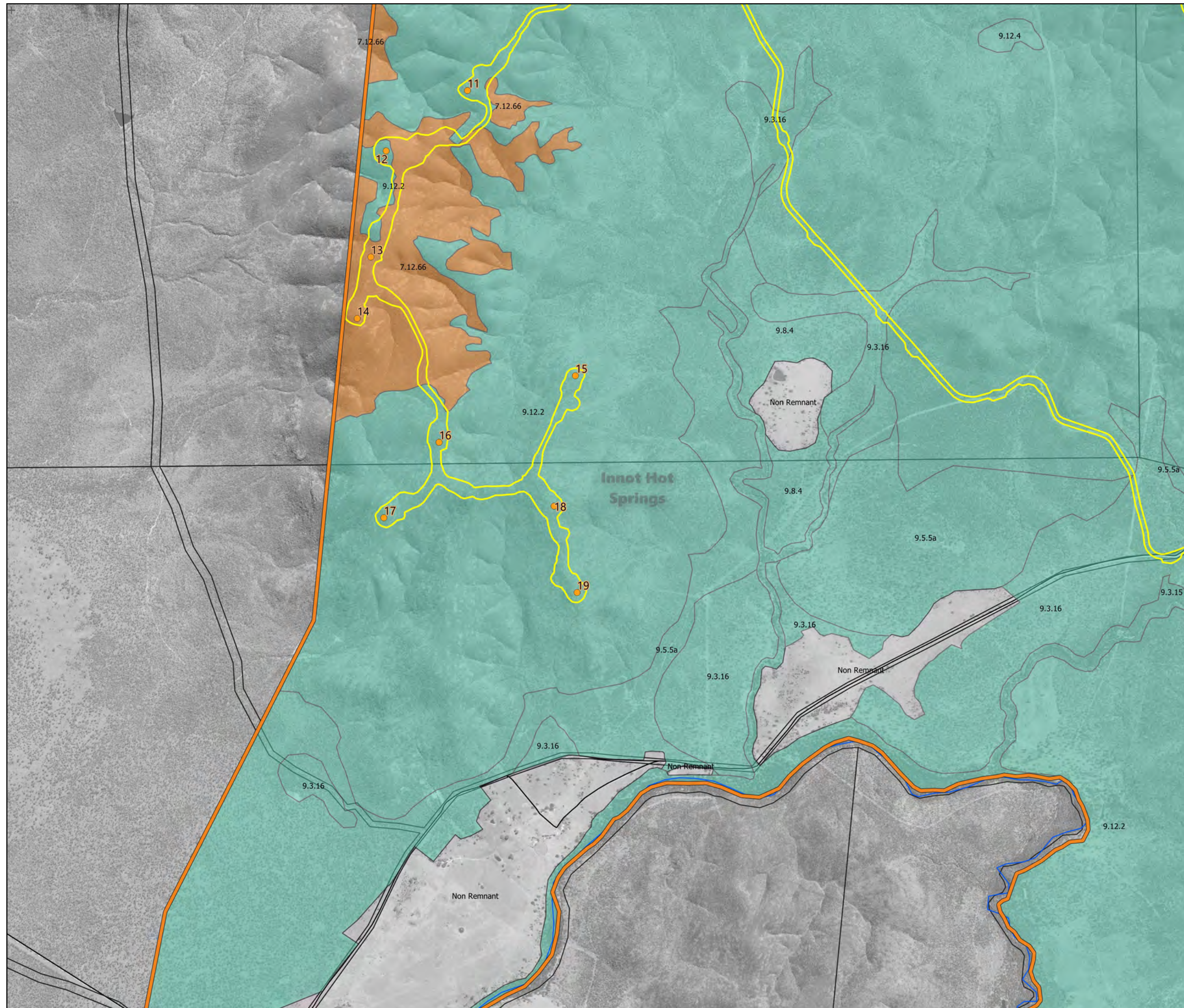
-  Project Area
-  Wind Turbine
-  Project Footprint
- Ground Truthed Regional Ecosystem**
-  Of Concern Remnant
-  Least Concern Remnant
-  Non Remnant
-  Creek
-  Lot Type Parcel

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 Project: EPU-004













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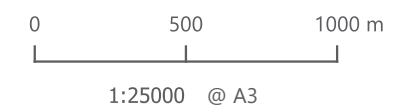
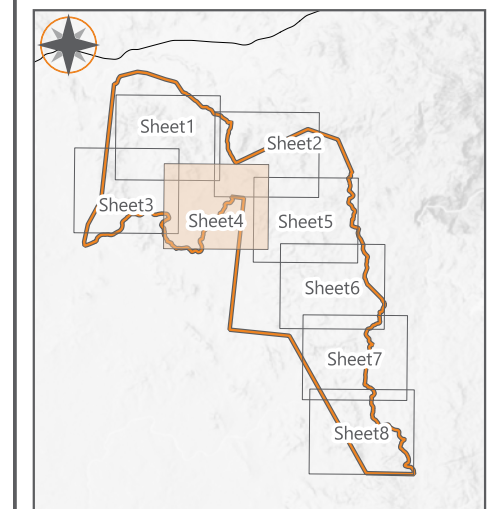


Chalumbin Wind Farm Regional Ecosystems in the Project area

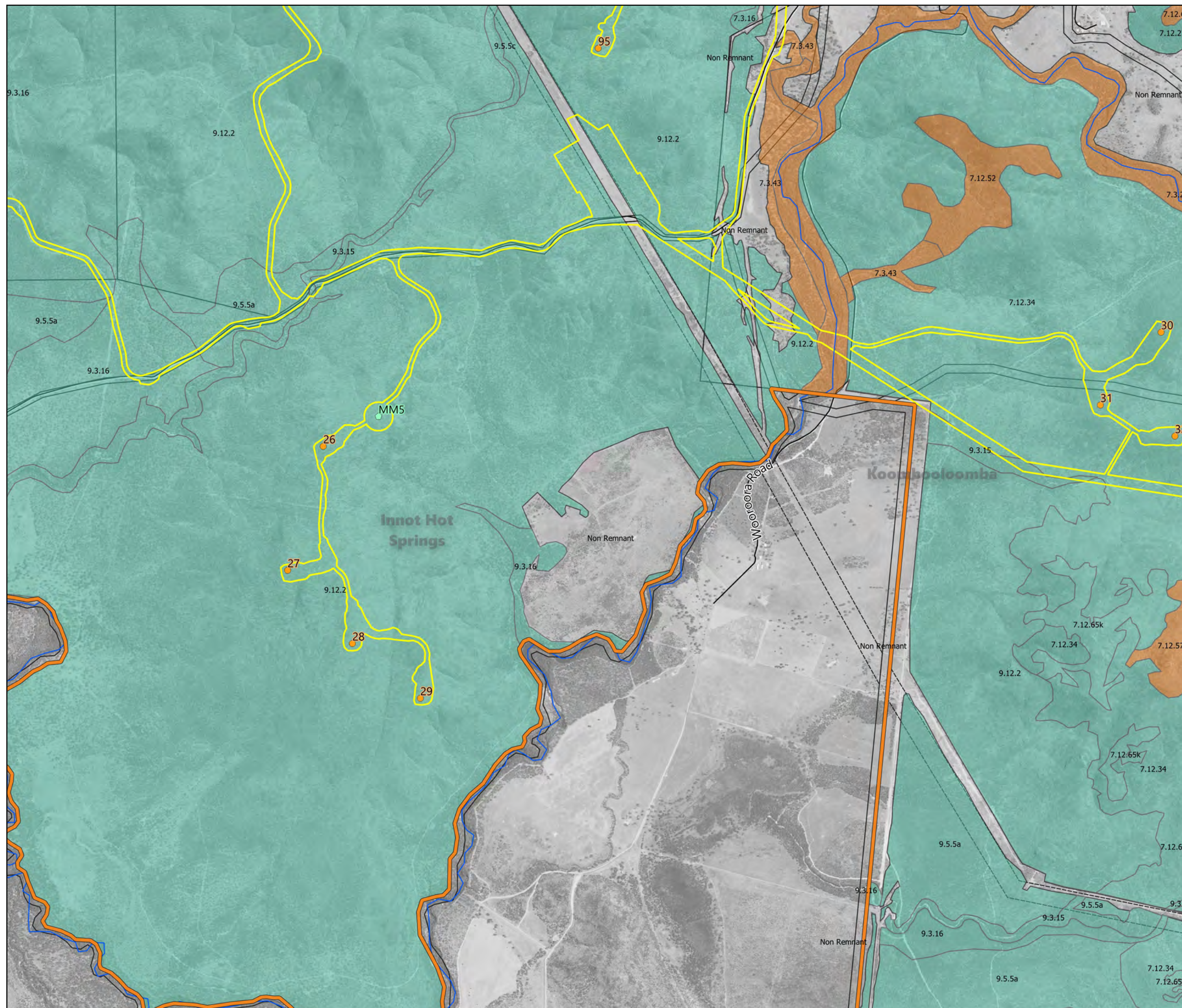
Figure 3.1 Sheet 4

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
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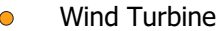






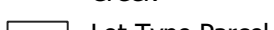
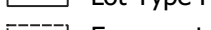


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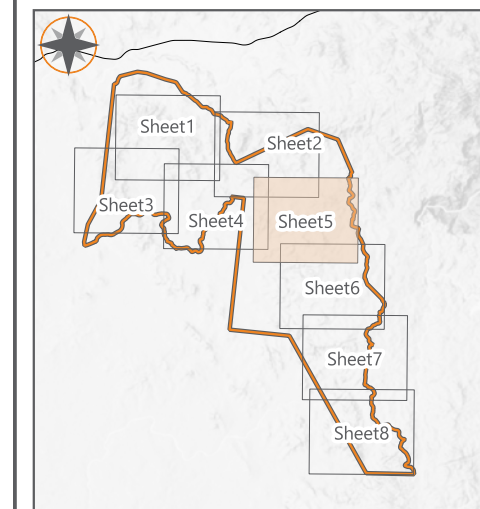


Chalumbin Wind Farm Regional Ecosystems in the Project area

Figure 3.1 Sheet 5

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
 -  Creek
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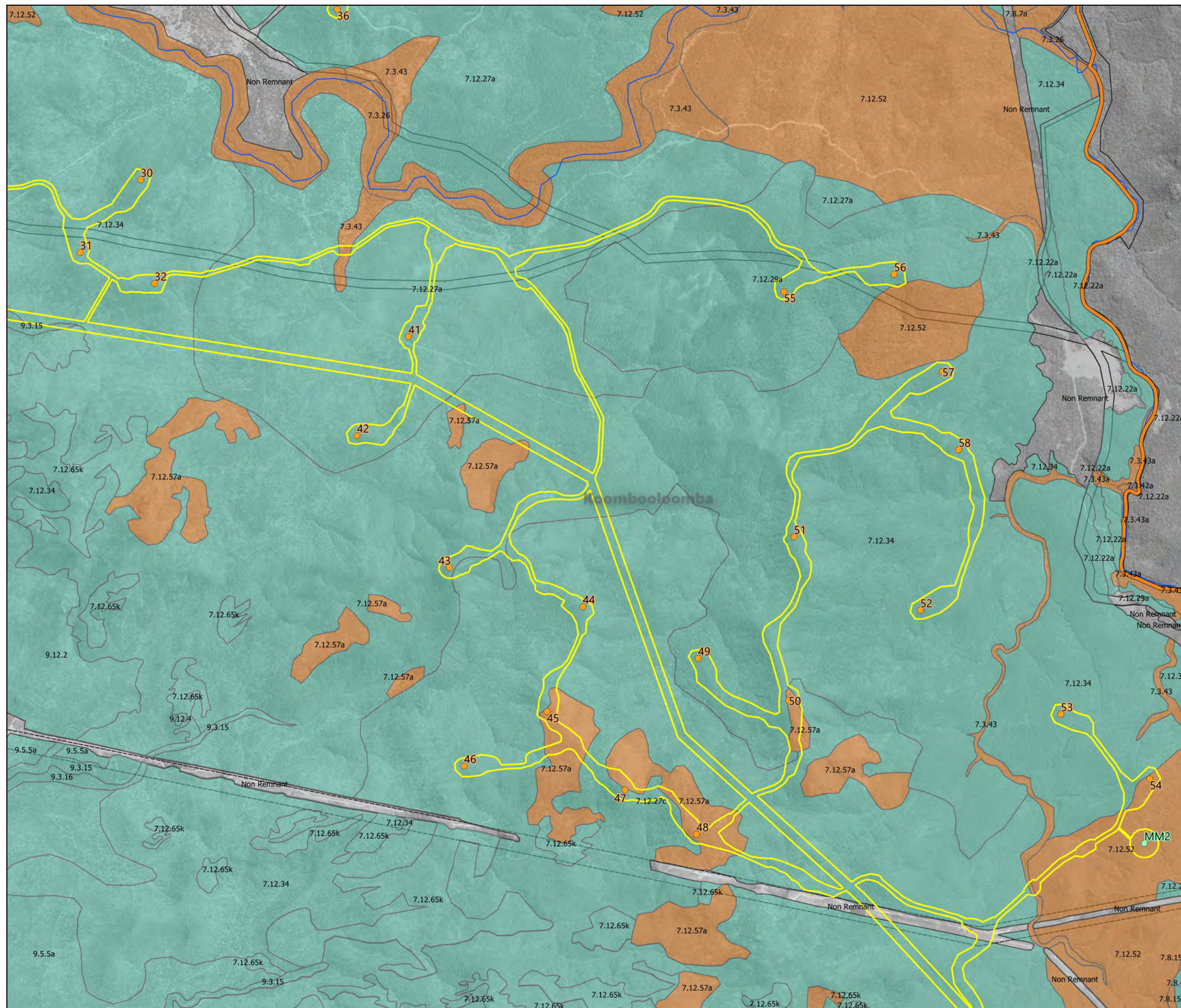
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

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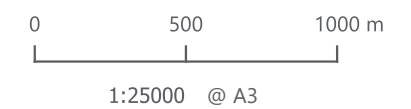
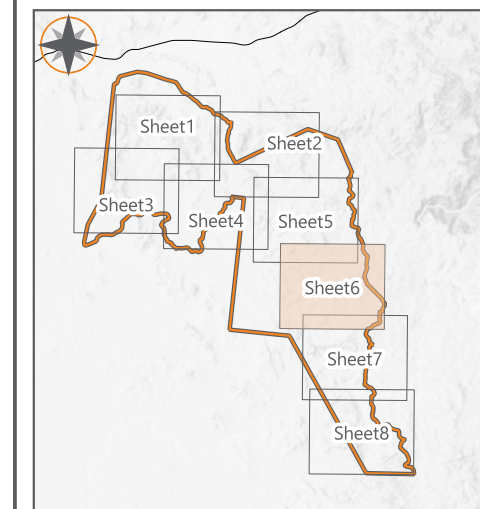


Chalumbin Wind Farm Regional Ecosystems in the Project area

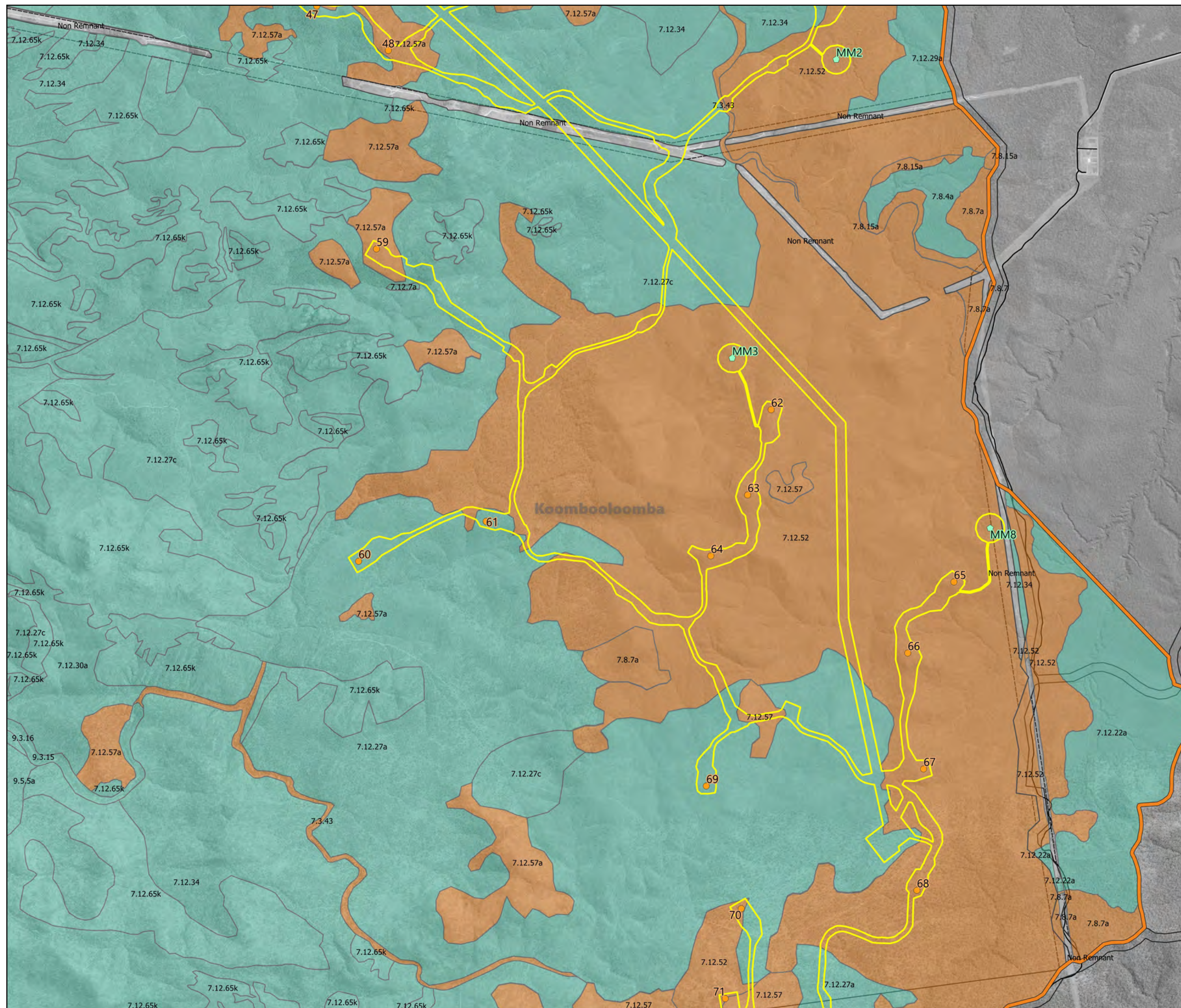
Figure 3.1 Sheet 6

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
 -  Lot Type Parcel
 -  Easement

Date: 2021-12-09
 Author: TOD
 Reviewed: CC
 Project: EPU-004












Data Source(s):
 Digital Cadastral Database - Department of Natural Resources,
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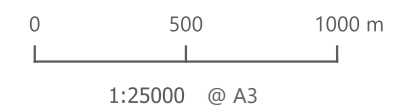
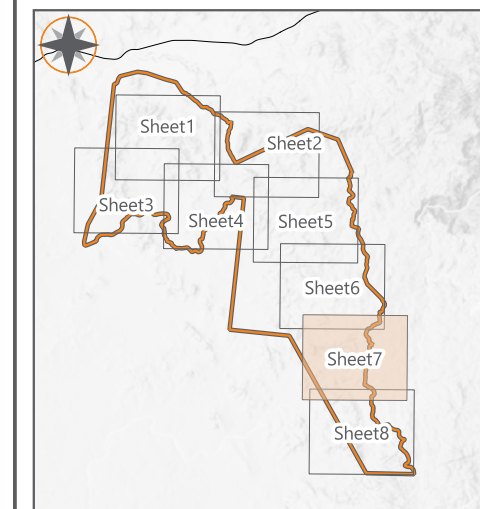


Chalumbin Wind Farm Regional Ecosystems in the Project area

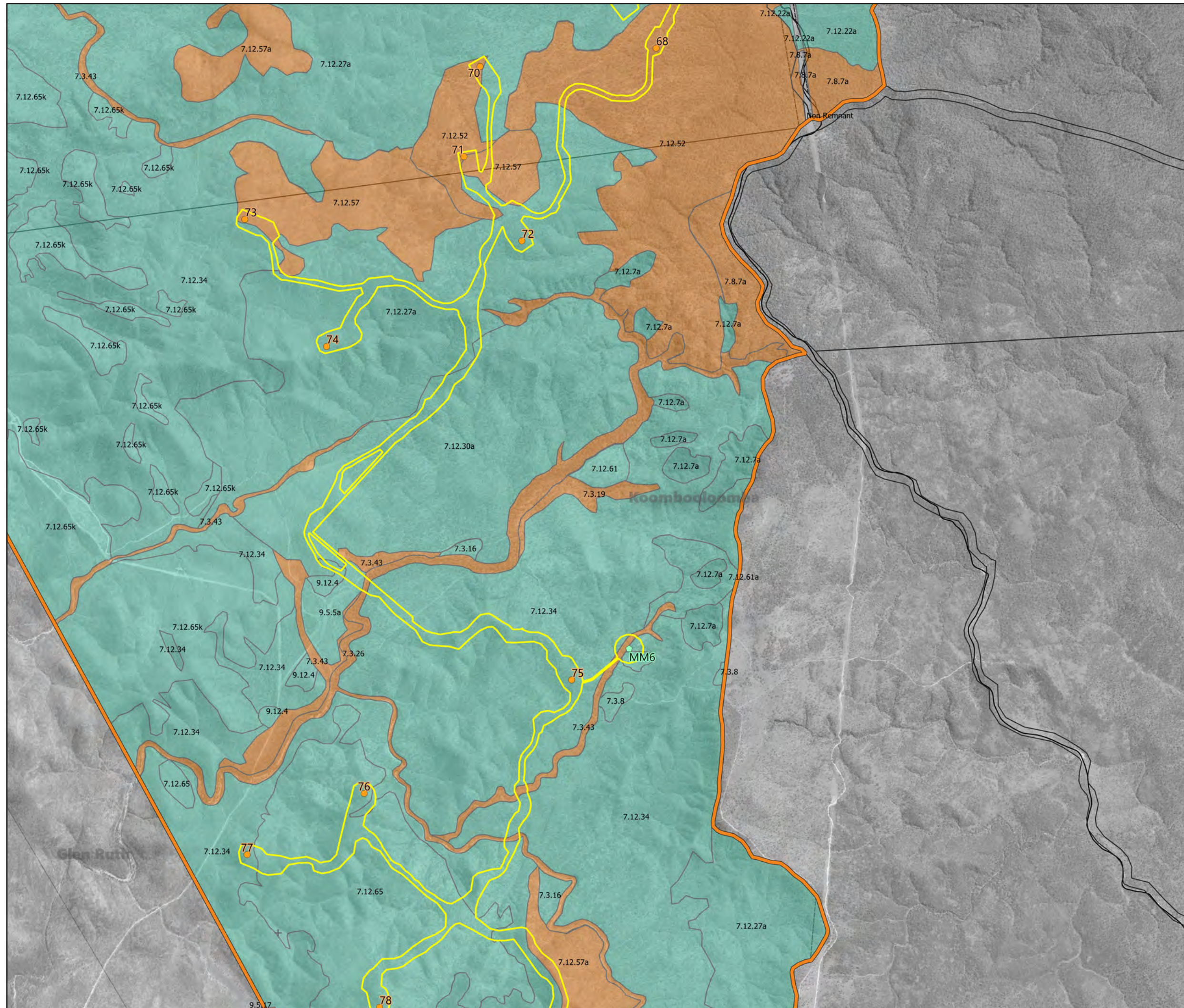
Figure 3.1 Sheet 7

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem**
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
 -  Lot Type Parcel
 -  Easement

Date: 2021-12-09
 Author: TOD
 Reviewed: CC
 Project: EPU-004












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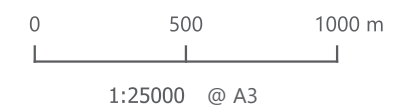
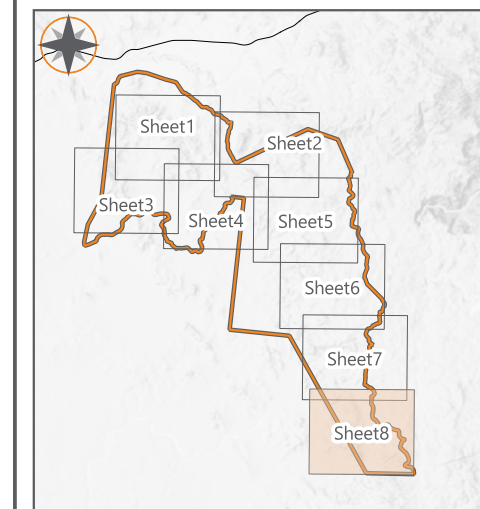


Chalumbin Wind Farm Regional Ecosystems in the Project area

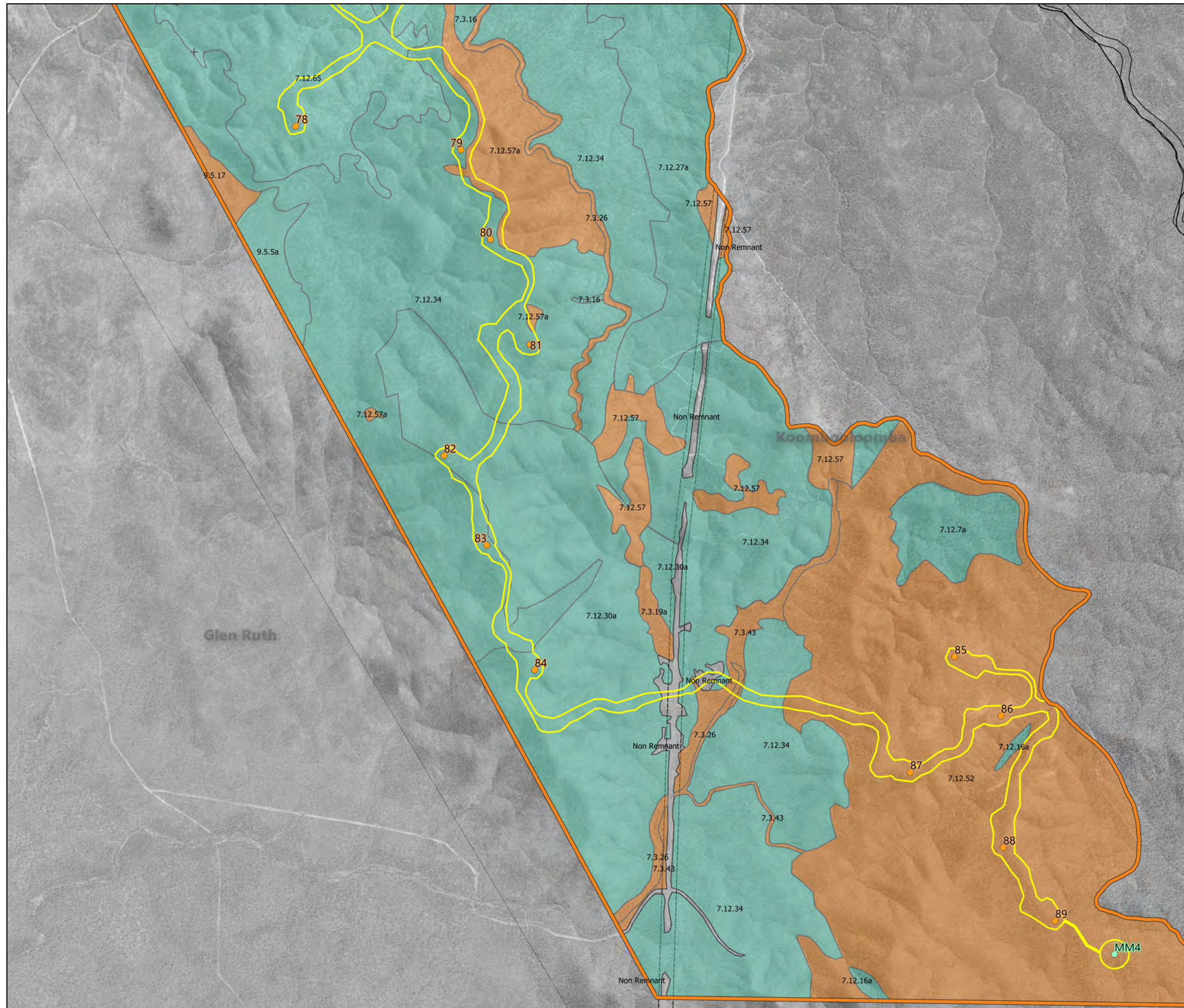
Figure 3.1 Sheet 8

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Ground Truthed Regional Ecosystem
-  Of Concern Remnant
 -  Least Concern Remnant
 -  Non Remnant
 -  Lot Type Parcel
 -  Easement

Date: 2021-12-09
 Author: TOD
 Reviewed: CC
 Project: EPU-004



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Field surveys confirmed the presence of four broad vegetation communities within the Project footprint, with their structural components and key characteristics described in **Table 3.2**. Patches of simple notophyll vine forest within the Project area will all be avoided by the Project footprint.

Table 3.2 Vegetation Communities in the Project Footprint

Vegetation Community	Description	Relevant RE
Open eucalypt woodland	Generally occur on igneous hills and/or granite or rhyolite uplands. These communities generally comprise scattered eucalypts and bloodwoods including white mahogany (<i>Eucalyptus portuensis</i>), Queensland stringybark (<i>E. reducta</i>), red mahogany (<i>E. resinifera</i>) and/or pink bloodwood (<i>Corymbia citriodora</i>). The understorey comprises shrubs and grasses including <i>Xanthorrhoea johnsonii</i> , <i>Grevillea spp.</i> , <i>Acacia spp.</i> and Kangaroo Grass (<i>Themeda triandra</i>) whilst trees range in heights from 2-30 m and canopy cover of 20-50 %. In most instances these communities support hollow-bearing trees.	9.12.2, 9.12.4, 9.5.5a, 7.3.8a, 7.3.43, 7.8.7a, 7.12.27ac, 7.12.29a, 7.12.30a, 7.12.34, 7.12.52, 7.12.57, 7.8.18 and 7.8.10
Riparian zones	These communities primarily consist of eucalypt woodlands on alluvium with occasional small sections of dry rainforest type communities fringing ephemeral drainage and creek lines. These communities typically consist of large forest red gums (<i>Eucalyptus tereticornis</i>) with sub-dominance of river she-oak (<i>Casuarina cunninghamiana</i>) and/or poplar gum (<i>E. platyphylla</i>). Canopy and mid-storey is fairly low with trees <20 m tall and shrubs 1-4 m.	9.3.15, 9.3.16, 7.3.26 and 7.3.43
Rocky pavement	Rocky pavement are characteristic of granite and rhyolite rock outcrop and associated with the dry western areas, often with shrublands to closed forests with vegetation communities dominated by <i>Acacia spp.</i> and/or <i>Lophostemon spp.</i> and/or <i>Allocasuarina spp.</i> and/or <i>Eucalyptus spp.</i>	7.12.65 and 7.12.66
Non-remnant vegetation	Primarily in proximity to the homesteads or agricultural infrastructure such as cattle yards and mostly consists of active grazing land with only pasture grasses remaining.	n/a

3.2 Threatened Flora Species

Protected plant trigger mapping (maintained by the Queensland Government) extends across parts of the Project footprint and identifies high-risk areas where EVNT plants are present or are likely to be present as shown in **Figure 3-2**. A number of specific protected plants surveys were undertaken in accordance with the *Flora Survey Guidelines – Protected Plants* (DES 2020) at discrete locations within high-risk trigger areas as part of the broader ecological surveys to support the Project and associated wind monitoring campaign. These areas relate to threatened flora associated with 'rocky pavement shrub complex' habitat which predominantly occurs on ridgelines within the Project area. GPS coordinates of detected species were recorded, a direct count (or estimate in high-density populations) was taken, population extent mapped, and specimens collected for verification by the Queensland Herbarium.

3.2.1 EVNT Flora

Field surveys and verification by the Queensland Herbarium confirmed the presence of five EVNT flora species within the Project area, as described below. The locations of these threatened flora observations are mapped in **Figure 3-3**.



3.2.1.1 *Prostanthera clotteniana*

Prostanthera clotteniana is listed as Critically Endangered under the EPBC Act and Endangered under the NC Act. Nine records were observed in the Project area, all within RE 7.12.65. Eight sites were within an area of approximately 130 ha on the Wooroora property, to the south of the existing powerline at altitudes between 780-790 m asl whilst one site was to the north of the existing powerline on the Wooroora property at 790 m asl.

3.2.1.2 *Triplarina nitichaga*

Triplarina nitichaga is listed as Vulnerable under the EPBC Act and NC Act. Eight records were observed, all within RE 7.12.65 in the northwest of the Glen Gordon property, in the area known as Arthur's Seat at altitudes of 840-875 m asl. Arthur's Seat is one of two previously documented populations of the species (DEWHA 2008a).

3.2.1.3 *Homoranthus porteri*

Homoranthus porteri is listed as Vulnerable under the EPBC Act and NC Act. The species was recorded 30 times during the various vegetation surveys across the Project area, all within RE 7.12.65. Records were observed in the northwest of Glen Gordon in the area of Arthur's Seat at altitudes of 830-860 m asl., on an adjacent ridgeline to the east of this area at an altitude of 920 m asl., and an area south and north of the existing powerline in the Wooroora property where *Prostanthera clotteniana* records occur. Extensive protected plant surveys were conducted along the ridgelines to the east of Arthur's Seat in the Project area, with individuals occurring in discrete pockets on the rocky pavements.

3.2.1.4 *Dodonaea uncinata*












Dodonaea uncinata is listed as Near Threatened under the NC Act and was confirmed present within the Project area. The species was observed 12 times all within RE 7.12.65 and the same area south and north of the existing powerline in the Wooroora property where *Prostanthera clotteniana* records occur.

3.2.1.5 *Coleus amoenus*

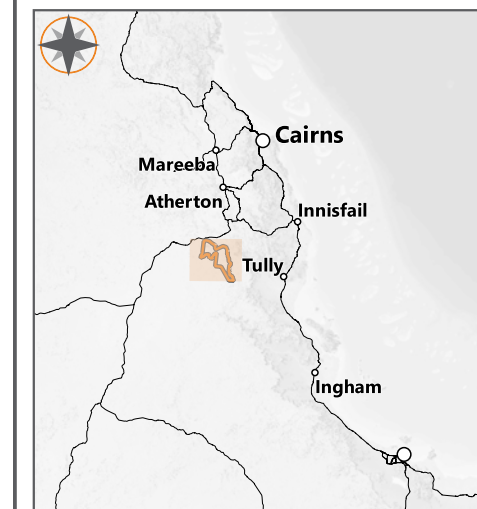
Coleus amoenus is listed as Vulnerable under the NC Act and was confirmed present within the Project area. The species was recorded 41 times during field surveys. Records were observed in the northwest of Glen Gordon east of the area of Arthur's Seat, and distributed throughout the Wooroora property but mostly concentrated in the area north and south of the existing powerline. Associated REs in both Wooroora and Glen Gordon where *Coleus amoenus* was found include RE 7.12.65, 7.12.52, 7.12.66 and 7.12.34.

Chalumbin Wind Farm Protected Plant Trigger Mapping within the Project Area

Figure 3.2

-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint
-  Protected Plant
-  Trigger Mapping
-  Major Road
-  River
-  Creek
-  Lot Type Parcel
-  Easement

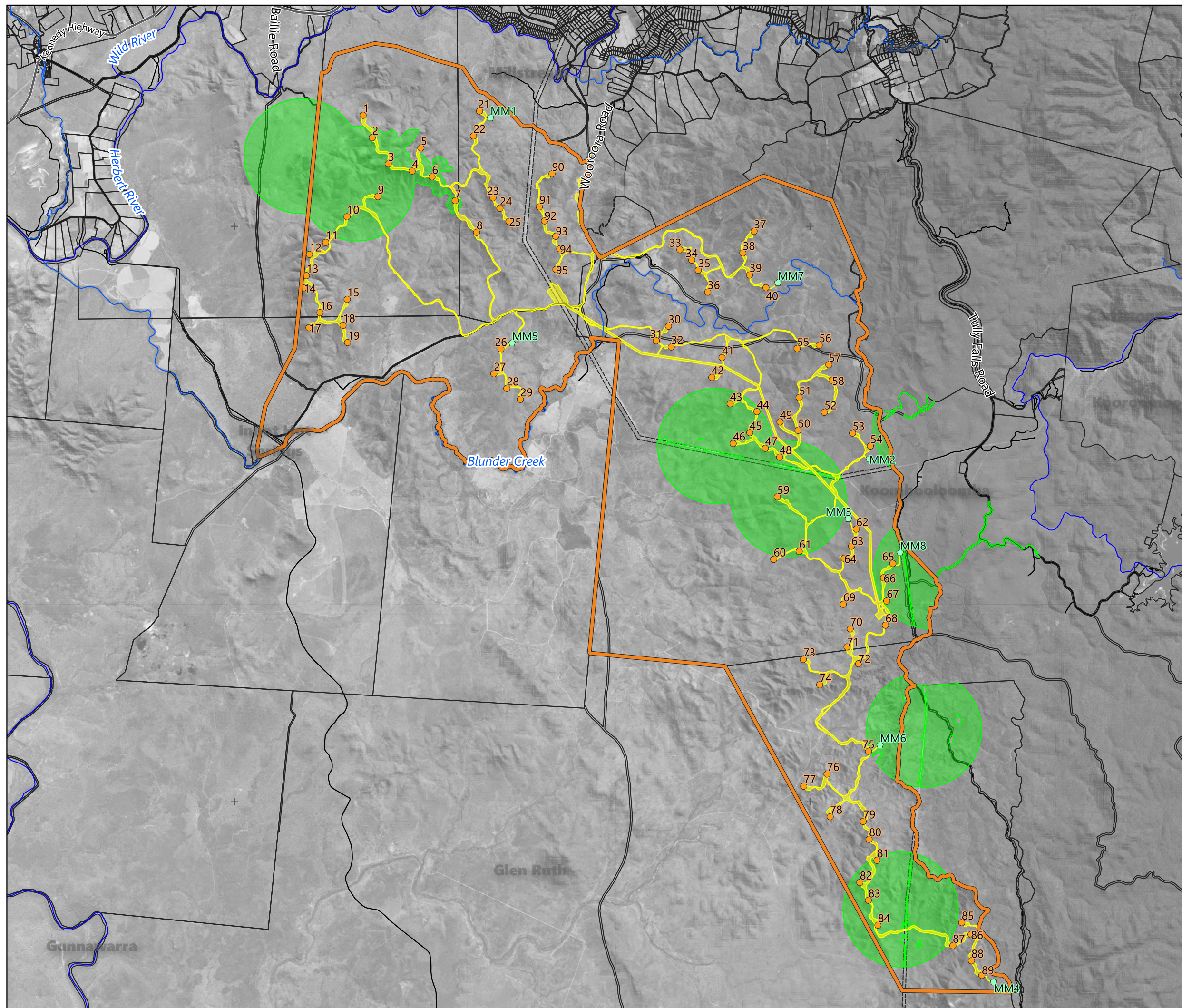
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
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 Digital Cadastral Database - Department of Natural Resources,
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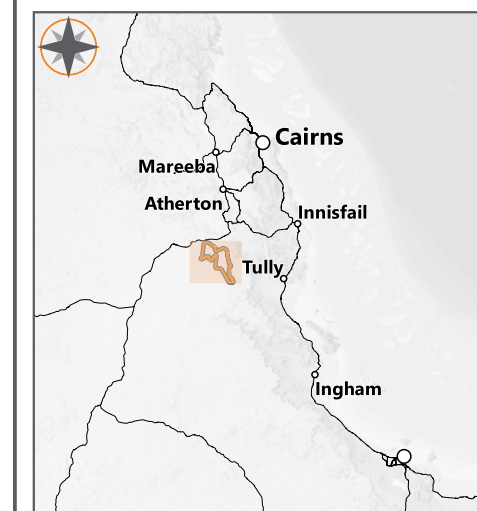


Chalumbin Wind Farm Field Survey Records of Protected Plants in the Project area

Figure 3.3

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Threatened Flora Record**
-  Homoranthus porteri
 -  Homoranthus porteri & Triplarina nitchaga
 -  Triplarina nitchaga
 -  Prostanthera clotteniana
 -  Coleus amoenus
 -  Dodonea uncinata
-  Major Road
 -  River
 -  Creek
 -  Lot Type Parcel
 -  Easement

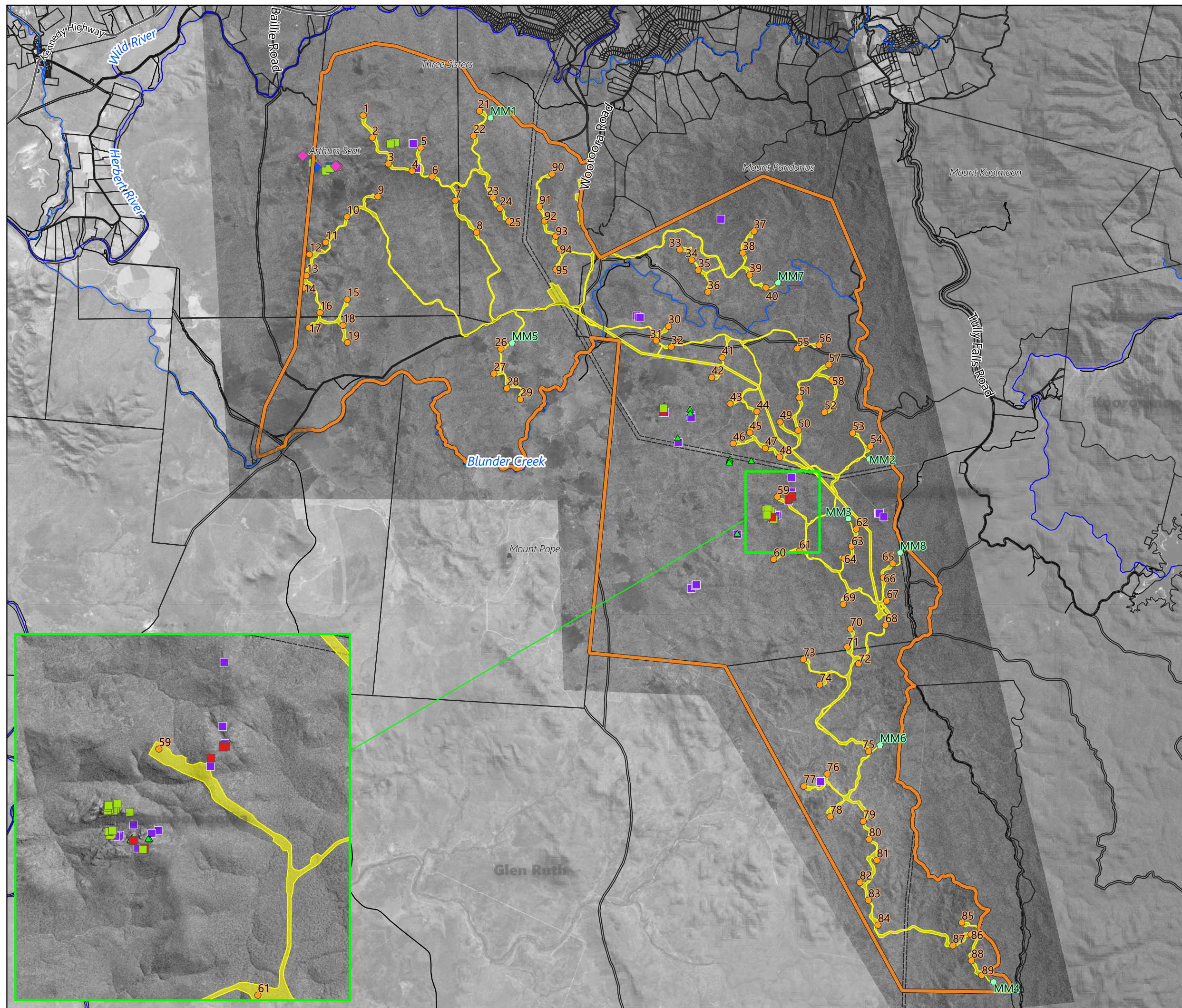
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 Author: TOD Project: EPU-004



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Data Source(s):
 Digital Cadastral Database - Department of Natural Resources, Mines and Energy (2021)
 Queensland Imagery Whole Of State
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3.3 Restricted and Prohibited Weed Species

Detailed weed mapping has not been undertaken within the Project area; however, field surveys did record the presence of *Lantana camara* (a category 3 weed under the *Biosecurity Act 2014* and a Weed of National Significance) along alluvial zones and in moist gullies.

Under the *Biosecurity Act 2014*, persons in possession of a Restricted Matter must not do the following:

- Category 3 – a person who has, or has a thing infested with, the Restricted Matter in the person's possession or under the person's control must not distribute or dispose of the restricted matter unless the distribution or disposal is carried out via the methods set out in the *Biosecurity Act 2014*.



4.0 Impacts and Risks

CWF will avoid impacts to native vegetation communities and EVNT flora species to the greatest extent practicable (refer to **Section 5.0**). Mitigation actions proposed in this VMP will follow sequential actions of avoiding, minimising and mitigating any potential impacts on native vegetation and will be applied at all stages of the Project. Where impacts cannot be avoided, mitigation and management measures will be implemented to reduce residual impacts to the lowest extent practicable. Detailed design and targeted field surveys will inform micro-siting of infrastructure to reduce the extent of clearing required for the Project. It is anticipated final design and results from additional surveys can reduce the extent of clearing described in this VMP.

4.1 Vegetation Communities

Throughout the construction phase, the Project has the potential to impact vegetation communities through:

- Loss of breeding, foraging and sheltering habitat and microhabitat features for native fauna such as tree hollows, coarse woody debris, complex rock fissures and outcrops, and leaf litter;
- Habitat fragmentation;
- Land degradation through increased erosion and sedimentation processes;
- Introduction and spread of pest flora and fauna;
- Altering natural fire regimes that can change the ecological function and structure of vegetation communities and be harmful for native fauna.

Approximately up to 1079.4 ha of remnant vegetation and 1 ha of regrowth vegetation is required to be cleared for the Project. **Table 4.1** GTRE provides the REs ground-truthed within the Project footprint and the total area that is required for clearing.

Table 4.1 GTRE Within the Project Footprint

RE	Description	Remnant (ha)	Regrowth (ha)
Least Concern (VM Act Status)			
7.3.8	<i>Melaleuca viridiflora</i> (broad leaf tea tree) +/- <i>Eucalyptus</i> spp. +/- <i>Lophostemon suaveolens</i> (swamp mahogany) open forest to open woodland. Humic gleyed texture contrast soils with impeded drainage, on alluvial plains.	0.9	0
7.3.16	<i>Eucalyptus platyphylla</i> woodland to open forest on alluvial plains. Gently sloping to flat, moderately to poorly drained alluvial lowlands, foot slopes and piedmont fans.	3.4	0
7.12.27a	<i>Eucalyptus reducta</i> medium open forest and woodland. Uplands and highlands on shallow granitic and rhyolitic soils, of the moist rainfall zone.	155.3	0



RE	Description	Remnant (ha)	Regrowth (ha)
7.12.27c	<i>Eucalyptus resinifera</i> and <i>Syncarpia glomulifera</i> open woodland. Uplands and highlands on shallow granitic and rhyolitic soils, of the moist rainfall zone.	80.6	0
7.12.29a	<i>Corymbia intermedia</i> , <i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> open forest to low open forest and woodland with <i>Allocasuarina torulosa</i> , <i>A. littoralis</i> , <i>Lophostemon suaveolens</i> , <i>Acacia cincinnata</i> , <i>A. flavescens</i> , <i>Banksia aquilonia</i> , and <i>Xanthorrhoea johnsonii</i> . Uplands, on granite and rhyolite.	11.6	0
7.12.30a	<i>Corymbia citriodora</i> , <i>Eucalyptus portuensis</i> , <i>C. intermedia</i> , <i>Syncarpia glomulifera</i> woodland to low woodland to open forest with <i>Callitris intratropica</i> , <i>Acacia calyculata</i> and <i>Xanthorrhoea johnsonii</i> . Uplands and highlands, of the most and dry rainfall zones.	61.5	0
7.12.34	<i>Eucalyptus portuensis</i> and/or <i>E. drepanophylla</i> +/- <i>C. intermedia</i> +/- <i>C. citriodora</i> , +/- <i>E. granitica</i> open woodland to open forest on uplands on granite	182.1	0
7.12.65	Rock pavement or areas of skeletal soil on granite and rhyolite of dry western or southern areas +/- shrublands to closed forests of <i>Acacia</i> spp. and/or <i>Lophostemon suaveolens</i> and/or <i>Allocasuarina littoralis</i> and/or <i>Eucalyptus lockyeri</i> subsp. <i>exuta</i> .	26.7	0
7.12.65k	Granite and rhyolite rock outcrop, of dry western areas, associated with shrublands to closed forests of <i>Acacia</i> spp. and/or <i>Lophostemon</i> spp. and/or <i>Allocasuarina</i> spp. Dry western areas. Granite and rhyolite.	5.6	0
9.5.5a	Mixed woodland to open forest of <i>Eucalyptus crebra</i> (narrow-leaved ironbark), <i>Corymbia clarksoniana</i> (Clarkson's bloodwood) and <i>C. citriodora</i> subsp. <i>citriodora</i> (lemon-scented gum) +/- <i>E. portuensis</i> (white mahogany) with a generally open sub-canopy of canopy species +/- <i>Callitris intratropica</i> (cypress pine) and <i>Acacia</i> spp. The open shrub layer often contains juvenile canopy species, <i>Petalostigma pubescens</i> (quinine), <i>Acacia flavescens</i> (powder puff wattle) and other <i>Acacia</i> spp. <i>Themeda triandra</i> (kangaroo grass) is the dominant species in a dense grassy ground layer. Occurs on Tertiary plateaus and remnants.	6.8	0
9.3.15	Fringing woodland to open forest containing any combination of <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> and <i>E. platyphylla</i> +/- <i>Lophostemon suaveolens</i> +/- <i>Nauclea orientalis</i> +/- <i>Corymbia tessellaris</i> +/- <i>C. clarksoniana</i> . There is often a low sub-canopy layer which can include canopy species and <i>Ficus</i> spp. The open shrub layer contains juvenile canopy species and can include mesic species such as <i>Euroschinus falcatus</i> , <i>Acacia mangium</i> and <i>Syzygium</i> sp. The ground layer is medium to dense grassy and contains <i>Imperata cylindrica</i> , <i>Crotalaria</i> sp., <i>Heteropogon contortus</i> , <i>Cyperus</i> spp. and <i>Paspalum</i> spp. Occurs on stream banks and channels in areas of higher rainfall in the central east of the bioregion.	2.7	0



RE	Description	Remnant (ha)	Regrowth (ha)
9.3.16	<i>Eucalyptus tereticornis</i> and/or <i>E. platyphylla</i> and/or <i>Corymbia clarksoniana</i> woodland on alluvial flats, levees and plains.	6.4	0
9.12.2	<i>Eucalyptus portuensis</i> , <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , <i>E. granitica</i> or <i>E. crebra</i> , <i>C. intermedia</i> or <i>C. clarksoniana</i> mixed woodland on steep hills and ranges on igneous hills close to Wet Tropics boundary.	291.7	0
9.12.4	Low open woodland to woodland of <i>Eucalyptus shirleyi</i> +/- <i>Corymbia peltate</i> +/- <i>Callitris intratropica</i> . The mid layer varies from absent to a mid-dense sub-canopy and/or shrub layer and the ground layer is dense and grassy. Occurs predominantly on sandy shallow soils derived from igneous rocks on rolling low hills to hills.	0.6	0
Of Concern			
7.3.26	<i>Casuarina cunninghamiana</i> woodland to open forest on alluvium fringing streams.	3.8	0
7.3.43	<i>Eucalyptus tereticornis</i> open forest to woodland on uplands on well-drained alluvium	5.5	0.4
7.3.43a	<i>Eucalyptus tereticornis</i> open forest, tall open forest and woodland including communities ranging from those dominated by <i>E. tereticornis</i> to mixtures of that species with <i>Corymbia intermedia</i> , <i>E. drepanophylla</i> , <i>Lophostemon suaveolens</i> and <i>Allocasuarina torulosa</i> . Uplands on alluvium. Contains palustrine wetland (e.g. in swales).	0.7	0
7.8.7a	<i>Eucalyptus tereticornis</i> open forest, tall open forest and woodland. May also include <i>Corymbia intermedia</i> , <i>E. drepanophylla</i> , <i>Lophostemon suaveolens</i> and <i>Allocasuarina torulosa</i> . Uplands and highlands on basaltic krasnozems and prairie soils, of the moist rainfall zone.	0.5	0
7.8.10	<i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> (or <i>E. granitica</i>), <i>E. portuensis</i> , <i>Corymbia intermedia</i> woodland to open forest, or <i>E. moluccana</i> woodland to open forest, of uplands and highlands on basalt.	0.9	0
7.8.18d	<i>Lophostemon suaveolens</i> woodland and open forest.	0.1	0
7.12.52	<i>Eucalyptus resinifera</i> , <i>Corymbia intermedia</i> , <i>Allocasuarina littoralis</i> , <i>Syncarpia glomulifera</i> , <i>E. drepanophylla</i> +/- <i>E. reducta</i> woodland on granite and rhyolite in the dry to moist rainfall zone	170.2	0
7.12.57	Shrubland and low woodland mosaic with <i>Syncarpia glomulifera</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus portuensis</i> , <i>Allocasuarina littoralis</i> and <i>Xanthorrhoea johnsonii</i> on uplands and highlands on granite	7.6	0
7.12.57a	Shrubland and low woodland mosaic with <i>Syncarpia glomulifera</i> , <i>Corymbia abergiana</i> , <i>Eucalyptus portuensis</i> , <i>Allocasuarina littoralis</i> and <i>Xanthorrhoea johnsonii</i> . Uplands and highlands on granite and rhyolite, of the moist and dry rainfall zones.	27.5	0



RE	Description	Remnant (ha)	Regrowth (ha)
7.12.66	<i>Lophostemon confertus</i> (brush box) low shrubland or low to medium closed forest. Exposed rocky slopes on granite and rhyolite.	23.4	0
Endangered			
7.8.19	<i>Corymbia clarksoniana</i> open forest to woodland on basalt.	3.4	0.7
Total		1,079.4	1.1

4.2 EVNT Flora

Field surveys identified five EVNT flora species within the Project area; *Homoranthus porteri*, *Prostanthera clotteniana*, *Triplarina nitthaga*, *Coleus amoenus* and *Dodonaea uncinata*. No direct or indirect impacts will occur to *Homoranthus porteri*, *Prostanthera clotteniana*, *Triplarina nitthaga* and *Dodonaea uncinata* as there are no individuals located within the Project footprint, and additional measures will be taken to ensure no indirect impacts occur to these populations. There is a known *Coleus amoenus* population located within the Project footprint near proposed WTG4 in the Glen Gordon property. Protected plant surveys undertaken in accordance with the NC Act requirements will determine the extent of the Project's proposed impacts on *Coleus amoenus*.

4.3 Invasive Flora

Clearing activities, unregulated vehicle movement and equipment sourced from regions beyond the Project area have the potential to introduce and spread weeds into currently unaffected areas within the Project area. *Lantana camara* is present along alluvial zones and in moist gullies within the Project footprint. Seeds and fruits have the potential to be spread by clearing activities and vehicle movement, whilst establishment into new areas is highly likely after heavy rainfall as several thousand seeds can be produced per square metre that can remain viable for several years. *Lantana camara* degrades habitat as it forms dense thickets that smother and kill native vegetation and inhibits fauna dispersal, whilst its thin, combustible canes can create hotter bushfires that alter native vegetation communities and pastures. The spread of weeds is also a risk during ongoing operational activities associated with the Project.

4.4 Land Degradation

Construction activities such as excavations and earthmoving associated with construction of the turbine pads and access roads have the potential to cause land degradation through erosion and sedimentation. This can lead to a reduction in water quality and changes to water flows. Accidental releases of hazardous materials such as fuels and oils from vehicles and machinery have the potential to lead to localised soil contamination and contamination of water resources, degrading aquatic habitat quality in the Project area. The volume of such substances being used and stored on site during operation will be significantly less than during construction, with a corresponding reduction in risk.

4.5 Bushfire

The increased presence of construction vehicles and personnel in the Project area may increase fire risk through the use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation. Changes in the natural fire regime may result in changes in the species composition and/or



structure of the vegetation. There will be fewer Project vehicles on site during operation than during construction, with a corresponding reduced risk of bushfire.



5.0 Impact Avoidance, Management and Mitigation

5.1 Avoidance

Ecological surveys of the Project area commenced at an early stage during Project design, and as such the results of the surveys have been able to significantly inform the Project layout. Central to this process was ensuring that areas of higher ecological significance were avoided to the greatest practical extent, taking into consideration the challenging terrain and wind resource requirements. These avoidance measures are described in the Project EAR (Attexo 2021a).

5.2 Minimisation and Mitigation

Where impacts on native vegetation cannot be avoided during construction and operational Project stages, mitigation and management measures will be implemented to reduce residual impacts to the lowest extent practicable. To minimise impacts to vegetation communities and threatened flora in the Project footprint, management and mitigation actions have been proposed for the relevant Project stage and outlined in **Table 5.1**.

Table 5.1 Management and mitigation actions for vegetation clearing

Impact	Management/mitigation actions	Monitoring	Corrective actions
Construction Phase			
Habitat loss	<ul style="list-style-type: none"> Pre-clearance surveys by suitably qualified ecologist will be completed to: <ul style="list-style-type: none"> Identify EVNT flora within the Project footprint Identify EVNT flora within 100 m of the Project footprint Identify habitat features to be marked and inspected before clearing by Fauna Spotter/Catcher (i.e. tree hollows, complex rock fissures and cracks, fallen hollow logs) (more detail in the <i>Fauna Management Plan</i> (Attexo 2021b)) Clearly delineate clearing boundaries and 'no-go' zones with flagging tape or fluorescent marker to avoid unnecessary clearing and to ensure personnel and vehicle stay within the approved footprint <ul style="list-style-type: none"> Maps and GIS to be provided to contractors Construction compounds, temporary and permanent offices, workshops and amenities to be placed in existing cleared areas where practicable 	<ul style="list-style-type: none"> Inspection and monitoring of clearing activities and that clearing has been undertaken in approved boundaries Clearing will not commence unless the Fauna Spotter/Catcher is present on site Fauna Spotter/Catcher will monitor vegetation clearing to ensure no fauna are harmed and Sequential Clearing Method is implemented 	<ul style="list-style-type: none"> Inspect and repair damaged fencing; replace any flagging tape or respray fluorescent marker Where clearing has occurred outside of clearing boundary, this must be recorded and investigated Assessment of temporarily disturbed areas and revegetation implemented as required If any new threatened species, communities and associated habitat are identified, DES will be notified and consulted on any requirement for an additional permit or amendment to this Plan Fauna injuries or deaths as a result of clearing



Impact	Management/mitigation actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> ● Widths of access roads to be minimum extent where practicable ● All clearing activities will not commence unless a suitably qualified Fauna Spotter/Catcher is present, clearing will follow the Sequential Clearing Method (see Section 5.2.2) and the following measures employed: <ul style="list-style-type: none"> – Vegetation clearing will be limited to those areas required for earthworks and construction of the Project – Temporarily disturbed areas will be rehabilitated to pre-disturbance – Access roads will be aligned along approved or existing routes, tracks, firebreaks and cleared areas wherever practicable to minimise vegetation removal and loss of hollow-bearing trees, as well as to avoid additional disturbance through GBR wetland protected areas – Turbine locations will be micro-sited within the Project corridor, where conditions and wind resource allow, to take advantage of areas of lower ecological significance – Overhead transmission lines will be limited in width to that required for construction and required firebreaks 		<p>must be reported to DES and investigated (more detail in the <i>Fauna Management Plan</i> (Attexo 2021b))</p>
Habitat fragmentation	<ul style="list-style-type: none"> ● Access tracks will be limited to already existing and approved routes and tracks, firebreaks and cleared areas ● Temporary and permanent infrastructure to be placed in existing cleared areas ● Widths of access roads to be minimum extent where practicable, particularly watercourse crossings to maintain connectivity along riparian corridors ● Clearing activities to following Sequential Clearing Method, specifically: <ul style="list-style-type: none"> – Retaining habitat trees to form stepping stones for wildlife dispersal 	<ul style="list-style-type: none"> ● Inspection and monitoring of clearing activities and that clearing has been undertaken in approved boundaries ● Clearing will not commence unless the Fauna Spotter/Catcher is present on site ● Fauna Spotter/Catcher will monitor vegetation clearing to ensure no fauna are harmed and Sequential Clearing Method is implemented 	<ul style="list-style-type: none"> ● Inspect and repair damaged fencing; replace any flagging tape or respray fluorescent marker ● Where clearing has occurred outside of clearing boundary, this must be recorded and investigated ● Assessment of temporarily disturbed areas and revegetation implemented as required ● If any new threatened species, communities and associated habitat



Impact	Management/mitigation actions	Monitoring	Corrective actions
			<p>are identified, DES will be notified and consulted on any requirement for an additional permit or amendment to this Plan</p> <ul style="list-style-type: none"> • Fauna injuries or deaths as a result of clearing must be reported to DES and investigated (more detail in the FMP)
Land degradation	<ul style="list-style-type: none"> • A CEMP including a certified Erosion and Sediment Control Plan (ESCP) has been developed and describes erosion and sediment control measures to be implemented during clearing, such as: <ul style="list-style-type: none"> – Access tracks will be constructed in accordance with <i>Erosion control on property roads and tracks – managing runoff</i> (Queensland Government 2013) – Creek crossing locations will seek to take advantage of existing gaps in the riparian corridors as far as practicable. Work in these areas will take place in periods of no flow where the schedule permits – Constructed access tracks (i.e. culverts or splash through crossings) must be provided with a scour apron and cut off wall on the downstream side sufficient to prevent bed erosion • Equipment to be maintained to minimise risk of spill or leakage • Materials to be stored in bunded areas with a storage capacity of 110 % of the storage vessel. Floors and walls of bunding will be lined with impermeable material and must be adequately protected from rainfall and stormwater • Refuelling should not take place within 50 m of a watercourse • Spill control materials (i.e. booms, absorbents) will be maintained on site, commensurate with the types and volumes of materials in use, and in place where hazardous materials are stored or used 	<ul style="list-style-type: none"> • Daily dust suppression monitoring during clearing and construction • Daily weather observation monitoring during clearing and construction • Weekly erosion and sediment measure control checks to monitor performance and effectiveness • Quarterly monitoring of rehabilitation of temporary construction areas for a period of 12 months to monitor native vegetation regeneration progress, presence of weeds or other disturbance 	<ul style="list-style-type: none"> • If appropriate, cease works until weather passes to minimise sediment runoff and dust • Implement additional erosion and sediment control measures if existing controls are ineffective • Notify government bodies of any spills or leakages and implement management as required



Impact	Management/mitigation actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> ● Spill control induction and training provided to all personnel ● Design on site infrastructure to ensure water flows are not impounded or concentrated ● No material or equipment to be stored across flow paths ● Waterway crossings to be designed in accordance with development requirements for waterway barrier works to ensure fish passage is not impeded ● Watercourse crossings must be designed to maintain flow and minimise the increase in flow volume or velocity ● Routine dust suppression during construction ● Temporary construction areas will be rehabilitated as soon as practicable following completion of construction 		
Bushfire	<ul style="list-style-type: none"> ● As part of the construction planning a certified Bushfire Management Plan will be prepared prior to any clearing activities and implemented on site ● For 'hot-work' activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions ● Vehicles may not idle or be parked in areas of long grass ● Access tracks, fencelines and cleared overhead powerline easements will be regularly maintained and used as firebreaks within the Project area ● Smoking is prohibited on site ● Fuel loads across the Project area will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management 	<ul style="list-style-type: none"> ● Monthly assessment of fuel loads ● During construction phase and bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website 	<ul style="list-style-type: none"> ● An Emergency Response Plan will be implemented should an uncontrolled fire event occur ● If fuel loads have increased following heavy rainfall, control methods will be implemented as required (i.e. weed control or cool burns) ● Prescribed burns are to be conducted based on present fuel load and ecosystem (Peeters and Butler 2014)
Introduction and spread of weeds	<ul style="list-style-type: none"> ● Pre-clearance surveys will be implemented to identify weeds, and large infestations will be treated to prior to clearing to minimise the spread of weed seed 	<ul style="list-style-type: none"> ● Record all weed species present in pre-clearance surveys, and confirm infested areas to be treated 	<ul style="list-style-type: none"> ● Increase Hygiene Control requirements if vehicles or equipment are found to introduce or spread new weeds



Impact	Management/mitigation actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> ● Weed mapping will be developed to identify localities of existing weeds within and adjacent to the Project area ● Hygiene Control (see section 5.1) will be implemented to reduce the spread of weed from infested sites ● Vehicle access restricted to existing roads and tracks ● Any materials required for restoration or road maintenance must be certified weed and disease free (i.e. Weed Hygiene Declaration) ● Use of herbicides to be applied by appropriately trained and qualified persons ● Weed management will occur across the Project site to ensure weed cover and abundance does not increase, particularly along edges of access roads and turbine pads 	<ul style="list-style-type: none"> ● Regular auditing of Hygiene Control implementation ● Weed Hygiene Declaration to be checked for all material brought onto site 	<ul style="list-style-type: none"> ● Increase weed control efforts where required (i.e. after heavy rainfall) or if current controls ineffective
<p>Loss of threatened flora – directly or indirectly (i.e. dust, sediment runoff)</p>	<ul style="list-style-type: none"> ● Pre-clearance surveys will record: <ul style="list-style-type: none"> – EVNT flora within the Project footprint – EVNT flora within 100 m of the Project footprint ● Any translocation of EVNT that occur within the Project footprint will occur under an approved Translocation Plan ● No clearing of EVNT flora is to occur without appropriate permits in place for their removal ● Cleared vegetation or soil is not be stockpiled within 100 m of EVNT flora outside the Project footprint and if required temporary exclusion fencing should be erected around EVNT to provide protection from further damage ● Vehicles and machinery to stay on designated access roads and laydowns to avoid impacting EVNT flora ● Erosion and sediment control measures are to be implemented to avoid runoff impacting on retained EVNT flora ● Dust mitigation measures to be implemented to ensure EVNT plants in 	<ul style="list-style-type: none"> ● Regular inspection and monitoring of erosion and sediment control measures to assess performance and that EVNT are not being impacted ● Inspect retained EVNT flora within 100 m of Project footprint are not impacted by dust, sediment or other indirect construction actions ● Monitoring and performance assessment of any translocated EVNT following approved translocation plan, as required 	<ul style="list-style-type: none"> ● Implement additional erosion and sediment control measures if existing measures ineffective in protecting EVNT ● Establish further exclusion zones if EVNT flora show signs of damage or poor survivorship ● Implement corrective actions provided in approved translocation plan as required



Impact	Management/mitigation actions	Monitoring	Corrective actions
	adjacent areas to access roads and earthworks are not impacted by dust deposition		
Operation Phase			
Land degradation	<ul style="list-style-type: none"> An Operational Environmental Management Plan (OEMP) will be developed and will include erosion and sediment controls to be implemented during the operations phase Temporary construction areas will be rehabilitated as soon as practicable following completion of construction Erosion and sediment control measures are to be implemented to avoid runoff impacting on retained EVNT flora Dust mitigation measures to be implemented to ensure dust deposition from earthworks and adjacent roads do not impact EVNT flora 	<ul style="list-style-type: none"> 6 monthly assessment of erosion and sediment loads 	<ul style="list-style-type: none"> Where erosion and sediment levels exceed acceptable limits, the incident will be recorded and investigated
Bushfire	<ul style="list-style-type: none"> Continue implementation of the Bushfire Management Plan Vehicles may not idle or park in areas of long grass Access tracks, fencelines and cleared overhead powerline easements will be regularly maintained and used as firebreaks within the Project area during construction and operation stages Smoking is prohibited on site Fuel loads across the Project area will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management 	<ul style="list-style-type: none"> Monthly assessment of fuel loads 	<ul style="list-style-type: none"> An Emergency Response Plan will be implemented should an uncontrolled fire event occur If fuel loads have increase following heavy rainfall, control methods will be implemented as required (i.e. weed control or cool burns) Prescribed burns are to be conducted based on present fuel load and regional ecosystem (Peeters and Butler 2014)
Introduction and spread of weeds	<ul style="list-style-type: none"> Hygiene Control (see Section 5.2.1) will be implemented to reduce the spread of weed from infested sites Vehicle access restricted to existing roads and tracks Any materials required for restoration or road maintenance must be certified weed and disease free (i.e. Weed Hygiene Declaration) 	<ul style="list-style-type: none"> Record all weed species present in pre-clearance surveys, and confirm infested areas to be treated Regular auditing of Hygiene Control implementation 	<ul style="list-style-type: none"> Increase Hygiene Control requirements if vehicles or equipment are found to introduce or spread new weeds Increase weed control efforts where required (i.e. after heavy rainfall) or if current controls ineffective



Impact	Management/mitigation actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> Use of herbicides to be applied by appropriately trained and qualified persons Weed management will occur across the Project site to ensure weed cover and abundance does not increase, particularly along edges of access roads and turbine pads 	<ul style="list-style-type: none"> Weed Hygiene Declaration to be checked for all material brought onto site 	
Loss of threatened flora – directly or indirectly (i.e. dust, sediment runoff)	<ul style="list-style-type: none"> Vehicles and machinery to stay on designated access roads and laydowns to avoid impacting EVNT flora Erosion and sediment control measures are to be implemented to avoid runoff impacting on retained EVNT flora Dust mitigation measures to be implemented to ensure EVNT plants in adjacent areas to access roads and earthworks are not impacted by dust deposition 	<ul style="list-style-type: none"> Regular inspection and monitoring of erosion and sediment control measures to assess performance and that EVNT are not being impacted Inspect retained EVNT flora within 100 m of Project footprint are not impacted by dust, sediment or other indirect construction actions Monitoring and performance assessment of any translocated EVNT following approved translocation plan, as required 	<ul style="list-style-type: none"> Implement additional erosion and sediment control measures if existing measures ineffective in protecting EVNT Establish further exclusion zones if EVNT flora show signs of damage or poor survivorship Implement corrective actions provided in approved translocation plan, as required

5.2.1 Hygiene Control

It is critical that new or existing weeds (such as *Lantana camara*) are not introduced and spread into unaffected areas, especially the transfer of weeds from the Project area into surrounding National Parks and properties. Invasive weeds are the primary focus for control measures; however, other pests and diseases may indirectly be introduced and spread therefore require hygiene procedures, as necessary.

Strict weed hygiene strategies to avoid the spread of seeds from infested areas will include:

- All vehicles and machinery are to be washed down at an appropriate washdown facility regularly during works, especially when transferring between sites and when working in areas where weed infestations are known. A washdown bay will be provided on site and the location will be clearly identified for all personnel to use.
- All vehicles and machinery are to be certified weed free before commencing work on site (Weed Hygiene Declarations);
- All clothing, shoes and other equipment are to be cleaned regularly between activities, especially when leaving an area and starting work in a new area, and before leaving known weed infested areas;
- Soil, gravel or fill from infected areas should not be moved to uncontaminated areas, unless absolutely necessary;



- Appropriate waste disposal system: strategies or facilities to contain contaminated materials and disposal away from adjacent native vegetation and waterways; and
- Training and inductions are to be provided for contractors and workers about the importance of weed control, including a briefing on appropriate hygiene measures.

Decontamination practices will be routine for all personnel upon entering the site, when working within a known contaminated area within the site, and prior to exiting the contaminated area. To reduce the transfer of weed vegetation, seed, mud or soil material, the following decontamination procedure at washdown bays is recommended:

- Preparation for decontamination:
 - Position vehicle/equipment safely and ensure stability (i.e. brakes applied);
 - Remove excessive debris (i.e. mud, branches) for appropriate disposal using a dry cleaning method before wet where possible (e.g. scrape off mud before pressure hose applied); and
 - Detach removal items or parts and decontaminate individually.
- Decontamination of external surfaces:
 - Start top-down of vehicle or equipment;
 - Vehicles and equipment with moving parts (i.e. wheels, trays, buckets) will need to be removed to access all areas;
 - Wet decontamination procedure: apply disinfectant/detergent and leave for appropriate contact time (usually 10 minutes) then rinse with clean water; and
 - If other techniques e.g. heat, fumigation for tools, equipment and other things are required, ensure exposure requirements are met as required by disease/pest guidelines.
- Decontamination of internal surfaces (only necessary if internal surfaces are exposed to potential contamination while on site):
 - Protective covers (i.e. seat covers, dash covers) will be removed and cleaned or appropriately disposed of;
 - Remove solid materials with a vacuum, cloth or brush; and
 - Air filters will be removed, replaced and cleaned (technician may be required).
- Surfaces can be wiped or sprayed with 70% alcohol or another appropriate disinfectant.

5.2.2 Sequential Clearing Method

The suitably qualified ecologist on site will be made aware of any vegetation clearance and maintenance activities so that appropriate post-clearance rehabilitation and restoration can be undertaken and will be responsible for monitoring these activities. Damage to vegetation intended to be retained will be assessed by the suitably qualified ecologist on site, recorded in a non-conformance report and the appropriate management strategy for repair or revegetation implemented.

Where any clearing is required it will be done as part of sequential clearing as follows:



- 1.** Removal of understorey vegetation and smaller juvenile trees only. Juvenile trees are under 4 m in height or diameter at breast height (DBH) less than 31.5 cm at 1.3 m above the ground. No hollow-bearing trees are to be cleared during this stage.
- 2.** After 48 hours, the remaining larger trees including those with hollows can be cleared. Trees with small hollows will be cleared using the “slow drop” method. The tree be brought down slowly by the machine and mulch put underneath to soften the fall. The Fauna Spotter/Catcher will then complete an inspection to ensure no wildlife remain in the hollow. Where practicable, fauna will be caught and released into suitable habitat once clearing has stopped.
 - a.** If any fauna are injured they will be taken to the nearest local vet/wildlife carer for treatment.
- 3.** Clearing should be done in such a way that fauna are given the opportunity to disperse once clearing has commenced under their own volition. This will be done through:
 - a.** No habitat trees will be isolated (either singly or in groups);
 - b.** Dispersal corridors will be formed to link vegetation being cleared to adjacent areas of retained habitat (i.e. single row of trees no more than 30-40 m apart).
- 4.** Fell trees away from retained areas of vegetation where practicable. Where trees unavoidably fall into retained areas, leave in-situ to mimic natural tree fall and provide habitat for ground-dwelling fauna.
- 5.** Micro-habitats (i.e. hollow logs and branches, rocks) will be moved into adjacent habitat.



6.0 Compliance

6.1 Roles and Responsibilities

All personnel involved are responsible for working in accordance with this VMP and are required to identify potential environmental impacts and implement and maintain control measures, procedures, and constraints accordingly.

6.2 Adaptive Approach to Management

To maintain relevance and effectiveness, this VMP will require review and amendment throughout the life of the Project to ensure that measures within the document remain effective. It is recommended that this document be reviewed and updated as required, for example:

- If there is a modification of the Project schedule, design or construction methods;
- If performance criteria are not being met and additional measures are required to minimise impact to vegetation communities and EVNT flora; or
- If a legislative change or modification of best practice methods affects the currency of this document.

A compliance register will be developed to track how commitments are being achieved. this compliance register will include document tracking for all reporting required, along with how data and reporting is stored and disseminated.

6.3 Induction and Training

All personnel involved in the development and operational stages of the Project will undergo site induction training relating to biodiversity management issues within the Project area. Specifically, inductions must include:

- Objectives of this VMP and associated controls (i.e. hygiene control, sequential clearing method);
- Information and general descriptions provided about vegetation communities, EVNT flora, and Restricted Matter and WoNS weeds within the Project area;
- Restricted and 'no-go' areas;
- Procedures for responding to environmental incidents and emergencies;
- Environmental obligations for individuals and organisation; and
- Responsibilities for environmental monitoring and reporting.

6.4 Pre-start Briefing

All personnel will be briefed on environmental requirements daily prior to commencing activities, focusing on practical measures. Briefings will include the following:

- Changed environmental conditions;
- Vegetation clearing demarcations;



- EVNT flora or sensitive communities and their localities in or near the Project footprint; and
- Vehicle speed limits and access tracks.

6.5 Incident Management

An incident investigation procedure and reporting form will be developed by the construction contractor as part of the Project CEMP.

6.6 Emergency Response

An Emergency Response Plan will be developed as part of the Project CEMP and will include measures around emergencies directly related to vegetation.



7.0 References

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Appendix E

Preliminary Fauna Management Plan

Preliminary Fauna Management Plan

Chalumbin Wind Farm

Prepared for:

Chalumbin Wind Farm Pty Ltd

December 2021





Document Information

DOCUMENT	Preliminary Fauna Management Plan
ATTEXO REF	EPU-004
DATE	10-12-2021
PREPARED BY	Corey Callahan – Environmental Consultant
REVIEWED BY	Nikki O'Donnell – Principal Consultant – Biodiversity and Impact Assessment

Quality Information

REVISION	DATE	DETAILS	AUTHORISATION	
			Name/Position	Signature
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Attexo Group Pty Ltd 2021

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1.0 Introduction

1.1 Background

Chalumbin Wind Farm Pty Ltd (CWF) proposes to develop the Chalumbin Wind Farm Project (the Project) at a location approximately 15 km south-west of Ravenshoe in Far North Queensland within the Tablelands Regional Council Local Government Area (LGA). The Project consists of up to 94 wind turbine generators (WTGs) and associated infrastructure. A Project description is presented in **Section 1.4** and the Project layout is shown in **Figure 1-1**.

The Project area (which encompasses the land parcels within which infrastructure is proposed, including parts of the Wooroora Road reserve) is a total of 31,679.70 ha, as described in **Section 1.3**. The Project footprint (i.e. maximum area of disturbance) is a much smaller area within these land parcels, and is a total of 1,132.08 ha (3.57 % of the Project area) consisting primarily of native vegetation (96%) and historically cleared grazing land (4%). The Project footprint is sufficiently wide to allow the micro-siting of infrastructure to respond to site-specific constraints.

1.2 Purpose and Scope

The purpose of this Fauna Management Plan (FMP) is to establish a framework for managing impacts on native fauna during the construction and operation of the Project. Acting as a preliminary document, this FMP is also prepared to demonstrate partial compliance with Performance Outcome (PO) 5 of *State Code 23: Wind farm development* within the State Development Assessment Provisions (SDAP).

To achieve these outcomes, the scope of this FMP aims to:

- Review potential Project impacts to native fauna, threatened fauna species and associated habitats identified in the Ecological Assessment Report (EAR); and
- Provide recommendations for avoidance, mitigation and management of potential fauna impacts in order to maintain these ecological values in the Project area.

Impacts and management measures specific to bird and bats arising from potential collision with wind turbines are assessed in the Preliminary Bird and Bat Management Plan for the Project (Attexo 2021a).










1.3 Project Location

The Project area is located 15 km southwest of Ravenshoe 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). The Project footprint spans parts of the Wooroora Road reserve in addition to two properties: Glen Gordon Station (31SP288862) is a freehold property and Wooroora Station (1CWL3298) is a leasehold property. Both properties are primarily used for grazing and there are several easements intersecting them associated with roads and electrical infrastructure.

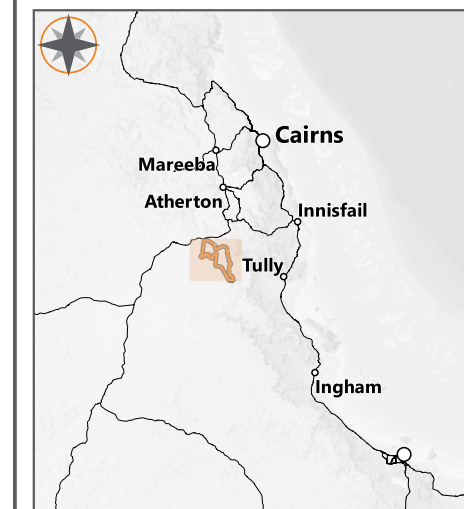
Surrounding properties are used for grazing and conservation purposes, with National Parks and Timber Reserve abutting the northern and eastern boundaries of Wooroora Station. The Kennedy Highway is within 8 km north-northwest of the Project area whilst Tully Falls Road is within 5 km of the Wooroora Station eastern boundary.

Chalumbin Wind Farm Project Layout

Figure 1.1

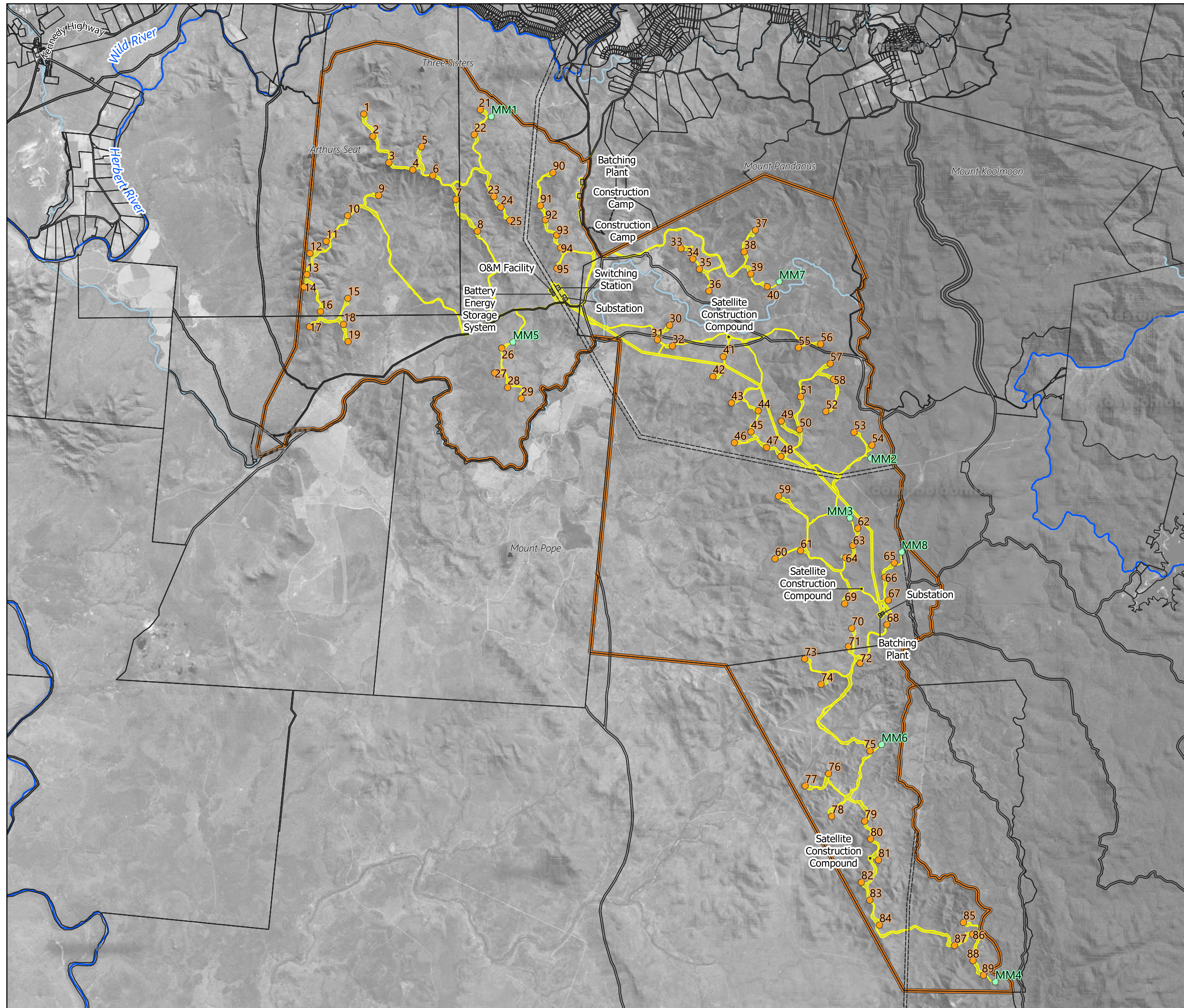
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint
-  Major Road
-  River
-  Creek
-  Lot Type Parcel
-  Easement

Date: 2021-12-02
 Author: TOD
 Reviewed: CC
 Project: EPU-004



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





1.4 Project Description

A detailed Project description is provided within the Planning Report supporting the development application under State Code 23 and State Code 16. The Project is proposed to have 94 WTGs and will generate approximately 658 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. Other infrastructure will include linking access tracks and associated infrastructure including substations and battery energy storage system, medium voltage overhead and underground powerlines, permanent wind monitoring masts, temporary construction compound, laydown areas and stockpile areas, temporary site offices and an operation and maintenance facility (refer **Figure 1-1**). A full description of the Project is provided in the Planning Report as part of the Development Application for the Project.

1.5 Project Stages

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

1.5.1 Construction

Construction is expected to commence in early 2023, subject to approvals and commercial considerations. The construction phase is expected to last for a period of approximately 24-30 months, with approximately 250 to 350 staff employed during the peak construction period. The workforce will likely reside in Ravenshoe and other surrounding townships.

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 m³ 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.



1.5.2 Operations

The operational life of the wind farm is expected to be 30 years. Approximately 15 to 30 full-time jobs will be generated during operation, typically 10 to 20 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.

1.5.3 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, most above-ground infrastructure apart from roads (which are left to benefit the landholders) will be removed (e.g., all turbines, transmission lines, etc). The land will then be rehabilitated in line with development permit conditions and specific landowner agreements. Some infrastructure may remain in-situ depending on landowner preferences.



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 communities (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;
- The environment, where Commonwealth agencies are proposing to undertake the action.

There are known matters of national environmental significance (MNES) within the Project area, including threatened flora, fauna, and migratory species. A referral to the Commonwealth Department of Agriculture, Water, and the Environment (DAWE) (reference: EPBC 2021/8983) was made for the Project in June 2021. On 10 August 2021 DAWE determined that the Project is a controlled action and will be assessed by Public Environment Report.

2.2 Queensland State Framework

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 Report (EAR) addressing prescribed matters of state environmental significance (MSES) has been prepared as part of the development application. This Preliminary FMP, a Preliminary Vegetation Management Plan (VMP), and a Preliminary Bird and Bat Management Plan (BBMP) have been prepared to support the EAR. Where



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).

2.2.2 Vegetation Management Act 1999

The Project requires the clearing of vegetation that is regulated under the *Vegetation Management Act 1999* (VM Act) and therefore triggers a need for approval under the VM Act. The OPW development permit that is being sought under State Code 16 will authorise clearing of regulated vegetation in accordance with conditions of approval under the Planning Act and the VM Act.

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. As part of the EAR impact assessment, threatened flora and fauna species have been reviewed based on their potential to occur in the Project area, and including consideration of their habitat within the Project area.

2.2.3.1 Fauna Breeding Places

For the purposes of this FMP, an animal breeding place is defined as: a bower; burrow; cave; hollow; nest; or other thing that is commonly used by the animal to incubate or rear offspring. For a proposed activity that will have an unavoidable impact on a defined breeding place of protected animals (which include all classes of native wildlife including those classified as least concern) a Species Management Program (SMP) is required to be prepared under the NC Act and approved by DES.

The purpose of a SMP is to:

- assess the threats to native animal breeding places resulting from a planned activity;
- incorporate management actions that will avoid or minimise both the immediate and the long-term impact of removing or altering an animal breeding place; and
- set monitoring and reporting requirements that demonstrate the management actions in the SMP are effectively implemented and produce the intended results.

For species listed as least concern, a Low Risk SMP is required for tampering with animal breeding places. For species listed as colonial breeders, special least concern (SLC) and Endangered, Vulnerable and Near Threatened (EVNT) species, a High Risk SMP will authorise tampering for fauna breeding places. Both classifications of SMP require a duration to be defined and must be relevant to the activity being undertaken and allow for a periodic review of the program. The standard term for an SMP is three years.

The seasonal terrestrial ecology surveys undertaken between 18 January and 1 February 2020 (wet season) and between 18 June and 29 June 2021 (dry season) included habitat assessments and identification of animal breeding places. This information has been used to inform the likely occurrence of species within the Project area, habitat mapping and also to inform an assessment of potential impacts to threatened fauna species. The field survey results will inform the preparation of a High Risk SMP for the Project. The High Risk SMP must be approved by DES prior to vegetation clearing commencing.



2.2.3.2 Protected Plants

The Project may require the clearing of plant species protected under the NC Act. For any EVNT plant species with the potential to be impacted by the Project, a Protected Plant Clearing Permit may be required from DES. This is further described within the Project's Preliminary Vegetation Management Plan (Attexo 2021b).

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 1.10);
- Significant Residual Impact Guideline – for prescribed activities under Planning Act (EHP 2014).

Impacts to Matters of State Environmental Significance (MSES) are assessed in the EAR (Attexo 2021c). An assessment of significant residual impacts to MSES has been completed for those prescribed matters relevant to the Project under State Code 16 and applying criteria from the SRI Guideline (DSDIP 2014). Environmental offsets will only be required if it is determined that there are significant residual impacts to the following listed matters:

- Endangered or Of Concern REs;
- REs within a defined distance of a watercourse;
- REs that intersect with a wetland;
- Connectivity; and
- Essential Habitat.

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 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. The presence of weeds and pest fauna species in the Project area and their proposed control are addressed in this Preliminary FMP.

2.3 Local Framework

Minor permit and approvals processes are likely to be required under the Tablelands Regional Council's Planning Scheme for earthworks, access works, interfaces with road reserves, etc. The requirements of the respective local



governments are unlikely to have a significant bearing on the fauna management measures associated with the Project; these are governed at Commonwealth and State level for wind farm development.



3.0 Ecological Values

Wet season fauna surveys were undertaken by three teams of two people between 18 January and 1 February 2021, 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 2021, 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 serrata* 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.

Dry season fauna surveys were undertaken by three teams of two people between 18 and 29 June 2021.

Key findings for all surveys are detailed below.

3.1 Fauna Habitat Descriptions

Fauna habitat within the Project area is generally remnant vegetation associated with woodlands or open forests. Some vegetation within the Project area has historically 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 Stations. 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 habitat including *Acacia spp.* and *Lophostemon suaveolens* associated with RE 7.12.65k. 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*, and RE 9.3.16, a *Eucalyptus tereticornis* and *E. platyphylla* woodland occurring on alluvial flats. Blunder Creek is the largest waterway to traverse the Project area with a catchment of 142 km² (Heiner & Grundy 1994). Blunder Creek flows east to west across both Wooroora and Glen Gordon Stations before joining the Herbert River approximately 9 km to the west. Blunder Creek is identified as a stream order four where it traverses the Wooroora property and becomes a stream order five waterway within Glen Gordon Station. There are a series of stream orders one, two and three across the site consisting of soft substrate bottom, and rocky gullies with distinct water holes and dense riparian vegetation. A number of farm dams also occur on the site.

Five broad fauna habitat types were identified in the Project area and are summarised in **Table 3.1**. A short summary and representative photos of each are provided in the following sections.



Table 3.1 Fauna habitat types within the Project area

Habitat Type	Habitat Description	Associated REs ¹	Habitat Features	Area within the Project Area (ha)	Area within the Project Footprint (ha)
1	Open eucalypt woodland	9.8.4, 9.11.10, 9.12.2, 9.12.4, 9.12.17, 9.5.5a, 9.5.17, 7.3.8, 7.3.19, 7.3.19a, 7.3.42b, 7.3.43, 7.8.7, 7.8.7a, 7.8.15, 7.12.21, 7.12.27ac, 7.12.29a, 7.12.30a, 7.12.34, 7.12.52, 7.12.57, 7.12.57a, 7.12.61, 7.8.19 and 7.8.10	<ul style="list-style-type: none"> ● Rare to regular tree hollows. ● Occasional rocky outcrops. ● Occasional caves and rock crevices. ● Rare to regular fallen logs. ● Leaf litter in varying densities. ● Regular suitable burrowing substrate. 	27,186.1	1008.39
2	Riparian areas along natural creeks or drainage lines with temporary or permanent water	9.3.15, 9.3.16, 7.3.16, 7.3.26 and 7.3.43	<ul style="list-style-type: none"> ● Occasional permanent water. ● Regular tree hollows. ● Occasional rocky outcrops. ● Occasional fallen logs. ● Regular leaf litter. ● Regular suitable burrowing substrate. 	1,437.6	16.23
3	Low <i>Lophostemon</i> and <i>Acacia</i> shrubland on exposed rocky pavements	7.12.65k, 7.12.66 and 7.12.65.	<ul style="list-style-type: none"> ● Regular rocky outcrops. ● Occasional caves and rock crevices. ● Occasional to regular leaf litter. ● Rare suitable burrowing substrate. 	1,778.1	55.73

¹ These are ground-truthed REs rather than those mapped by the Department of Resources



Habitat Type	Habitat Description	Associated REs ¹	Habitat Features	Area within the Project Area (ha)	Area within the Project Footprint (ha)
4	Notophyll vine forest	7.8.4, 7.8.4a, 7.12.7a and 7.12.16a.	<ul style="list-style-type: none">Occasional tree hollows.Regular fallen logs.Regular leaf litter.Regular suitable burrowing substrate.	144.5	0
5	Non-remnant	N/A	<ul style="list-style-type: none">Occasional permanent waterRare tree hollows.Occasional fallen logs.Rare leaf litter.Regular suitable burrowing substrate.	1,133.4	51.73

3.1.1 Open Eucalypt Woodland

Over a third of the Project area supports moist to dry open forests to woodlands dominated by white mahogany (*Eucalyptus portuensis*), Queensland stringybark (*E. reducta*), red mahogany (*E. resinifera*) and/or pink bloodwood (*Corymbia citriodora*) on igneous hills and/or granite or rhyolite uplands (corresponding to REs 9.12.2, 7.12.34 and 7.12.27) (**Plate 3-1**). The understorey is typically comprised of shrubs and grasses including *Xanthorrhoea johnsonii*, *Grevillea spp.*, *Acacia spp.* and kangaroo grass (*Themeda triandra*) whilst trees range in heights from 2-30 metres and canopy cover of 20-50%. In most instances these communities support large, hollow-bearing trees which are recognised to provide habitat for glider species (where trees are >20 m tall with suitable hollows) and hollow nesting birds whilst microhabitat such as cracks and crevices of exposed rocks, fallen timber and dense leaf litter provide habitat for reptiles and small ground-dwelling mammals. Rocky outcrops may also provide habitat for the northern quoll (*Dasyurus hallucatus*) although the presence of this species has not been confirmed within the Project area, with any stream order 1 watercourses providing potential habitat for the magnificent brood-frog (*Pseudophryne covacevichae*); the latter species has been recorded in a number of locations within the Project area.



Plate 3-1 Open Eucalypt woodland on ridges and undulating hills

3.1.2 Low *Lophostemon* and *Acacia* shrubland on exposed rocky pavements

Rocky pavements are characteristic of granite and rhyolite rock outcrops and correspond with RE 7.12.65k. Rocky pavement within the Project area is associated with the drier western areas, often shrublands to closed forests with vegetation communities dominated by *Acacia spp.* and/or *Lophostemon spp.* and/or *Allocasuarina spp.* and/or *Eucalyptus spp.* (**Plate 3-2**). Complex rocky pavements associated with increasing altitude and the formation of caves, fissures and crevices provide critical microhabitat for roosting, nesting and breeding of obligate cave-dwelling bat species such as the eastern horseshoe bat, (*Rhinolophus megaphyllus*). Rocky outcrops also support threatened flora species with restricted range such as *Prostanthera clotteniana*, *Triplarina nitchaga* and *Homoranthus porteri*.



Plate 3-2 Low *Lophostemon* and *Acacia* shrubland on exposed rocky pavements

3.1.3 Riparian Zones

Riparian habitats corresponding to REs 9.3.16, 9.3.15, 7.3.26 and 7.3.43 are represented as narrow communities primarily consisting of eucalypt woodlands on alluvium with occasional small sections of dry rainforest type communities fringing ephemeral drainage and creek lines. These communities typically consist of large forest red gums (*Eucalyptus tereticornis*) with sub-dominance of river she-oak (*Casuarina cunninghamiana*) and/or poplar gum (*E. platyphylla*) (**Plate 3-3**). The canopy and mid-storey are relatively low with trees <20 m tall and shrubs 1-4 m. The understorey is characterised by tussock species including black speargrass (*Heteropogon contortus*) and *Imperata cylindrica*, and provides rich habitat for small invertebrates. These areas also represent preferred habitats for folivores such as greater glider (*Petauroides volans minor*) as associated moisture expression provides both favoured foraging tree species as well as large hollows for denning. They also provide potential nesting habitat for the masked owl, northern subspecies (*Tyto novaehollandiae Kimberli*). Waterways within the Project area are known to contain special least concern species such as platypus (*Ornithorhynchus anatinus*).



Plate 3-3 Riparian Vegetation Along Blunder Creek

3.1.4 Notophyll Vine Forests

Several small patches of simple notophyll vine forest (SNVF) are present in the Project area, corresponding with REs 7.12.7 and 7.12.16. Larger SNVF communities generally occupy valleys or slopes with southerly aspects on richer soils, whilst smaller patches of SNVF occur as a result of lower soil moisture availability, impeded drainage, drier climate, increased elevation and exposure, and less fertile soils. This community is characterised by leaf size (medium sized leaves, 7.5-12.5 cm long) and described by the uniformity of tree basal diameter and the regularity of spacing between canopy trees which, as a result, provides even canopy height and crown cover. The provision of dense canopy cover offers potential sheltering opportunities for multiple faunal classes including threatened species such as the southern cassowary (*Casuarius casuarius johnsonii*) and the spectacled flying-fox (*Pteropus conspicillatus*); neither of these species has been recorded within the Project area to date. The ground layer of these communities also provides terrestrial microhabitat such as rocks and crevices with abundant leaf litter.

3.1.5 Non-remnant areas

Non-remnant areas are primarily represented within proximity to the homesteads or fixed agricultural infrastructure such as cattle yards and mostly consists of active grazing land (**Plate 3-4**). Large areas have been completely cleared with only pastoral grasses remaining, with other areas only partially cleared - particularly adjacent to vehicle tracks and artificial water sources. Completely cleared sites are heavily grazed and likely offer little habitat for specialised faunal groups. However, partially cleared areas offer habitat for species that typically prefer open grassy woodlands such as squatter pigeon, northern subspecies (*Geophaps scripta peninsulae*). This species also benefits from the permanent water storages in the Project area such as farm dams.



Plate 3-4 Non-remnant areas

3.2 Threatened Fauna Presence

Based on the findings of the Project EAR (Attexo 2021c), 19 threatened fauna species (listed as Endangered, Vulnerable, Migratory and/or Special Least Concern) were identified as known or likely to occur within the Project area, as listed in **Table 3.2**. Potentially suitable habitat for each of these species is shown in **Figure 3-1**, based on the broad habitat types described above. In most cases, the species will have niche habitat requirements that are more specialised than these broad habitat types; for example, northern greater gliders are broadly associated with open eucalypt woodland but have additional specific requirements relating to hollow-bearing trees. Habitat mapping within the Project EAR is more refined.

The locations of recorded EVNT fauna species within the Project area are also shown.

Table 3.2 Species habitat associations

Species	NC Act	EPBC Act	Likelihood of Occurrence	Associated habitat ²	Potential habitat within Project footprint (Ha)
Amphibians					
Magnificent brood-frog (<i>Pseudophryne covacevichae</i>)	V	V	Known to occur	1, 2	1,024.62
Tapping green-eyed tree frog (<i>Litoria serrata</i>)	V	-	Known to occur	2	16.23
Birds					

² Habitat types are described in **Table 3.1**.



Species	NC Act	EPBC Act	Likelihood of Occurrence	Associated habitat ²	Potential habitat within Project footprint (Ha)
Black-faced monarch (<i>Monarcha melanopsis</i>)	SLC	M	Known to occur	4	0
Fork-tailed swift (<i>Apus pacificus</i>)	SLC	M	Known to occur	1, 2, 3, 4, 5	1,132.08
Masked owl, northern subspecies (<i>Tyto novaehollandiae Kimberli</i>)	V	V	Known to occur	1, 2, 3	1,080.35
Red goshawk (<i>Erythrorchis radiatus</i>)	E	V	Likely to occur	1, 2, 3	1,080.35
Rufous fantail (<i>Rhipidura rufifrons</i>)	SLC	M	Known to occur	1, 2, 4	1,024.62
Satin flycatcher (<i>Myiagra cyanoleuca</i>)	SLC	M	Known to occur	1, 2	1,024.62
Southern cassowary – southern population (<i>Casuarius casuarius johnsonii</i>)	E	E	Likely to occur	4	0
Spectacled monarch (<i>Symposiachrus trivirgatus</i>)	SLC	M	Known to occur	1, 4	1,008.39
White-throated Needletail (<i>Hirundapus caudacutus</i>)	V	V & M	Known to occur	1, 2, 3, 4, 5	1,132.08
Mammals					
Lumholtz tree kangaroo (<i>Dendrolagus lumholtzi</i>)	NT & SLC	-	Known to occur	4	0
Northern greater glider (<i>Petauroides volans minor</i>)	V	V	Known to occur	1, 2	1,024.62
Northern quoll (<i>Dasyurus hallucatus</i>)	LC	E	Likely to occur	1	1,008.39
Platypus (<i>Ornithorhynchus anatinus</i>)	SLC	-	Known to occur	2	16.23
Short-beaked echidna (<i>Tachyglossus aculeatus</i>)	SLC	-	Known to occur	1, 2, 3, 4, 5,	1,132.08
Spectacled flying-fox (<i>Pteropus conspicillatus</i>)	E	E	Likely to occur	1, 2, 4	1,024.62
Spotted-tailed quoll – northern subspecies	E	E	Likely to occur	4	0

















Species	NC Act	EPBC Act	Likelihood of Occurrence	Associated habitat ²	Potential habitat within Project footprint (Ha)
<i>(Dasyurus maculatus gracilis)</i>					
Yellow-bellied glider (<i>Petaurus australis</i>)	E	E	Known to occur	4	0 ha

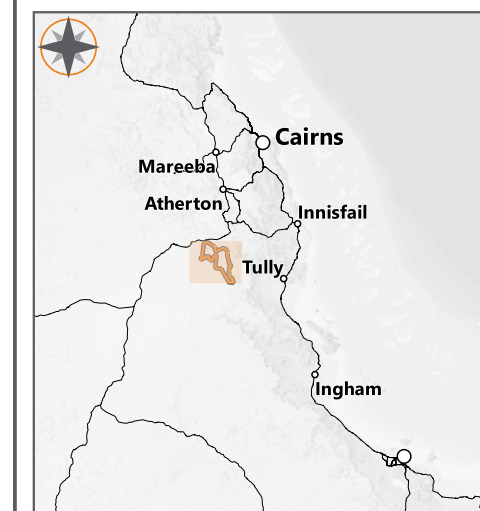
NT: Near Threatened, V: Vulnerable, E: Endangered, CE: Critically Endangered, M: Migratory, SLC: Special Least Concern

Chalumbin Wind Farm Broad Fauna Habitat Associations

Figure 3.1

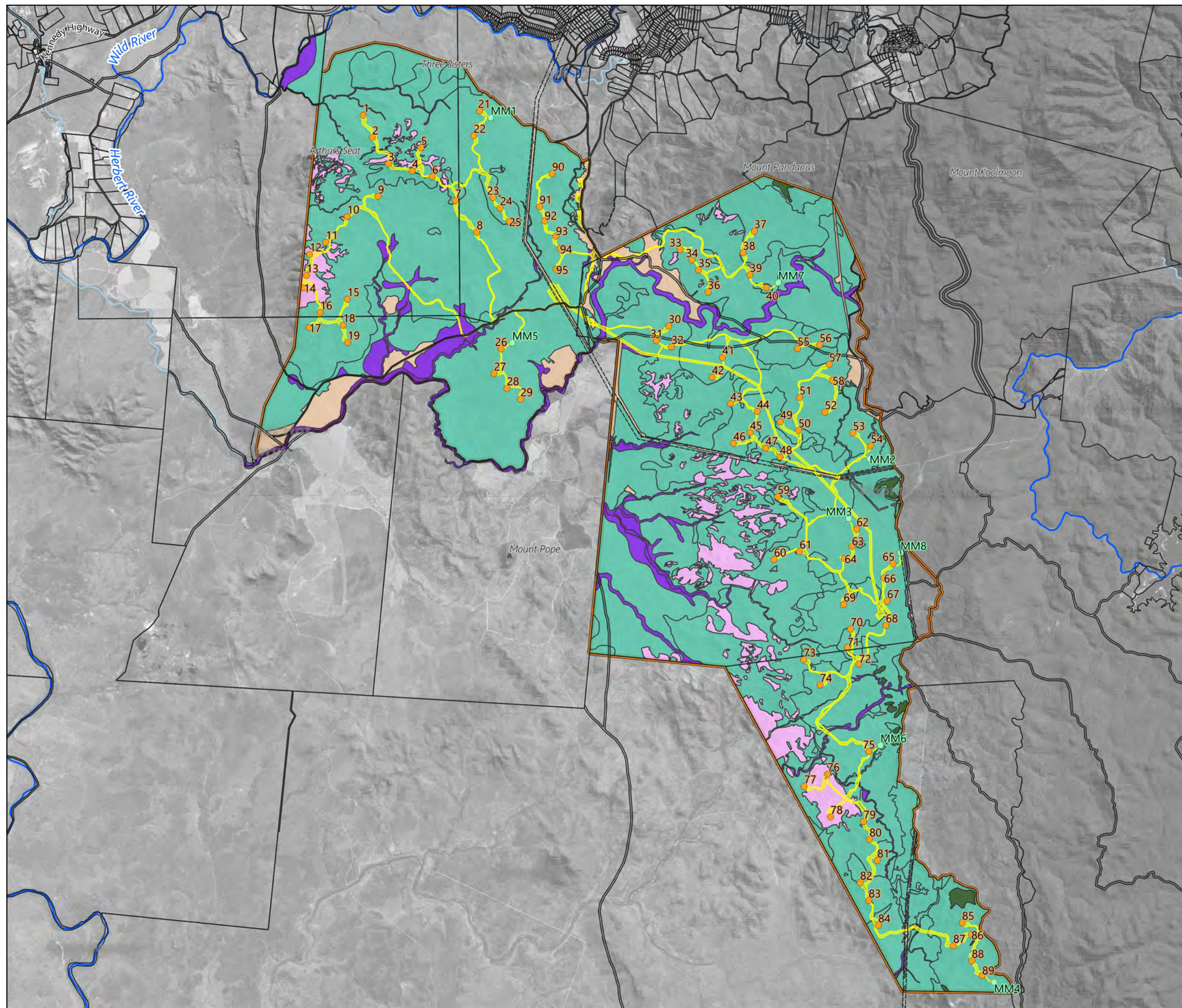
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint
-  Habitat 1 - Open eucalypt woodland
-  Habitat 2 - Riparian habitat
-  Habitat 3 - Low Lophostemon and Acacia shrubland on exposed rocky substrates
-  Habitat 4 - Notophyll vine forest
-  Habitat 5 - Non-remnant
-  Major Road
-  River
-  Creek
-  Lot Type Parcel
-  Easement

Date: 2021-12-02 Reviewed: CC
 Author: TOD Project: EPU-004



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





3.3 Least Concern Fauna Presence

Throughout the fauna survey program incidental sightings of 241 native fauna listed as Least Concern under the NC Act were recorded. These species included 32 mammals, 155 birds, 38 reptiles and 16 amphibians. These species are listed in Appendix D of the Project EAR (Attexo 2021c). Least concern species were widespread across the Project area, with most observed in Habitat Type 1 (open eucalypt woodland) and Habitat Type 3 (Riparian zones).

3.4 Introduced Fauna Presence

Seven pest fauna species were recorded during field surveys, including one amphibian, one bird and five mammals as follows:

- Domestic dog (*Canis lupus familiaris*);
- Domestic cat (*Felis catus*);
- Domestic cattle (*Bos taurus*);
- Feral pig (*Sus scrofa*);
- House mouse (*Mus musculus*);
- Common myna (*Acridotheres tristis*); and
- Cane toad (*Rhinella marina*).



4.0 Impacts and risks

4.1 Construction

Throughout the construction phase the Project has the potential to impact MSES values via the following:

- Vegetation clearing resulting in loss of habitat;
- Habitat fragmentation and reduced connectivity;
- Fauna injury or mortality during vegetation clearing and potential entrapment in trenches when installing underground powerlines;
- Injury or mortality due to vehicle strike;
- Wildlife disturbance due to dust, noise, light and vibration emissions;
- Reduced water quality due to erosion and sedimentation;
- Potential spills of hazardous materials;
- Introduction or increased prevalence of pests and weeds due to increased vehicle movements and vegetation clearing; and
- Increased risk of bushfire due to potential ignition sources on site associated with increased activity.

These are discussed in more detail in the following sections.

4.1.1 Habitat Loss

The Project area supports large areas of remnant vegetation dominated by open eucalypt woodland with small pockets of scattered rainforest communities close to the eastern boundary (i.e. closer to the Wet Tropics WHA). The Project has been designed to avoid any clearing of rainforest vegetation therefore threatened species specifically associated with these communities are not expected to be impacted.

Clearing of eucalypt woodland will reduce breeding, foraging and sheltering habitat for flora and fauna species, and the process of vegetation clearance has the potential to result in injury to or mortality of native fauna species. Some species are more sedentary and hence more susceptible to impacts than others. Conversely, more mobile species such as migratory birds are unlikely to be disturbed by vegetation clearing as they are able to disperse more easily.

The total estimated area of vegetation clearing is 1,084.26 ha of regulated vegetation. **Table 3.2** presents a summary of clearing of habitat associated with threatened species, based on broad habitat associations.

4.1.2 Habitat Fragmentation

Terrestrial habitat connectivity may be reduced as a result of the Project due to linear clearing, which may reduce fauna movements between areas of retained remnant vegetation. This habitat fragmentation will be more prominent where clearing widths are larger and intersect intact areas of vegetation. Clearing linear widths through habitats also has the potential to isolate plant populations by causing barriers to the dispersal of seeds and fruit, and to increase edge effects (additional light entering the forest, weed encroachment, increased feral animal abundance and increased risk of bushfire), thereby reducing the ecological functioning of those areas.



Some species are more prone to the impacts on fragmentation, such as greater gliders which are not able to traverse larger cleared areas. The maximum known gliding distance for a greater glider is 100 m (Smith et. al 2007) so clearings greater than 100 m wide are likely to act as a barrier to this species' movement at that location. Other species (such as masked owl) are less likely to be affected by clearings of this size and will disperse quite readily across access tracks and powerline easements.

Fragmentation impacts will be somewhat temporary as a substantial proportion of the clearing for the access roads is likely to be rehabilitated on completion of construction (subject to detailed design, this is estimated to be approximately 25% of the Project footprint). Further details on site rehabilitation will be outlined in a Rehabilitation Management Plan.

4.1.3 Injury or Mortality

Direct fauna injury or mortality may occur as a result of the Project during vegetation clearing (e.g. through removal of mature trees containing hollows), vehicle collision or through entrapment in trenches.

Mortality from tree clearing is a greater risk for nocturnal arboreal mammals such as the greater glider, whereby mortality may occur from removal of hollow-bearing trees which provide daytime denning habitat for the species.

Excavations will be required to create trenches in which underground cables will be carried, and to allow construction of turbine pads and access roads. This will involve removal of ground vegetation, soil and rock which provide fauna habitat (e.g. denning sites in rocky areas). During trenching activities there is potential for fauna to fall into and become trapped in open trenches, where they may perish or become subject to increased predation risk. Particularly susceptible species groups include reptiles, frogs and small mammals.

Increased traffic around the Project area has the potential to kill or injure fauna on impact. Some ground-dwelling or slow-moving species may be particularly susceptible to these impacts.

4.1.4 Noise and Vibration

Noise may adversely affect fauna by interfering with communication (e.g. territorial bird song), masking the sound of predators and prey, causing avoidance reactions and displacement from habitat. Construction noise will be generated by the Project through the use of machinery, plant and vehicles, and will vary from short intermittent noise from plant and equipment to more persistent noise from generators. The generation of construction noise may be in areas which have the potential to support threatened fauna species. Individuals that occur within the Project area may leave the area of impact. Project construction works and therefore potential noise impacts will be temporary.

Vibration from vehicles and equipment may cause temporary disturbance to fauna, and displacement or structural damage to boulder piles, rock fissures and caves which form habitat for fauna. Blasting may be required for construction of some pads and access roads depending on geological constraints, and obligate cave-dwelling bats would be particularly susceptible to vibration impacts from blasting.

4.1.5 Light Emissions

Artificial lighting from infrastructure and machinery may impact fauna within the Project area during construction. Artificial lighting can have a range of impacts which vary between species. Artificial light can disrupt patterns of both nocturnal and diurnal species by eliciting responses. Some species may avoid brightly lit areas, potentially due to the perception of being increased risk of predation. Conversely, some species such as nocturnal reptiles, frogs and bats may congregate at artificial light sources to feed on insects attracted to light.

Other potential adverse impacts include disruption of breeding and migratory patterns, disorientation and potential collision with structures.



4.1.6 Hazardous Materials

Project activities have the potential to result in accidental releases of hazardous materials, such as fuels and oils from vehicles and machinery. These hazardous materials can lead to localised soil contamination and contamination of water resources, which in turn can cause injury, reduced vigour or mortality to flora and fauna. The severity of the impact is dependent on the location and magnitude of the release.

4.1.7 Erosion and Sedimentation

The main construction activities that could impact on water quality are excavations and earthmoving for construction of turbine pads and access roads. This may lead to erosion and sedimentation, reduction in water quality and changes to water flows.

During construction activities, sediment may be mobilised and transported by surface water during rainfall events, ultimately discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes and decreasing dissolved oxygen levels. However, many creek lines in the Project area are ephemeral, which may reduce the magnitude of these impacts.

Changes in the hydrology of the Project area may occur through alteration of surface flows and stormwater runoff, including obstruction of flow. This can result in scouring or waterlogging occurring in some areas.

The accidental release of pollutants (including leaks and other uncontrolled releases) into the surrounding environment and waterways has the potential to degrade aquatic habitat quality in the Project area and impact vegetation communities and fauna utilising these areas. This includes direct toxic impacts on fauna from ingestion or inhalation. Without mitigation, contaminants may enter waterways including oily wastewater (from heavy equipment cleaning), contaminated runoff from chemical or fuel storage areas and general washdown water.

4.1.8 Dust

Increased dust from vegetation clearing, earthworks and vehicle movements during construction has the potential to temporarily and locally impact flora and fauna values in the vicinity of the Project footprint. Excess generation of dust and subsequent deposition on leaves can impair plant photosynthesis and productivity, resulting in reduced habitat quality for fauna. Increased dust can also impact on respiratory systems of fauna, alter soil properties impacting on plant species assemblages and reduce water quality in aquatic habitats.

Dust is expected to only be a potential issue during vegetation clearing and construction.

4.1.9 Bushfire Risk

Fire is a natural part of the Australian landscape, and most vegetation communities are adapted to periodic fires. However, changes in the natural fire regime may result in changes in the species composition and / or structure of the vegetation. The increased presence of construction vehicles and personnel in the Project area may increase fire risk through use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.



4.1.10 Pests and Weeds

Project activities have the potential to increase the abundance of pest flora in the Project area and facilitate dispersal of species to previously unaffected areas. Movement of vehicles, equipment and personnel throughout the Project area is the key vector of transmission, in particular vehicles and equipment sourced from regions beyond the Project area which may introduce new species. Many weed species thrive on disturbed ground and will rapidly colonise disturbed areas in advance of native species recolonisation.

Increased pest flora abundance has adverse impacts on native vegetation and biodiversity, as well as potential negative economic effects on local land uses such as grazing activities.

Project-related activities may also increase pest fauna abundance in the Project area. This can lead to increased competition with, and predation of native fauna. In addition, habitat degradation may occur through vegetation trampling (e.g. feral pig wallowing). Creation of new access points into areas of intact vegetation may create pathways for feral fauna species to disperse. Uncontained waste sources may also attract feral fauna such as wild dogs.

4.2 Potential Operational Impacts

Throughout the operational phase, the Project has the potential to impact on fauna via the following:

- Fauna injury or mortality due to vehicle strike;
- Collision with turbines towers, blades and powerlines;
- Barotrauma;
- Wildlife disturbance due to light emissions;
- Potential spills of hazardous materials;
- Increased pests and weeds due to increased vehicle movements; and
- Increased risk of bushfire due to potential ignition sources on site associated with increased activity.

These are discussed in more detail in the following sections.

4.2.1 Vehicle Strike

Increased traffic around the Project area has the potential to kill or injure fauna on impact although traffic levels will be greatly reduced from the construction phase and more geared towards light vehicles. Ground dwelling or slow-moving species may be particularly susceptible to traffic impacts.

4.2.2 Collision Risk

Potential impacts to threatened and migratory species, and other species groups of concern (e.g. microbats, raptors and waterfowl) may occur through direct collision with turbine towers and blades and associated powerlines, but also through flying through the “wake” behind the turbine. Many species will rarely, if ever, fly at rotor height while others will do so routinely. Different types of flight (e.g. soaring, direct flight, hovering) and different speeds of flight also will pose a different risk of collision. These impacts to birds and bats and the Projects mitigation measures are discussed in further detail in the Project Bat and Bird Management Plan (Attexo 2021a).



Turbine siting will influence collision risk, with turbines located near wetlands likely to lead to greater risk of collision with birds and bats which congregate near wetland habitats. Turbines located on ridgelines and in valleys or other topographical features which may “funnel” birds and bats through a narrow pathway, are pose a greater risk of collision.

Other factors that attract birds and bats to the proximity of turbines include an increase in perching habitat (from powerlines or the turbine structure itself), increased lighting that increases insect abundance around turbines, and the presence of carcasses around the base of turbines (attracting raptors and corvids in particular).

Generally, species at higher risk of collision are likely to comprise:

- Raptors – this group take advantage of updrafts associated with ridgelines to move around. Raptor species were reasonably well represented in the diurnal bird surveys, with observations of collared sparrowhawk, brown goshawk, grey goshawk, wedge-tailed eagle, Pacific baza, whistling kite, brown falcon and peregrine falcon.
- Migratory swifts – both white-throated needletail and fork-tailed swift were recorded during the field surveys and will routinely fly at RSA height.
- Waterfowl (ducks, cormorants, terns, herons, etc.) – these species are generally prone to collision due to their often-direct nature of flight, flight height and lower manoeuvrability than other species. No significant wetlands are present within the Project area and this group was not well represented in the diurnal bird surveys, with a few observations of Australian wood duck, Pacific black duck, white-necked heron and white-faced heron.
- Migrating passerines and other species – migratory passerines routinely fly at rotor swept area (RSA) height. Passerine species represent the majority of bird species recorded during the field surveys, albeit the Project area is not known to be located in a significant corridor for passerine migration.
- High-flying or migratory/nomadic microbats – many species forage at or below canopy height, but some species forage well above canopy height (e.g. some of the freetail and sheathtail species).

4.2.3 Barotrauma

Mortality from near-contact collision in the form of barotrauma is known to primarily affect microbat species. Barotrauma is associated with low air pressure produced in the wake of moving blade-tips in the form of vortices. These vortices increase in size and decompression gradients with increasing blade velocity. The sudden change in air pressure associated with the vortices is known to damage the internal air-containing tissues of microbats such as lungs when entering a fast-moving turbine wake, typically causing internal haemorrhaging resulting in death. This form of mortality may account for up to 50 % of all microbat deaths associated with wind farms in locations where microbats are common. Rapid air pressure changes are largely an undetectable hazard and it is thought that microbats are more susceptible to fatal barotrauma than other groups due to particular anatomical features such as large lungs to body ratios and specialised vascular system to power high-energy flight (*Baerwald et al. 2008*).

4.2.4 Light Emissions

Artificial lighting from infrastructure may impact fauna within the Project area during operation of the Project. In particular, artificial light can disrupt patterns of both nocturnal and diurnal species by eliciting responses. Some species may avoid brightly lit areas, potentially due to the perception of an increased risk of predation. Increased lighting of turbines may increase the presence of insects and in turn lead to an increased risk of collision with turbines for bats and birds. The Project is not expected to have any operational WTG lighting requirements.



4.2.5 Erosion and Sedimentation

During operational activities, sediment may be mobilised and transported by surface water during rainfall events across established tracks, laydown areas and other infrastructure. Any deposited dust or chemicals on these surfaces such as diesel residue may be collected by these flows and discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes and decreasing dissolved oxygen levels. However, many creek lines in the Project area are ephemeral, which may reduce the magnitude of these impacts.

Changes in the hydrology of the Project area may occur through alteration of surface flows and stormwater runoff, including obstruction of flow. This can result in scouring or waterlogging occurring in some areas.

4.2.6 Hazardous Materials

Operational activities have the potential to cause harm to fauna species through accidental releases of hazardous materials. The volume of such substances being used and stored on site during operation will be significantly less than during construction, with a corresponding reduction in risk.

4.2.7 Weeds and Pests

As described in Section 4.1.10 for construction activities, operational activities have the potential to increase the abundance of pest flora and fauna in the Project area and facilitate dispersal of species to previously unimpacted areas.

4.2.8 Bushfire Risk

During operational activities, there is potential for heightened fire risk due to the increased presence of maintenance and monitoring vehicles and personnel in the Project area. This is through the use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.

4.3 Potential Decommissioning Impacts

At the end of the Project's operational life, infrastructure will be decommissioned at the site rehabilitated to facilitate continuation of the current land use (i.e. agriculture). Decommissioning involves the removal of all above-ground infrastructure such as turbines, overhead transmission lines, switching stations, etc. Removal of buried infrastructure is not normally undertaken as this typically causes additional disturbance and environmental impacts. Once above-ground infrastructure is removed, the land is rehabilitated in line with specific approval conditions and landholder agreements.

Impacts during decommissioning are likely to relate primarily to vehicle movements around the Project area, potential for spread of weeds and elevated risk of bushfire as described in the sections above. No additional vegetation clearing would be anticipated during decommissioning activities; however, this it would be subject to a separate assessment if required.



5.0 Impact Avoidance, Minimisation and Mitigation

5.1 Avoidance

Ecological surveys of the Project area commenced at an early stage during Project design, and as such the results of the surveys have been able to significantly inform the Project layout. Central to this process was ensuring that areas of higher ecological significance were avoided to the greatest practical extent, taking into consideration the challenging terrain and wind resource requirements. These avoidance measures are described in the Project EAR (Attexo 2021c).

5.2 Minimisation and Mitigation

Where impacts cannot be avoided, mitigation and management measures will be implemented to reduce residual impacts to the lowest extent practicable. **Section 5.1** (Construction) and **Section 5.2** (Operation) detail stage-specific measures proposed for the Project to minimise impacts to native fauna. **Section 5.3** identifies species-specific measures proposed for impact minimisation and mitigation.



5.2.1 Construction – Impact Mitigation and Management

Table 5.1 Construction – Impact Mitigation and Management

Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
Habitat loss	<ul style="list-style-type: none"> • Construction Manager • Environmental Manager 	<ul style="list-style-type: none"> • Environmental manager will ensure exclusion zones are clearly defined and signage is in place prior to clearing commencing to confine clearing to approved areas and in contravention of disturbance limits. • Clearing boundaries to be identified in maps and GIS that are provided to contractors. • Placement of the substation, office, construction compound and temporary laydowns in existing cleared areas where practicable. • Vegetation clearing will be limited to those areas required for earthworks and construction of the Project. Access roads will be aligned along existing tracks wherever practicable to minimise vegetation removal, loss of hollow-bearing trees and fragmentation. Overhead transmission lines will be limited in width to that required for construction and required firebreaks. Minimising the widths of access roads where practicable, particularly across creeklines. 	<ul style="list-style-type: none"> • Monitoring to ensure vegetation clearing has stayed within approved boundaries and limits. • Monitor to ensure all exclusion fencing and signage remains in serviceable condition. 	<ul style="list-style-type: none"> • Replace any fencing or flagging tape that is in poor condition. • Where clearing extends outside the approved disturbance limits, a record must be taken of the incident and an investigation will occur. • Restoration and revegetation of additional cleared areas will be discussed and where required undertaken.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> Sequential clearing of native vegetation will occur to retain habitat trees where practicable, and to minimise impacts to native fauna species during clearing process. This includes clearing towards adjacent habitats to encourage movement to these areas and retaining large, canopy trees until second phase. The procedure will be outlined in the Construction Environmental Management Plan (CEMP). Woody debris, logs and rocks will be retained for use in rehabilitation. 		
Habitat fragmentation	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> All fencing on site will give consideration to the movement of fauna. Fencing design will use a best practice approach, allowing fauna to move through or over it and not using barbed wire on the top strand of fences. Install fauna exclusion fencing around infrastructure that presents a high risk to fauna species such as substations. Minimise clearing widths and, where feasible, introduce measures to facilitate safe fauna movement between adjacent habitats. This may include reduced vehicle speeds to minimise chance of vehicle 	<ul style="list-style-type: none"> Monitor that vegetation clearing has stayed within approved boundaries and limits. Fauna spotter-catcher will monitor vegetation clearing to avoid and minimise impacts on native fauna and ensure sequential clearing is occurring. 	<ul style="list-style-type: none"> Replace any exclusion fencing, signage or flagging tape that is in poor condition. Where clearing extends outside the approved disturbance limits, a record must be taken of the incident and an investigation will occur. Revegetation of additional cleared areas will be discussed and where required undertaken.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>strike, rope crossings at key glider corridors, and fauna furniture in culverts.</p> <ul style="list-style-type: none"> • Sequential clearing to occur. • Where practicable, access tracks are to follow previously cleared areas to minimise the total width of cleared land and fragmentation of habitats. • Placement of the substation, office, construction compound and temporary laydowns in existing cleared areas where practicable • Priorities the maintenance of connectivity along riparian corridors. 		<ul style="list-style-type: none"> • Any fauna injuries or deaths are required to be reported firstly to the Project Environmental Manager and then DES and/or DAWE if it involves a threatened species. The cause of injury or death will be investigated, and any required changes will be implemented.
Injury or mortality	<ul style="list-style-type: none"> • Construction Manager • Environmental Manager • Suitably qualified ecologist • Fauna spotter catcher 	<ul style="list-style-type: none"> • Pre-clearance surveys will be undertaken by a suitably qualified ecologist prior to any proposed clearing activities, and will include: <ul style="list-style-type: none"> – identification and marking all hollow-bearing trees; – identification and marking any other active breeding places such as nests and burrows; – identification if suitable release sites should any fauna species need to be captured and released during clearing phase; 	<ul style="list-style-type: none"> • During trenching activities, open trenches will be monitored daily. • Vehicle speed limits will be monitored and enforced. • Fauna spotter-catcher to monitor vegetation clearing to avoid and minimise impacts on native fauna and ensure sequential clearing is occurring. 	<ul style="list-style-type: none"> • Any fauna injuries or deaths are required to be reported firstly to the Project Environmental Manager and then DES and/or DAWE if it involves a threatened species. The cause of injury or death will be investigated, and any required changes will be implemented. • If native fauna become trapped in a trench they will



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> - identification of presence of weed species and identify if any require treatment prior to clearing. • A suitably qualified fauna spotter-catcher will be present during all clearing activities, working under an approved Species Management Program. The fauna spotter-catcher will be responsible for checking an area immediately prior to any clearing for presence of any native fauna including identification of tree hollows, reptiles under fallen logs, and check breeding places. Any captured species will be relocated to an agreed release site. The fauna spotter-catcher will then advise construction contractors as to best practice approach to avoiding impacts on breeding places and fauna species. • All vehicles associated with construction activities will travel at slow speeds to minimise the chance of any fauna strikes occurring. Speed limit signage will be placed at the entrance to the site and other key access tracks. • Appropriate procedures for managing injured wildlife will be developed and included in the CEMP and SMP. 		<ul style="list-style-type: none"> be released by a fauna spotter-catcher. • If native fauna are identified within the clearing area, the fauna spotter catcher will seek to capture and relocate them to appropriate habitat nearby. • Any fauna injuries or deaths are required to be reported firstly to the Project Environmental Manager and then DES and/or DAWE if it involves a threatened species. The cause of injury or death will be investigated, and any required changes will be implemented.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> All contractors will be educated on the presence of native fauna, including threatened species, and ways in which impacts to these species can be avoided. This training will form part of mandatory inductions. Vehicle traffic will be confined to designated roads and access tracks. The amount of open trench will be minimised and trenches will preferably be backfilled prior to nightfall. Escape ramps or planks and/or shelter (e.g. sawdust filled bags) for trapped fauna will be installed in open trenches. 		
Noise and Vibration	<ul style="list-style-type: none"> Construction Manager Fauna spotter catcher 	<ul style="list-style-type: none"> No blasting to be undertaken at night. No blasting will be undertaken within 200 m of known active breeding sites for sensitive species during breeding seasons for those species. 	<ul style="list-style-type: none"> Monitor noise levels during construction and determine acceptable noise limits. Fauna spotter catcher to monitor for active breeding places of sensitive species prior to blasting. 	<ul style="list-style-type: none"> Where noise levels go beyond acceptable limits documented in Project approval, a record must be taken of the incident and an investigation will occur.
Light Emissions	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> Construction activities will be limited to daytime hours where practicable. 	<ul style="list-style-type: none"> Monitor light levels during construction and 	<ul style="list-style-type: none"> Where light levels go beyond acceptable limits documented in Project



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> Minimal lighting will be required around buildings at night. 	<p>determine acceptable light limits.</p>	<p>approval, a record must be taken of the incident and an investigation will occur.</p>
Hazardous Materials	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> A detailed Construction Environmental Management Plan (CEMP) will be prepared prior to clearing that identifies water quality risks and controls. Construction equipment is to be maintained to minimise risk of spill or leakage. All refuelling facilities, or storage facilities for hydrocarbons and chemicals will be in appropriately designed sites and will comply with Australian Standards (e.g. AS 1940: The storage and handling of flammable and combustible liquids). Materials will be stored within bunded areas with a storage capacity of 110% of the storage vessel. Bunding will have floors and walls lined with impermeable material. These areas must be adequately protected from rainfall and stormwater. Refuelling should not take place within 50 m of a watercourse. Spill control materials such as booms and absorbent materials will be maintained on site, commensurate with the types and 	<ul style="list-style-type: none"> Monitor water quality within water courses located downslope from vehicle storage, refuelling or chemical storage facilities. Monitor stock of spill kits. Monitor storage facilities for signs of leaks. Daily weather observation checks to identify high-risk rain events. 	<ul style="list-style-type: none"> Where water quality levels go beyond acceptable limits documented in Project approval, a record must be taken of the incident and an investigation will occur. Spills or leaks are to be responded to immediately, as per the Projects CEMP.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>volumes of materials in use, and in place where hazardous materials are stored or used.</p> <ul style="list-style-type: none"> No equipment or materials will be stored across water flow paths. Personnel will receive appropriate spill clean-up training. 		
Erosion and sedimentation	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> A detailed CEMP including a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to clearing that identifies erosion and sediment control measures to be implemented during clearing. The controls are to include but will not be limited to: <ul style="list-style-type: none"> As a minimum standard, access tracks will be constructed in accordance with Erosion control on property roads and tracks—managing runoff (Queensland Government 2013). Creek crossing locations will seek to take advantage of existing gaps in the riparian corridors as far as practicable. Work in creek crossings will be carried out in periods of no flow where the schedule permits. 	<ul style="list-style-type: none"> Daily weather observation checks to identify high-risk rain events. 	<ul style="list-style-type: none"> Cease works until weather passes to minimise sediment runoff.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> - Constructed access tracks (e.g. culverts or splash through crossings) must be provided with a scour apron and cut off wall on the downstream side sufficient to prevent bed erosion. • Design on site infrastructure to ensure water flows are not impounded or concentrated (e.g. culverts, diversion ditches, etc.). • Waterway crossings will be designed in accordance with development requirements for waterway barrier works to ensure fish passage is not impeded. • Watercourse crossings must be designed to maintain flow and minimise the increase in flow volume or velocity. 		
Dust	<ul style="list-style-type: none"> • Construction Manager • Environmental Manager 	<ul style="list-style-type: none"> • Areas which have potential to generate airborne dust will be wetted down regularly. • Low speed limits will be implemented on site to minimise dust generation. • Areas stripped of topsoil not required for operation will be rehabilitated as soon as practicable. • Machinery and vehicle tyres will be regularly cleaned to reduce wheel 	<ul style="list-style-type: none"> • Daily dust suppression. • Monitor dust levels and effectiveness of mitigation measures. 	<ul style="list-style-type: none"> • In extremely dusty circumstances, cease works until dust suppression can be applied. • Increase frequency of mitigation measures including dust suppression.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>entrained dust emissions or consider use of vibration grids.</p> <ul style="list-style-type: none"> Water spraying of nearby sensitive vegetation should be considered if visible dust sedimentation is observed. 		
Bushfire	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> As part of the construction planning a certified Bushfire Management Plan will be prepared prior to construction and implemented during on-site activities. This is also typically a condition of a wind farm development permit in Queensland. For “hot-work” activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions. Vehicles may not idle or be parked in areas of long grass. Access tracks, fence lines and cleared overhead powerline easements will be maintained and used as firebreaks within the Project area and regularly maintained during construction and operation of the Project. Smoking is not permitted on site. Fuel loads across the Project area will be monitored and managed through 	<ul style="list-style-type: none"> Monthly assessment of fuel loads. During construction phase, and in the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website. 	<ul style="list-style-type: none"> An Emergency Response Plan will be implemented should an uncontrolled fire take place. If fuel loads are increasing due to rainfall, review current measures and increase if required. This may be increase stocking rates or undertake cool, mosaic burn.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>activities such as controlled grazing, cool mosaic burns and weed management.</p>		
Weeds and pests	<ul style="list-style-type: none"> Construction Manager Environmental Manager 	<ul style="list-style-type: none"> A dedicated vehicle and machinery cleaning bay will be installed at the main entrance to the site. This will not be placed near a watercourse. Hygiene checks will be conducted on all machinery or equipment being moved onto or out of the Project site to minimise distribution of weed species. Any materials brought into site (such as gravel) will be certified as weed and disease free. Waste disposal (especially food waste) will be removed from site regularly to discourage presence of pest fauna. When on site, waste will be stored in covered bins/skips to prevent fauna access. Weeds will be identified during pre-clearing surveys, targeting proposed disturbance areas. Clean and dirty zones should be demarcated on site to facilitate weed management. Weed management will occur across the Project site to ensure weed cover and abundance does not increase. This will be particularly important along edges of 	<ul style="list-style-type: none"> Record weed species during pre-clearance surveys, and confirm any large infestations required for treatment prior to clearing. Check wash downs are occurring in an effective manner during regular audits. Check material being brought into site such as gravel is weed and disease free. 	<ul style="list-style-type: none"> Increase hygiene protocol requirements if vehicles or equipment are found to introduce new weeds or because of spreading weeds. Weed control efforts to be increased if needed. Weed control methods to be adjusted if current techniques are not proving effective.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		access roads and turbine pads as disturbance and edge effects will increase weed species regeneration. Weed management will be detailed in the CEMP.		

5.2.2 Operation – Impact Mitigation and Management

Table 5.2 Operation – Impact Mitigation and Management

Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
Fauna Mortality	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> All vehicles associated with operations will travel at slow speeds to minimise the chance of any fauna strikes occurring. Speed limit signage will be placed at the entrance to the site and other key access tracks. All contractors will be educated on the presence of native fauna including threatened species and need to travel slowly and look out for fauna when driving. This training will form part of mandatory inductions. Vehicle traffic will be confined to designated roads and access tracks. Any fauna injuries (e.g. vehicle strike or during clearing activities) will be recorded in a central register by the Project Environment Manager. 	<ul style="list-style-type: none"> Vehicle speed limits will be monitored and enforced. 	<ul style="list-style-type: none"> Any fauna injuries or deaths are required to be reported firstly to the Project Environmental Manager and then DES and/or DAWE if it involves a threatened species. The cause of injury or death will be investigated, and any required changes will be implemented.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>Injured fauna to be recorded and reported to Environmental Manager.</p> <ul style="list-style-type: none"> Appropriate procedures for managing injured wildlife will be developed and included in the EMP. 		
Turbine Collision & Barotrauma	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> Implement management measures detailed in the Preliminary Bird and Bat Management Plan (Attexo 2021a). 	<ul style="list-style-type: none"> Monitoring of fauna collisions is detailed in the Preliminary Bird and Bat Management Plan (Attexo 2021a). 	<ul style="list-style-type: none"> Corrective actions and triggers for fauna collisions are detailed in the Preliminary Bird and Bat Management Plan (Attexo 2021a).
Lighting	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> Night lighting will be limited to aviation lighting on wind turbines (unlikely to be required) and around buildings. Project lighting will be minimised (i.e. low luminance) as far as practicable. 	<ul style="list-style-type: none"> Monitor light levels during operations and determine acceptable light limits. 	<ul style="list-style-type: none"> Where light levels go beyond acceptable limits, a record must be taken of the incident and an investigation will occur.
Erosion and Sediment	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> A detailed Operational Environmental Management Plan (OEMP) will be prepared that identified erosion and sediment control during the operations phase. Temporary areas will be rehabilitated as soon as practicable post completion of construction to reconnect habitats. Further details to be provided in a rehabilitation plan as part of the OEMP. Erosion and sediment control measures are to be implemented to avoid runoff impacting watercourses, water quality and fauna habitats. 	<ul style="list-style-type: none"> Regular checks of erosion and sediment control measures to ensure they are in working condition and EVNT fauna are not being impacted. 	<ul style="list-style-type: none"> Implement additional erosion and sediment control measures if existing measures are not effective in protecting EVNT species. Establish further exclusion zones if EVNT species are showing signs of impact. Dust suppression to take place where dust depositing



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> Implement dust mitigation measures to ensure native vegetation and animal breeding places in areas adjacent to access roads and earthworks are not impacted by dust deposition. 		<p>is identified beyond acceptable levels.</p>
Hazardous Materials	<ul style="list-style-type: none"> Environmental Manager 	<ul style="list-style-type: none"> A detailed OEMP will be prepared prior to clearing that identifies water quality risks and controls. Vehicles coming onto site are to be regularly serviced to minimise risk of spill or leakage. All storage facilities for chemicals will be in appropriately designed sites and will comply with Australian Standards (e.g. AS 1940: The storage and handling of flammable and combustible liquids). Materials will be stored within bunded areas with a storage capacity of 110% of the storage vessel. Bunding will have floors and walls lined with impermeable material. These areas must be adequately protected from rainfall and stormwater. Refuelling of vehicles should not be done on site. Spill control materials such as booms and absorbent materials will be maintained on site, commensurate with the types and volumes of materials in use, and in place where hazardous materials are stored or used. No equipment will be parked or stored across water flow paths. 	<ul style="list-style-type: none"> Monitor water quality within water courses located downslope from vehicle parking or chemical storage facilities. Monitor stock of spill kits. Monitor storage facilities for signs of leaks. Daily weather observation checks to identify high-risk rain events. 	<ul style="list-style-type: none"> Where water quality levels go beyond acceptable limits documented in Project approval, a record must be taken of the incident and an investigation will occur. Spills or leaks are to be responded to immediately, as per the Projects CEMP.



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<ul style="list-style-type: none"> Personnel will receive appropriate spill clean-up training. 		
Weeds and Pests	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> Vehicle access will be restricted to existing roads and tracks where practicable to minimise spread of weeds and damage to native vegetation. Any materials brought into site (such as gravel) will be certified as weed and disease free. A record of all materials brought into the site and their origin will be maintained. Any herbicides used on site must be dispensed by an appropriately trained and qualified weed sprayer. Weed management will occur across the Project site to ensure weed cover and abundance does not increase. Particularly along edges of access roads and turbine pads as disturbance and edge effects will increase weed species regeneration. 	<ul style="list-style-type: none"> Record any weed infestation areas. Wash down for each vehicle entering site from declared weed areas. 	<ul style="list-style-type: none"> Herbicides to be sprayed in areas of weed infestations in the Project footprint.
Bushfire	<ul style="list-style-type: none"> Environment Manager 	<ul style="list-style-type: none"> Continue implementation of the Bushfire Management Plan. Vehicles may not idle or be parked in areas of long grass. Access tracks, fence lines and cleared overhead powerline easements will be maintained and used as firebreaks within the Project area and regularly 	<ul style="list-style-type: none"> Bi-annual assessment of fuel loads. 	<ul style="list-style-type: none"> An Emergency Response Plan will be implemented should an uncontrolled fire take place. If fuel loads are increasing due to rainfall, review current measures and increase if required. This may be to increase stocking rates or to



Impact	Responsibility	Management/mitigation measures	Monitoring	Corrective actions
		<p>maintained during construction and operation of the Project.</p> <ul style="list-style-type: none">Fuel loads across the Project area will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.		<p>undertake cool, mosaic burns.</p>



5.2.3 Species-specific Impact Mitigation and Management

In addition to the general mitigation measures discussed above, species-specific measures are proposed for threatened species with specific habitat requirements or risk profiles. **Table 5.3** provides details on species-specific mitigation measures will be considered for inclusion within a subsequent High Risk SMP for the Project. The specific mitigation and management approach to bird and bat species are discussed in the Project Bird and Bat Management Plan (Attexo 2021a).

Table 5.3 Species-specific Impact Mitigation and Management

Species	Mitigation and Management
Northern greater glider <i>(Petauroides volans minor)</i> and Yellow-bellied glider <i>(Petaurus australis)</i>	<ul style="list-style-type: none"> • Pre-clearance surveys to be undertaken in all woodlands proposed to be cleared which are identified as potential habitat for the species (refer species habitat mapping in the EAR (Attexo 2021c)) to identify the presence of suitable hollow-bearing trees which may support the species. These trees will be clearly marked, and GPS locations recorded. Pre-clearance surveys will be completed no more than 48 hours prior to clearing commencing. • Conduct staged and sequential clearing within identified species habitat. Sequential clearing will be detailed in the High Risk SMP. This will include retaining larger, hollow-bearing trees to second phase of clearing to provide opportunity for arboreal fauna to vacate the area. It will also ensure trees are retained to facilitate movement into adjacent habitats. • Trees with large hollows will be cleared using the “slow drop” technique. This technique will be detailed in the High Risk SMP. This is to minimise any likely injury to gliders residing in the hollow. • If any injured gliders are found they will be taken to a local vet/wildlife carer for treatment. • If practical during construction, micro-siting of access tracks and other infrastructure will seek to avoid large hollow-bearing trees. • Avoid the use of barbed wire fencing. • Reduce the frequency and intensity of prescribed burns. Prevent hot bushfires occurring through fuel load management. • Where large, hollow-bearing trees cannot be avoided compensatory hollows will be installed prior to vegetation clearing commencing. This may be through the salvage of natural hollows or use of nest boxes. These hollows will be placed into adjacent suitable habitats for gliders in the Project area. Final numbers to be installed and installation methods and monitoring will be detailed in the High Risk SMP. • Targeted revegetation of areas of the clearance footprint not required for operation will occur using tree species such as Blue Gum, which are likely to form hollows.
Tapping green-eyed Tree Frog <i>(Litoria serrata)</i> and	<ul style="list-style-type: none"> • Potential impacts of the introduction/spread of chytrid fungus on threatened amphibians within the Project area will be mitigated through the requirement for state and federal disease control protocols to be implemented throughout all phases of the project. These include:



Species	Mitigation and Management
Magnificent Brood-frog (<i>Pseudophryne covacevichae</i>)	<ul style="list-style-type: none">- Hygiene protocols for the control of diseases in Australian frogs (Murray et al., 2011); and- Technical Manual: Interim hygiene protocol for handling amphibians (DEHP, 2016).• Areas with known populations of threatened amphibian species and outside of the Project footprint will be fenced off to avoid trampling.• No facilities will be placed directly up-stream of any known populations of threatened amphibian species to avoid impacts to water quality and sedimentation.• Monitoring of sedimentation and water quality will be conducted within known habitat for threatened amphibian populations as detailed within the High Risk SMP.• To assist in determining potential causes of increased sedimentation within threatened amphibian habitat, impact triggers have been established. These triggers include:<ul style="list-style-type: none">- visual evidence of erosion within Project footprint; and- evidence of erosion and sediment control device failure.



6.0 Compliance

6.1 Adaptive Approach to Management

To maintain relevance and effectiveness, this FMP will require review and amendment throughout the life of the Project to ensure that measures within this document remain effective. It is recommended that this document be reviewed and updated as required, for example:

- if there is a modification of the Project schedule, design, or construction methods;
- if performance criteria are not being met and additional measures are required to minimise impact to fauna species; or
- if a legislative change or modification of best practice methods affects the currency of this document.

A compliance register will be developed to track how commitments are being achieved. This compliance register will include document tracking for all reporting required, along with how data and reporting is stored and disseminated.

6.2 Inductions and training

Informing all workers and visitors to the site of their responsibilities in contributing to the protection of the ecological values of the Project area is a key component to the effectiveness of this FMP and all associated and subsequent documents. Managers are responsible for ensuring that they understand and acknowledge the risks associated with their work activities, and the management and mitigation measures that are to be followed to avoid, minimise, and mitigate impacts as a part of their duty of care.

The activities and procedures should be incorporated into a larger package of Health, Safety, Security and Environment (HSSE) training to be administered by managers throughout the life of the Project.

At a minimum, the induction will cover the following aspects:

- Objectives of the FMP and associated environmental controls (including hygiene protocols).
- Briefing on EVNT fauna and associated habitats within the Project area.
- Individual's and organisation's environmental obligations.
- Restricted and 'no-go' areas.
- Procedures for responding to environmental incidents and emergencies.
- Responsibilities for environmental monitoring and reporting.

6.3 Incident management

An overarching incident management and reporting protocol will be defined as a part of the Projects CEMP and OEMP.



7.0 References

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Appendix F

Preliminary Bird and Bat Management Plan

Preliminary Bird and Bat Management Plan Chalumbin Wind Farm

Prepared for:

Chalumbin Wind Farm Pty Ltd

December 2021





Document Information

DOCUMENT	Preliminary Bird and Bat Management Plan
ATTEXO REF	EPU-004-BBMP
DATE	10-12-2021
PREPARED BY	Corey Callahan – Environmental Consultant
REVIEWED BY	Nikki O'Donnell – Principal Consultant – Biodiversity and Impact Assessment

Quality Information

REVISION	DATE	DETAILS	AUTHORISATION	
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1.0 Introduction

1.1 Background

Chalumbin Wind Farm Pty Ltd (CWF), a subsidiary of Epuron Projects Pty Ltd (Epuron), proposes to develop the Chalumbin Wind Farm Project (the Project) at a location approximately 15 km south-west of Ravenshoe in Far North Queensland within the Tablelands Regional Council Local Government Area (LGA), see **Figure 1.1**. The Project area encompasses the Glen Gordon and Wooroorra properties plus adjoining road reserves. The Project footprint to construct and operate the Project (i.e. maximum area of disturbance) is a much smaller area within these land parcels, with up to 94 wind turbines proposed. Turbine towers will be up to 160 m tall and turbine blades may be as long as 90 m.

1.2 Purpose and Scope

The purpose of this Preliminary Bird and Bat Management Plan (BBMP) is to ensure appropriate processes and methods are in place during the operational phase of the Project to manage potential impacts to bird and bat species and identify species of particular concern.

This BBMP has also been prepared to comply with Performance Outcome 5 (PO5) under State Code 23: Wind Farm Development. Specifically, the objectives of this BBMP are to:

- Assess potential impacts to bird and bat species associated with the operation of the Project, as identified in the Ecological Assessment Report (EAR);
- Implement a monitoring program to deduce the impact of the Project on “at-risk” birds and bats that can reasonably be attributed to the operation of the Project;
- Directly record and document impacts on birds and bats through a statistically robust program of carcass searches;
- Present an agreed decision-making framework that identifies impact triggers that require a management response;
- Identify potential mitigation measures and other strategies to reduce impacts on birds and bats; and
- Identify matters to be included in periodic reporting on the outcomes of the implementation of this BBMP.

This BBMP is a dynamic document that is intended to function as an adaptive management tool. Management measures within this BBMP can be amended to respond to the results of monitoring programs such that impacts are managed appropriately. Any monitoring, training, data interpretation, reporting and the design of management measures associated with this BBMP will be undertaken by a suitably qualified ecologist.

The content of this BBMP, including the risk assessment framework and the proposed management measures, is developed based on approved plans for similar wind farm projects in Queensland, New South Wales and Victoria.

1.3 Commonwealth Requirements

The Project is currently being assessed by the Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Recent wind farm approvals under the EPBC Act provide guidance on the likely requirements of DAWE in relation to the management of bird and bat impacts associated with wind farms.



Based on a review of approvals on similar projects it is understood that the BBMP should present the information detailed in **Table 1.1** in relation to the EPBC Act.

Table 1.1 Commonwealth Matters associated with this BBMP

	Expected condition	Reference within this report
a)	The BBMP environmental objectives, for relevant protected matter(s) and a reference to EPBC Act approval conditions to which the Plan refers.	<ul style="list-style-type: none"> • N/A – to be included when EPBC Act approval is granted.
b)	A table of commitments made in the Plan to achieve the objectives, and a reference to where the commitments are detailed in the Bird and Bat Management Plan.	<ul style="list-style-type: none"> • Table 1.1 (this table) - constitutes the completion of this objective.
c)	Reporting and review mechanisms, and documentation standards to demonstrate compliance with the Plan.	<ul style="list-style-type: none"> • Section 6.4 – provides reporting and review mechanisms
d)	An assessment of risks to achieving the Plan's environmental objectives and risk management strategies that will be applied.	<ul style="list-style-type: none"> • Section 8.0 – describes impact triggers and the decision-making framework for adapting mitigation measures to ensure achievement of the Plan's objectives.
e)	Impact avoidance, mitigation and/or repair measures, and their timing.	<ul style="list-style-type: none"> • Section 7.0 – describes mitigation and management measures to be implemented under the Plan. • Section 8.3 – describes the process for the implementation of supplementary mitigation measures. • Section 8.4 – details specific management activities, timing and performance criteria.
f)	A monitoring program, which must include: <ol style="list-style-type: none"> i. measurable performance indicators; ii. trigger values for corrective actions; iii. the timing and frequency of monitoring to detect changes in the performance indicators and timely detection of trigger values; iv. mortality monitoring; and v. proposed corrective actions if trigger values are reached. 	<ul style="list-style-type: none"> • Section 6.0 – describes monitoring activities to occur during operation of the Project. • Section 8.0 – describes impact triggers and the decision-making framework for adapting mitigation measures to ensure achievement of the Plan's objectives. • Section 8.3 – describes the process for the implementation of supplementary mitigation measures.



	Expected condition	Reference within this report
		<ul style="list-style-type: none"> • Section 8.4 – details specific management activities, timing and performance criteria.
g)	Provide any links to other plans or conditions of approval (including State/Territory approval conditions).	<ul style="list-style-type: none"> • Section 1.4 – describes other documents that should be reviewed in parallel with this BBMP.
h)	<p>Details of mitigation measures to minimise impacts on EPBC Act listed threatened bird and bat species including but not limited to:</p> <ol style="list-style-type: none"> measures to minimise impacts associated with lighting, such as preventing the attraction of EPBC Act listed threatened bird and bat species and prey species to locations with high risk of collision with turbines; measures to minimise the risk of turbine collision with EPBC Act listed threatened bird and bat species, such as, but not limited to, bird and insect deterrents and low wind speed curtailment. 	<ul style="list-style-type: none"> • Section 7.0 – describes mitigation measures addressing lighting and turbine collision risks. • Section 8.3 – describes the process for the implementation of supplementary mitigation measures.
i)	Details of how the effectiveness of mitigation measures will be monitored and reported as part of the annual compliance reporting	<ul style="list-style-type: none"> • Section 6.0 – describes monitoring activities to be undertaken during the operation of the Project. This includes carcass monitoring, activity monitoring and bird utilisation surveys. • Section 6.4 – describes monthly and annual reporting requirements.
j)	Procedures for dealing with any EPBC Act listed threatened bird and bat species that require relocation or are injured on the wind farm site;	<ul style="list-style-type: none"> • Section 7.3 – discusses the management of injured bats or birds associated with operation of the Project.
k)	A program of monitoring and reporting to determine the effectiveness of management measures and inform adaptive implementation of management measures to minimise the impacts to EPBC Act listed threatened bird and bat species.	<ul style="list-style-type: none"> • Section 8.0 – describes impact triggers and the decision-making framework for adapting mitigation measures to ensure achievement of the Plan’s objectives.
l)	A process and trigger levels (including justification) for determining if a significant impact has occurred to EPBC Act listed bird and bat species.	<ul style="list-style-type: none"> • Section 8.1 – describes the impact triggers and decision-making framework for threatened species, including MNES species. • Section 8.4 – describes specific management objectives, activities, timing and performance criteria for



Expected condition	Reference within this report
	threatened species, including MNES species.

1.4 State Requirements

Based on a review of other wind farm approval conditions applied by the Queensland Department of State Development, Infrastructure, Local Government and Planning (DSDILGP), it is understood that the BBMP should present the information detailed in **Table 1.2**.

Table 1.2 State Matters associated with this BBMP

Expected condition	Reference within this report
a) Identification of 'at risk' bird and bat groups (i.e. all threatened and common species), seasons, and areas within the project area which may attract high levels of mortality.	<ul style="list-style-type: none"> ● Section 4.0 – details species considered as a part of this Plan. ● Section 5.0 – presents the risk assessment for each of the species considered as a part of this Plan.
b) Incorporate baseline data, including additional pre-operational surveys.	<ul style="list-style-type: none"> ● Section 3.2 – describes pre-operational surveys undertaken to establish baseline data.
c) The identification of threshold (trigger) levels for species.	<ul style="list-style-type: none"> ● Section 8.1.1 – defines impact triggers for threatened species. ● Section 8.2.1 – defines impact triggers for non-threatened species. ● Section 8.4 – describes the performance criteria for species addressed by this Plan.
d) Identification of mitigation measures and implementation strategies in order to reduce impacts on bird and bat groups.	<ul style="list-style-type: none"> ● Section 7.0 – describes mitigation measures addressing lighting and turbine collision. ● Section 8.3 – describes the process for the implementation of supplementary mitigation measures.
e) Monitoring requirements.	<ul style="list-style-type: none"> ● Section 6.0 – describes monitoring activities to be undertaken during operational activities.
f) A decision-making framework, including the trigger for operational shut-down.	<ul style="list-style-type: none"> ● Section 8.0 – describes the decision-making framework, including triggers for operational shut-down.



1.5 Project Description

1.5.1 Project Components

The Project is proposed to consist of up to 94 wind turbines, linking access tracks and associated infrastructure including a new Powerlink connection substation and wind farm collector substations, permanent meteorological monitoring masts (met masts), medium and high-voltage underground and overhead powerlines, temporary construction compound and stockpile areas, and temporary and permanent site offices for asset management and operation and maintenance facilities. Each turbine tower will be up to 160 m tall and turbine blades may be as long as 90 m; with a maximum tip height of 250 m above ground level. A full Project description is provided in the Planning Report for the Project, to support the Development Application.

1.5.2 Project Stages

The Project has three stages, and activities associated with each stage are summarised in the following sections.

1.5.2.1 Construction

Construction is expected to commence in early 2023, subject to approvals and commercial considerations. The construction phase is expected to last for a period of approximately 24-30 months, with approximately 250 to 350 staff employed during the peak construction period.

1.5.2.2 Operations

The operational life of the wind farm is expected to be 30 years. Approximately 15 to 30 full-time jobs will be generated during operation, typically 10 to 20 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.

1.5.2.3 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, most above-ground infrastructure apart from roads (which are left to benefit the landholders) will be removed (e.g., all turbines, transmission lines, etc). The land will then be rehabilitated in line with development permit conditions and specific landowner agreements. Some infrastructure may remain in-situ depending on landowner preferences.