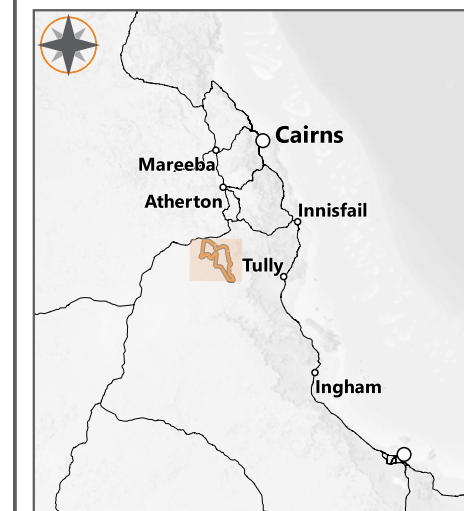


Chalumbin Wind Farm Project Layout

Figure 3.5

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

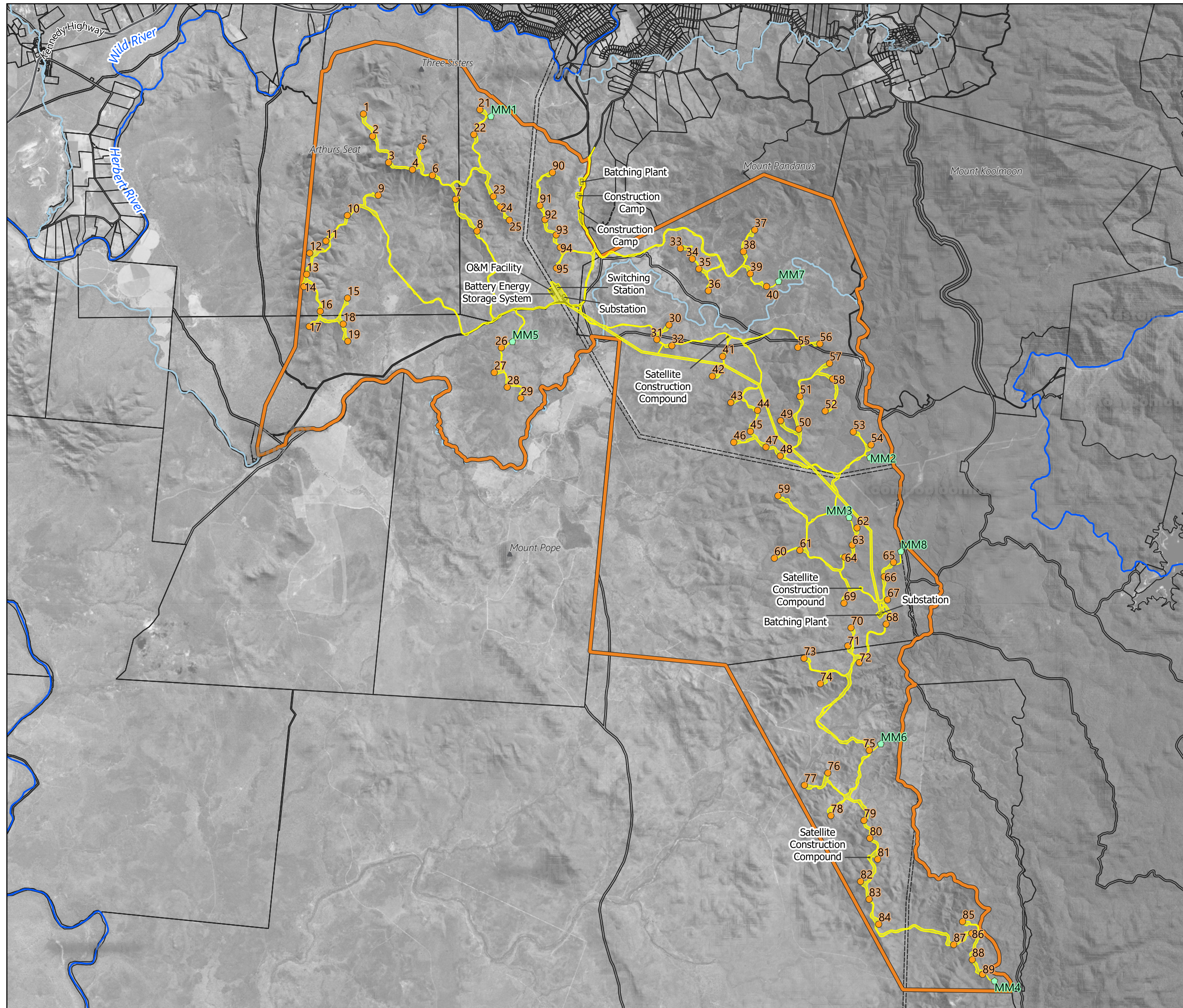
Date: 2021-12-10
 Author: TOD
 Reviewed: CC
 Project: EPU-004



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





3.3 Project Stages

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

3.3.1 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.

3.3.2 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.

3.3.3 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.



4.0 Methodology

4.1 Desktop Assessment

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

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

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

4.2 Field Assessment

4.2.1 Survey Teams, Timing and Conditions

A summary of the surveys undertaken to date, including the timing of the surveys and the team members involved, is presented in **Table 4-1**.

Table 4-1 Summary of Survey Timing and Teams

Survey	Timing	Survey Team	Years of Experience
Protected plants survey at proposed meteorological monitoring mast location	23 September 2020	Dr Paul Williams	> 25 years



Survey	Timing	Survey Team	Years of Experience
Spring vegetation surveys	20-29 October 2020	Dr Paul Williams	> 25 years
		Darren Maxwell	> 25 years
		Nicholas Heard	8 years
		Corey Callahan	8 years
Fauna reconnaissance survey	20-21 October 2020	Terry Reis	> 25 years
		Nikki O'Donnell	> 20 years
Wet season fauna surveys	19-31 January 2021	Terry Reis	> 25 years
		Dr Bruce Thomson	> 30 years
		Ben Nottidge	> 15 years
		Rhys Sharry	3 years
		Janelle VanderBeek	3 years
		Alex Wright	1 years
Additional protected plants surveys in new areas of Project footprint	16-19 March 2021	Dr Paul Williams	> 25 years
		Selina Carruthers	1 year
Supplemental wet season fauna surveys	23-31 March 2021	Ben Nottidge	> 15 years
		Nikki O'Donnell	> 20 years
		Rhys Sharry	3 years
Protected plants surveys at additional two meteorological monitoring masts	30 March 2021	Darren Maxwell	> 25 years
Dry season fauna surveys	19-28 June 2021	Dr Bruce Thomson	> 30 years
		Ben Nottidge	> 15 years
		Janelle VanderBeek	3 years
		Wise Lum	3 years
Dry season bird utilisation surveys	19-28 June 2021	Mervyn Mason	> 25 years
		Rhys Sharry	3 years
Protected plants surveys at additional sites within the Project footprint	23 June 2021	Ben Nottidge	> 15 years
Additional (spring) bird utilisation surveys and red goshawk surveys	5-17 October 2021	Mervyn Mason	> 25 years



Survey	Timing	Survey Team	Years of Experience
		Janelle VanderBeek	3 years

Weather conditions leading up to and during these surveys are summarised in **Table 4-2**. Rainfall was measured at the Ravenshoe Alert gauge (weather station 31200) approximately 10 km from the Project area while temperature was measured at the Walkamin Research Station (weather station 31108) approximately 70 km from the Project area.

The Project area received significant rainfall in the weeks immediately prior to the start of the wet season fauna surveys, associated with Tropical Cyclone Imogen. Heavy rainfall also occurred leading up to the supplemental wet season fauna surveys in March 2021, with the result that both survey events can be considered as indicative of wet season conditions. Rainfall in the two months prior to the dry season surveys was lower than the 1968-2021 average and can therefore be considered as indicative of dry season conditions.



Table 4-2 Weather Conditions Indicative of the Project Area Prior to the Surveys (BOM, 2021)

	Sep 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	June 2021	July 2021	August 2021	September 2021	October 2021
Rainfall (mm)	35 (22.1)	19 (46.6)	22 (52.8)	75 (138.4)	43 ² (243)	293 (287)	143 (272.4)	183 (124.8)	54 (64.8)	35 (58)	32 (45.2)	26 (27.3)	44 (23.1)	41 (46.3)
Mean minimum temperature (°C)	16 (14.8)	16.7 (16.7)	18.2 (18.5)	20.5 (19.8)	20.7 (20.3)	20.6 (20.5)	19.5 (19.6)	18.8 (18.1)	16.1 (16.2)	15.4 (14)	15.2 (13.1)	15.3 (13.3)	15.5 (14.8)	* (16.7)
Mean maximum temperature (°C)	26.6 (27.2)	29.6 (29.3)	31.2 (30.6)	31.6 (30.8)	28.9 (30)	29.2 (29.3)	29 (28.2)	27 (26.7)	25.1 (25.1)	25.2 (23.7)	26.1 (23.4)	25.1 (24.7)	26 (27.2)	* (29.3)

* temperature data for October 2021 was not yet available from the Bureau of Meteorology at the time of writing.

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

² The volume of rainfall recorded at Ravenshoe Alert station for January 2021 appears to have been incorrectly recorded as it would not suggest the cyclonic conditions experienced on site, nor is it comparable with rainfall data recorded over the same period at nearby weather stations: Innot Hot Springs to the west (363.4mm), Woodleigh Station to the west (381.6 mm), Greenhaven to the northeast (653.8 mm) and Sutties Creek to the east (653 mm)



4.2.2 Flora Surveys











4.2.2.1 Vegetation Community Surveys

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

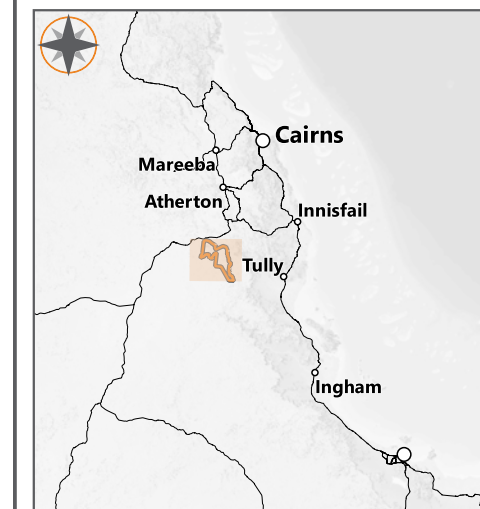
Flora surveys were undertaken throughout the Project area, as mapped in **Figure 4-1**.

Chalumbin Wind Farm Flora survey sites

Figure 4.1

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

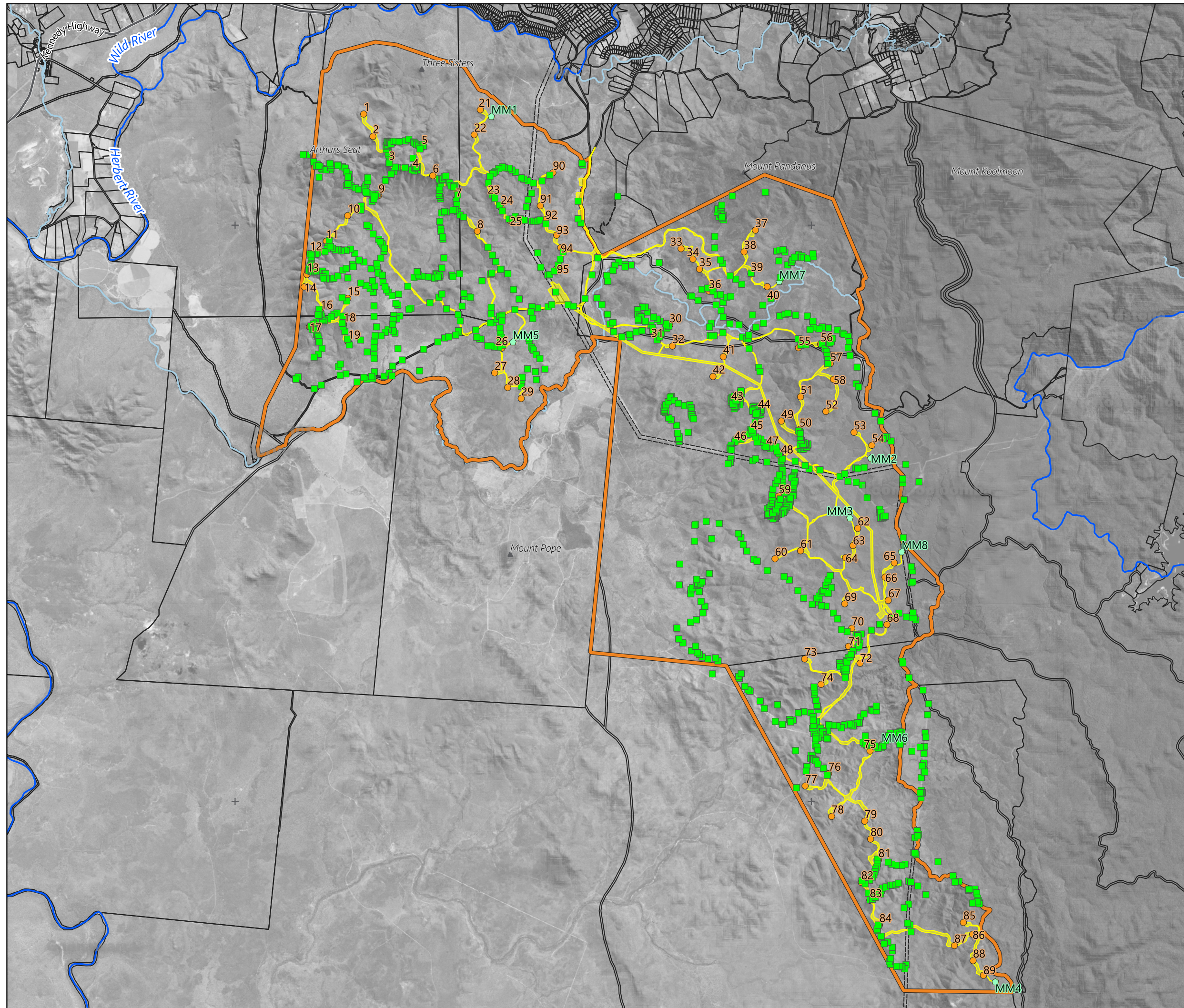
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Data Source(s):
 Digital Cadastral Database - Department of Natural Resources,
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 Queensland Imagery Whole Of State
 Satellite Public Basemap Service





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

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

Surveys also included an assessment of the diagnostic characteristics for TECs where these were highlighted in the desktop assessment as potentially occurring. Subsequent to the field surveys, vegetation mapping was undertaken based on the results of the vegetation surveys and interpretation of high-resolution orthophotos. Vegetation mapping was undertaken by Dave Stanton, who has published vegetation mapping of the Wet Tropics World Heritage Area on behalf of the Australian Government which formed the core of the Queensland Herbarium's regional ecosystem mapping for the Wet Tropic Bioregion and contiguous areas of the Einasleigh Uplands; and Dr Paul Williams, who has extensive experience undertaking vegetation surveys and research focusing on northern QLD including regional ecosystem mapping and biocondition surveys for the Australian Government, Bush Heritage and numerous private proponents in the Wet Tropics bioregion.

4.2.2.2 Protected Plants Surveys

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

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

September 2020

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

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



March 2021

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

June 2021












Protected plants surveys were undertaken at one additional location in June 2021 in accordance with the Flora Survey Guidelines – Protected Plants (DES, 2020), as shown in **Figure 4-2**.

4.2.2.3 Flora Survey Limitations

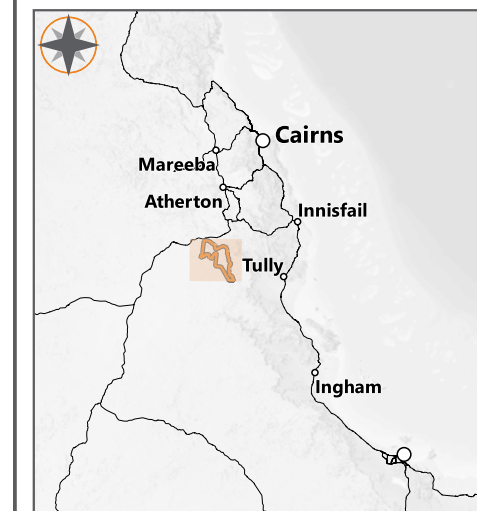
Rainfall in the two months leading into the spring vegetation community survey was below average for the time of year, potentially resulting in reduced biomass of non-woody species and limited reproductive material to facilitate the identification of grasses and other understorey plants. However, these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

Chalumbin Wind Farm Protected Plants surveys

Figure 4.2

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

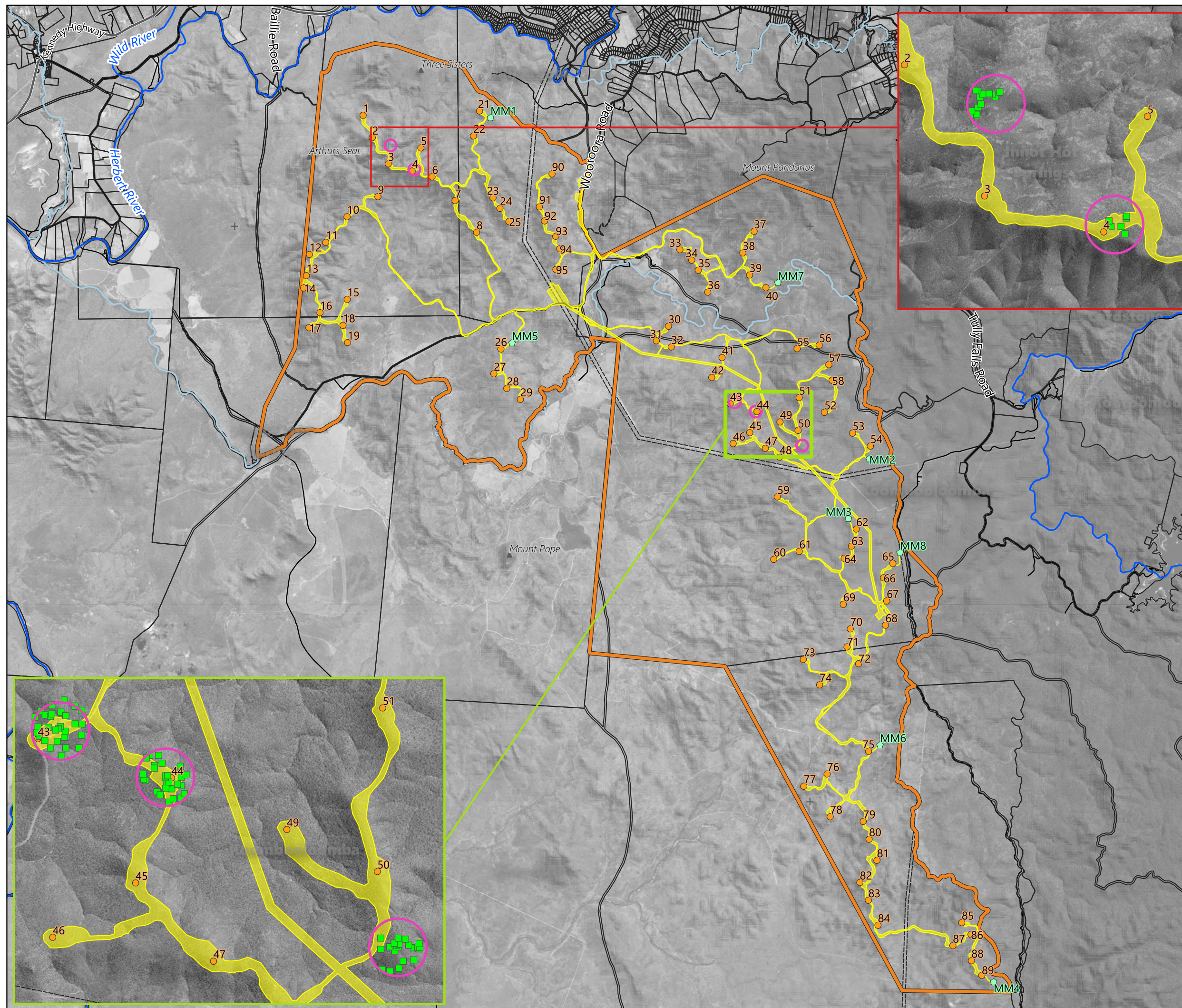
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 Reviewed: CC
 Project: EPU-004



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





4.2.3 Fauna Surveys

4.2.3.1 Overview

Wet season fauna surveys were undertaken by three teams of two people between 18 January and 1 February 2021, whilst dry season fauna surveys were undertaken between 19 and 28 June 2021. These survey periods are 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).

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, 2010c), the optimum timing for surveying for a number of the target threatened frog species (such as *Litoria nannotis* and *Pseudophryne covacevichae*) is during periods of peak activity from September to March, after but not during heavy rainfall.

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










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

4.2.3.2 Fauna Survey Methods

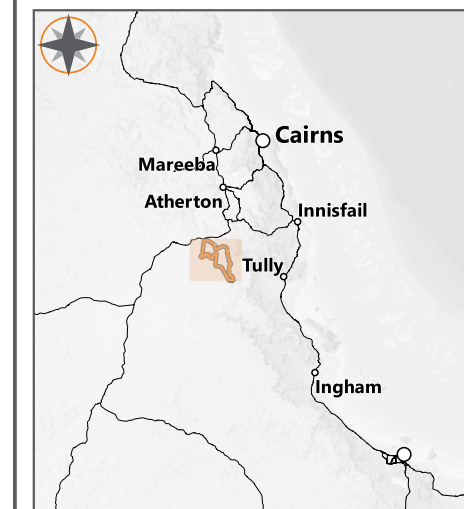
Fauna surveys comprised a combination of habitat assessments and targeted survey techniques as described in the following sections. Fauna surveys were undertaken at various sites across the Project area as shown in **Figure 4-3**. Much of the survey effort was focused on proposed access roads and turbine locations as these disturbance areas represent the highest risk for direct impacts on threatened fauna species. Preferred habitat for potentially occurring MSES fauna was also targeted. Survey sites are shown in **Figure 4-3** and a summary of survey effort for MSES species known or considered likely to occur is provided in **Table 4-3**. Opportunistic records of all fauna species were taken during all survey types, including during travel to and between survey sites.

Chalumbin Wind Farm Fauna survey sites

Figure 4.3

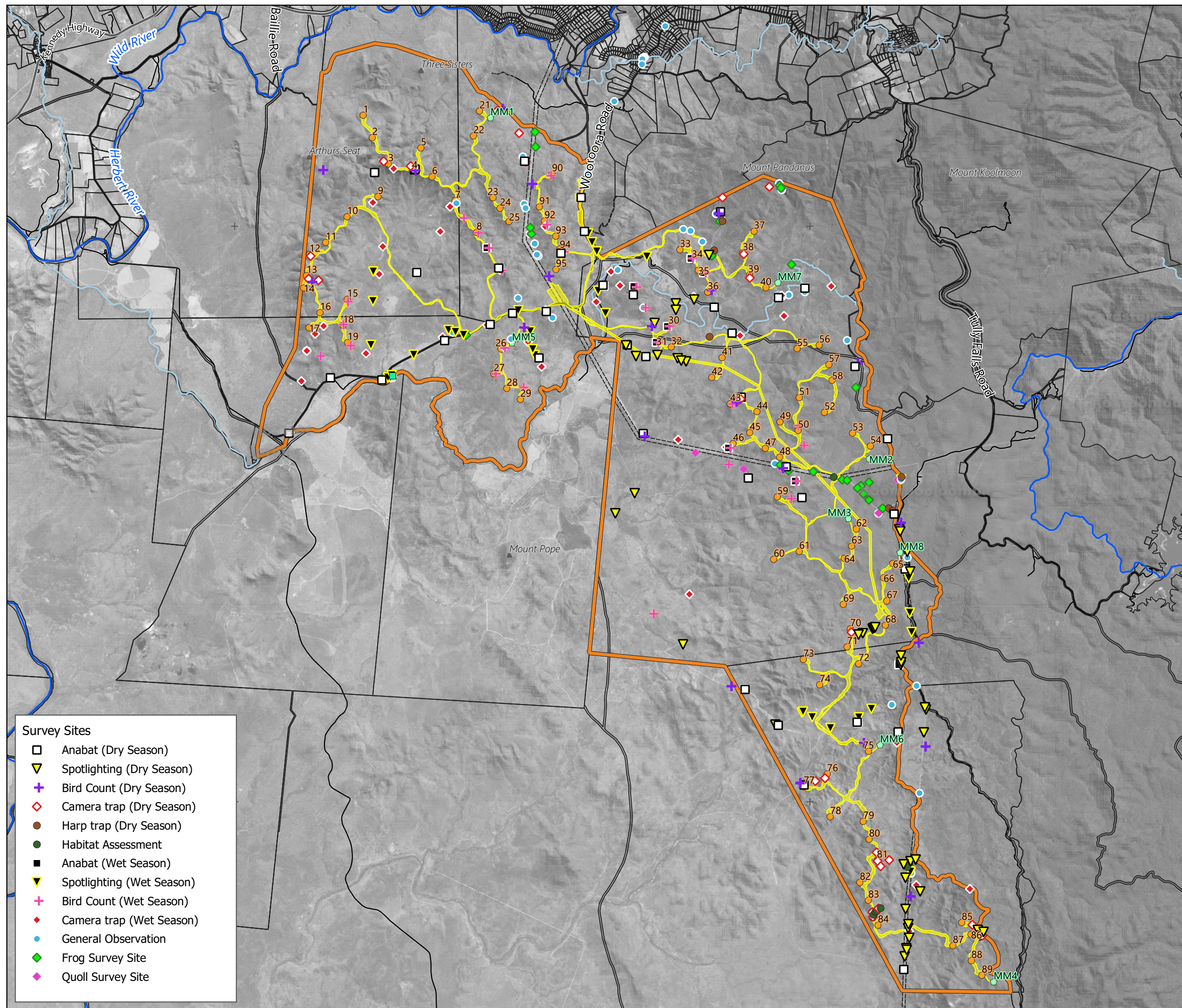
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-  Wind Turbine
-  Met-mast
-  Project Footprint
-  Major Road
-  River
-  Creek
-  Lot Type Parcel
-  Easement

Date: 2021-12-10
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Data Source(s):
 Digital Cadastral Database - Department of Natural Resources,
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- ### Survey Sites
-  Anabat (Dry Season)
 -  Spotlighting (Dry Season)
 -  Bird Count (Dry Season)
 -  Camera trap (Dry Season)
 -  Harp trap (Dry Season)
 -  Habitat Assessment
 -  Anabat (Wet Season)
 -  Spotlighting (Wet Season)
 -  Bird Count (Wet Season)
 -  Camera trap (Wet Season)
 -  General Observation
 -  Frog Survey Site
 -  Quoll Survey Site

Habitat Assessments

At each of the fauna survey sites, habitat assessments were undertaken to document the value of habitats for birds, reptiles, mammals and amphibians based on the presence of key resources and microhabitats, such as hollows, caves and rocky outcrops, leaf litter, water, etc. Key habitat features considered important for threatened species were recorded at each site.

Camera Trapping

Remote surveillance camera traps were installed at 40 sites across the Project area in January 2021, targeting areas of rocky outcrop, waterbodies, riparian corridors, natural openings and pathways through forest, and areas of fallen logs. Camera traps were baited using chicken and were situated in such a way as to minimise false triggers as much as possible, such as vegetation that moves in the breeze. Habitat assessments were undertaken at camera trap sites, to ensure that the cameras targeting each species were deployed in appropriate locations. Thirty-one of the cameras were retrieved at the end of March 2021, and the photographs were analysed by a suitably qualified ecologist. The remaining nine cameras were not able to be retrieved at that time due to storm damage on the access road leading to the south of the Woorooro property; these cameras were instead retrieved as part of the dry season fauna surveys that were undertaken in June 2021. Fifteen of the cameras retrieved in March 2021 were immediately redeployed into previously inaccessible habitat to specifically target potential quoll shelter habitat (potential foraging and dispersal habitat were partially covered in the January deployment); data from these cameras was downloaded in June 2021. All cameras were re-set in June 2021 and were retrieved for analysis in November 2021. The cameras collectively recorded 5,490 trap nights and over 102,450 images.

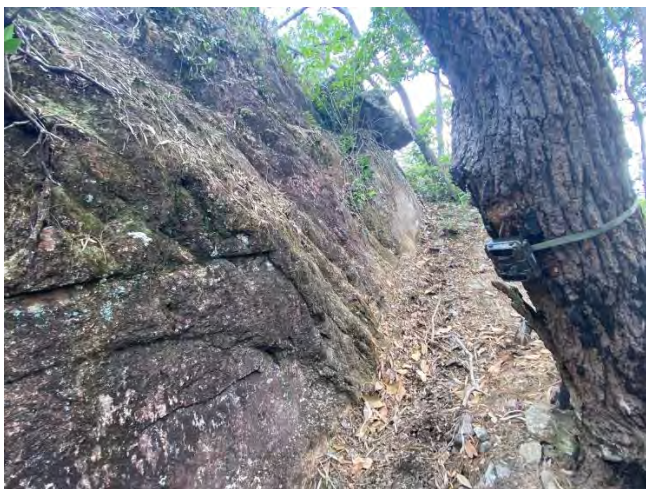


Plate 4-1 Camera traps

Passive Acoustic Detection

Microbats rely on echolocation for orientation and foraging, and though the calls of almost all species are outside the range of human hearing, they can be detected by a bat detector. Anabat Swift detectors were installed along potential flyways (e.g. along an animal track or adjacent to a waterway) and set to record bat calls between dusk and dawn each night. During the wet season, six Anabats were deployed at five locations each, and for two consecutive nights at each location. During the dry season, six Anabats were deployed at three locations each, for two consecutive nights at each location. In total, 96 survey nights at 48 locations were achieved using the Anabats. The resulting library of recorded calls was then processed by an experienced technician and identified to species level where possible.



Plate 4-2 Anabats

Harp Traps

During the dry season surveys, harp traps were set at seven locations in flyways, at water sources (e.g. dams and creeks) and in forest openings. Traps were deployed for three nights at each of the survey locations.



Plate 4-3 Harp Trap on a creek

Spotlighting

Spotlighting and assessment of hollow-bearing trees for occupation by nocturnal mammals and owls was undertaken across the Project area. The surveys targeted masked owl, koala, greater glider and yellow-bellied glider. Spotlighting



involved walking or slowly driving through areas of potential habitat (i.e. native woodland or forest) with powerful spotlights and shining them into the canopy to try and identify eye-shine of active avian, mammal or reptile species. The spotlights were also periodically shone onto the ground to identify reptiles or amphibians that may be foraging on the ground surface. Six nights of spotlighting and active searching were carried out by a three-person team in January 2021, focusing on riparian areas where the vegetation is taller, more mature and more likely to support large hollows. An additional 40 person-hours of spotlighting were undertaken in March 2021, including some ridgelines in the north of the Project area. Remaining ridgelines were targeted during an additional 35 person-hours of spotlighting undertaken in June 2021.

Nocturnal Active Searches

Nocturnal active searches and call playback were undertaken on several watercourses within the Project area for frogs, including the EPBC Act listed magnificent brood frog and Australian lace-lid. A two-person team surveyed 24 locations in three broadly suitable areas over four nights after a decent rainfall event in March 2021.

Diurnal Bird Counts

During the wet season, diurnal bird counts were undertaken at 28 fixed point, 2 ha area sites across the Project area, focusing primarily on ridgelines. Two ecologists recorded all birds seen and heard over a 20-minute period, repeated at each location in the morning and afternoon to maximise detectability of all species present. Birds were identified by call and sight, using binoculars to aid identification and a rangefinder to estimate the flight height to the nearest 10-20 m. Over the duration of the 12-day survey period, bird counts were undertaken for 37 person hours.

Bird Utilisation Surveys

During the dry season (19-28 June 2021), bird utilisation surveys (BUS) following a Before-After-Control-Impact (BACI) design were undertaken as per the requirements of State Code 23. BUS were undertaken at 21 locations across the Project area, comprising 17 impact sites and four control sites as shown on **Figure 4-4**.

Survey sites were distributed as evenly as possible across the Project area to maximise coverage of potential wind turbine locations. Given the large extent of the Project area and the ruggedness of the terrain, vantage-point surveys (VPS) were preferred over standard point count surveys as they maximise the observer's field of view across the Project area. The sites for each VPS were located at the highest point in the landscape, with a viewshed radius of up to 1 km, depending on visibility. Control sites were located at least 1.5 km from proposed turbine locations, outside the wind farm development footprint and in areas of similar habitat.

A spotting scope with a variable, 25x to 50x magnification was used to maximise bird detection and identification, and the survey effort was a 20-minute period at each location, repeated twice (once in the morning up to 10am and once in the afternoon after 3pm). This resulted in a total survey effort of 1,680 minutes or 28 person-hours.

Bird activity was stratified into height bands to accommodate the potential Rotor Swept Area (RSA) for the turbines, which has conservatively been identified as between 40 m and 265 m. Bands were defined as:

- below the RSA: 0 m to 40 m;
- within the likely RSA: 40 m to 265 m; and
- above the RSA: > 265 m.

At each point the following information was recorded:

- survey site number;
- date;














-
- start and end time of the observation period;
 - species or best possible identification;
 - number of individuals recorded;
 - distance from plot centre when first observed;
 - closest distance;
 - height above ground (per the bands defined above);
 - activity, that is aerial pursuit of prey, aerial searching, ground pursuit, scavenging, canopy searching and feeding, ground searching and feeding, water searching and feeding, ambush predation, chasing prey from a perched location, shrub searching and feeding;
 - habitat; and
 - flight path.

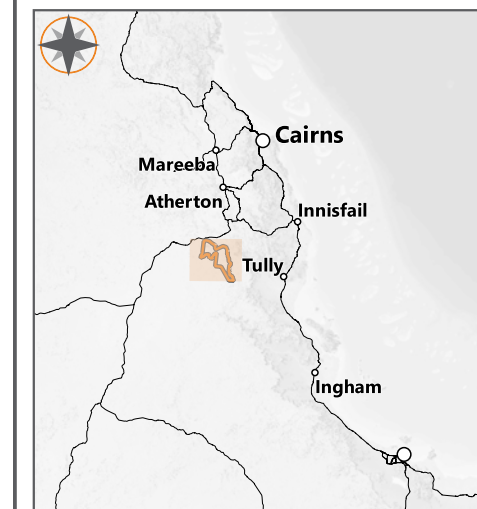
The BUS were repeated between 5 and 17 October, following the approach above, adding a further bird survey effort of 28 person-hours.

Chalumbin Wind Farm Bird Utilisation Surveys

Figure 4.4

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

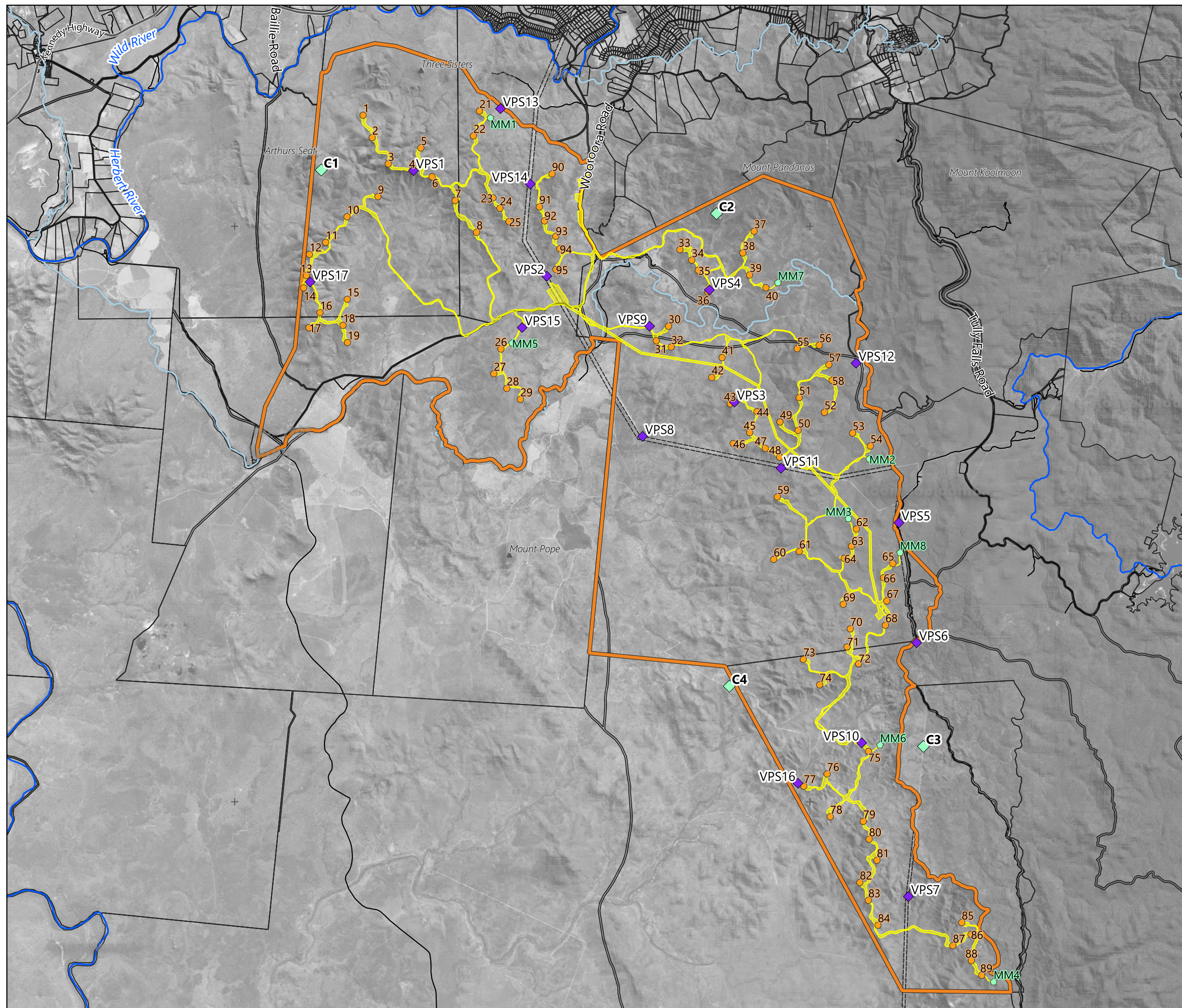
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Data Source(s):
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 Satellite Public Basemap Service





Surveys of Potential Red Goshawk Nesting Habitat

A nest considered possibly belonging to red goshawk was observed in the Project area in January 2021, in riparian vegetation. The nest was unoccupied (as would be expected in late January) but appeared to have been recently built (no older than the 2019-20 breeding season). Photographs of the nest were sent to four recognised red goshawk experts; one (a QPWS ranger) confirmed the nest as likely belonging to the red goshawk while two others considered it was 'possibly' belonging to the red goshawk (the fourth did not respond). There are a small number of alternative raptor species that the nest could belong to. It was therefore considered necessary to actively survey appropriate areas of potential habitat during the nesting season. In northern Australia red goshawks lay eggs from July to September, and fledge young from October to December (DEWHA 2010b). The chicks are dependent on the adults until they leave the natal territory by the end of December. Surveys undertaken in October are therefore appropriate to identify nesting pairs that are actively tending to chicks.

The *Survey guidelines for Australia's threatened birds* (DEWHA 2010b) indicate that red goshawks are very secretive birds and generally silent; their presence is most likely to be detected by the location of nests. Therefore, the survey guidelines recommend that searches for their characteristic nests are undertaken within patches of the tallest forest which requires ground searches along river banks. Driving slowly through woodland tracks and scanning groups of tall trees for nests can also be effective. Soaring birds can also sometimes be located from vantage points such as mountain tops. The recommended survey effort guide is 50 hours over 8 days for a 50 ha area.

The survey team spent a total of 263 person hours over 13 days surveying the Project area for red goshawk. Of this, 83 person hours were spent undertaking dedicated searches for red goshawk nests across the 165 ha area mapped as potential nesting habitat, as described above. Transects were a mixture of driven and walked. An additional 180 person hours were spent undertaking bird utilisation surveys (as described above) which would include any soaring red goshawks, if present.

Incidental observations

Ecologists recorded any secondary signs encountered at each site during the survey period, or while walking between sites in the Project area. Secondary signs can lead to the positive identification of mammals, reptiles and birds. Animals often reveal their presence through tracks left in soft substrate. Similarly, arboreal animals may leave distinctive scratches on tree trunks as they climb. Some glider species leave feeding marks on tree trunks, with those of the yellow-bellied glider being particularly distinctive. Scats of many mammals can be identified, for example northern quolls use distinctive latrines and the faecal pellets of koalas at the base of trees may be an indication of their presence. Finally, hair, feathers bones or nests can often be identified to species level.

Table 4-3 Summary of Threatened Fauna Species Survey Effort

Species	Survey Method	Survey Effort
Greater glider Yellow-bellied glider	Spotlighting (DSE 2011) Searches for secondary signs	28 person hours of spotlighting in January 2021 An additional 40 person hours of spotlighting in March 2021 An additional 35 person hours of spotlighting in June 2021 Total of 103 person hours of spotlighting
Koala	Spotlighting (DSEWPC 2011a, Eyre et al 2018, DoE 2014a)	Total of 103 person hours of spotlighting



Species	Survey Method	Survey Effort
	Searches for secondary signs	
Northern quoll Spotted-tailed quoll Black-footed tree-rat Northern bettong	Camera trapping (DSEWPC 2011a, Eyre et al 2018, DoE 2016) Searches for secondary signs	5,490 trap nights at 55 sites across the Project area
Southern cassowary	Camera trapping (DEWHA 2010d, DEWHA 2010b, Eyre et al 2018) Searches for animals and secondary signs	5,490 trap nights at 55 sites across the Project area
Red goshawk	Diurnal bird counts (DEWHA 2010b, Eyre et al 2018) Searches for nests within appropriate habitat	93 person hours at 49 sites across the Project area for birds in flight 83 person hours actively searching for nests within appropriate habitat
Masked owl	Nocturnal searches & call playback (DEWHA 2010b, Eyre et al 2018)	103 person hours of nocturnal searches & call playback
Australian painted snipe White-throated needletail	Diurnal bird counts (DEWHA 2010b, Eyre et al 2018, DoE 2015a)	93 person hours at 49 sites across the Project area
Ghost bat Semon's leaf-nosed bat Large-eared horseshoe bat Bare-rumped sheath-tailed bat Tube-nosed insectivorous bat	Anabats (DSEWPC 2011, DEWHA 2010a, Eyre et al 2018)	96 detector nights at 48 sites across the Project area 21 nights of harp trapping at 7 locations across the Project area
Spectacled flying-fox	Flora surveys to identify food trees (DEWHA 2010a, Eyre et al 2018) Searches for camps	440 person hours across the Project area
Magnificent brood frog Australian lace-lid Mountain mistfrog Waterfall frog Common mistfrog	Nocturnal searches & call playback (DEWHA 2010c, Eyre et al 2018)	40 person hours at 24 sites in 3 broad locations within the Project area

4.2.3.3 Fauna Survey Limitations

Wet season surveys were planned for late January 2021 in accordance with the Queensland Terrestrial Vertebrate Fauna Survey Guidelines (Eyre et al 2018). This year's wet season brought a number of cyclones / tropical storms to the region. Although there was little rainfall during the field surveys, there was considerable rainfall leading up to the surveys and conditions across the Project area were very wet. Flooding across the low-lying parts of the site cut off access to many of the ridgelines, limiting the amount of survey work that could be undertaken in close proximity to proposed turbine sites. In response to this, some additional survey work was undertaken in March 2021 at the end of



the wet season, specifically targeting potential habitat for northern and spotted-tailed quoll, magnificent brood frog and a number of rainforest stream frogs in areas that had not been accessible earlier in the season.

Night-time survey work was targeted towards vegetated areas that were safely accessible. Due to the terrain and the target species, most of the spotlighting surveys were undertaken from a vehicle on existing access tracks that were considered safe to drive at night.

4.3 Likelihood of Occurrence Assessment

An assessment was undertaken to assess the likelihood of occurrence within the Project area of conservation significant species (i.e. listed under the EPBC Act and/or the NC Act) that were predicted to occur as part of the desktop assessment. The likelihood of occurrence assessment was based on a review of species' distributions and habitat requirements, historical records for the broader region, and the results of the Project habitat assessments and field surveys.

Definitions used for the likelihood of occurrence applied included:

- **Known** – the species or ecological community has been recently recorded in the Project area (within last 10 years).
- **Likely** – Project area is within the species' or ecological community's known range and suitable habitat occurs in the Project area; REs associated with a threatened ecological community are present in the Project area.
- **Potential** – suitable habitat for a species or community occurs in the broader study area (comprising the Project area plus a 10 km buffer) but only marginal habitat is present in the Project area and/or the species has not been recorded in the desktop assessment. This includes cryptic, vagrant or transient species that have a reduced likelihood of occurrence but cannot be definitively discounted.
- **Unlikely** – a low to very low probability that a species or community occurs in the broader study area due to the lack of suitable habitat and/or the Project area is outside of the species' or community's known range.

4.4 Threatened Species Habitat Mapping

Light Imaging Detection And Ranging (LiDAR) data was acquired for the Project area in March 2021 to assist with the civil design of Project infrastructure and the assessment of environmental constraints. This data was processed to create a Digital Elevation Model (DEM) and Digital Surface Model (DSM) for the Project area. The former is derived from 'ground-returns' representing the true height of the ground surface. The latter is derived from 'non-ground returns' reflected off trees and built structures and represents the height of the highest feature of the landscape. The difference of these two layers (DSM - DEM) was used to derive the height of vegetation present in the Project area.

The derived tree height layer was interrogated to estimate the abundance and distribution of large trees (>20 m) within Eucalyptus dominated communities, which may provide suitable nesting habitat for the greater glider. Where the canopy was closed with all vegetation greater than 20 m, the entire area was considered potentially suitable for the greater glider. The results were collated as a heat-map which was then used to stratify the survey design of the dry season surveys planned for mid-June 2021 to cover as much of the potential habitat as possible. Similarly, large trees (> 20 m) within 100 m of permanent water were identified as potential red goshawk nesting trees and were the focus of the red goshawk nest surveys in October 2021.

In addition, the DEM was processed using a 'roughness' algorithm, to highlight areas where the ground surface is highly dissected such as on rocky outcrops. These areas were identified as potentially supporting caves and rock fissures suitable for bat roosting habitat, and incorporated into the dry season survey design for bats.



Following the desktop assessments, field surveys and LiDAR analysis, habitat constraints mapping was prepared for those MSES known or considered likely to occur within the Project area. Best available information relating to a species' habitat requirements such as distance to permanent water or altitude limits, from sources such as SPRAT profiles, Recovery Plans, Conservation Advice statements and stakeholder engagement (e.g. with researchers and members of relevant Working Groups), was used alongside vegetation community mapping to conservatively model potential habitats. The resulting threatened species habitat mapping formed the basis for the subsequent quantification of direct impacts to these species.

4.5 Assessment of Potential Impacts

Significant residual impact assessments were undertaken for MSES using the SRI Guideline (DSDIP 2014) applying State Code 16. This includes the following matters:

- Endangered or Of Concern REs;
- Remnant vegetation with the defined distance of a watercourse;
- REs that intersect with a wetland;
- Connectivity; and
- Essential habitat.

Project-related impacts are discussed in broad terms in **Section 9.0**, with full significant impact assessments for each relevant MSES results using the SRI Guideline (DSDIP 2014) provided in **Section 11.0**.



5.0 Desktop Assessment Results

5.1 World Heritage Sites and National Heritage Properties

The Wet Tropics of Queensland World Heritage Area (WTWHA) stretches along the north-east coast of Australia for approximately 450 km and encompasses 894,420 ha of mostly tropical rainforest. The region is considered to represent the most intact record of the ecological and evolutionary processes that shaped the flora and fauna of Australia, containing the relicts of the great Gondwanan forest that covered Australia and part of Antarctica 50 to 100 million years ago. All of Australia's unique marsupials and many other Australian animals originated in rainforest ecosystems, and their closest surviving relatives occur in the Wet Tropics (IUCN 1988).

The Wet Tropics of Queensland was inscribed as a natural World Heritage Area in 1988. **Table 5-1** lists the relevant criteria and outstanding universal values for which the property was inscribed. At the time of its inscription the property was identified as being an essentially intact ecosystem with low levels of human impact, especially when compared to other tropical forest regions (UNESCO 2021). There has been a comprehensive management scheme in place for the property since 1990, jointly funded and coordinated by the Australian and Queensland Governments.

Table 5-1 Criteria and Outstanding Universal Value of the Wet Tropics of Queensland World Heritage Area

Criterion	Outstanding Universal Value of the Wet Tropics WHA (UNESCO 2021)
(vii) to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance	The Wet Tropics exhibit exceptional natural beauty, with superlative scenic features highlighted by extensive sweeping forest vistas, wild rivers, waterfalls, rugged gorges and coastal scenery. This is particularly apparent between the Daintree River and Cedar Bay, where exceptional coastal scenery combines tropical rainforest and white sandy beaches with fringing offshore coral reefs. The winding channels of the Hinchinbrook Channel contain the most extensive mangroves in the region, providing a rich visual mosaic of rainforest and mangroves, and a terrestrial continuum with the Great Barrier Reef.
(viii) to be outstanding examples representing major stages of earth's history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features	The Wet Tropics contains one of the most complete and diverse living records of the major stages in the evolution of land plants, from the very first pteridophytes more than 200 million years ago to the evolution of seed-producing plants including the cone-bearing cycads and southern conifers (gymnosperms), followed by the flowering plants (angiosperms). As the Wet Tropics in the largest part of the entire Australasian region where rainforests have persisted continuously since Gondwanan times, its living flora, with the highest concentration of primitive, archaic and relict taxa known, is the closest modern-day counterpart for Gondwanan forests. In addition, all of Australia's unique marsupials and most of its other animals originated in rainforest ecosystems, and the Wet Tropics still contains many of the closest surviving members. This makes it one of the most important living records of the history of marsupials as well as of songbirds.
(ix) to be outstanding examples representing significant ongoing ecological and biological processes in	The Wet Tropics provides outstanding examples of significant ongoing ecological processes and biological evolution. As a centre of endemism for the region (second only to New Caledonia in the number of endemic



Criterion	Outstanding Universal Value of the Wet Tropics WHA (UNESCO 2021)
the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals	<p>genera per unit area), the Wet Tropics provides fundamental insights into evolutionary patterns both in isolation from and in interaction with other rainforests. Its tall, open forests on the drier western margins of the rainforest are also significant as part of an evolutionary continuum of rainforest and sclerophyll forests. Eucalypts, that now dominate the Australian landscape, are considered to have evolved from such rainforest stock and radiated into drier environments from the margins of closed forests.</p> <p>The area supports an exceptionally high level of diversity of both flora and fauna, with over 3,000 vascular plant species in 224 families, of which 576 species and 44 genera are endemic, including two endemic plant families. Vertebrate diversity and endemism are also very high, with 107 mammal species including 11 endemic species and two monotypic endemic genera. In terms of avifauna, there are 368 bird species, of which 11 species are endemic. For reptiles, there are 113 species of which 24 species are endemic, including three monotypic endemic genera. The diversity of amphibians includes 51 species of which 22 are endemic.</p>
(x) to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation	<p>The Wet Tropics holds a largely intact flora and fauna with hundreds of endemic species restricted to the property, of which many are classified as threatened. The majority of plant species have restricted distributions, and many monotypic plant genera and several species of marsupials, frogs and reptiles have very restricted distributions either as isolated or disjunct populations, reflecting the refugial nature of the rainforests found in several locations. The diversity of the plant communities and animal habitats of the Wet Tropics is recognised as being the most floristically and structurally diverse in Australia and is also outstanding on a global scale. Among the many emblematic species occurring in the property is the flightless Australian cassowary, one of the largest birds in the world.</p> <p>In an Australian context, the Wet Tropics covers less than 0.2% of Australia, but contains 30% of the marsupial species, 60% of bat species, 25% of rodent species, 40% of bird species, 30% of frog species, 20% of reptile species, 60% of butterfly species, 65% of fern species, 21% of cycad species, 37% of conifer species, 30% of orchid species and 18% of Australia's vascular plant species. It is therefore of great scientific interest and of fundamental importance to conservation.</p> <p>Although the Wet Tropics is predominantly wet tropical rainforest, it is fringed and, in a few places, dissected by sclerophyll forests, woodlands, swamps and mangrove forests, adding to its diversity.</p>

In 2007, the Wet Tropics of Queensland was added to the National Heritage List alongside other World Heritage Areas (WTMA 2021). Australia's national heritage comprises exceptional natural and cultural places which help give Australia its national identity. Such places are a living and accessible record of the nation's evolving landscape and experiences.



In 2012, the Wet Tropics World Heritage Area's Indigenous heritage values were included as part of the national heritage listing of the property, acknowledging that rainforest Aboriginal heritage is unique to the Wet Tropics that represents a remarkable and continuous Indigenous connection with a tropical rainforest environment (WTMA 2021). The Wet Tropics is unique in the course of Australia's cultural history, providing at least 5,000 years of evidence of occupation as the only area in Australia where Aboriginal people lived permanently in the rainforest, adapting to seasonal abundance and lean times with plants providing much of their food. Traditions linked to the volcanic events at Lake Eacham occurring between 10,000 and 20,000 years ago also suggest Aboriginal occupation of the area occurred as far back as during these events (Horsfall and Hall 1990).

The current National Heritage Listing for the Wet Tropics corresponds to the following criteria:

- Criterion a) the place's importance in the course, or pattern, of Australia's natural or cultural history
- Criterion b) the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;
- Criterion c) the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;
- Criterion d) the place's importance in demonstrating the principal characteristics of;
 - i) a class of Australia's natural or cultural places; or
 - ii) a class of Australia's natural or cultural environments; and
- Criterion e) the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

The Project area is located adjacent to the Wet Tropics as defined by GIS layers provided by the Wet Tropic Management Authority (August 2020). The nearest proposed Project infrastructure is approximately 275 m from the edge of the WTWHA boundary (a permanent met mast), whilst the nearest proposed wind turbine is approximately 625 m from the edge of the WTWHA boundary. The Project footprint and WTWHA boundary is largely buffered by an existing high voltage powerline easement. Whilst there will be no direct impacts to the WTWHA, the proximity of the site and the mobility of many of its unique fauna suggest that there is the potential for indirect impacts on some of the features of outstanding universal value. Understanding the importance of the WTWHA, the Proponent has been active in engaging with the Wet Tropics Management Authority to date to ensure positive outcomes and will continue to do so throughout the life of the Project.

5.2 Protected Area Estate

The Project area does not overlap with any Protected Areas but there are multiple properties in proximity to the Project area as illustrated in **Figure 5-1**:

- The eastern boundary of the Project area is entirely bordered by national parks and reserves for a total distance of 37.9 km:
 - Tully Falls National Park is part of the WTWHA and one of wettest areas of Queensland. It comprises endangered wet sclerophyll forest, upland rainforest, clear mountain streams and waterfalls. The property supports iconic fauna species such as Lumholtz's tree-kangaroo and the endangered southern cassowary.
 - Koombooloomba National Park is also part of the WTWHA. The western part of the property is in the rain shadow of the Cardwell Range and supports endangered wet sclerophyll forest. In the Wet Tropics this vegetation community is restricted to a narrow, broken strip, 400 km long, bordering the western edge of the














rainforest. As well as Lumholtz's tree-kangaroo, this property is known to support the endangered yellow-bellied glider.

- Koombaloo South Forest Reserve is part of the WTWHA and was converted from a timber reserve in 1967. It encompasses a continuous cross-section of wet tropical forest types from high altitude rainforest to open woodlands over a very steep rainfall gradient. This adds to the variety of habitat types and range of flora and fauna species present.
- The northern boundary of the Project area is bordered by Ravenshoe Forest Reserve 1.
- The Bluff State Forest, Ravenshoe State Forest 3 and Millstream Falls National Park are within 9 km of the Project's northern boundary whilst the south-eastern boundary abuts a Queensland special wildlife reserve³, Yourka Station, which is managed by Bush Heritage Australia.

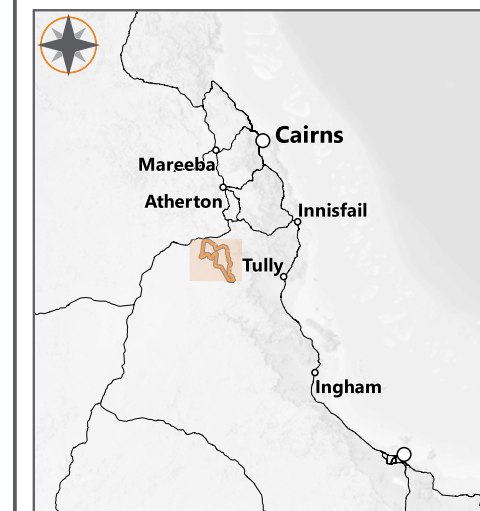
³ A special wildlife reserve is a voluntary, binding and perpetual class of protected area on privately-owned land

Chalumbin Wind Farm Protected Area Estate

Figure 5.1

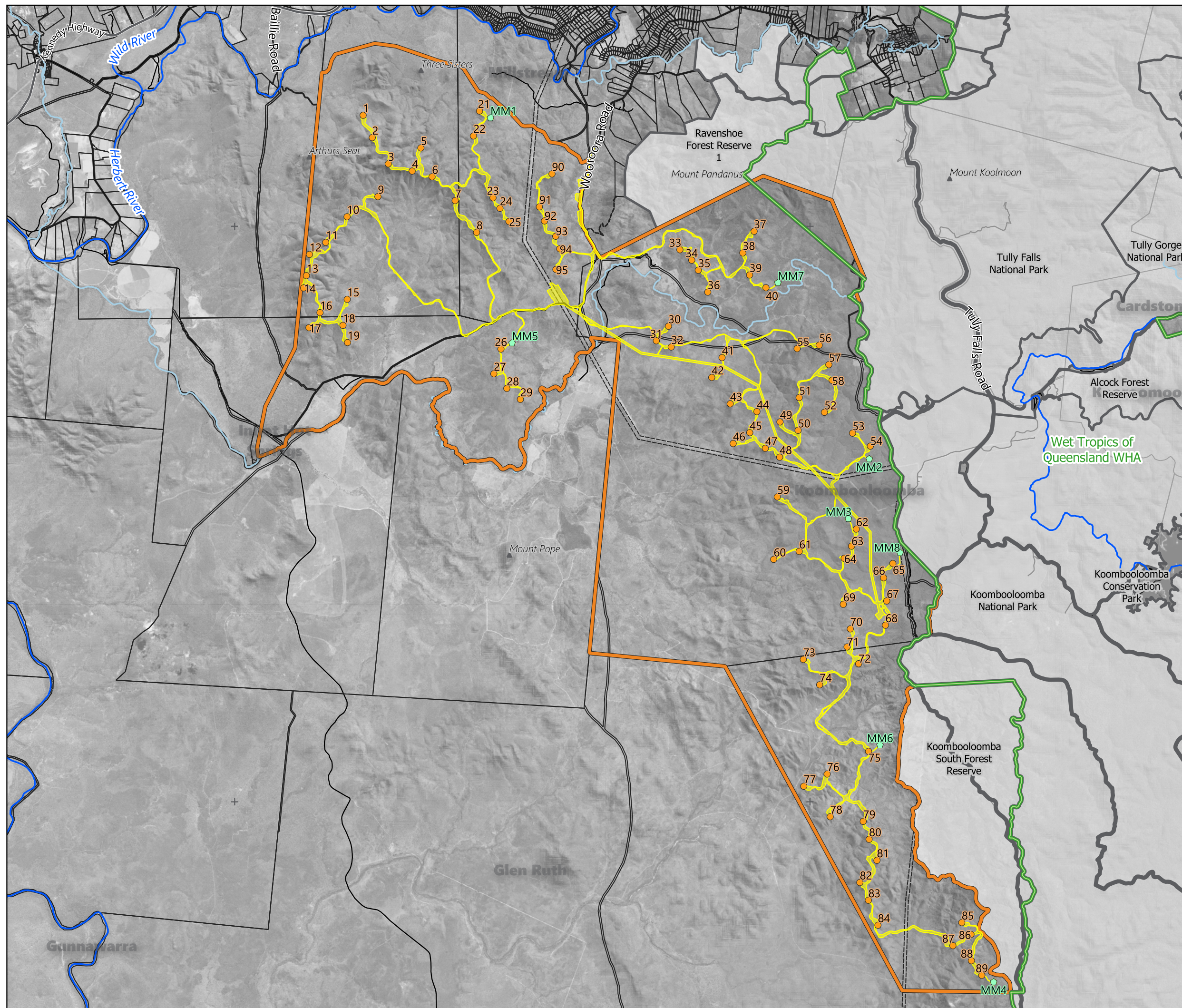
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint
-  World Heritage Area Boundary
-  Protected Areas Estate
-  Major Road
-  River
-  Creek
-  Lot Type Parcel
-  Easement

Date: 2021-12-10
 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





5.3 Wetlands of International Importance

Wetlands of International Importance are those listed under the Ramsar Convention. The nearest Ramsar wetland to the Project area is Bowling Green Bay, located approximately 250 km south-east. The Project will not impact the values of this wetland directly or indirectly.

5.4 Great Barrier Reef Marine Park and Commonwealth Marine Area

The Great Barrier Reef Marine Park is located approximately 60 km east of the Project area. The nearest Commonwealth Marine Area, the Coral Sea Marine Park, is beyond the Great Barrier Reef Marine Park. The Project will not impact these sites directly or indirectly; the catchment that contains the Project area drains from east to west.

5.5 Regional Ecosystems

Table 5-2 lists the REs that have been mapped as occurring within the Project area based on government-certified mapping along with their biodiversity and vegetation management status. These are mapped in **Figure 5-2**.

Table 5-2 Regional Ecosystems Mapped within the Project Area

Regional Ecosystem	Status (VM Act)	Status (BD Status)
7.3.8a <i>Melaleuca viridiflora</i> open forest to open woodland, on poorly drained alluvial plains	Least concern	Endangered
7.3.19a <i>Corymbia intermedia</i> , <i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> , <i>Allocasuarina torulosa</i> , <i>A. littoralis</i> , <i>Lophostemon suaveolens</i> woodland with <i>Acacia cincinnata</i> , <i>A. flavescens</i> , <i>Banksia aquilonia</i> and <i>Xanthorrhoea johnsonii</i> . Well-drained alluvium	Of concern	Of concern
7.3.19g <i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> , <i>E. portuensis</i> , <i>Corymbia intermedia</i> , <i>C. tessellaris</i> woodland and open forest with <i>Allocasuarina torulosa</i> and <i>Angophora floribunda</i> . Uplands and highlands on alluvium, of the dry rainfall zone	Of concern	Of concern
7.3.26a <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> , <i>Lophostemon suaveolens</i> , <i>Melaleuca leucadendra</i> , <i>M. fluviatilis</i> , <i>Buckinghamia celsissima</i> , <i>Mallotus philippensis</i> woodland and forest with an understorey of <i>Melaleuca viminalis</i> and <i>Bursaria tenuifolia</i> . Fringing forests of larger streams. Riverine wetland or fringing riverine wetland	Of concern	Endangered
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	Of concern	Endangered
7.3.45b <i>Corymbia clarksoniana</i> woodland to open forest. May include small areas of <i>Acacia leptostachya</i> shrubland. Alluvial plains	Least concern	Of concern
7.3.48a <i>Eucalyptus portuensis</i> , <i>E. drepanophylla</i> , <i>Corymbia intermedia</i> , <i>C. citriodora</i> , <i>Lophostemon suaveolens</i> woodland and open forest with <i>Melaleuca viridiflora</i> , <i>Acacia</i>	Of concern	Endangered



Regional Ecosystem	Status (VM Act)	Status (BD Status)
<i>flavescens</i> , and <i>Allocasuarina littoralis</i> . Areas of alluvium on uplands and highlands of the dry rainfall zone		
7.8.4a Complex notophyll vine forests. Highlands on very limited areas, of the cloudy wet rainfall zone	Least concern	Endangered
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	Of concern	Endangered
7.8.10a <i>Eucalyptus tereticornis</i> , <i>E. drepanophylla</i> , <i>E. portuensis</i> , <i>Corymbia intermedia</i> , <i>C. tessellaris</i> woodland to open forest with <i>Allocasuarina torulosa</i> . Uplands and highlands on basaltic euchrozems-krasnozems, of the dry rainfall zone.	Of concern	Of concern
7.8.10b <i>Eucalyptus moluccana</i> woodland to open forest. Uplands and highlands on basalt, of the dry rainfall zone	Of concern	Of concern
7.8.15a <i>Eucalyptus grandis</i> open forest to woodland. Basalt	Of concern	Endangered
7.8.16a <i>Eucalyptus resinifera</i> , <i>Corymbia intermedia</i> , <i>E. cloeziana</i> , <i>Syncarpia glomulifera</i> open forest and woodland with <i>Allocasuarina torulosa</i> . Uplands and highlands on basalt, of the moist rainfall zone	Of concern	Endangered
7.8.16c <i>Lophostemon confertus</i> closed forest. Uplands and highlands on basalt, of the moist rainfall zone	Of concern	Endangered
7.8.19 <i>Corymbia clarksoniana</i> open forest to woodland on basalt	Endangered	Endangered
7.12.7a Complex notophyll vine forests (with emergent <i>Agathis robusta</i>). Foothills and uplands on granite and rhyolite north of the Herbert River. Moist rainfall zone	Least concern	No concern at present
7.12.16a Simple notophyll vine forest on wet and moist uplands, granite and rhyolite. Uplands of the cloudy wet to moist rainfall zones. Granite and rhyolite	Least concern	No concern at present
7.12.21a <i>Eucalyptus grandis</i> tall open forest and woodland. Granites and rhyolites	Least concern	Endangered
7.12.21b <i>Eucalyptus grandis</i> tall open forest and woodland with a well-developed vine forest understorey. Granites and rhyolites	Least concern	Endangered
7.12.22a <i>Eucalyptus resinifera</i> , <i>Eucalyptus acmenoides</i> , <i>Corymbia intermedia</i> , <i>Eucalyptus cloeziana</i> , <i>Syncarpia glomulifera</i> tall open forest to tall woodland with <i>Allocasuarina torulosa</i> and <i>Callitris macleayana</i> . Uplands and highlands of the moist rainfall zone	Least concern	Endangered
7.12.22d <i>Syncarpia glomulifera</i> , <i>Eucalyptus resinifera</i> , and <i>Corymbia intermedia</i> open forest to tall open forest, often with <i>Callitris macleayana</i> and <i>Allocasuarina torulosa</i> . Uplands of the wet rainfall zone	Least concern	Endangered



Regional Ecosystem	Status (VM Act)	Status (BD Status)
7.12.26a <i>Syncarpia glomulifera</i> , <i>Allocasuarina torulosa</i> and/or <i>A. littoralis</i> open forest and woodland. Uplands and highlands, often on steep slopes, of the wet rainfall zone. Granite and rhyolite	Least concern	No concern at present
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	No concern at present
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	No concern at present
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	No concern at present
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	No concern at present
7.12.30c <i>Eucalyptus portuensis</i> , <i>Corymbia citriodora</i> , <i>Syncarpia glomulifera</i> woodland and shrubland with a shrubby understorey of <i>Lophostemon confertus</i> and <i>S. glomulifera</i> , and a ground stratum of <i>Xanthorrhoea johnsonii</i> . Rocky slopes on rhyolite and granite	Least concern	No concern at present
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	No concern at present
7.12.37i Bare rock pavements associated with <i>Allocasuarina</i> spp. (sheoaks) shrublands and/or sedgeland on seepage areas of wet lowlands, uplands and highlands of the eastern escarpment and central range (excluding high granite areas of Hinchinbrook Island and Bishops Peak). Rock pavements and outcrops. Granite and rhyolite	Of concern	Of 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	Of concern
7.12.53a <i>Corymbia clarksoniana</i> woodland to open forest. Lowlands, foothills and uplands on granite and rhyolite, of the dry to moist rainfall zone.	Least concern	No concern at present
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	Of concern
7.12.58 <i>Eucalyptus reducta</i> +/- <i>E. granitica</i> +/- <i>Corymbia dimorpha</i> +/- <i>C. citriodora</i> woodland to open forest on granite and rhyolite	Of concern	Of concern
7.12.60a <i>Melaleuca viridiflora</i> woodland. Granite and rhyolite. Floodplain (other than floodplain wetlands)	Of concern	Endangered



Regional Ecosystem	Status (VM Act)	Status (BD Status)
7.12.61a <i>Eucalyptus tereticornis</i> open forest to tall open forest and woodland. Includes 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> . Foothills and uplands on granite and rhyolite, of the moist and dry rainfall zones	Least concern	Of concern
7.12.65a Rock pavement communities of the dry rainfall zone with <i>Acacia leptostachya</i> , <i>Eucalyptus lockyeri</i> subsp. <i>exuta</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> , <i>Persoonia falcata</i> , <i>Ficus rubiginosa</i> and <i>Allocasuarina inophloia</i>	Least concern	Of concern
7.12.65e Complex of open to closed shrublands, low to medium woodlands and forests and grasslands of mountain granite and rhyolite rock pavements. Main component: scrub (<i>Allocasuarina littoralis</i> , <i>Syncarpia glomulifera</i> , <i>Lophostemon confertus</i>), shrubland (<i>Banksia aquilonia</i> , <i>Leptospermum</i> sp.) and heath (<i>Xanthorrhoea johnsonii</i> , <i>Gahnia</i> spp., <i>Dicranopteris linearis</i>). Granite and rhyolite rock pavements	Least concern	Of 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 loliiformis</i> , <i>Gonocarpus acanthocarpus</i> and <i>Eragrostis</i> spp. Dry western areas. Granite and rhyolite	Least concern	Of concern
7.12.66b <i>Lophostemon confertus</i> shrubland. Exposed rocky slopes on granite and rhyolite	Of concern	Of concern
7.12.66c <i>Lophostemon confertus</i> low closed forest to closed forest. Exposed rocky slopes on granite and rhyolite	Of concern	Of concern
7.12.66e Bare rock of exposed rocky slopes on granite and rhyolite, associated with <i>Lophostemon confertus</i> shrublands and closed forests. Exposed rocky slopes on granite and rhyolite	Of concern	Of concern
9.3.4 Permanent or seasonal wetlands frequently fringed by narrow bands of trees and shrubs including <i>Eucalyptus</i> spp. on alluvial plains	Of concern	Of concern
9.3.15 <i>Eucalyptus tereticornis</i> +/- <i>Casuarina cunninghamiana</i> +/- <i>Melaleuca</i> spp. fringing woodland on channels and levees	Least concern	Of 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	Of concern
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	Least concern	Of concern






Regional Ecosystem	Status (VM Act)	Status (BD Status)
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		
9.5.5b Woodland of <i>Eucalyptus crebra</i> or <i>E. granitica</i> +/- <i>Corymbia clarksoniana</i> +/- <i>C. dallachiana</i> +/- <i>C. erythrophloia</i> with a usually open sub-canopy and shrub layer including juvenile canopy species, <i>Grevillea glauca</i> , <i>G. parallel</i> , <i>Acacia flavescens</i> , <i>Petalostigma pubescens</i> , <i>Melaleuca viridiflora</i> and <i>Denhamia cunninghamii</i> . The grassy ground layer is dominated by <i>Themeda triandra</i> . Occurs on Tertiary plateaus and remnants	Least concern	Of concern
9.5.5c Woodland to open woodland of <i>Eucalyptus moluccana</i> or <i>E. tereticornis</i> +/- <i>Lophostemon suaveolens</i> +/- <i>Corymbia clarksoniana</i> . The distinct sub-canopy usually contains canopy species +/- <i>Melaleuca viridiflora</i> . Scattered <i>M. viridiflora</i> , <i>Petalostigma pubescens</i> and <i>Acacia</i> spp. may be found in the shrub layer. The dense grassy ground layer is often dominated by <i>Themeda triandra</i> and <i>Chrysopogon fallax</i> . Occurs on Tertiary sandplains	Least concern	Of concern
9.5.5d Low woodland to tall shrubland of <i>Callitris intratropica</i> +/- <i>Melaleuca viridiflora</i> +/- <i>Petalostigma pubescens</i> . A number of <i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. can occur in the dominant layer including <i>Eucalyptus crebra</i> , <i>Corymbia clarksoniana</i> and <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , or occur as emergents. A dense lower canopy layer can occur and include <i>Callitris intratropica</i> and other canopy species. The lower mid-layer is generally open and usually contains canopy juvenile species +/- <i>Acacia</i> spp. The ground layer is mid-dense grassy and usually dominated by <i>Themeda triandra</i> or <i>Chrysopogon fallax</i> . This description can include <i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. woodlands with a dense understory of <i>Callitris intratropica</i> . Occurs on Tertiary plateaus and remnants	Least concern	Of concern
9.5.6a Woodland to open woodland of <i>Eucalyptus leptophleba</i> +/- <i>Corymbia clarksoniana</i> +/- <i>E. platyphylla</i> +/- <i>C. tessellaris</i> . The mid layer is generally isolated shrubs which may include <i>Petalostigma pubescens</i> , <i>Melaleuca</i> spp. and <i>Acacia</i> spp., <i>Alphitonia pomaderroides</i> and <i>Grevillea glauca</i> . There is a grassy ground layer usually dominated by <i>Heteropogon contortus</i> . Occurs on yellow kandosols and mapped as YEPR (yellow earths on gently undulating plains and plateaus on Tertiary lateritic remnants) by Grundy	Least concern	No concern at present
9.5.14 <i>Melaleuca viridiflora</i> and/or <i>M. stenostachya</i> low open woodland on erosional plains	Of concern	Of concern
9.5.17 <i>Eucalyptus exserta</i> , <i>Corymbia abergiana</i> and <i>Callitris intratropica</i> mixed low woodland on Tertiary remnants	Of concern	Of concern
9.8.2a Woodland to open woodland of <i>Eucalyptus leptophleba</i> +/- <i>Corymbia clarksoniana</i> /- <i>C. dallachiana</i> +/- <i>C. erythrophloia</i> +/- <i>E. cullenii</i> +/- <i>E. platyphylla</i> . There is often an open sub-canopy layer with canopy species. The shrub layer is absent or contains scattered canopy species, <i>Planchonia careya</i> , <i>Melaleuca</i> spp. and/or <i>Grevillea</i> spp. The ground layer is mid-dense and dominated by <i>Heteropogon</i> spp. and	Least concern	Of concern













Regional Ecosystem	Status (VM Act)	Status (BD Status)
<i>Themeda triandra</i> . Occurs on basalt plains and undulating rises of the Tertiary MacLean Basalt group.		
9.8.4 <i>Eucalyptus crebra</i> and/or <i>E. tereticornis</i> open woodland on basalt plains	Least concern	No concern at present
9.11.10 <i>Eucalyptus cloeziana</i> , <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , <i>E. portuensis</i> and <i>E. cullenii</i> mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks	Least concern	Of 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	No concern at present
9.12.4a Low woodland to occasionally a low open forest of <i>Eucalyptus shirleyi</i> and <i>Corymbia peltata</i> +/- <i>E. crebra</i> (sens. lat.) +/- <i>Corymbia</i> spp. +/- <i>Acacia leptostachya</i> . <i>E. melanophloia</i> can sometimes occur. <i>E. crebra</i> may also occur as an emergent. A sub-canopy containing <i>E. shirleyi</i> , <i>Alphitonia excelsa</i> , <i>Acacia</i> spp. and <i>Persoonia falcata</i> can occur. <i>E. shirleyi</i> can occur as a dense sub-canopy under <i>C. peltata</i> . The shrub layer varies from absent to mid-dense with a variable species mix including <i>E. shirleyi</i> , <i>Denhamia cunninghamii</i> , <i>Acacia leptostachya</i> , <i>Petalostigma banksii</i> , <i>Persoonia falcata</i> , <i>Alphitonia</i> spp. and <i>Acacia</i> spp. <i>Xanthorrhoea johnsonii</i> can also occur in a lower shrub layer. The dense grassy ground layer is dominated by <i>Heteropogon</i> spp., <i>Schizachyrium fragile</i> and <i>Themeda triandra</i> . Occurs predominantly on sandy shallow soils derived from granitic or rhyolite geologies on rolling low hills to hills	Least concern	No concern at present
9.12.30a Woodland to open forest of <i>Corymbia leichhardtii</i> and <i>Eucalyptus cloeziana</i> +/- <i>E. portuensis</i> +/- <i>C. citriodora</i> subsp. <i>citriodora</i> +/- <i>E. cullenii</i> +/- <i>Callitris intratropica</i> . Some canopy species can occur as emergents. The sparse to mid-dense shrub layer is dominated by juvenile canopy species, <i>Persoonia falcata</i> , <i>Grevillea glauca</i> and <i>Allocasuarina inophloia</i> and a lower shrub with <i>Jacksonia thesioides</i> and <i>Xanthorrhoea johnsonii</i> can occur. The sparse to mid-dense ground layer is dominated by <i>Themeda triandra</i> . Rocky rhyolite hills to steep hills	Least concern	No concern at present
9.12.30b Shrubland of <i>Acacia leptostachya</i> +/- <i>A. umbellata</i> +/- <i>Callitris intratropica</i> emergents. There is no mid layer or ground layer. Occurs on shallow soils on rock pavements within 9.12.30a	Least concern	No concern at present

Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 1

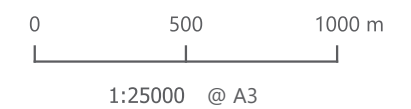
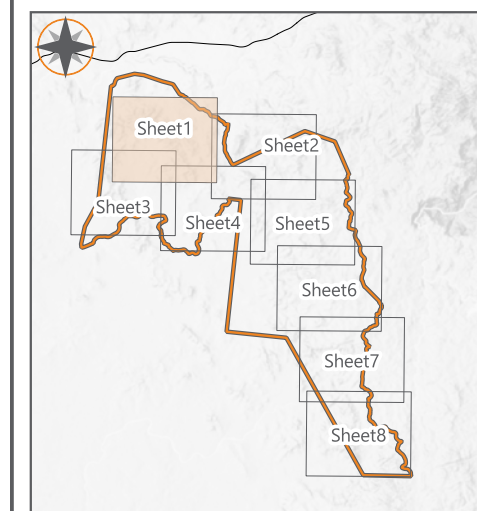
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint

Regional Ecosystem Mapping (v12)

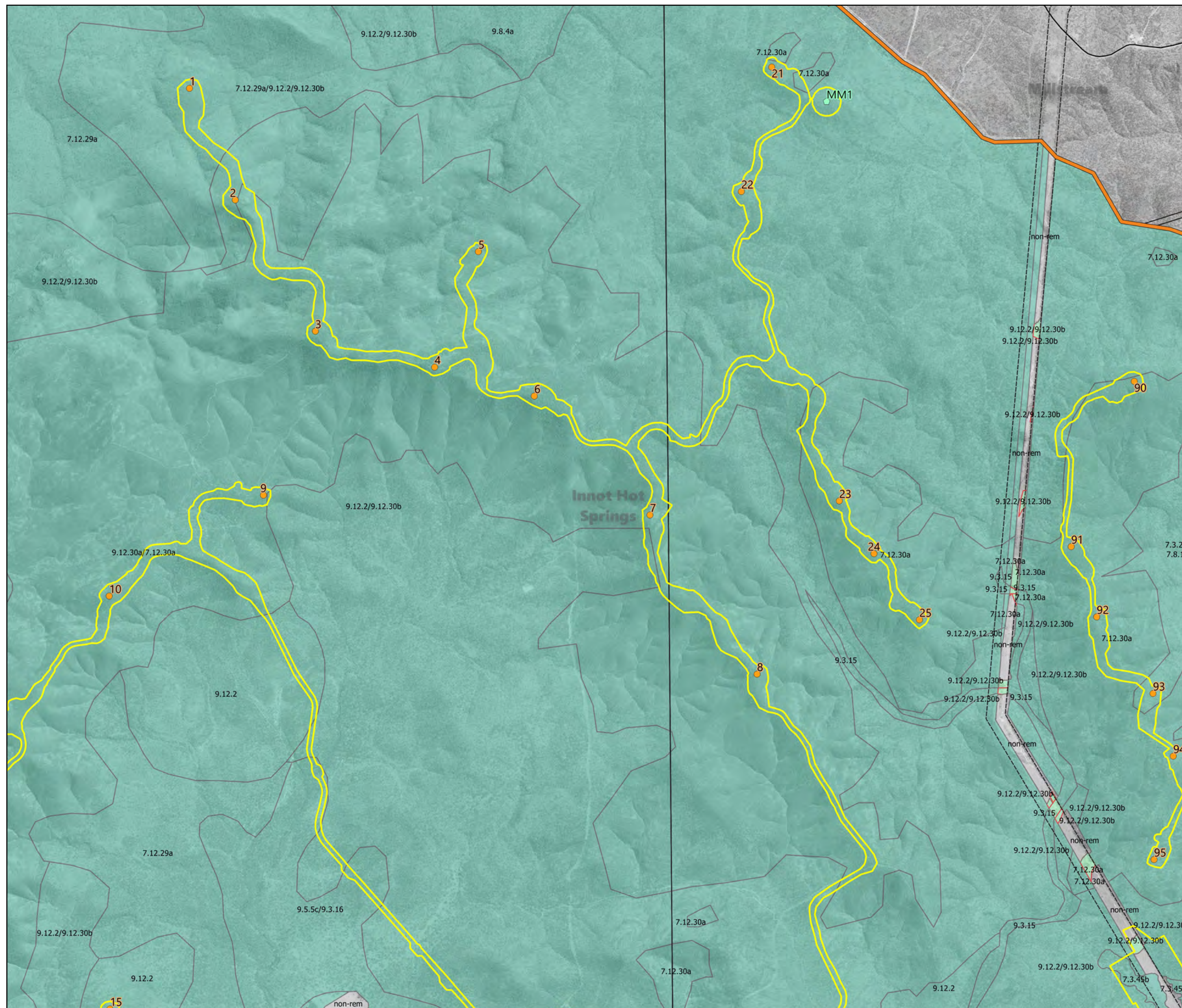
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-  Endangered High Value Regrowth Vegetation
-  Of Concern High Value Regrowth Vegetation
-  Least Concern High Value Regrowth Vegetation
-  Non-remnant
-  Watercourse
-  Lot Type Parcel
-  Easement

Date: 2021-12-11
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



Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 2

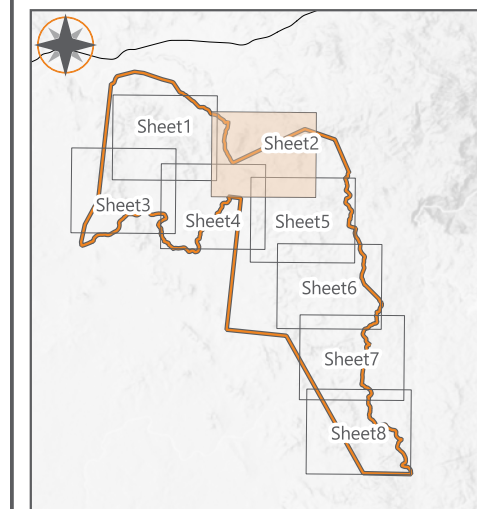
- Project Area
- Wind Turbine
- Met-mast
- Project Footprint

Regional Ecosystem Mapping (v12)

- Endangered Remnant Vegetation
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- Least Concern Remnant Vegetation
- Endangered High Value Regrowth Vegetation
- Of Concern High Value Regrowth Vegetation
- Least Concern High Value Regrowth Vegetation
- Non-remnant
- Watercourse
- Lot Type Parcel
- Easement

Date: 2021-12-11
Author: TOD

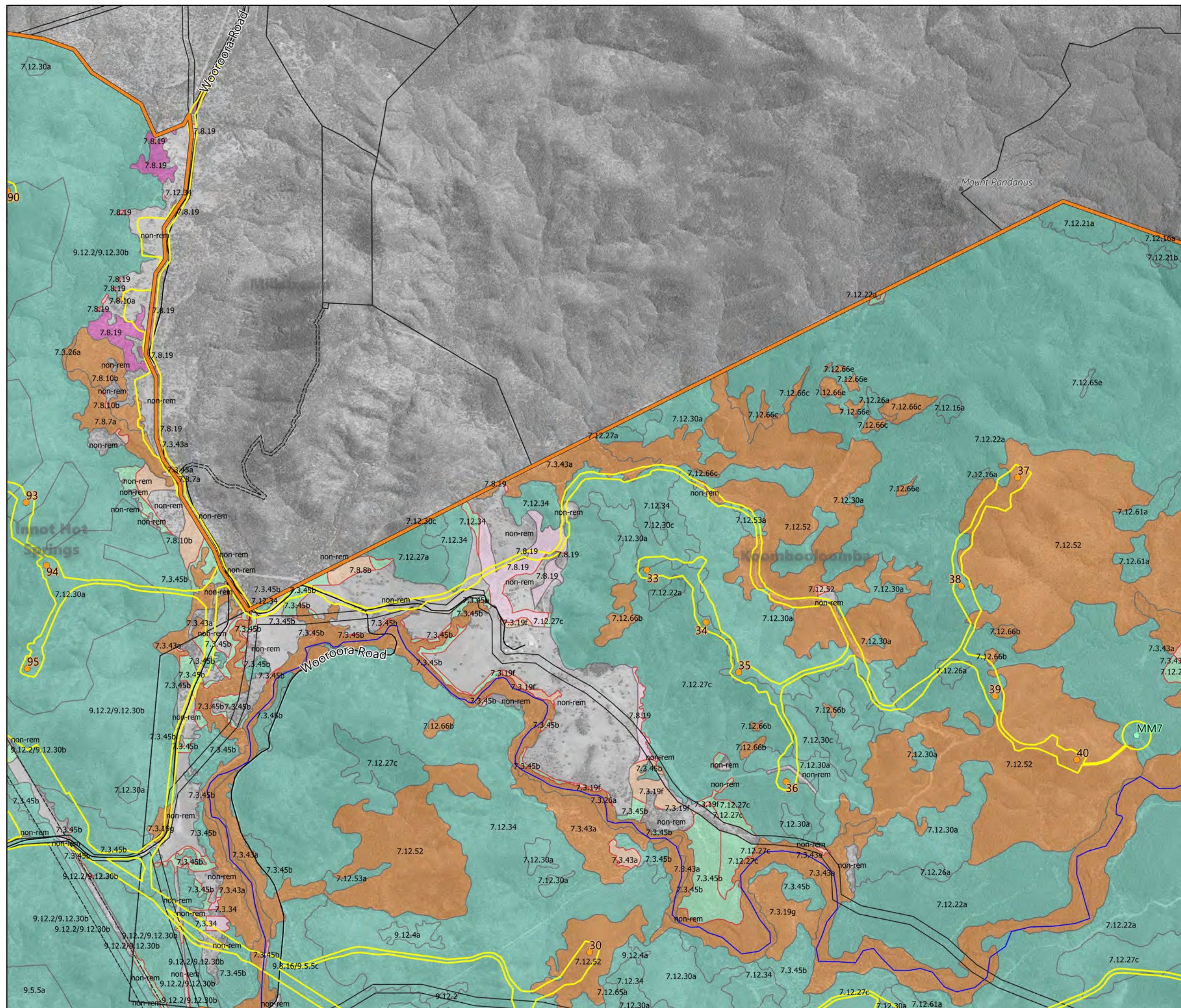
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Project: EPU-004



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

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Queensland Imagery Whole Of State
Satellite Public Basemap Service

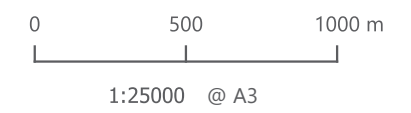
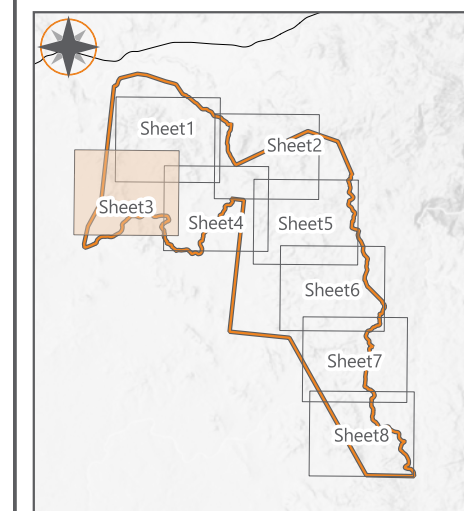


Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

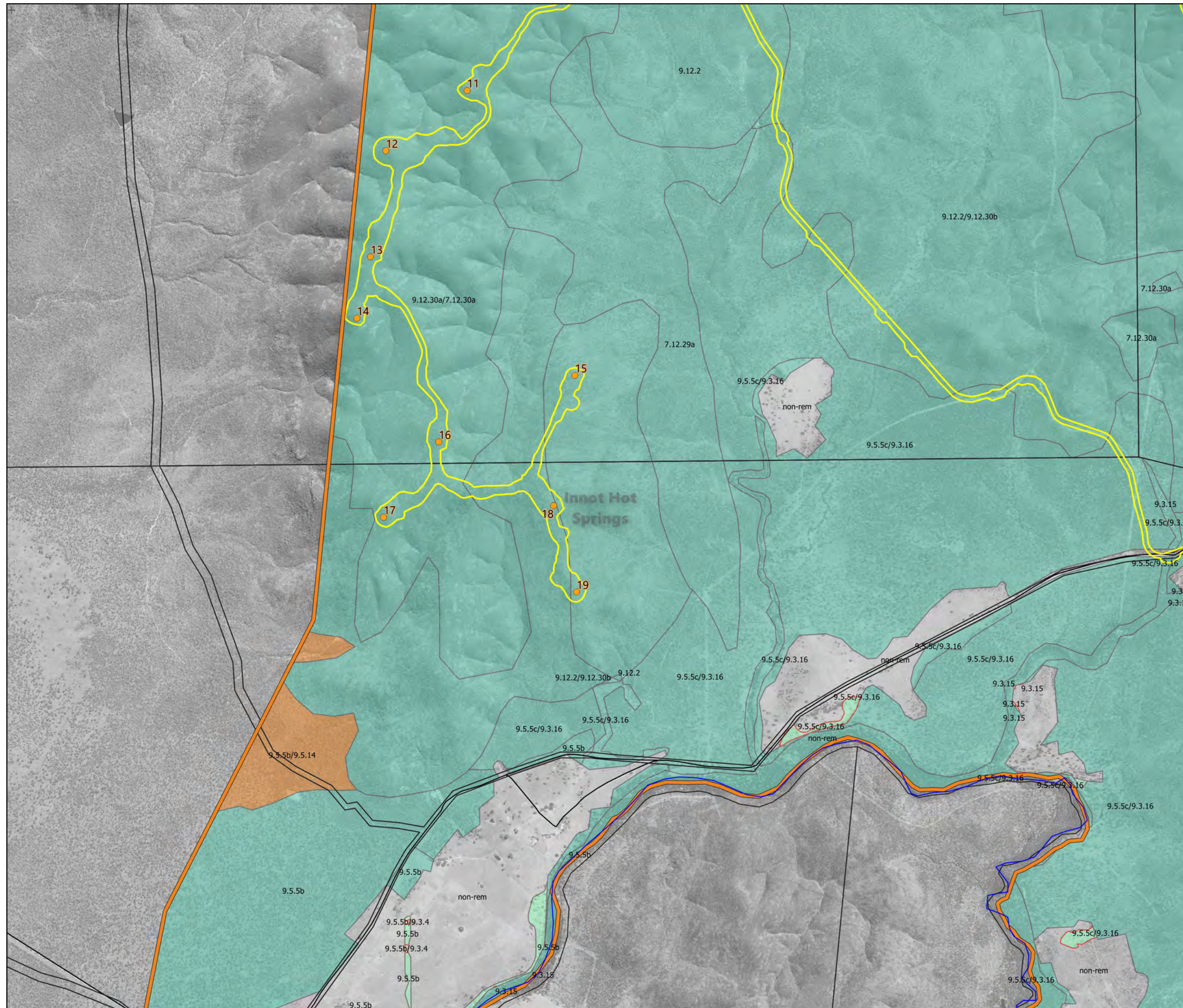
Figure 5.2 Sheet 3

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Regional Ecosystem Mapping (v12)
-  Endangered Remnant Vegetation
 -  Of Concern Remnant Vegetation
 -  Least Concern Remnant Vegetation
 -  Endangered High Value Regrowth Vegetation
 -  Of Concern High Value Regrowth Vegetation
 -  Least Concern High Value Regrowth Vegetation
 -  Non-remnant
 -  Watercourse
 -  Lot Type Parcel
 -  Easement

Date: 2021-12-11 Reviewed: CC
 Author: TOD Project: EPU-004















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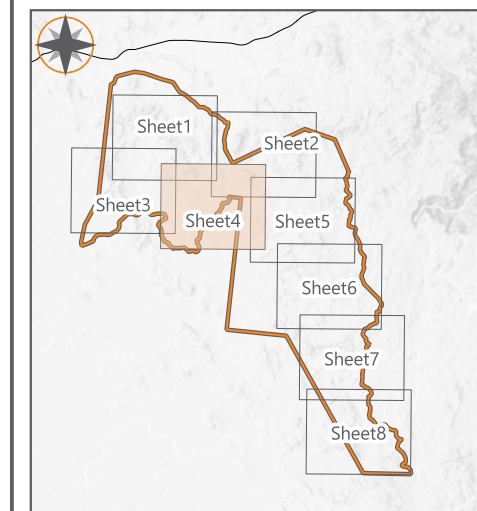


Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 4

-  Project Area
 -  Wind Turbine
 -  Met-mast
 -  Project Footprint
- Regional Ecosystem Mapping (v12)**
-  Endangered Remnant Vegetation
 -  Of Concern Remnant Vegetation
 -  Least Concern Remnant Vegetation
 -  Endangered High Value Regrowth Vegetation
 -  Of Concern High Value Regrowth Vegetation
 -  Least Concern High Value Regrowth Vegetation
 -  Non-remnant
 -  Watercourse
 -  Lot Type Parcel
 -  Easement

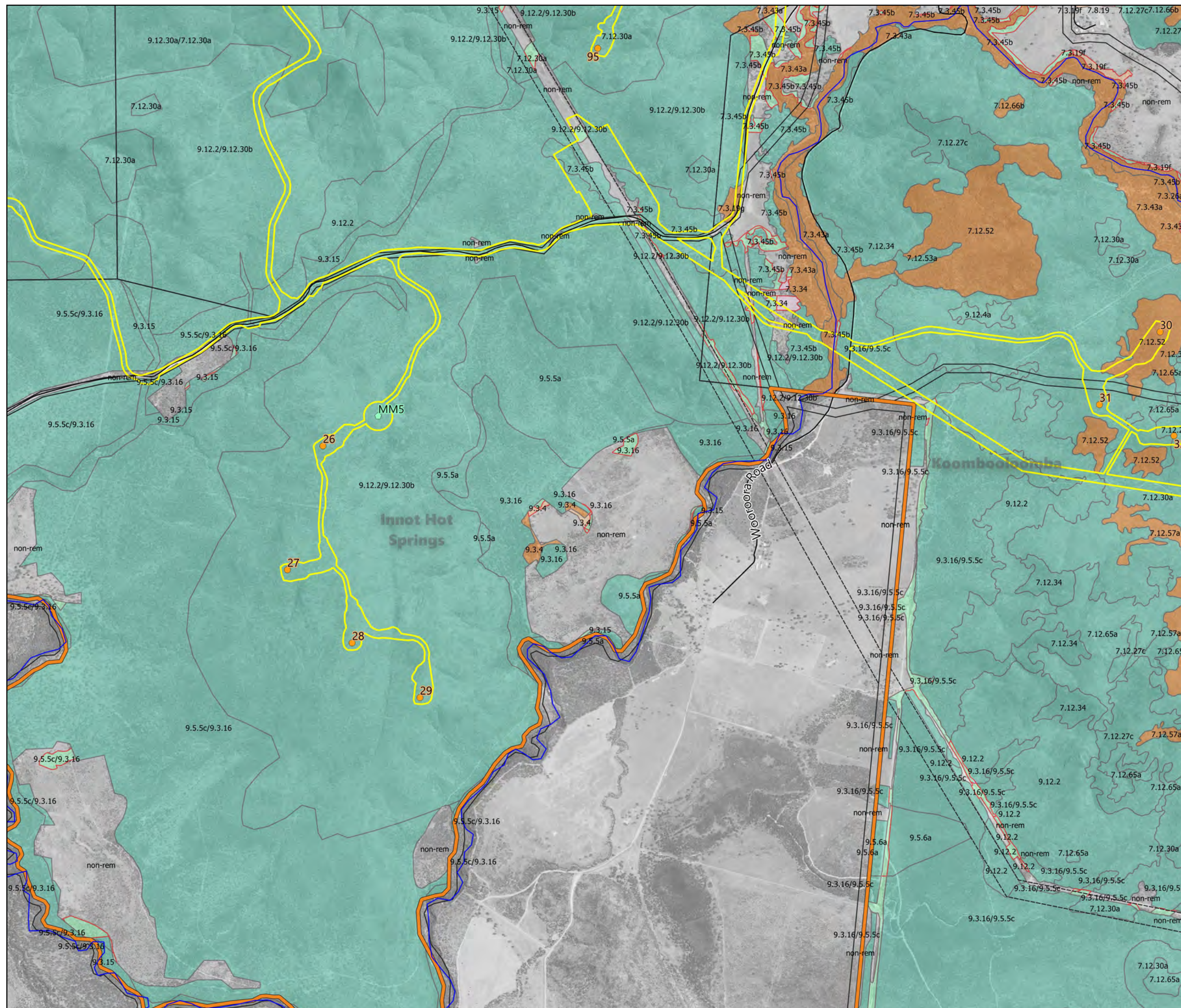
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 Satellite Public Basemap Service













Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 5

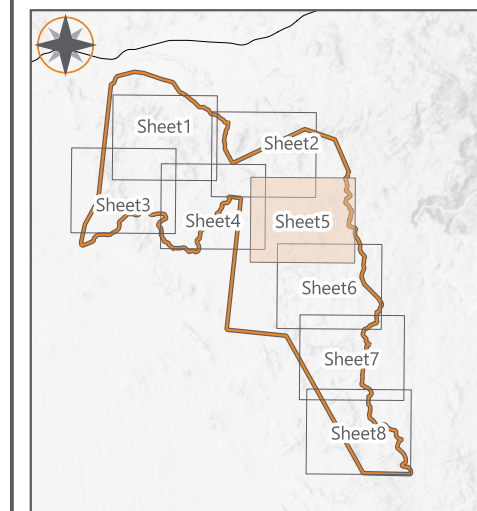
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint

Regional Ecosystem Mapping (v12)

-  Endangered Remnant Vegetation
-  Of Concern Remnant Vegetation
-  Least Concern Remnant Vegetation
-  Endangered High Value Regrowth Vegetation
-  Of Concern High Value Regrowth Vegetation
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-  Watercourse
-  Lot Type Parcel
-  Easement

Date: 2021-12-11
Author: TOD

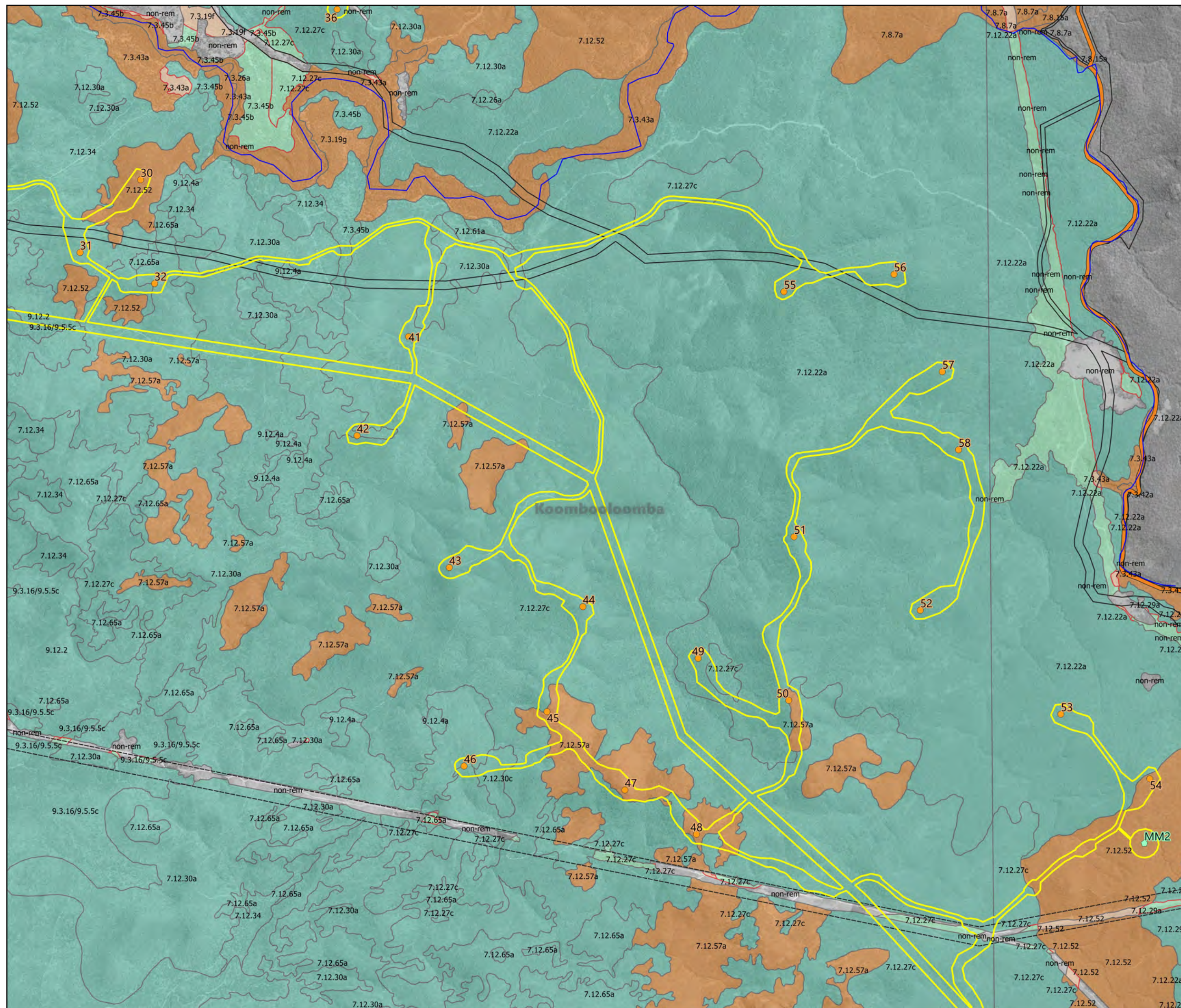
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Queensland Imagery Whole Of State
Satellite Public Basemap Service













Chalumbin Wind Farm Vegetation Mangement Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 7

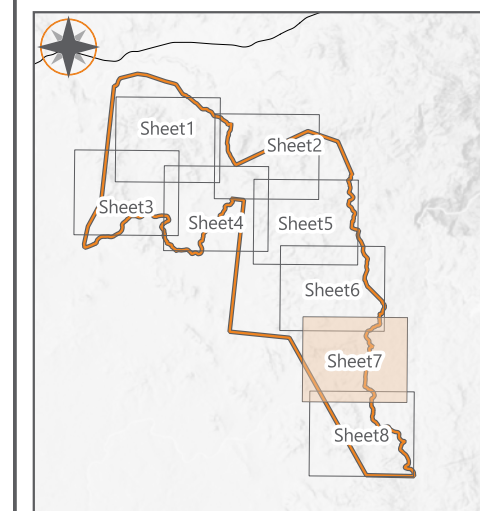
-  Project Area
-  Wind Turbine
-  Met-mast
-  Project Footprint

Regional Ecosystem Mapping (v12)

-  Endangered Remnant Vegetation
-  Of Concern Remnant Vegetation
-  Least Concern Remnant Vegetation
-  Endangered High Value Regrowth Vegetation
-  Of Concern High Value Regrowth Vegetation
-  Least Concern High Value Regrowth Vegetation
-  Non-remnant
-  Watercourse
-  Lot Type Parcel
-  Easement

Date: 2021-12-11
Author: TOD

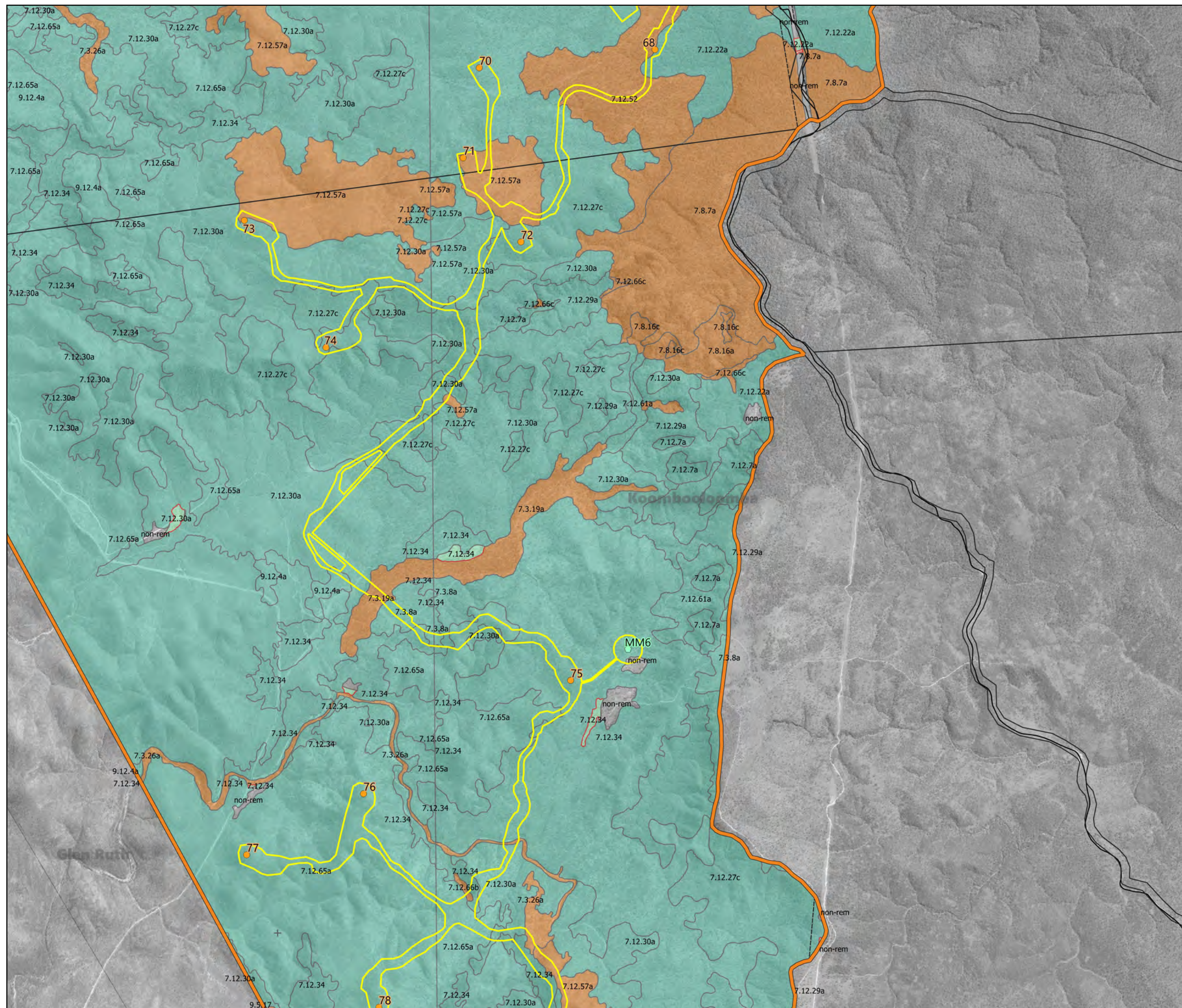
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Project: EPU-004



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Queensland Imagery Whole Of State
Satellite Public Basemap Service



Chalumbin Wind Farm Vegetation Management Regional Ecosystem Mapping (DoR)

Figure 5.2 Sheet 8

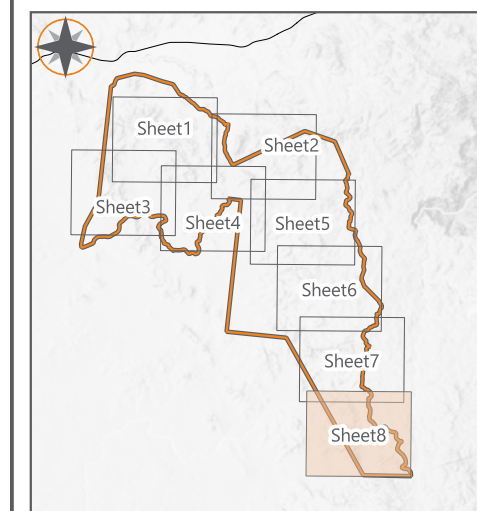
- Project Area
- Wind Turbine
- Met-mast
- Project Footprint

Regional Ecosystem Mapping (v12)

- Endangered Remnant Vegetation
- Of Concern Remnant Vegetation
- Least Concern Remnant Vegetation
- Endangered High Value Regrowth Vegetation
- Of Concern High Value Regrowth Vegetation
- Least Concern High Value Regrowth Vegetation
- Non-remnant
- Watercourse
- Lot Type Parcel
- Easement

Date: 2021-12-11
Author: TOD

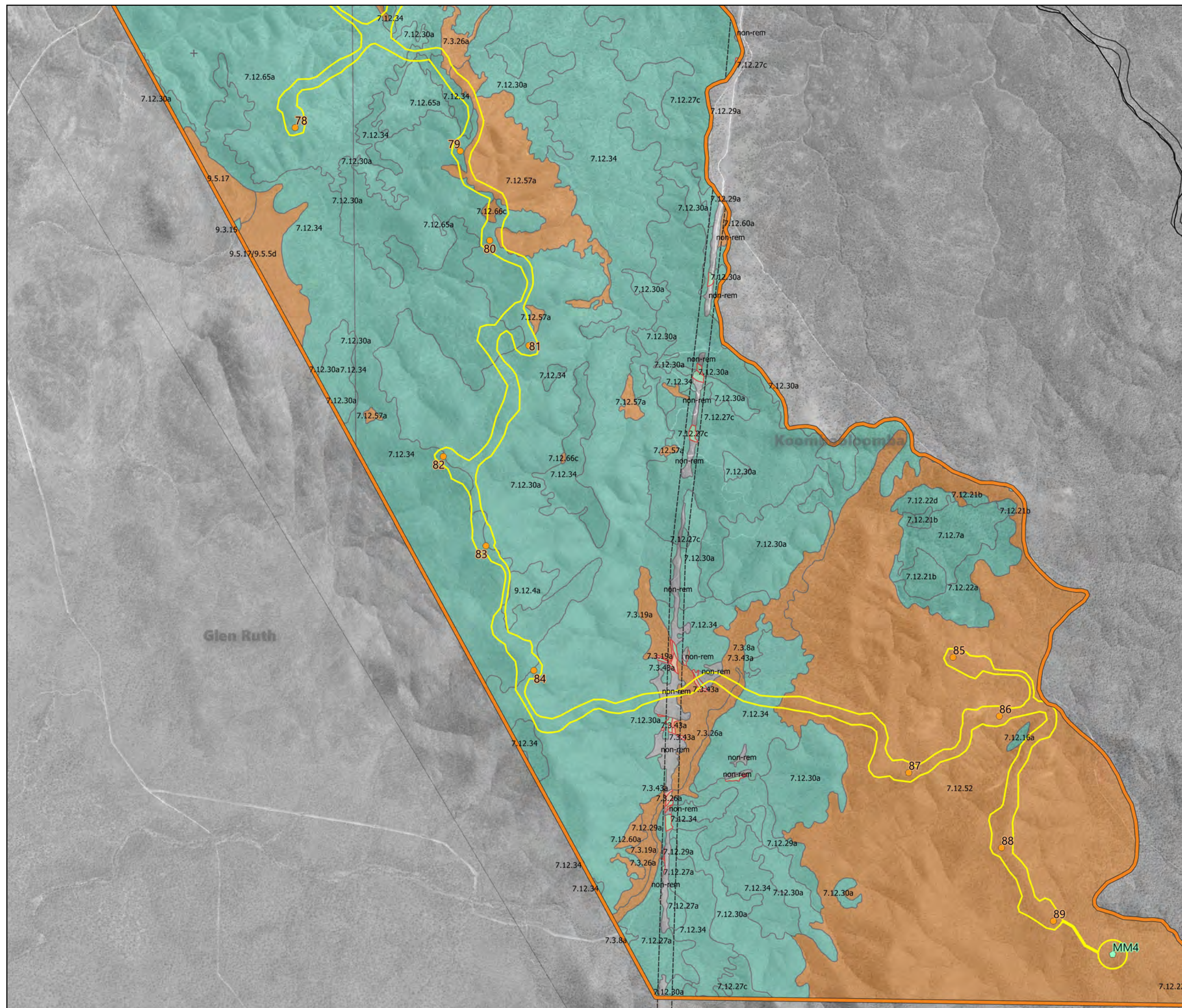
Reviewed: CC
Project: EPU-004



0 500 1000 m

1:25000 @ A3

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

Table 5-3 provides a list of threatened flora species with potential to occur within the study area (the Project area plus a 10 km buffer) based on the desktop assessment. Threatened flora records within the study area are shown on **Figure 5-3**.

Table 5-3 Threatened Flora Species Potentially Occurring within the Study Area

Species Name	EPBC Act Status	NC Act Status	Species Recorded in Study Area (Wildlife Online)
<i>Acacia purpureopetala</i> , purple-flowered wattle	Critically endangered	Vulnerable	
<i>Alloxylon flammeum</i> , red silky oak	Vulnerable	Vulnerable	✓
<i>Aponogeton bullosus</i>	Endangered	Endangered	✓
<i>Arthraxon hispidus</i> , hairy-joint grass	Vulnerable	Vulnerable	
<i>Canarium acutifolium</i>	Vulnerable	Vulnerable	
<i>Carronia pedicellata</i>	Endangered	Endangered	
<i>Chingia australis</i>	Endangered	Endangered	
<i>Corymbia rhodops</i> , red-throated bloodwood	Vulnerable	Vulnerable	
<i>Cycas platyphylla</i>	Vulnerable	Vulnerable	
<i>Dichanthium setosum</i> , bluegrass	Vulnerable	Least concern	
<i>Diplazium cordifolium</i>	Vulnerable	Vulnerable	
<i>Euphorbia carissoides</i>	Vulnerable	Vulnerable	
<i>Grevillea glossadenia</i>	Vulnerable	Vulnerable	
<i>Homoranthus porteri</i>	Vulnerable	Vulnerable	✓
<i>Lastreopsis walleri</i>	Vulnerable	Vulnerable	✓
<i>Macropteranthes montana</i>	Vulnerable	Vulnerable	
<i>Phaius australis</i> , lesser swamp-orchid	Endangered	Endangered	
<i>Phaius pictus</i>	Vulnerable	Vulnerable	
<i>Phlegmariurus marsupiiiformis</i> , water tassel-fern	Vulnerable	Vulnerable	



Species Name	EPBC Act Status	NC Act Status	Species Recorded in Study Area (Wildlife Online)
<i>Polyphlebium endlicherianum</i> , middle filmy fern	Endangered	Vulnerable	
<i>Prostanthera clotteniana</i>	Critically endangered	Endangered	✓
<i>Tephrosia leveillei</i> (poss syn. <i>Tephrosia flagellaris</i>)	Vulnerable	Least concern	
<i>Triplarina nitchaga</i>	Vulnerable	Vulnerable	✓
<i>Tropilis callitrophilis</i> (syn. <i>Dendrobium callitrophilum</i>), thin feather orchid	Vulnerable	Vulnerable	
<i>Vappodes lithocola</i> (syn. <i>Dendrobium lithocola</i>), dwarf butterfly orchid	Endangered	Vulnerable	
<i>Zeuxine polygonoides</i> (syn. <i>Rhomboda polygonoides</i>), velvet jewel orchid	Vulnerable	Vulnerable	