ARK ENERGY

Attexo

Chalumbin Wind Farm

Potential Habitat for Satin flycatcher

Figure 4.41

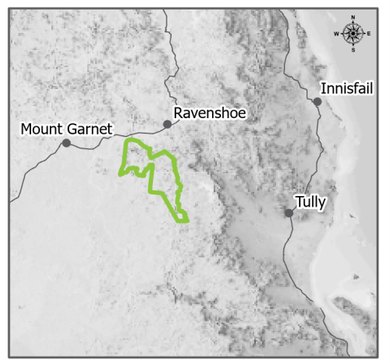
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Survey Observation
- Threatened Fauna Record (ALA/WildNet)
- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 12/10/2022 Author: TOD

Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\Tim ODonnell\Attexo Group\Attexo - Documents\Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PER_Submission.aprx

4.9.6 Spectacled Monarch

4.9.6.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The spectacled monarch (*Monarcha trivirgatus* syn. *Symposiarchus trivirgatus*) is listed as Migratory under the EPBC Act and Special Least Concern under the NC Act. It is listed globally as Least Concern on the IUCN Red List.

The global population size has not been quantified but the species is reported to be generally common. In Australia it is considered to be secure across its range (DoE 2015a).

The spectacled monarch is largely confined to the northeast and east coastal and near coastal regions of Australia. There are three 229orter229229229229 subspecies, of which *Symposiarchus t. melanorrhous* occurs from Yarraden in the north along the Queensland coast near Cairns to approximately Mackay in the south. Movements of this subspecies are not well understood although it is believed that this subspecies may migrate within this range or winter in PNG (DoE 2015a).

The species inhabits dense rainforests and moist eucalypt forests of eastern and north-eastern Australia, including waterside vegetation and mangroves (BirdLife International 2017b).

4.9.6.2 Known Threats

SPRAT 2021 does not identify any threat abatement plans as being as relevant for this species.

4.9.6.3 Survey Effort

An initial bird census was undertaken in January 2021. Following this, six bird utilisation surveys have been undertaken at 21 sites across the Project area (June 2021, October 2021, January 2022, April 2022, August 2022 and November 2022), as described in **Section 4.2.2.3**. This has resulted in a total survey effort to date of 205 person hours.

4.9.6.4 Project Area Habitat Assessment

The spectacled monarch has previously been recorded within the Study area, within the WTQWHA (**Figure 4-42**).

One spectacled monarch was observed during the bird utilisation surveys in October 2021. This is mapped in **Figure 4-42** along with potential habitat which was mapped as rainforest and moist eucalypt forest, including riparian vegetation.

ARK ENERGY

Attexo

Chalumbin Wind Farm

Potential Habitat for Spectacled Monarch

Figure 4.42

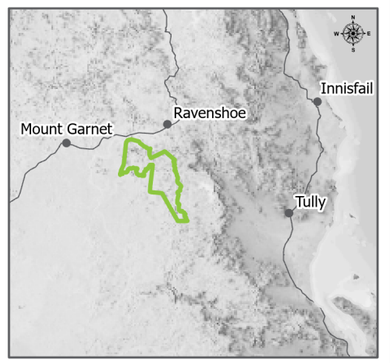
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Survey Observation
- Threatened Fauna Record (ALA/WildNet)
- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 12/10/2022 Author: TOD

Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\Tim ODonnell\Attexo Group\Attexo - Documents\Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PER_Submission.aprx

4.10 Listed Threatened Fish Species

4.10.1 Lake Eacham Rainbow Fish

4.10.1.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The Lake Eacham rainbow fish (*Melanotaenia eachamensis*) is listed as Endangered under the EPBC Act. It is listed globally as Endangered on the IUCN Red List. The species was initially only known from Lake Eacham and was listed as extinct in the wild until it was rediscovered in a few tributaries of the upper Johnstone River and the upper Barron River (Pusey at al 2014). This presumed extinction was suggested to be due to predation by translocated indigenous fishes.

The species is considered to only occur in the upper Barron and Johnstone River catchments at altitudes above 700 m, but as low as 500 m (DSEWPC 2012d).

The species has a restricted geographic distribution with an extent of occurrence estimated at 850 km^2 and an area of occupancy of 1 km^2 (DSEWPC 2012d). Unmack & Brown 2019 lists the extent of occurrence as 941 km^2 and the area of occupancy as 72 km^2. It is only known from three locations, the Barron, the North Johnstone and the South Johnstone Rivers (Unmack & Brown 2019). The Fishes of Australia database reports that the species is also present in Koombooloomba Dam on the Tully River (Gomon & Bray 2017).

The species occurs in small streams, especially smaller tributaries, and lakes, including crater lakes (Euramoo and Bromfield Swamp) and artificial lakes (Lake Tinaroo and Koombooloomba Dam) (DSEWPC 2012d).

The species is known to interbreed with the eastern rainbowfish (*Melanotaenia splendida splendida*) in many locations. Sympatry is common in the Johnstone River drainage basin however the Lake Eacham rainbowfish is the predominant species present (SPRAT 2023).

The species prefers shallow waters with slow to moderate flow (DSEWPC 2012d) usually occurring among, or directly adjacent to aquatic vegetation, submerged terrestrial vegetation and root masses (DSEWPC 2012d, Unmack & Brown 2019) in areas with streamside riparian vegetation or grasses (including the invasive Para Grass, *Brachiara mutica*). It is usually close to the riverbed in specific locations with rock and cobble substrates (DSEWPC 2012d).

Spawning occurs from August to April when water temperature exceeds 17 °C (DSEWPC 2012d, Unmack & Brown 2109). Eggs are demersal and adhesive, and are most commonly attached to submerged root masses in well oxygenated areas (TSSC 2012c).

The species is now considered to be a stream-dwelling species that prefers headwaters and smaller streams, although significant lacustrine populations are known (TSSC 2012c).

4.10.1.2 Known Threats

The Dirran Creek and Lake Eumaroo populations are the most genetically pure and hence the most important to conserve (DSEWPC 2012d, TSSC 2012c). Pure Lake Eacham rainbowfish populations are predator-naïve and extremely susceptible to translocated predatory fish.

The main identified threat to the species is likely predation by illegally translocated native fish (TSSC 2012c; DSEWPC 2012d). Other potential threats include hybridization with other rainbow fish; habitat degradation by siltation as a result of grazing and sugar cane farming; changes to channel morphology by removal of riparian vegetation; and invasive weeds (including smothering by Para Grass, *Brachiaria mutica*)(DSEWPC 2012).

There is ongoing introgression with the eastern rainbowfish (*M. splendida*) and there has been an observed decline in the number of adults as a result (Unmack & Brown 2019). There has been historical confusion with taxonomy and identification of Tablelands rainbowfish, which has made reliable population monitoring difficult (DSEWPC 2011d). The main threat to this species is hybridization with other rainbowfish that are expanding their range into eastern rainbowfish habitat, along with expansion of invasive fish such as Tilapias and Gambusias (Unmack & Brown 2019).

SPRAT 2023 does not identify any threat abatement plans as being relevant to this species.

4.10.1.3 Survey Effort

As the Project area is outside the known range of the Lake Eacham rainbow fish, surveys for this species within the Project area were not undertaken.

4.10.1.4 Project Area Habitat Assessment

The Project area does not overlap with the known species range as presented in SPRAT 2023. There are no records of this species within 10 km of the Project area from publicly available databases (Wildnet or ALA).

There is one paper (Pusey et al 1997) that mentions the presence of Lake Eacham rainbowfish within Blunder Creek, presumably within the Project area (the paper does not provide a precise location for the record). Pusey et al 1997 found that collections made in the Herbert River drainage (including Blunder Creek, Cameron Creek and Millstream) were dominated (81%) by the eastern rainbowfish although the individuals assigned to the Lake Eacham rainbowfish (n = 4 individuals, or 19%) were assigned to this species with high probability (>0.95). More broadly, this study found that few sites contained both species in roughly equal proportions and where this did occur, sample sizes were not large. When one species dominated (such as with the Herbert River drainage), there was a general tendency for the other species to have an intermediate morphology – suggestive of hybridization.

The study concluded that *M. eachamensis* is widespread throughout the Johnstone River and present in the upper reaches of the Tully River and in the Herbert River.

Based on this study and despite the availability of any further records, Blunder Creek and Oaky Creek (the only semi-permanent watercourses within the Project area that are stream order 3 or higher) have been mapped as potential habitat for the Lake Eacham rainbow fish, as shown in **Figure 4-43**.

ARK ENERGY

Attexo

Chalumbin Wind Farm

Potential Habitat for Lake Eacham Rainbow Fish

Figure 4.43

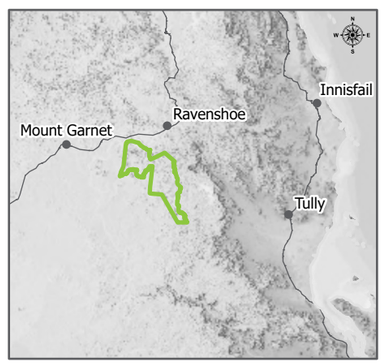
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Threatened Fauna Record (ALA)
- Potential Habitat
- Watercourse
- Lake
- Catchment Boundary

Date: 20/02/2023 Author: TOD

Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:250,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PER_Submission.aprx

4.11 Wet Tropics of Queensland

4.11.1 World Heritage Values

4.11.1.1 Overview

The Wet Tropics of Queensland World Heritage Area stretches along the northeast 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. These living relicts of the Gondwanan era and their subsequent diversification provide unique insights to the process of evolution in general. They also provide important information for the interpretation of fossils of plants and animals found elsewhere in Australia, and about the evolution of Australia's sclerophyll flora and marsupial fauna in particular (IUCN 1988).

The Wet Tropics supports tropical rainforests at their latitudinal and climatic limits, and unlike most other seasonal tropical evergreen equatorial forests, is subject to a dry season and to frequent cyclonic events. Many of the distinct features of the Wet Tropics relate to its extremely high but seasonal rainfall, diverse terrain and steep environmental gradients. In addition to its complex array of species and life forms, the Wet Tropics is also recognised as an area possessing outstanding scenic features, natural beauty and magnificent sweeping landscapes.

The Wet Tropics provides the only habitat for numerous rare species of plants and animals. There are 380 plants and 102 animal species in the Wet Tropics that are considered rare or threatened. These species include 40 rare animal species, including the northern bettong, the spotted-tailed quoll, the yellow-bellied glider and the southern cassowary.

The vegetation is predominantly rainforest but also includes mixtures with sclerophyll tree species occurring as emergent and co-dominant species in the canopy. Fringing the rainforests are tall, open forest, and tall, medium and low woodland. The sharp demarcation between the rainforest and adjacent sclerophyll vegetation is a unique feature.

The Wet Tropics rainforests contain an almost complete record of the major stages in the evolution of plant life on earth. These rainforests are floristically and structurally the most diverse in Australia. They include 13 major structural types, further classified into 64 broad plant communities.

4.11.1.2 Outstanding Universal Value

The Wet Tropics of Queensland was inscribed as a natural World Heritage Area in 1988. **Table 4-12** lists the relevant criteria and outstanding universal values (OUV) for which the property was inscribed. 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 4-12 Criteria and Outstanding Universal Value of the Wet Tropics of Queensland World Heritage Area

Criterion	Outstanding Universal Value of the Wet Tropics WHA (compiled from DASETT 1987, WTMA 2002, DES 2019c and UNESCO 2021)[18]
(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. The region between the Bellenden Ker Range and the Atherton Uplands contains superb gorge scenery with swiftly flowing rivers. The Russel, Mulgrave and Johnstone Rivers are wild rivers and have become popular with canoeists. In this area of high rainfall and rugged topography, spectacular waterfalls abound.
(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 235orter235y of marsupials as well as of songbirds. The original and updated nominations identified the following key features under this criterion: a) The age of the Pteridophytes b) The age of the conifers and cycads c) The age of the angiosperms d) The final break-up of Gondwana: several groups regarded as likely relicts of Gondwanan fauna are represented in the nominated area. Two of Australia's three families of frogs are believed to have Gondwanan origins, including in the genera *Taudactylus, Nyctimystes* and *Litoria*. Birds with accepted Gondwanan origins include the cassowary and megapodes (mound-builders) (orange-footed scrubfowl and the Australian brush turkey). e) Biological evolution and radiation during 35 million years of isolated rafting of the Australian continental plate: after

[18] Note "property" in this context refers to the WTQWHA not either of the Project area properties

Criterion	Outstanding Universal Value of the Wet Tropics WHA (compiled from DASETT 1987, WTMA 2002, DES 2019c and UNESCO 2021)[18]
	separation of the Australian landmass from Antarctica and during its isolated drift towards the equator, there was a general increase in aridity. During this time, major evolutionary radiations occurred within the flora and the marsupials. The WT region contains the highest concentration of surviving remnants of ancestral stock of sclerophyll flora and marsupial fauna that now dominate the landscape. The most primitive of the marsupials are the Dasyuroids, a carnivorous group that are preceded in in the evolutionary history of the marsupials only by the236orter236m family in South America. Nine species of Dasyuroid are found within the nominated area, including one restricted species, the Atherton antechinus, which is considered a relict species. It has been proposed that the earliest marsupials evolved in rainforests, with the extent rainforest-dependent species being among the most primitive in their respective groups, e.g. the green ringtail possum. The musky-rat kangaroo, which is restricted to the nominated area, is the most primitive of the living kangaroos and is unique in representing an early stage of evolution of macropods from arboreal possum-like stock. f) The origin and radiation of the songbirds: it has been suggested that the world's songbirds may have evolved from ancestors that emigrated from Australia. The Wet Tropics region contains the highest numbers of rainforest-dwelling species extant in Australia within the group of birds considered to represent the ancestral stock from which Australia's and possibly the world's songbirds evolved. Rainforest birds of the Wet Tropics hold vital clues to the origin, evolution and biogeography of songbirds within Australia and the world. This group is represented in the Wet Tropics by at least 30 species, all of which are primarily rainforest inhabitants. The Wet Tropics is the most important area for several lineages of Australo-Papuan songbirds e.g. the bowerbirds, scrubwrens, thornbills and gerygones. Of this family, 16 species inhabit closed forests, with 10 of these occurring in the Wet Tropics. Three are endemic to the uplands of the property: fernwren, Atherton scrubwren and mountain thornbill. Chowchilla is likely to be a relict species, endemic to the Wet Tropics. g) The mixing of the continental biota of the Australian and Asian continental plates: the collision of Australian and Asian continents about 15 million years ago after having been largely separated for at least 80 million years led to a unique mixing of flora and fauna. Among the fauna, the microphylid frogs are believed to have originated in Gondwana but to have arrived in Australia via India when landbridges became available. Of the 16

Criterion	Outstanding Universal Value of the Wet Tropics WHA (compiled from DASETT 1987, WTMA 2002, DES 2019c and UNESCO 2021)[18]
	species in Australia, 12 occur in the Wet Tropics. It is thought that skinks also arrived in Australia from the time of the earliest connection between Australia and Asia. Ten rainforest-dependent skinks are restricted to the property. Recent reassessment of the origins of Australia's native birds suggest that only a few groups arrived from Asia. Rodents and bats are considered to have entered since connections with the Asian plate were established. 60% of Australia's bat species are found in the Wet Tropics. h) The extreme effects of the Pleistocene glacial periods on tropical rainforest vegetation
(ix) to be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals	Geological history involving the separation and drifting of continents, vulcanism, mountain building and erosion has profoundly influenced the evolutionary history of life on earth. The tropical rainforests, in particular, are one of the most significant biomes harbouring the majority of the earth's genetic diversity. Processes resulting in exceptional species richness or of high endemism are of outstanding scientific interest. The long-isolated ancient flora of the Australian Wet Tropics has exceptionally high levels of endemism compared with similar 'recent origin' habitats in Malaysia, New Guinea, West Africa and the Andes. 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 genera per unit area), the Wet Tropics provides fundamental insights into evolutionary patterns both in isolation from and in interaction with other rainforests. It is unique as part of an ancient continental as opposed to an island landscape. 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. 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. Many of the endemic species and genera within the Wet Tropics are narrowly restricted within the property and several local centres of endemism have been identified. All encompass altitudinal gradients within the most equably wet climatic zones allowing for mobility of refugia and survival of relict taxa during climatic fluctuations on

Criterion	Outstanding Universal Value of the Wet Tropics WHA (compiled from DASETT 1987, WTMA 2002, DES 2019c and UNESCO 2021)[18]
	geological time scales. The rapid and ongoing ecological, biological and geological processes occurring in the Wet Tropics have left many species restricted to upland areas and divided by altitudinal barriers into two or more disjunct allopatric populations. As allopatry is an important mechanism of speciation, these species may be regarded as potential examples of ongoing evolution. Species with disjunct populations outside the Wet Tropics have potential for allopatric speciation, including the brown antechinus, the white-footed dunnart, the spotted-tailed quoll and the brush-tailed bettong. In all of these cases the disjunction is at least 1,000 km. Several species of fauna restricted to the property also occur as two or more disjunct populations, including the frogs *Taudactylus*. *Rheophilus*, *Cophixalus concinnus*, *Litoria nannotis* and *L. nyakalensis*; the skink *Lampropholis czechurae* and the Herbert River ringtail possum.
(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	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 (see **Section 4.6.4**). 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. The Wet Tropics has more rainforest dependent endemic vertebrates than any other area in Australia. Most of these are confined to the cooler, upland rainforests and are considered to be relicts from formerly widespread temperate environments. For example, the musky rat-kangaroo is a species of considerable evolutionary significance and is restricted to the rainforests of the Wet Tropics wherein it has a very patchy distribution. Little is known of this species' biology. 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. The wet sclerophyll forest that forms a narrow band on the western edge of the rainforest is very rich in vertebrate species with at least 227 species in only 72,000 ha. This high diversity but low regional endemism is due to this habitat being an overlap zone between rainforest and dry sclerophyll forests and woodlands. There are only five species of vertebrates that are confined to

Criterion	Outstanding Universal Value of the Wet Tropics WHA (compiled from DASETT 1987, WTMA 2002, DES 2019c and UNESCO 2021)[18]
	the wet sclerophyll forest in the Wet Tropics and of these, only one is a regional endemic. The lemuroid ringtail possum occurs only above 550 m with the larger population in the Atherton Uplands and a smaller population on Mt Carbine Tableland, separated by the Black Mountain Corridor. Of the 13 endemic mammals, only the mahogany glider and northern bettong are not rainforest dependent. The mahogany glider was rediscovered in 1989 after having been essentially forgotten for more than a century. It has been found at only a few localities in lowland woodland between Ingham and Tully. Over 80 % of its habitat has been cleared for sugar cane, plantation pine, bananas and cattle. The northern bettong was once widely distributed in a range of tall and medium sclerophyll habitats in the uplands of the Wet Tropics but is currently known to occur at only three locations: Mt Carbine Tableland (very small, restricted and low density population), Lamb Range (including Davies Creek, Emu Creek and Tinaroo) and Coane Range (recently discovered small disjunct population).

4.11.1.3 Integrity

At the time of its inscription the WTQWHA was identified as being an essentially intact ecosystem with low levels of human impact, especially when compared to other tropical forest regions, with 80 % of the estimate cover originally present at the time of the first European settlement remaining. However, a substantial amount of lowland forest had been cleared for agricultural purposes. A number of human disturbances that cumulatively detracted from the overall natural integrity were scattered throughout the property and included infrastructure such as transmission lines, access roads, abandoned mine sites and more extensive areas which had been selectively logged, However, the evaluation also noted that these disturbances accounted for only a small proportion of the total area of the property. In addition, other local management issues that needed attention included invasions of exotic plants, animals and forest diseases (UNESCO 2021).

Since inscription, the Australian and Queensland governments have worked cooperatively to put in place a comprehensive management regime for the property, outlined in **Section 4.11.1.4**. Logging has been prohibited since 1987, with the infrastructure associated with this activity removed and the impacted forests allowed to recover. Maintenance activities associated with the provision of community infrastructure are now regulated under a statutory management plan and guided by environmental codes of practice.

A number of threatening processes still impact the overall integrity of the property, including invasive species, fragmentation, and altered hydrological and fire regimes. In addition, a key emerging threat to the integrity of the property is climate change, as with even a small increase in temperature, large declines in the range size for almost every endemic vertebrate species confined to the property are predicted (see **Section 4.1.10**). The WTQWHA 2020 Outlook Report to the IUCN (WTMA 2020) states "…the insidious and damaging threat posed by invasive plants, animals and diseases, and the impacts of climate change present real danger to the continuing integrity of the site's biodiversity and associated endemic species". Mountain tops of the Wet Tropics are vulnerable to the impacts of climate change and it is known that many endemic forest species are already reduced in both distribution and population, primarily as a result of climate change (see **Appendix T**). These species are a highly valued component of Wet Tropics biodiversity due to their high conservation and evolutionary value.

4.11.1.4 Protection and Management

The WTW Periodic Report to the World Heritage Committee (WTMA 2011) identified that there was no buffer zone around the property at the time of its inscription and that a buffer zone was not considered necessary, with the boundaries of the property being adequate to maintain the property's Outstanding Universal Value.

The management of the WTQ World Heritage Area is on three levels. A State and Commonwealth Ministerial Council coordinates policies and funding. The Wet Tropics Management Authority (WTMA) is responsible for general planning and policy development, advised by Rainforest Aboriginal Advisory, Community Consultative and Scientific Advisory Committees. The Queensland Department of Environment and Science (DES) and DoR manage the day-to-day aspects of the Wet Tropics.

In 1990 the Australian and Queensland Governments agreed to jointly fund and coordinate management of the Wet Tropics, signing an agreement that established the Wet Tropics Management Scheme. The agreement outlined the broad structural and funding arrangements for the management scheme, including the establishment of WTMA. The management scheme also establishes a scientific advisory committee to provide advice to the Authority and a community consultative committee to report to the Authority on matters relating to the management of the property from the viewpoint of representative interest groups and the community at large.

The Queensland *Wet Tropics World Heritage Protection and Management Act 1993* (Wet Tropics Act) and the Commonwealth *Wet Tropics of Queensland World Heritage Conservation Act 1994* together give effect to the administrative and operational aspects of the agreement and facilitate the implementation of Australia's obligations under the World Heritage convention. These Acts require WTMA to produce an annual state of the Wet Tropics World Heritage Area report for the Queensland and Commonwealth parliaments respectively.

The *Wet Tropics Management Plan 1998* (WT Plan) was subsequently developed under the Wet Tropics Act. This statutory Plan provides for the regulation of potentially damaging activities within the property. The Plan includes a zoning system and a system for administration of permit applications and a penalty regime for any infringements. Under the WT Plan, WTMA is required to consider a set of principles and criteria for deciding permit applications of which the most important consideration is the likely impact of a proposed activity on the integrity of the property.

While the WT Plan applies to all lands within the Wet Tropics, the property contains a diversity of different tenures, and a corresponding range of government agencies and private land holders with responsibilities for managing these tenures, under different legislation. Since listing, the Queensland Government has transferred the majority of former forestry tenures to protected area tenure. This has resulted in the total of protected area estate being increased from 14 % at listing to over 65 %. The conversion to protected area estate ensures a more compatible conservation management regime.

The EPBC Act provides an extra protection mechanism for all World Heritage properties in Australia. Under the EPBC Act, any action that has, will have or is likely to have a significant impact on the World Heritage values of a World Heritage property must be referred to the responsible Minister for consideration. The EPBC Act applies whether the activity is inside or outside of the boundaries of a World Heritage property. Substantial penalties apply for taking such an action without approval.

As well as the regulatory protection mechanisms described above, WTMA has prepared a number of strategies to guide management of the property, including the *Wet Tropics Nature Based Tourism Strategy* (2000); the *Wet Tropics Conservation Strategy* (2004); and the *WTMA Research Strategy 2010 – 2014*.

WTMA is committed to promoting and developing partnerships with people and stakeholders with rights, responsibilities and interests associated with the Wet Tropics. The Wet Tropics Act recognises the important role that Aboriginal people can play in the management of natural and cultural heritage in the property. The *Wet Tropics World Heritage Area Regional Agreement 2005* provides for the cooperative management of the property between 18 Rainforest Aboriginal tribal groups, WTMA, and the Australian and Queensland governments. This Regional

Agreement has seen the formal establishment of a Rainforest Aboriginal Advisory Committee under the Wet Tropics Act and the inclusion of two Rainforest Aboriginal directors on WTMA's Board. WTMA has also established a conservation sector liaison group and a tourism industry liaison group to promote improved communication and liaison with these key stakeholders.

The WTQ World Heritage Area has been proposed as an example of best practice in relation to usual practices, innovative research, community consultative committee, active program of communication, Cassowary Awards for community achievements and community survey.

It is considered that the successful management of the WTQ World Heritage Area over the past 20 years can be attributed to several inter-related factors that represent best practice, most notably:

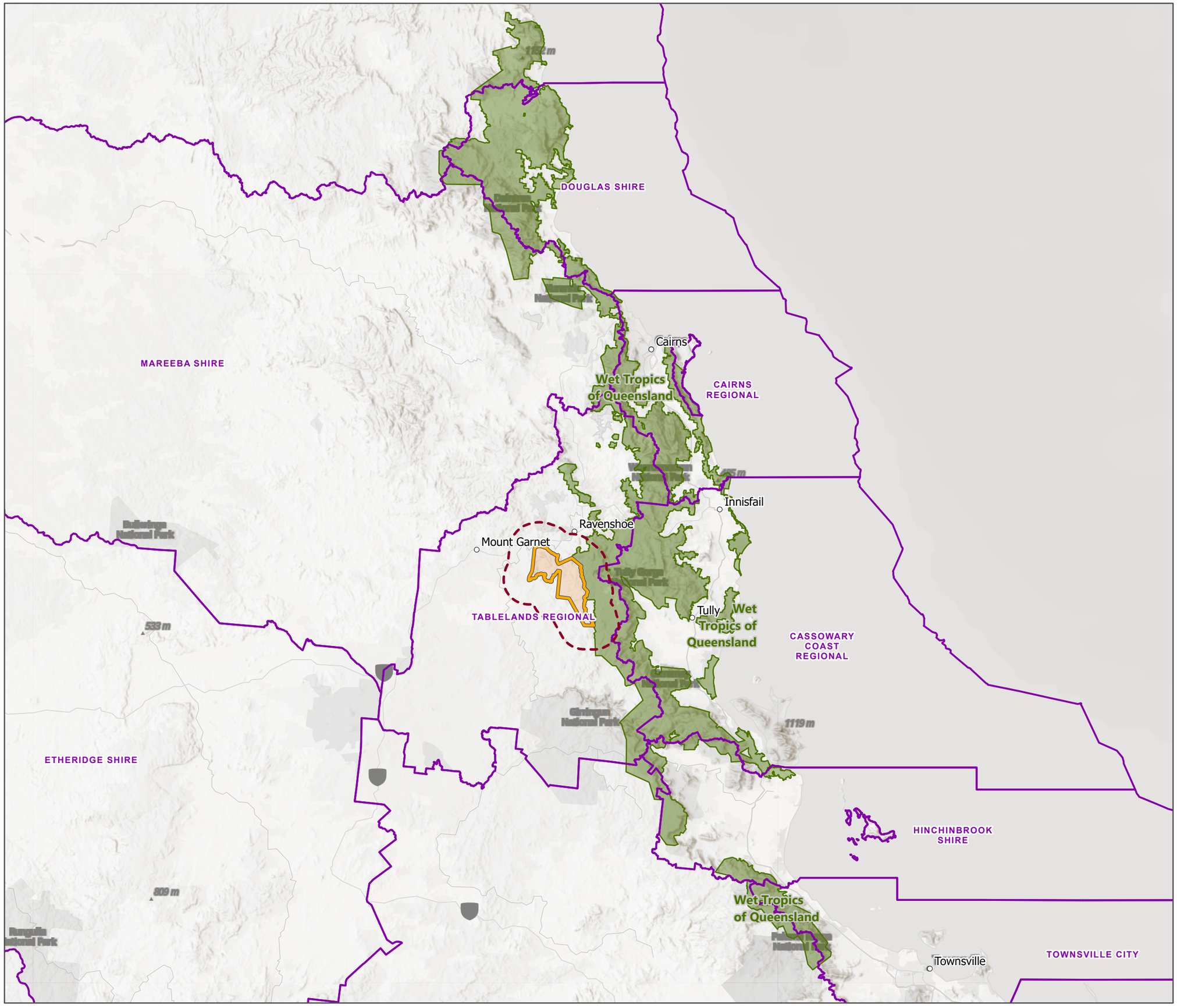
- Design and implementation of a comprehensive property-specific management regime that integrates and coordinates the interests of the State and Commonwealth governments and the role of various land management agencies and entities;
- Establishment of a regionally based independent management authority for the Area with statutory roles. This ensures effective regional leadership, a close connection with the regional community and continued advocacy for the Outstanding Universal Values of the area.
- Strong and continuing interest and policy support from successive Commonwealth, State and local governments;
- Establishment and implementation of a property-specific regulatory regime for the area that applies over all tenures within the area;
- A system of complementary legislation and regulation that supports conservation of the area in the wider landscape;
- Sophisticated and well-resourced systems of community engagement for the area, ensuring that regional communities are aware of its OUV, have a direct and influential say in its management and can contribute to its conservation;
- A strong focus on the rights and interests of the Indigenous peoples of the area with the objective of ensuring their participation contributes to community well-being;
- Strong partnerships with the regional tourism industry to ensure high standard of presentation of the area while ensuring tourism development is sympathetic to the effective protection and conservation of the area; and
- An extensive program of management-oriented research, building relevant knowledge about the area and generating information that has application in other protected area landscapes.

A particular feature of the management regime for the WTQ World Heritage Area is that the World Heritage status of the property remains a primary driver of management, communications and engagement. Most importantly, the World Heritage status of the WTQ and its outstanding universal values are widely recognised and supported in the Australian community. This is a result of the communications and engagement efforts of WTMA and other Commonwealth and Queensland Government agencies, with strong support from environmental NGOs. This strong foundation is remarkably important in implementing regulatory frameworks, attracting public investment and ensuring alignment in management of the area.

While recognising that international differences in culture, legislative system, patterns of land ownership and financing capacity must be taken into account, many of the best-practice aspects of the management regime for the WTQ World Heritage Area are transferable. Possibly the most important transferable aspect is that of putting people at the centre of the management system, and supporting and empowering their contributions (UNESCO 2021).

4.11.1.5 Species Associated with the Values of the WTQ in Proximity to the Project Area

The Project area is located adjacent to, but outside, the WTQWHA as illustrated in **Figure 4-44** and there is limited rainforest habitat within the Project area. The Project area contains habitat for species that use habitat within the WTQWHA and are therefore considered values of the WTQWHA, above and beyond those described in the sections above. **Appendix T** provides an overview of species that have been identified as values of the WTQWHA through extensive literature review, and describes the recorded or likely presence of these species or their habitat within the Project area. In addition, the final PER Guidelines required the specific assessment of a number of species that are particular values of the property, along with wet sclerophyll forest. This is provided below.



ARK ENERGY

Attexo

Chalumbin Wind Farm

Wet Tropics World Heritage Area

Figure 4.44

- Project Area
- Study Area (10km Buffer)
- WTQ Boundary
- Local Government Area

Date: 20/02/2023 Author: TOD

Project: EPU-004 Reviewed: NOD

0 10 20 30 40 Km

Scale: 1:1,500,000@A3

Data Source(s):
Local Government Area - Department of Resources (2022)
© State of Queensland (Department of Resources) 2022, Department of Resources, Dept.of Environment and Science, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, CGIAR

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PER_Submission.aprx

Green-eyed Tree Frog

Also known as the tapping green-eyed frog (*Litoria serrata*), the green-eyed tree frog is listed as Vulnerable under the NC Act. It is a medium to large treefrog, originally described from Malanda but believed to be widespread across the Wet Tropics. It occupies rainforest and adjacent wet sclerophyll forest, and is usually found near creeks or seepages.

There are previous records of the species within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 2013 (ALA). Tapping green-eyed frogs were observed near creeks during spotlighting surveys in March 2021 at two locations within the Wooroora property, towards the boundary with the WTQWHA. Creeks within rainforest and wet sclerophyll forest were mapped as potential habitat for the tapping green-eyed frog, see **Figure 4-45**.

Herbert River Ringtail Possum

The Herbert River ringtail possum (*Pseudochirulus herbertensis*) is an upland specialist with highly restricted ranges and minimum elevational limits ranging from 300-600 m (Winter et al. 1984). The species prefers tall high-diversity forest (rainforest and mature mixed-regrowth) at elevations of above 350 m and is found between Mount Lee, west of Ingham and Kuranda, west of Cairns, Queensland. Occasionally the species is found in open forests of *Eucalyptus grandis* on the western edge of rainforests however, it is unlikely that self-sustaining populations exist in eucalypt forest (Burnett and Winter 2016a). They are almost exclusively arboreal, rarely descending to the ground (Winter et al. 1984). The species is nocturnal; emerging from dens shortly after sunset and return 50-100 minutes before daybreak. Diet is folivorous and feeds mainly on leaves of *Alphitonia petrei* and secondary food sources of *Elaeocarpus ruminates, Polyscias murrayi, Syzgium cormiflorum, S. alliiligneum, Acmena resam, Eucalyptus acmenoides, E. torelliana* and *Melodinus bacellianus* (McKay 1987).

There are numerous previous records of Herbert River ringtail possum within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 2018 (ALA). It has not been previously recorded within the Project area and was not observed during field surveys. Potential habitat within the Project area has been mapped as rainforest and wet sclerophyll forest, as indicated in **Figure 4-46**.

Macleay's Fig Parrot

Macleay's fig parrot (*Cyclopsitta diophthalma macleayana*) is the Wet Tropics subspecies of the double-eyed fig parrot. It is a rainforest species which is common in the Wet Tropics, distributed between Cooktown and Eungella. It is not a higher altitude specialist and is currently not subjected to known threats.

There are previous records of Macleay's fig parrot within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 2020 (ALA). It has not been previously recorded within the Project area and was not observed during field surveys. There is limited potential habitat for Macleay's fig parrot within the Project area, which has been mapped as rainforest and wet sclerophyll forest, as indicated in **Figure 4-46.**

Lumholtz's Tree Kangaroo

Lumholtz's tree kangaroo (*Dendrolagus lumholtzi*) is listed as Near Threatened under the NC Act. It occurs mostly at high altitudes along the western edge of the Atherton Tablelands. It is mostly restricted to rainforest habitats but also extends along riparian vegetation through primarily open forest habitats and, less abundantly, wet sclerophyll forests. It is mainly nocturnal and predominantly arboreal. The species shows strong site fidelity, with individuals remaining within their home range even when this is threatened by clearing or disturbance; as such, it has been known to occupy forest fragments of less than 20 ha. Populations in such fragments may have limited long-term viability (Woinarski & Burbridge 2016b).

There are numerous previous records of Lumholtz's tree kangaroo within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 2014 (ALA). It has not been previously recorded within the

Project area. One adult and one juvenile were recorded on camera within a small patch of rainforest vegetation within the Project area, close to the boundary with the WTQWHA as indicated in **Figure 4-47**. Potential habitat for the Lumholtz tree-kangaroo was mapped as rainforest habitats, riparian vegetation through primarily open forest habitats and wet sclerophyll forests as shown in **Figure 4-47**.

Rufous Owl

Rufous owl (*Ninox rufa queenslandica*) is a tropical rainforest specialist and highly confined to high rainfall areas (Keast 1961). It occurs from New Guinea, the Aroe Islands to northern Australia west of the Gulf of Carpentaria and the east coast of Queensland. It has an extent of occurrence of 4,250,000 km^2 (Keast 1961). The rufous owl nests in live or dead trees, with nests up to 30 m high. It roosts in dense rainforest vegetation as well as river-edge gallery forest, monsoon scrubs, swamps and mangroves up to elevations between 680-1200 m; and hunts through adjacent eucalypt woodland up to 1 km from the rainforest. Rainforests margins thought to constitute ideal habitat by providing both concealed roosts in dense rainforest and foraging opportunities in the adjacent woodlands and swamps (Schodde and Mason 1980; Estbergs & Braithwaite 1985; Hollands 1991; Nielsen 1995).

There are previous records of rufous owl within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 1998 (ALA). It has not been previously recorded within the Project area and was not observed during field surveys. Potential habitat has been mapped as rainforest and eucalypt forest up to 1 km from rainforest, as well as riparian vegetation associated with Blunder Creek (see **Figure 4-48**).

Tube-nosed Insectivorous Bat

Tube-nosed insectivorous bat (*Murina florium*) has been recorded from a range of tropical moist forest types, including rainforest, and from dry and wet sclerophyll woodland. It roosts as solitary animals or in small groups, amongst dead leaves and other foliage, in caves or in disused buildings.

There are five previous records of the species within the WTQWHA where it overlaps with the broader Study area, with the most recent one dating from 1998 (ALA). It has not been previously recorded within the Project area. One call file from the Anabat deployment in January 2021 potentially corresponds with this species; however, the species is difficult to accurately identify based on call alone. There is limited suitable habitat for the tube-nosed insectivorous bat within the Project area and these areas were targeted with harp traps in June 2021. The species was not recorded. As such, the presence of this species within the Project area is considered unlikely. Potential habitat has been mapped as rainforest, wet sclerophyll and forests with *Eucalyptus grandis* dominant, see **Figure 4-49**.

Wet Sclerophyll Forests

Wet sclerophyll forests are characterised by very tall eucalypt trees (and their close relatives) which form the upper canopy layer. These trees typically range in height from 10 m to over 30 m and canopy cover can vary from 50 % to 80 %. The trunks of these trees tend to be straighter than those of other eucalypts, and their leafy parts are often concentrated in the top third of the tree. The understorey of wet sclerophyll forest can contain shrubs and small trees (often with rainforest species) or may be grassy with scattered shrubs (Peeters and Butler 2014, DES 2014).

Within the Wet Tropics region, wet sclerophyll forests are dominated by rose gum (*Eucalyptus grandis*), red stringybark (*E. resinifera*), white stringybark (*E. acmenoides*), pink bloodwood (*E. intermedia*), brush box (*Lophostemon confertus*) and turpentine (*Syncarpia glomulifera*). Variation in species composition and concentration within these forests relates to soil type, rainfall and fire frequency. There is striking contrast in the structure between the adjoining rainforest and wet sclerophyll forests of north Queensland. The tall open forests on the drier western margins of the rainforest are significant as part of an evolutionary continuum of rainforest and sclerophyll forests (DASETT 1987, DES 2015).

Wet sclerophyll forests located within the boundary of the WTQWHA form part of the values of the WTQWHA under Criterion ix where "*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*" and Criterion x where "*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".

Wet sclerophyll forest is not a listed threatened community under the EPBC Act and is not endangered under the VM Act; rather the corresponding Regional Ecosystems are either Of Concern (REs 7.8.15, 7.8.16, 7.12.52, 12.2.4, 12.3.2 and 12.8.8) or Least Concern (REs 7.12.21, 7.12.22, 7.12.27, 12.8.9 and 12.11.2).

Wet sclerophyll forest can be viewed as a disclimax vegetation type, dependent on disturbance by fire within the lifespan of the dominant species (350 years). Seedling establishment is virtually impossible for eucalypts beneath the light-limited conditions of the dense canopy and is restricted to very shade-tolerant rainforest species. Consequently there is a successional transition from the eucalypt dominants over an understory of short-lived (< 100 years) *Acacia* species, to a forest of emergent eucalypts over a canopy of shade-tolerant rainforest species if fire is excluded from the community for more than 150 years (Wiltshire 2004). A study evaluating the long-term succession of wet sclerophyll forest on K'Gari (Fraser Island) found evidence that more pronounced disturbance regimes than those that have occurred over the past 65 years may be required to conserve wet sclerophyll forest – as without intervention, transition to rainforest is a likely trajectory (Krishnan et al 2019). Another study by Harrington and Sanderson 1994 showed that during a 50-year period rainforest invaded between 57% and 70% of wet sclerophyll forests. Grass was quickly excluded from invaded areas and thereafter they would only burn under extreme atmospheric conditions. Sclerophyll trees are unable to regenerate in the shade and usually require fire to provide the appropriate conditions. It is not known whether these vegetation changes represent a trend, possibly caused by a change a century ago from fire management by Aboriginal people to management for the cattle industry, or whether it is a temporary phase in the fire-induced, dynamic relationship between rainforest and sclerophyll vegetation (Harrington and Sanderson 1994).

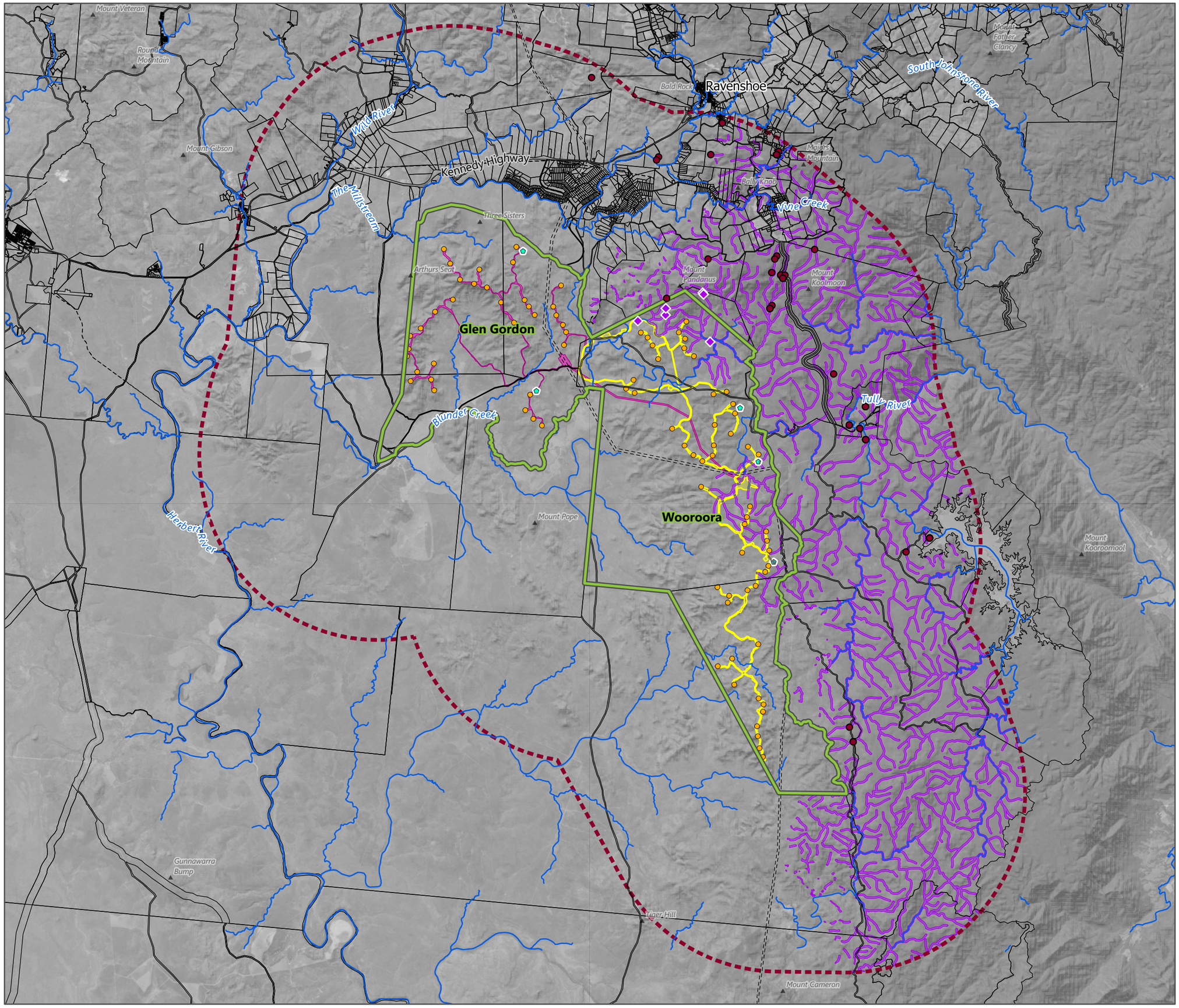
In areas that support wet sclerophyll forest in northern Queensland, most fires occur in the drier part of the year (June to November). However, the resulting fires are usually surface fires and are seldom intense enough to kill large areas of mature wet sclerophyll eucalypts. High intensity crown fires are a rare event in Queensland and the regeneration of wet sclerophyll forests often occurs under much lower levels of disturbance. In particular, fires of the intensity required to generate and maintain larger stands of wet sclerophyll forest seldom occur in the Wet Tropics, and low-moderate intensity fires are rapidly extinguished once they encounter rainforest. Rainforest plants have invaded the wet sclerophyll forest in many areas, and canopy eucalypts do not appear to be regenerating. There are concerns that wet sclerophyll forests in northern Queensland will be replaced by rainforest, to the detriment of species that rely on the former for food and shelter, such as the yellow-bellied glider (Peeters and Butler 2014).

Surveys undertaken by Harrington et al 2005 of wet sclerophyll forests that occur to the west of rainforest areas (at Mt Windsor Tableland, Carbine Tableland, Lamb Range, Herberton Range, Longlands Gap, Koombooloomba, Kirrama, Wallaman Falls and the Paluma Range) found that 48% of wet sclerophyll forests were invaded by rainforest at the time (between 1990 and 1994) and that *E. grandis* forest proved the most susceptible, with 80% of the area invaded. In contrast, approximately 41% of the somewhat drier *E. resinifera / C. intermedia / Syncarpia glomulifera* forest was invaded (Harrington et al 2005).

Peeters and Butler 2014 suggested that regeneration may be triggered by more patchy, low level disturbance (e.g. low intensity surface fire or mechanical clearing). In time, climate variability may also alter the potential mature structure and floristic composition of wet sclerophyll forests. This is because changes in rainfall, temperature, levels of carbon dioxide and other factors may affect the reproduction, growth and competitive ability of the plants and animals that are currently part of this ecosystem (Peeters and Butler, 2014).

The distribution of wet sclerophyll forests within and adjacent to the Project area is shown in **Figure 4-50**, with rainforest communities also shown for reference. Some of these communities exist as isolated patches surrounded by dry sclerophyll forest, representing a natural transition through the ecotone from east to west. Approximately half of the wet sclerophyll forests within the Project area are fragmented from other wet sclerophyll forests within the WTQWHA by existing electricity transmission infrastructure and associated access roads, with evidence of edge effects (such as weed incursion) noted during field surveys. There are approximately 13,600 ha of wet sclerophyll forests

mapped by the Queensland DoR within the broader Study area (comprising a 10 km buffer around the Project area) and approximately 69,500 ha of wet sclerophyll forests in the Wet Tropics bioregion overall. Vegetation surveys have ground-truthed approximately 3,582 ha of wet sclerophyll forests within the Project area, of which 1,853 ha are contiguous with similar vegetation communities within the WTQWHA and 1,728 ha are fragmented by existing areas of disturbance.



ARK ENERGY

Attexo

Chalumbin Wind Farm

Habitat and Survey Records for Tapping green-eyed tree frog

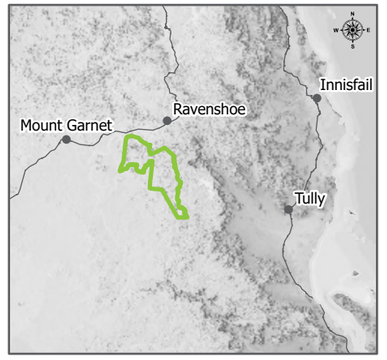
Figure 4.45

- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Survey Observation
- Threatened Fauna Record (ALA/WildNet)
- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 20/02/2023 Author: TOD
Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\43 Cartography\11_PER_Submission\11_PER

ARK ENERGY

Attexo

Chalumbin Wind Farm

Potential Habitat for Herbert River Ringtail Possum and Macleay's Fig Parrot

Figure 4.46

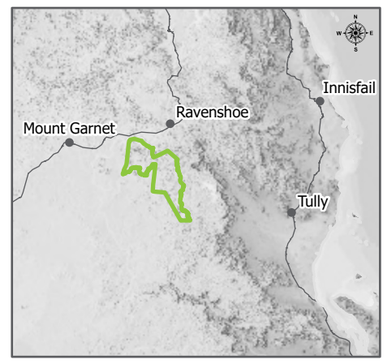
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope
- Stage 1
- Stage 2

Threatened Fauna Record (ALA/ WildNet)
- Herbert River ringtail possum
- Macleay's fig-parrot

- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 20/02/2023 Author: TOD
Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PE

ARK ENERGY

Attexo

Chalumbin Wind Farm

Habitat and Survey Records for Lumholtz's tree kangaroo

Figure 4.47

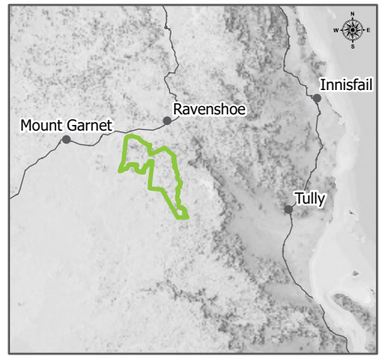
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Survey Observation
- Threatened Fauna Record (ALA/WildNet)
- Preferred Habitat
- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 20/02/2023 Author: TOD

Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\43 Cartography\11_PER_Submission\11_PER

ARK ENERGY

Attexo

Chalumbin Wind Farm

Potential Habitat for Rufous owl

Figure 4.48

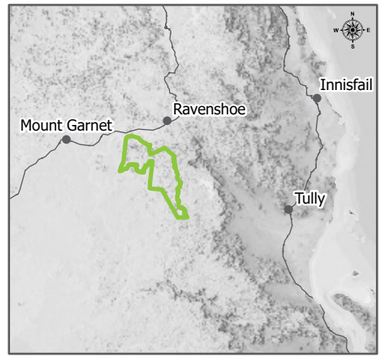
- Project Area Boundary
- Study Area
- Turbine
- Met-mast

Clearance Envelope

- Stage 1
- Stage 2
- Threatened Fauna Record (ALA/WildNet)
- Potential Habitat
- Watercourse
- Lot Boundary
- Easement

Date: 20/02/2023 Author: TOD

Project: EPU-004 Reviewed: NOD



0 5 10 Km

Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022); Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020) Earthstar Geographics, © State of Queensland (Department of Resources) 2022

Path: C:\Users\TimODonnell\Attexo Group\Attexo - Projects\Epuron\EPU-004 - Chalumbin\GIS\4.3 Cartography\11_PER_Submission\11_PER