



6.0 Avoidance, Mitigation and Management Measures

6.1 Design Phase

Early stages of the Project scoping and design included the commissioning of a range of due diligence assessments (both desktop and field) to understand the existing values of the Project area and surrounds. This included a wind measurement campaign, desktop and field ecological surveys, early engagement with the Jirrbal #4 People (Traditional Owners), early engagement with the Wet Tropics Management Authority, engagement of planning and impact assessment specialists, engagement of civil engineers and engagement of landscape and visual amenity specialists.

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

Initial ecological surveys were designed to collect information about the characteristics of the broader Project area, such that the opportunities and constraints could inform the subsequent Project design activities.

The iterative nature of the Project design, progressively considering Project objectives, wind resource quality and environmental values demonstrates the Project's implementation of the avoidance hierarchy. From the Project inception, the proponent's commitment to ecologically sustainable development practice has resulted in numerous scenarios where observations in the field have resulted in tangible and significant changes to the Project.

A summary of the Project changes made in response to feedback from stakeholders on opportunities for improvement in the Project design is provided in **Table 6-1**.

Table 6-1 Summary of Project Changes & Commitments Made in Response to Stakeholder Feedback

Aspect	Project Change/ Commitment
Project footprint	Project is now less than 50% of its original proposed size. Initial development configuration proposed 200 WTGs. The referral involved a proposed 95 WTGs. The current proposal is for 86 WTGs, with a concomitant reduction in supporting infrastructure. Overall significant reduction in the Project footprint from 1,250 ha to 1,071.1 ha.
Magnificent Brood Frog Habitat	The 200-turbine development included at least 36 turbines located within 50 m of potential habitat for the magnificent brood frog which would have resulted in clearing of over 300 ha of this species' habitat. An interim Project configuration (dated June 2021) would have resulted in a clearing area of approximately 123 ha. The current Project layout has been further refined to comprise only 7 turbines within 50 m of potential habitat for the magnificent brood frog with a total potential habitat clearing area of 120.5 ha.
Wet Sclerophyll Forest Vegetation	In mid-2022, the Project design included the proposed clearing of 170 ha of wet sclerophyll forest vegetation. Based on feedback from the WTMA, the Project team has sought to avoid and minimise impacts to this vegetation (reorientation and reduction in size of the southern substation, removal of WTGs, redesign of access tracks, removal of the southernmost WTG string), achieving a reduction of 52.6 ha of proposed clearing of wet sclerophyll forest vegetation with the current proposed design. See Section 6.1.6 for further information.
WTQWHA buffer	The Project footprint has been designed to achieve a separation distance of at least 600 m at the closest point to the WTQWHA, incorporating the conclusions made in relevant literature on the extent of edge effects. It is relevant to note that the buffer to the WTQWHA from the Windy Hill Wind Farm project infrastructure is approximately 500 m.


















Aspect	Project Change/ Commitment
Rehabilitation	The Project has made an industry-leading commitment to rehabilitate up to 70% of the temporary construction disturbances and to retain only the minimum footprint required for safe operations (e.g. 5.5 m wide access tracks). This operational footprint is 107.2 ha (0.3% of the Project area). The Preliminary Rehabilitation Plan is included in Appendix K .
Site Access	The feasibility of an alternative access route to site (from the west, via Innot Hot Springs) is under investigation by CWF and is considered an alternative access arrangement for the purposes of this PER. This alternative access was identified by Tablelands Regional Council and certain stakeholders within the Wooroora Road community. The key determinant with this alternative access via Innot Hot Springs will be the results of a load rating investigation for the Herbert River bridge crossing for over-sized and over-mass vehicles. See Transport Route Study in Appendix R .
Biodiversity Offsets	The Project proposes a substantial biodiversity offset package, including land-based offsets at a ratio of at least 5 times the significant residual impact, plus an additional voluntary contribution of \$250,000 towards scientific research on the Magnificent Brood Frog. See Offset Management Strategy in Appendix O .
Erosion and Sediment Control	<p>The Project commits to avoiding ground-disturbing construction activities in the highest rainfall months of January, February and March. This reduces the risks associated with large rainfall events (both in terms of frequency and size) and adds 30% to the construction costs. See the Sediment and Erosion Management Plan in Appendix J.</p> <p>The Project has located the clearing areas for the substation, office, construction compound and temporary laydown areas away from watercourses to the extent practicable; thereby minimising potential impacts to water quality and downstream impacts to the Great Barrier Reef World Heritage Area.</p>
Infrastructure Optimisation and Realignment	<p>The Project will co-locate underground electrical cabling with the Project's access tracks in order to minimise disturbance for this linear infrastructure as far as practicable.</p> <p>The Project design has sought to minimise the number and width of watercourse crossings. Not only does this minimise impacts to some of the higher value riparian areas within the Project area, this also minimises potential impacts to the Greater Glider and the Masked Owl.</p> <p>The Project avoids the need for an off-site transmission line (and associated linear vegetation clearance) to an external connection point. The Project includes a proposed T-connection into the existing Powerlink 275 kV transmission line that traverses the Project area (and nearby WTQWHA).</p> <p>The Project design has ensured complete avoidance of the rocky pavement shrub complex habitat that was found to support numerous MNES flora species.</p>
Culturally Significant Areas	The Project layout was refined to ensure that no infrastructure was located within 2 km of Arthur's Seat, which was identified by the Traditional Owners as a landscape feature of high cultural significance.
Accommodation Facility	In response to feedback from stakeholders regarding the potential for the Project to displace the currently limited affordable housing stock, the Project team is investigating the potential for an accommodation facility to support the construction of the Project on adjoining cleared agricultural land. This would also reduce potential impacts associated with construction traffic and nearby sensitive land uses.

An illustrative example of how the design has changed to avoid these constraints is provided in a three-map series presented in **Figure 6-1**, **Figure 6-2** and **Figure 6-3**. This has resulted in an initial development concept involving 200 wind turbines to maximise the economic wind resource reduced by 106 wind turbines (red dots) down to 86 wind turbines (green dots) to avoid sensitive topographic, ecological and cultural heritage constraints to the extent practicable.

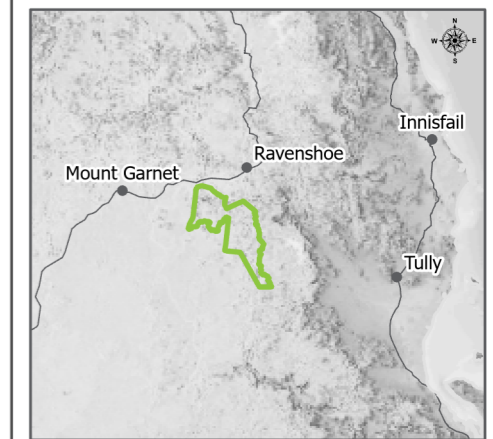
Avoidance of MNES has been demonstrated during the design process as described in the following subsections.

Chalumbin Wind Farm
Notable MNES Constraints

Figure 6.1

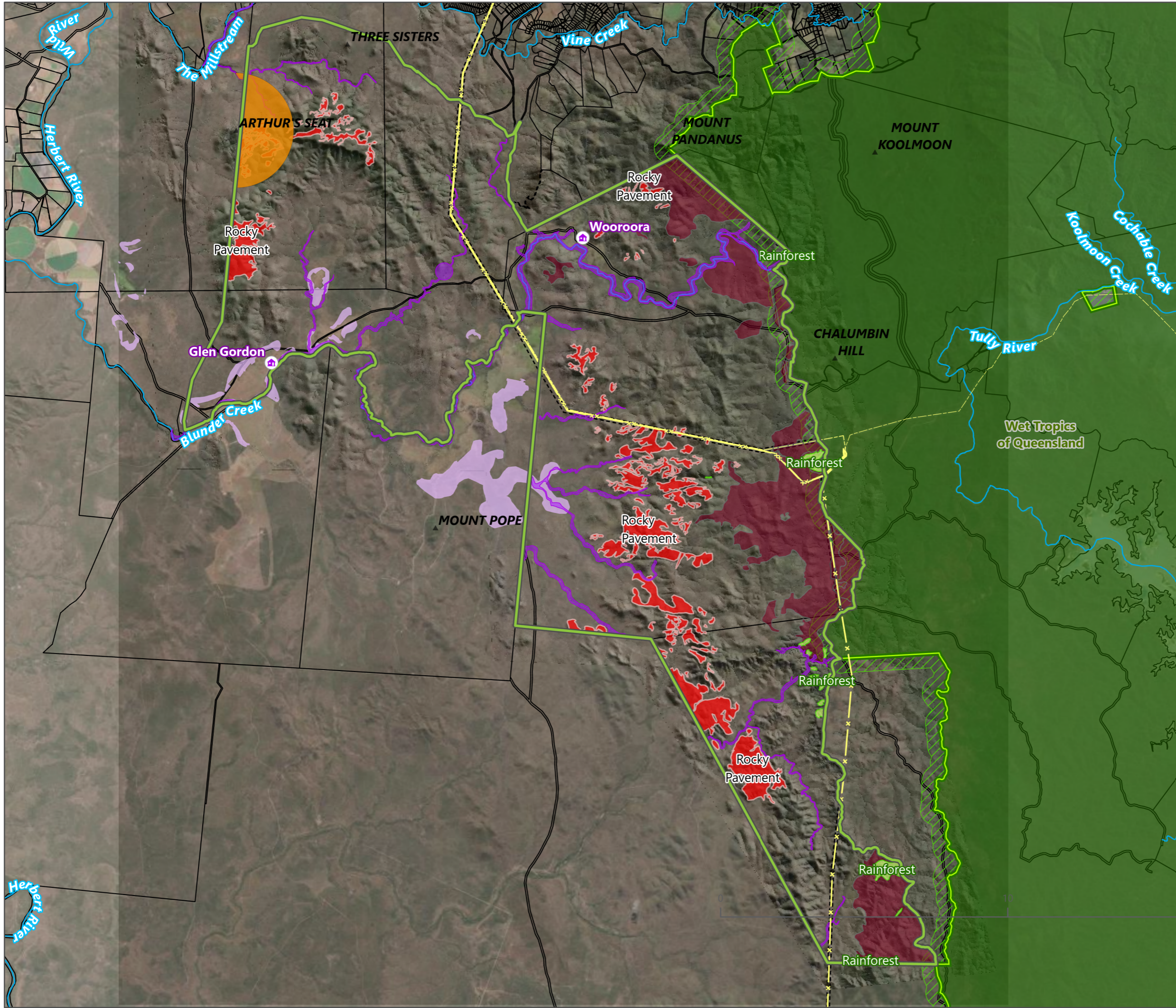
-  Project Area Boundary
-  Homestead
-  Existing 132kV Powerline
-  Existing 275kV Powerline
-  WTQWHA Boundary
-  WTQWHA Buffer (500m)
-  Rainforest Habitat
-  Rocky Pavement Shrub Complex
-  Wet Sclerophyll Forest
-  Potential Red Goshawk Nesting Habitat
-  Cultural Heritage Constraint
-  Wetland
-  Watercourse
-  Property Boundary
-  Easement

Date: 13/10/2022 Author: TOD
Project: EPU-004 Reviewed: NOD





















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Data Source(s):
Local Government Area - Department of Resources (2022)
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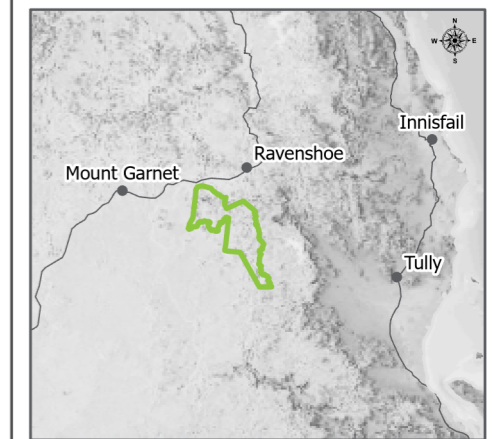


Chalumbin Wind Farm
Notable MNES Constraints and
Previous Project Layout

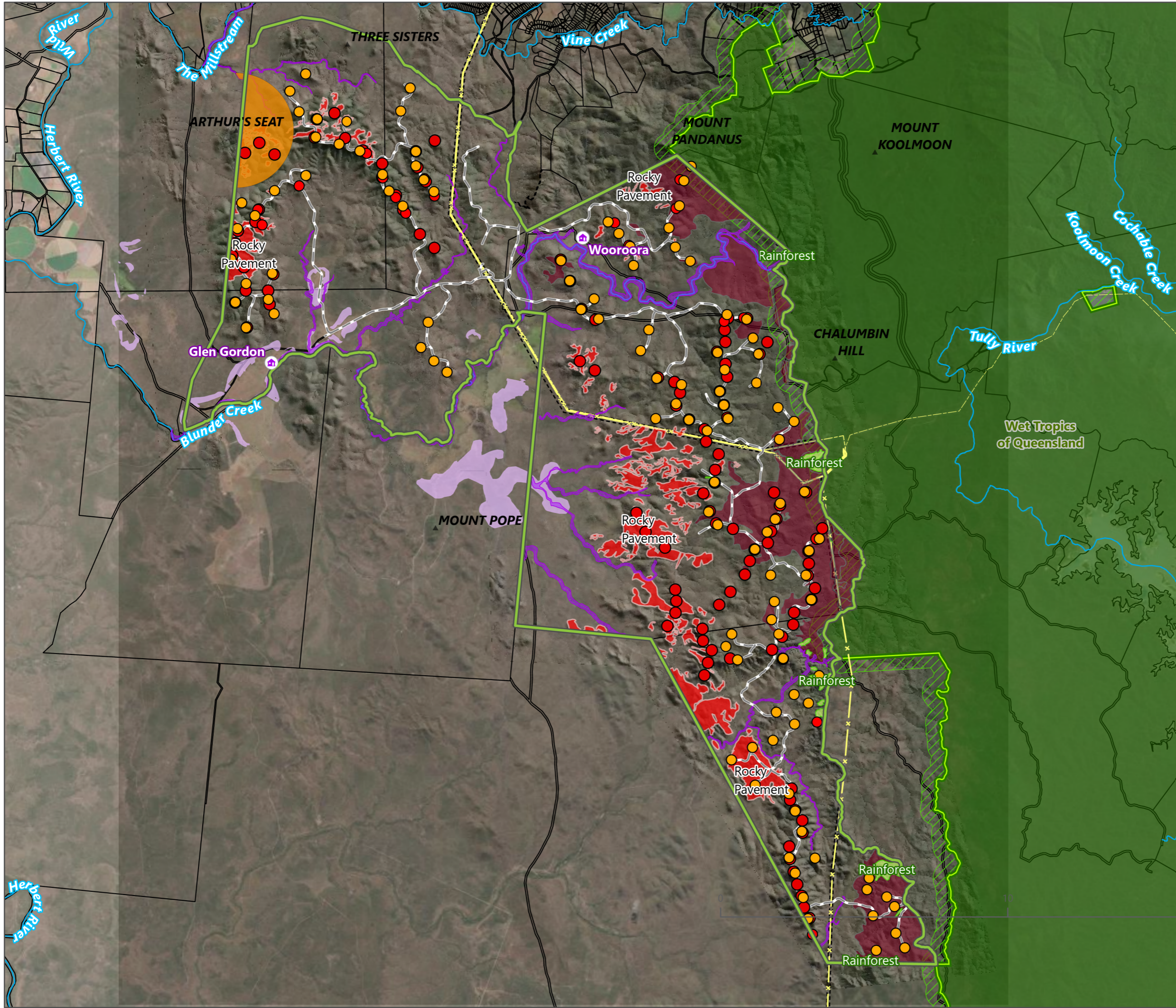
Figure 6.2

-  Project Area Boundary
-  Avoid High Risk Constraints
-  Preliminary Wind Model
-  Homestead
-  Initial Access Road
-  Watercourse
-  Existing 132kV Powerline
-  Existing 275kV Powerline
-  WTQWHA Boundary
-  WTQWHA Buffer (500m)
-  Cultural Heritage Constraint
-  Potential Red Goshawk Nesting Habitat
-  Rainforest Habitat
-  Rocky Pavement Shrub Complex
-  Wet Sclerophyll Forest
-  Wetland
-  Property Boundary
-  Easement

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







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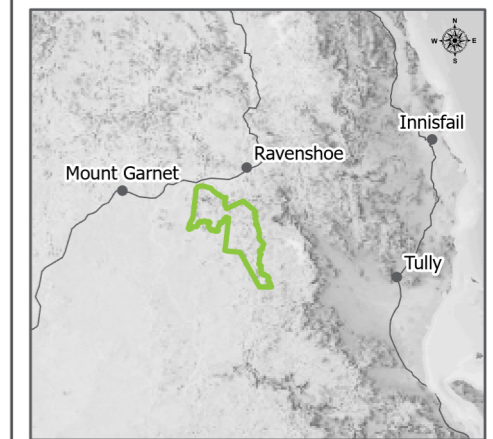


Chalumbin Wind Farm
Notable MNES Constraints and Current Project Layout

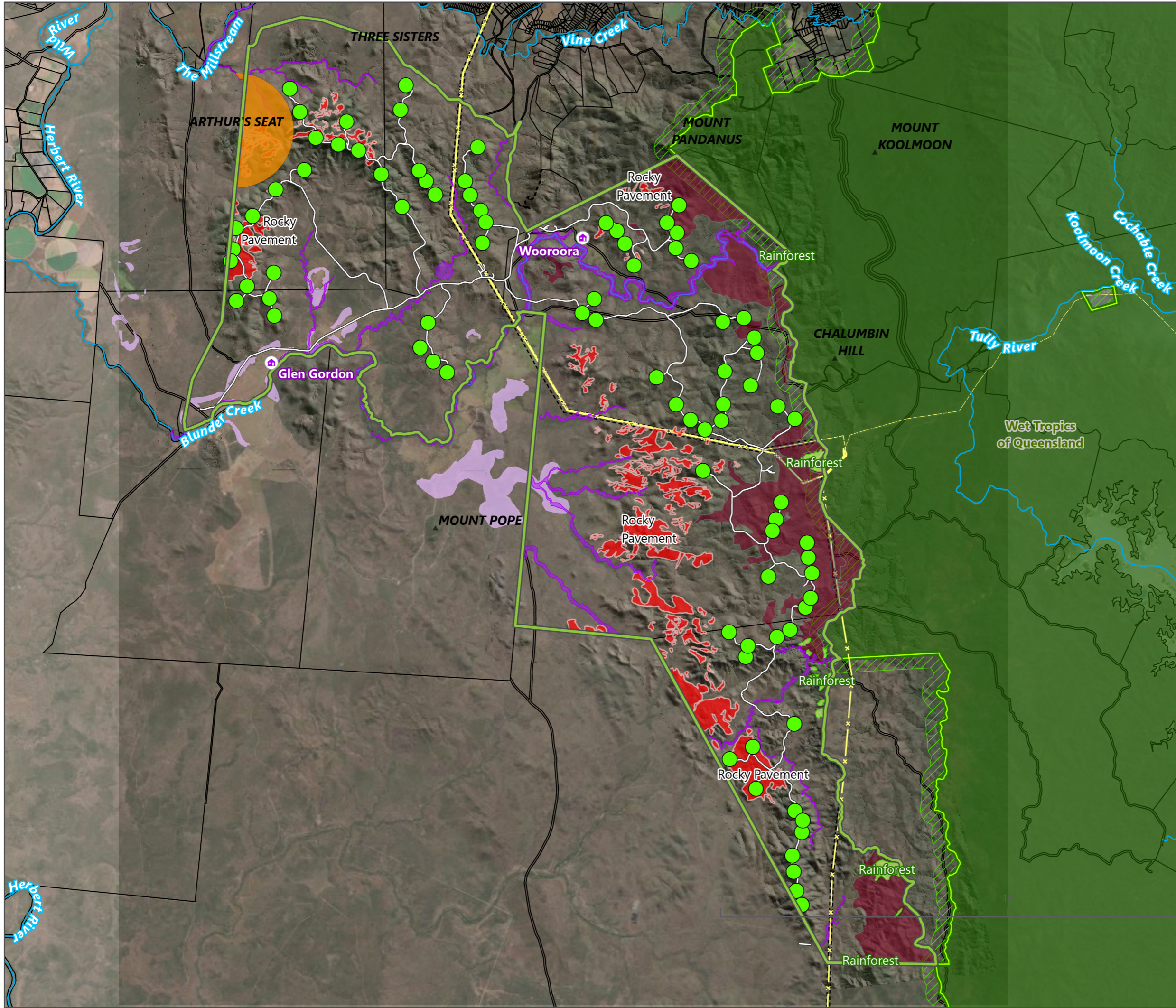
Figure 6.3

-  Project Area Boundary
-  Current Turbine Layout
-  Preferred Access Road
-  Homestead
-  Watercourse
-  Existing 132kV Powerline
-  Existing 275kV Powerline
-  WTQ Boundary
-  WHA Buffer (500m)
-  Cultural Heritage Constraint
-  Potential Red Goshawk Nesting Habitat
-  Wetland
-  Rainforest Habitat
-  Rocky Pavement Shrub Complex
-  Wet Sclerophyll Forest
-  Property Boundary
-  Easement

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Scale: 1:125,000@A3
Data Source(s):
Local Government Area - Department of Resources (2022)
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6.1.1 Avoidance of Wet Tropics of Queensland World Heritage Area

The WTQWHA is located to the east of the Wooroora property, and also cuts across a portion of the north-eastern extent of Wooroora Station (immediately adjacent to the Project area). It was considered critical by the Project team to ensure that the Project footprint did not extend into the WTQWHA. The Project footprint has been designed to achieve a separation distance of at least 600 m from the WTQWHA at its closest point (in the east of Wooroora). This not only avoids direct impacts to the WTQWHA, but also decreases the likelihood of any indirect impacts to the WTQWHA being associated with the Project. For comparison, the buffer to the WTQWHA from the Windy Hill Wind Farm is approximately 500 m.

6.1.2 Avoidance of Rainforest Habitats

Since the inception of the Project, the rainforest habitats associated with the WTQWHA and various MNES were identified as some of the higher-value ecological characteristics of the Project area. Consequently, the ecological surveys on site were partly designed to ground-truth the extent of these rainforest habitats such that they could be avoided by the Project footprint.

The Project area supports large areas of remnant vegetation dominated by open eucalypt woodland with small pockets of scattered rainforest communities close to the eastern boundary comprising a total of approximately 7.4 ha. The Project has been designed to avoid any clearing of rainforest vegetation therefore threatened species specifically associated with these communities are not expected to be directly impacted.

6.1.3 Avoidance of Arthur's Seat and other Known Cultural Heritage Constraints

A key requirement within the CHMA between the proponent and Jirrbal People #4 Traditional Owners was the commissioning and completion of a Preliminary Scoping Study by the Jirrbal's chosen advisors which included desktop literature reviews, engagement with senior knowledge holders, a site overview inspection and a workshop with members of the Jirrbal community. The Preliminary Scoping Study produced a list of areas of known high potential for cultural heritage (red zones), areas of low potential for cultural heritage (green zones) and areas of unknown heritage potential (orange zones). These investigations identified that the Arthur's Seat topographical feature was of high cultural significance for the Jirrbal People #4. No infrastructure is proposed within 2,000 m of Arthur's Seat, as per early recommendations from the Jirrbal People #4.

Jirrbal people have provided advice to the proponent about the sensitivity of a place on Wooroora Station known as Kara Outstation which is a place of significance due to it being an expected area of pre contact seasonal semi-permanent camping by Jirrbal and a post-contact massacre event sometime around 1890. The outstation is mentioned in F.S. Grant's [of Woodleigh Station] diary in October 1889 (May 1983:61), referring to local Aboriginal station workers attending to their social and cultural obligations, occasionally leaving their stations to attend ceremonies at Kara Outstation.

The location of Kara Outstation has been established in early 2022 through a secondary round of Project consultation and research and through interviews with Jirrbal descendants, studies of maps and observations from the air. The positive identification of Kara Outstation location has enabled Jirrbal people to be provided with certainty that there is adequate separation between the project development footprint and Kara Outstation

6.1.4 Avoidance of Habitat for MNES Plants Associated with Rocky Pavement Shrub Complex

The terrestrial MNES flora species that are known to exist within the Project area (*P. clotteniana*, *H. 312orter* and *T. nitchaga*) all share a common trait – their habitat requirements are highly niche. All recorded observations of these species during the field surveys were in association with the rocky pavement shrub complex habitat, corresponding



with RE 7.12.65k. This vegetation community occurs on the granite and rhyolite outcrops favoured by all three listed plant species.

Through analysis of high-resolution aerial photography, these rocky pavement areas were identified and mapped throughout the Project area. These rocky pavement areas were then targeted for flora surveys in October 2020, March 2021 and June 2021, and those found to contain MNES species were avoided entirely by the Project footprint through subsequent refinement by the Project team. This has resulted in the complete avoidance of known impacts to the populations of these MNES flora species and their habitat through appropriate and considerate Project design.

6.1.5 Avoidance of Potential Red Goshawk Nest

The location of the potential red goshawk nest within the Glen Gordon property and within riparian vegetation associated with Blunder Creek was identified as a high constraint for the purposes of Project design. The Project footprint has been designed to achieve a separation distance of more than 1,000 m between this nest and any proposed wind turbine. The Project footprint has also avoided this location through the appropriate placement of access tracks in areas removed from this potential red goshawk nest.

Subsequent advice has indicated that this is unlikely to be a red goshawk nest (see **Section 4.6.3**); however, the design adopted the precautionary principle and consequently avoids this site.

6.1.6 Design Changes following WTMA Feedback

The CWF Project team has had ongoing engagement with the WTMA since the submission of the referral to DCCEEW. This has manifested in numerous site visits for key WTMA personnel as well as a collaborative information-sharing workshop held at the WTMA offices in September 2022. WTMA was afforded an opportunity to review the draft PER in early 2022 and key comments have made their way into the DCCEEW information requests following adequacy review. Key feedback/concerns from WTMA on the CWF included:

- Insufficient information provided in the draft PER in relation to the values of the WTQWHA and in particular the OUV associated with the WTQWHA that are not necessarily limited to the WTQWHA boundary;
- Lack of a comprehensive visual impact assessment associated with the values of the WTQWHA;
- Impacts to wet sclerophyll forest vegetation
 - WTMA preference is to avoid wet sclerophyll forest vegetation²⁴ entirely, or
 - Demonstrate how ecological function is maintained despite impacts;
- Clearing and fragmentation of vegetation that may lead to:
 - Exacerbating fire risk in the WTQWHA;
 - Exacerbating weed and pest animal spread, contributing to ecosystem change in the WTQWHA; and

²⁴ The wet sclerophyll forest vegetation is considered by WTMA to be reflective of many of the OUVs associated with the WTQWHA; there are strong interrelationships between patches inside and outside the WTQWHA and it provides an important ecological function in the broader landscape as a buffer to the rainforest environments within the WTQWHA. Although not limited to the WTQWHA, the wet sclerophyll forest vegetation is viewed by WTMA to be of high value within the Project area for this reason.



- Prevention of east/west movement of endemic fauna species throughout the landscape (from and into the WTQWHA).

Following the receipt of this feedback, the Project team sought to redesign the CWF in such a way that the WTMA concerns could be reflected to some degree within the proposed Project layout. Since the WTMA feedback was received, the CWF has:

- Reduced in overall size to 86 WTGs;
- Reduced impacts by a further 31% (52.5 ha) of wet sclerophyll forest, including complete avoidance of the southernmost patch of wet sclerophyll forest within the Project area;
- Responded to the WTMA comments within the DCCEEW RFIs, including updates to the LVIA and additional visualisations;
- Committed to maintenance of landscape ecological function through design and implementation of key fauna movement enabling infrastructure, with a particular focus on the wet sclerophyll forest areas;
- Made additional commitments in relation to design and implementation of an appropriate fire regime for the Project area, and a pest animal and weed management program for the Project area.

It should be noted that the wet sclerophyll forest vegetation within the Project area could not be entirely avoided by the CWF. The large central patch of wet sclerophyll forest vegetation within Wooroora is located in a critically important part of the site from a Project design perspective. The area extends significantly west from the WTQWHA boundary and is intersected by the existing high voltage transmission line running north/south through the Project area. The area is of varied topography and includes locations of highly productive wind resource. Beyond this patch to the west, the environment becomes constrained through the rocky pavement shrub complex habitat and such areas are not suitable for Project infrastructure (refer **Section 6.1.4**). The area is also important to allow the connection of the southernmost Project infrastructure to the rest of the Project. For these reasons, the wet sclerophyll forest vegetation has not been completely avoided by the Project design. However, the Project has taken the WTMA feedback on board and has sought to ensure that the design can maintain the important ecological function of this area despite the construction and operation of the Project.

Importantly, the Project design enables the maintenance of east-west movement through this area of wet sclerophyll forest vegetation via the strategic placement of fauna movement infrastructure across the Project footprint as a key part of the rehabilitation activities within the Project area as the construction footprint is reduced to the operational footprint (see **Figure 8-6**).

6.1.7 Reduction in Number of Turbines and Project Footprint

In mid-2020, the proponent had identified a development concept involving 200 wind turbines to maximise the economic wind resource across the Project area for further investigation and refinement once specific constraints were identified. The Project has evolved to the point where less than half of the original number of wind turbines are proposed. Central to the process was the preparation of ecological constraints mapping that sought to bring together the collective implications associated with ecological findings throughout the Project area to inform the Project team. This ecological constraint mapping (and associated advice) was then overlaid with other considerations (e.g. wind mapping, topography, landholder considerations) to determine the current Project footprint. A Project involving 200 wind turbines had the potential for double the footprint of disturbance. The current Project design thereby avoids in the order of 1,200 ha of disturbance including 1,100 ha of remnant vegetation, and habitat for multiple MNES that are not significantly impacted by the current proposed action (e.g. protected flora species associated with the rocky pavement shrub complex).

The 200-turbine development included at least 36 turbines located within 50 m of potential habitat for the magnificent brood frog which would have resulted in clearing of over 300 ha of this species' habitat. An interim



Project configuration (dated June 2021) would have resulted in a clearing area of approximately 123 ha. The current Project layout has been further refined to comprise only 7 turbines within 50 m of potential habitat for the magnificent brood frog with a total potential habitat clearing area of 120.5 ha. The 200-turbine development also directly impacted approximately 182 ha of wet sclerophyll forest. Following a reorientation and reduction in the size of the southern substation as well as various turbine hardstands and associated access roads, the current Project layout will result in clearing of approximately 117.5 ha of wet sclerophyll forest (3.3% of the total wet sclerophyll forest within the Project area, and 0.9% of the total wet sclerophyll forest within the Study area). The current Project design thereby avoids over 180 ha of magnificent brood frog habitat and 64.5 ha of wet sclerophyll forest.

6.1.8 Additional Mitigation Measures

Further to the measures described above, the following general measures have been implemented throughout the design phase to avoid and minimise environmental impacts to the greatest practical extent:

- Locating the substation, office, construction compound and temporary laydown areas away from watercourses, thereby minimising potential impacts to water quality and downstream impacts to the Great Barrier Reef WHA;
- Co-locating underground electric cabling with Project access roads and minimising the width of Project access roads as far as practicable; and
- Minimising the number and width of watercourse crossings – this has been a considerable driver to minimise potential impacts on greater glider and masked owl.
- Avoiding the requirement for transmission lines (with associated linear vegetation clearance) from the Project site to an external connection point; the Project area, including the WTQWHA, is traversed by an existing 275 kV high voltage transmission line (Chalumbin to Walkamin/Tully).

Following Project approvals and prior to construction, detailed design will be undertaken. This will include optimisation of civil and electrical design, and extensive pre-clearance surveys and geotechnical surveys prior to the commencement of the Action. At this stage, micro-siting of the Project will occur to further minimise potential impacts.

6.2 Construction Phase

6.2.1 Vegetation Clearing

The following measures will be employed during the construction phase of the Project to avoid and minimise impacts associated with vegetation clearing:

- Vegetation clearing will be limited to those areas required for earthworks and construction of the Project. Those areas which are not required for the ongoing operation of the Project will be rehabilitated to pre-disturbance vegetation state as soon as practicable following construction.
- The approved disturbance area will be clearly demarcated on-ground, with site-specific construction management plans, and on GIS software for the construction team. This will be undertaken prior to clearing to avoid unnecessary clearing of vegetation and to ensure personnel and vehicles stay within the approved footprint.
- Sequential clearing will occur to minimise impacts on native fauna, particularly arboreal fauna which may be using tree hollows.
- Measures to ensure clearing limits are adhered to will be documented in the CEMP and addressed in site inductions.



- Access will be limited to approved access routes and tracks.
- Turbine locations will be microsituated within the Project corridor, where conditions and wind resource allow, to take advantage of areas of lower ecological significance.
- Removal of protected plants will be avoided as much as practicable by locating infrastructure away from populations and individuals during micro-siting activities.
- Access roads will be aligned along existing tracks wherever practicable to minimise vegetation removal and loss of hollow-bearing trees, as well as to avoid additional disturbance through GBR wetland protection areas.
- Develop a Species Management Program (SMP) to identify specific measures to be implemented that will mitigate impacts to threatened fauna species and breeding places during construction as well as the operation of the Project.
- Pre-clearance surveys will be undertaken by a suitably qualified ecologist to:
 - identify GPS locations of any protected plants within the proposed disturbance areas noting details for each individual, including a health assessment;
 - identify and mark all hollow-bearing trees;
 - identify and mark any other active breeding places such as nests, burrows etc.;
 - identify suitable release sites; and
 - identify presence of weed species.
- A suitably qualified fauna spotter-catcher will be present during all clearing activities, working under an approved SMP. The fauna spotter-catcher will be responsible to check an area immediately prior to any clearing for; presence of any native fauna including searches of all potential habitats such as terrestrial microhabitats and hollows, etc. Any captured species (excluding koalas) will be relocated to an agreed release site. The fauna spotter-catcher will then advise the ground staff as to measures that need to be taken to avoid impacts on breeding places and fauna species. Specific threatened species pre-clearance activities within the Project footprint will include:
 - canopy searches in suitable foraging tree species for koala; and
 - inspections of suitable sized hollows for the presence of greater glider.
- Sequential clearing will occur. Key steps as part of sequential clearing are summarised below:
 - the first phase will consist of removing understorey vegetation and smaller juvenile trees only. Juvenile trees are under 4 m in height or trunk circumference of less than 31.5 cm at 1.3 m above the ground. No hollow-bearing trees will be cleared in Phase 1;
 - after 48hrs the second phase can commence which is to clear the remaining larger trees, including those with hollows. Trees with small hollows will be cleared using the “slow drop” technique. The tree will be brought down slowly by the machine and mulch put underneath to soften the fall. They will then be inspected by the fauna spotter-catcher to ensure no wildlife remain in the hollow. Where practicable, fauna will be caught, and released into suitable recipient sites once clearing has stopped.
 - if any native fauna are injured they will be taken to a local vet/wildlife carer for treatment.
 - it is important the clearing is done in such a way that arboreal fauna are given the opportunity to disperse from the area once clearing has commenced under their own volition. To encourage this to occur, no habitat trees will be isolated (either singly or in groups) and instead dispersal corridors will be left in place that link



vegetation with clearing areas to adjacent areas of retained habitat. Such corridors could consist of a single row of trees no more than 30-40 m apart that will act as 'stepping stones'.

- any confirmed koalas will be identified by putting flagging tape and/or marking spray on the tree they are in, and any nearby trees with overlapping crowns or those trees that may impact the koala's tree during felling will not be cleared until the koala has moved from the area under its own volition. In most situations the koala will move from the area overnight.
- fell trees away from retained areas of vegetation where practicable. Where trees unavoidably fall into retained areas, leave in-situ to mimic natural tree fall and provide habitat for ground-dwelling fauna.
- micro-habitats such as fallen logs and rocks will be moved into adjacent habitat.

6.2.2 Habitat Fragmentation

The following measures will be implemented to mitigate and manage impacts of fragmentation as much as practicable during the construction phase:

- All fencing on site, including security fencing, will incorporate design measures to allow for the movement of fauna. Fencing design must consider allowing fauna to move through or over it and will not use barbed wire.
- Installation of glider rope crossings and glider poles in areas of confirmed glider habitat with a clearance width of 50 m or greater to maintain habitat connectivity.
- Nest box installation to be undertaken where active dens are identified within the Project footprint to compensate for loss of denning resources.
- Minimise clearing widths and where feasible install measures to assist fauna safely move across these areas to adjacent habitats. This may be reducing vehicle speeds to minimise chance of vehicle strike, establish rope crossings at key fauna corridors (such as watercourse crossings).
- Install fauna exclusion fencing around some infrastructure such as the substation if there is a high risk of fauna species being impacted.
- Undertake staged clearing of native vegetation, and retain habitat trees where practicable, to minimise impacts to native fauna species.
- Implement weed and pest control across the Project area to reduce degradation of habitats and edge effects as a result of the Project.

6.2.3 Fauna Injury or Mortality

The following measures will be implemented to prevent species mortality during the construction phase:

- All vehicles associated with construction activities will travel at slow speeds (e.g. 40 km/h) to minimise the chance of any fauna strikes occurring, with the majority of vehicle movements being during the daylight hours. Speed limit signage will be placed at the entrance to the site and other key access tracks.
- A suitably qualified fauna spotter/catcher will be present during all clearing activities associated with the vegetation clearance, working under a Species Management Program. The spotter/catcher will be responsible to check an area prior to any slashing, minor vegetation removal, or ground disturbance occurring for; animal breeding places (such as hollow bearing trees, nests, dens and fallen logs) and presence of any fauna species (such as checking for reptiles under fallen logs, and koalas within eucalypt trees).



- All contractors will be educated on the presence of native fauna including threatened species and need to travel slowly and look out for fauna when driving. This training will form part of mandatory inductions.
- Vehicle traffic will be confined to designated roads and access tracks.
- All fauna encountered (e.g. vehicle strike or during clearing activities) will be recorded in a central register by the Project Environment Manager. Any injured fauna will be reported as required in the Species Management Program that will be in place for the Project.
- Appropriate procedures for managing injured wildlife will be developed and included in the CEMP.
- During trenching activities, open trenches will be monitored daily. If species are trapped in the trench they will be released by a fauna spotter-catcher. The amount of open trench will be minimised and trenches will preferably be backfilled prior to nightfall.
- Escape ramps or planks and/or shelter (e.g. sawdust filled bags) for trapped fauna will be installed in open trenches.

6.2.4 Dust Emissions

The following measures will be implemented to mitigate and manage impacts from dust as much as practicable during the construction phase:

- Dust suppression techniques such as the use of water carts or application of soil binders will be implemented as required during construction.
- Dust generating activities will be minimised during dry, windy conditions.
- Low speed limits will be implemented on site to minimise dust generation.
- Areas of exposed soils will be stabilised / rehabilitated as soon as practicable, in line with best practice requirements.
- Machinery and vehicle tyres will be regularly cleaned to reduce wheel entrained dust emissions and/or the use of vibration grids will be considered.
- Access roads will be designed to have a less erodible surface.
- Water spraying of nearby sensitive vegetation should be considered if visible dust sedimentation is observed.

6.2.5 Noise and Vibration

The following measures will be implemented to mitigate and manage impacts from noise and vibration as much as practicable during the construction phase:

- Standard construction work hours for noise-generating activities will generally be between 6.30am and 6.30pm, reducing the risk of disturbance to nocturnal and crepuscular fauna.
- Equipment is to be fitted with noise reduction devices where practicable and switched off when not in use.
- Blasting will be minimised as far as practicable.
- Prior to construction, likely locations for blasting will be reviewed to determine the risk of damage or disturbance to caves that have the potential to support bat roosts and additional controls will be developed as necessary.



6.2.6 Light Emissions

The following measures will be implemented to mitigate and manage impacts from lighting as much as practicable during the construction phase:

- Standard construction work hours (generally 6.30am to 6.30pm) predominantly coincide with daylight hours, minimising the need for lighting to facilitate night works. There may be some night work associated with the Project, subject to construction schedule and climatic conditions.
- Site lighting will be kept to the minimum required for safety.
- Where necessary, construction lighting will be directed to the required areas and designed to minimise light spill to surrounding areas through the use of shields or similar.

6.2.7 Erosion and Sedimentation

The following measures will be implemented to mitigate and manage impacts of erosion and sediment as much as practicable during the construction phase:

- Erosion in active construction areas cannot be eliminated but can be controlled. As part of the construction planning a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to construction and implemented during on-site activities. Sediment and erosion control measures to prevent soil loss will be developed consistent with the International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) document. The ESCP will form part of the overall CEMP. Particular focus will be given to managing runoff in the vicinity of watercourses. The Preliminary Erosion and Sediment Control Plan (**Appendix I**) and the Sediment and Erosion Management Plan (**Appendix J**) provide further detail.
- CWF commits to avoiding all ground-disturbing construction activities during the highest rainfall months of January, February and March – thereby minimising the risk of larger erosion events impacting exposed soils.
- As a minimum standard, access tracks will be constructed in accordance with EHP publication: “Erosion control on property roads and tracks—managing runoff”.
- Creek crossing locations will seek to take advantage of existing gaps in the riparian corridors as far as practicable. Work in creek crossings will be carried out in periods of no flow where practicable.
- Design on site infrastructure to ensure water flows are not impounded or concentrated (e.g. culverts, diversion ditches, etc.).
- No equipment or materials will be stored across flow paths.
- The extent of the area required to carry out the permitted activity must be limited to the minimum area necessary to reasonably carry out the works.
- Waterway crossings will be designed in accordance with accepted development requirements for waterway barrier works wherever practicable to ensure fish passage is not impeded.
- Watercourse crossings will be designed to maintain flow and minimise the increase in flow volume or velocity.
- Constructed access tracks (e.g. culverts or splash-through crossings) must be provided with a scour apron and cut off wall on the downstream side sufficient to prevent bed erosion.



6.2.8 Hazardous Materials

The following measures will be implemented to mitigate and manage impacts from accidental releases of hazardous substances:

- Hazardous chemicals will be stored within dedicated, bunded areas or within self-bunded containers away from watercourses and other sensitive receptors.
- Refuelling and the maintenance of machinery and equipment will be undertaken over hardstand areas with containment measures in place.
- Any accidental releases of hazardous materials will be reported within internal incident reporting systems so that these events can be reviewed, and corrective action taken as appropriate.
- Spill kits will be maintained onsite and located in proximity to chemical storage and handling areas; spill kit contents will be commensurate to the type and quantity of chemicals stored on-site.
- All recovered materials including affected soils, used absorbent pads and gravel, recovered liquids etc. are to be disposed of offsite at an appropriately licenced landfill facility.

6.2.9 Pests and Weeds

The following measures will be implemented to mitigate and manage impacts from weeds and pest animals as much as practicable during the construction phase:

- A Weed and Pest Management Plan will be developed for the Project with specific advice for key identified species. The plan will include management of weed spread, management of pest infestations, and monitoring effectiveness of control measures. This is to be based on the Weed and Pest Management Plan Outline provided in **Appendix F**.
- Weed hygiene protocols will be implemented such as a dedicated vehicle and machinery cleaning bay at the main entrance to the site. This will not be placed near a watercourse.
- Restricted invasive plants present within the construction footprint will be treated prior to the commencement of works at that location.
- Onsite waste disposal (especially food waste) to discourage presence of pest fauna. Waste will be stored in covered bins/skips to prevent fauna access.
- Weeds will be identified during pre-clearing surveys, in particular, any large infestations within proposed disturbance areas. Clean and dirty zones should be demarcated on site to facilitate weed management.
- All vehicles, equipment and materials brought into site (such as gravel) will be certified as weed and disease free.
- Design weed washdown facilities at key access points and ensure that runoff is contained on site.
- Any herbicides used on site must be dispensed by an appropriately trained and qualified weed sprayer.

6.2.10 Bushfire Risk

The following measures will be implemented to mitigate and manage impacts from bushfire risks as much as practicable during the construction phase:



- As part of the construction planning a certified Bushfire Management Plan will be prepared prior to construction and implemented during on-site activities. During the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website.
- For “hot-work” activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions.
- Vehicles may not idle or be parked in areas of long grass.
- Access tracks and fencelines will be used as firebreaks within the Project area and regularly maintained during construction and operation of the Project.
- Smoking will not be permitted on site.
- Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

6.2.11 Justification for and Likely Effectiveness of Mitigation Measures

Justification for the above mitigation measures (including their successful use on prior projects, where relevant) is provided in **Table 6-2**. The anticipated effectiveness of these measures has also been indicated in **Table 6-2**, using the following ratings:

- Very highly effective: complete avoidance of known occurrences and/or habitats;
- Highly effective: substantial avoidance of known occurrences and/or habitats;
- Moderately effective: areas of direct impact are minimised and/or indirect impacts to behaviours/lifecycles are minimised through design and construction methods;
- Low effectiveness: mitigation of impacts through implementation of EMP, spotter-catchers, pest fauna and weed control; and
- Very low effectiveness: no mitigation strategies proposed.



Table 6-2 Effectiveness of Construction Phase Mitigation Measures

Mitigation Measure	Justification	Anticipated Effectiveness
General Impacts to Flora and Fauna		
<p>All site personnel will attend environmental training as part of the site induction process prior to entering the work site. This will include instructions on obligations regarding vegetation clearing protocols. Areas identified for vegetation clearance will be clearly defined and detailed in the site inductions.</p>	<p>This measure will improve awareness of key environmental obligations across the construction workforce. This will assist personnel in meeting the General Environmental Duty under the <i>Environmental Protection Act 1994</i>, which requires a person to not carry out any activity that causes, or is likely to cause, environmental harm unless they take all reasonable and practicable measures to prevent or minimise the harm.</p> <p>This is a standard measure that has been used effectively across a range of major infrastructure projects throughout Australia.</p>	<p>Highly effective at educating personnel on the sensitivity of the flora and fauna of the site, with particular focus on the MNES.</p>
Vegetation Clearing		
<p>Areas which are not required for the ongoing operation of the Project will be rehabilitated to pre-disturbance vegetation state as soon as practicable.</p>	<p>This measure will minimise the potential for erosion and thereby mitigate against potential degradation of habitats through impacts such as sedimentation. This measure will also reduce opportunities for weed establishment, whilst encouraging temporarily disturbed areas to recover as quickly as possible.</p> <p>This measure is a standard practice for contemporary construction projects.</p>	<p>Moderately effective: indirect impacts to fauna behaviour / life cycles will be minimised, and the chances of successful rehabilitation will be maximised.</p> <p>Vegetation reportedly grows quickly within the Project area. On Wooroora Station, previous 50-100 m wide clearings for Energy QLD successfully recruited from the seed bank with saplings reaching 60-90 cm DBH diameter within 20 years (pers. comm. Don Ramsey, prior owner of Wooroora Station, 2021). Revegetated areas would be expected to provide some habitat value to listed threatened species (in terms of foraging resources and cover for dispersal) well before this time.</p>
<p>Measures to ensure clearing limits are adhered to will be documented in the CEMP and addressed in site inductions</p>	<p>Site inductions are a standard construction practice and an effective means of ensuring construction personnel are all aware of their General Environmental Duty under the Queensland <i>Environmental Protection Act 1994</i>.</p>	<p>Highly effective at avoiding clearing of vegetation outside the approved Project footprint.</p>
<p>Access roads will be aligned with existing tracks wherever practicable</p>	<p>This measure has been used previously on road construction and transmission line projects, and will minimise the amount of clearing required, as well as minimising loss of hollow-bearing trees. This will lead to the use of approximately 20 km of existing tracks throughout the Project area.</p>	<p>Highly effective in minimising clearing and substantially avoiding specific habitat features for listed threatened species.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
Turbine locations will be micro-sited within the Project footprint, where conditions and wind resource allow, to take advantage of areas of lower ecological significance	This will minimise impacts to vegetation and habitat of listed threatened fauna, such as hollow-bearing trees.	Highly effective in minimising impacts and substantially avoiding known occurrences and/or habitats of listed threatened species.
The approved disturbance area will be clearly demarcated prior to clearing to avoid unnecessary clearing of vegetation and to ensure personnel and vehicles stay within the approved footprint.	Nomination of no-go zones is a common construction practice that is effective in keeping machinery and personnel out of environmentally sensitive areas.	Highly effective for mitigating the risk of accidental clearing of unapproved habitat.
Sequential/staged clearing will occur to minimise impacts on native fauna, particularly arboreal fauna which may be using tree hollows.	<p>A clearing procedure will be developed and communicated to all personnel involved in vegetation clearing. The procedure of tree felling conducted by machine operators will follow procedures outlined in the <i>Guide to Managing Risks of Tree Trimming and Removal Work</i> (Safe Work Australia 2016) whilst direction for clearing will be conducted by the fauna spotter catcher (FSC). Sequential/staged clearing is best practice as it protects habitat for as long as reasonably practical and assists in the management of erosion and sediment control.</p> <p>Where habitat trees are immediately adjacent to areas of earthworks, install tree protection measures in accordance with <i>Australian Standard: Protection of trees on development sites</i> (AS 4970-2009).</p> <p>Records of re-located wildlife are to be kept and lodged to the Queensland Government in accordance with the Rehabilitation Permit.</p> <p>Sequential clearing is a requirement for clearing koala habitat trees in koala districts under the <i>Queensland Nature Conservation (Koala) Conservation Plan 2017</i> and can be considered best practice elsewhere.</p> <p>If an animal is injured during any stage of works, it will be taken to a licenced wildlife carer in accordance with the <i>Code of Practice for Care of Sick, Injured or Orphaned Protected Animals in Queensland</i> (DES 2020b).</p>	<p>Moderately effective for mitigating the impacts of clearing on arboreal fauna such as the northern greater glider</p> <p>Highly effective for mitigating the impacts of clearing on koala, if present</p>
Removal of protected plants will be avoided as much as practicable by locating infrastructure away from	In accordance with the <i>Nature Conservation Act 1992</i> (NC Act) to allow necessary clearing and to support a clearing application, protected plant surveys following the <i>Protected Plant Survey Guideline version 2.01</i> will be undertaken prior to	Highly effective and minimising loss of listed threatened plants



Mitigation Measure	Justification	Anticipated Effectiveness
populations and individuals during micro-siting activities	<p>construction, to identify any Endangered, Vulnerable or Near Threatened (EVNT) flora species within the Project footprint.</p> <p>Unavoidable removal of protected plants will follow legislative requirements and conditions of the <i>Protected Plant Clearing Permit, Clearing for endangered, vulnerable or near threatened plants</i> under the <i>Nature Conservation (Plants) Regulation 2020</i>.</p>	
Develop a Species Management Program (SMP) to identify specific measures to be implemented that will mitigate impacts to threatened fauna species and breeding places during clearing, as well as operation of the Project	<p>Section 335 of the <i>Nature Conservation (Animals) Regulation 2020</i> prescribes that a person must not tamper with an animal breeding place unless, amongst other matters, the tampering (including removal of the breeding place but not the animal) is part of an approved species management program (SMP) for animals of the same species; approval granted and conditions of approval by the chief executive, DES.</p> <p>It is a requirement of approval that an SMP must be applied in conjunction with an Impact Management Plan and breeding place survey report.</p>	Highly effective: identification and relocation of breeding places for threatened fauna species
<p>Pre-clearance surveys will be undertaken by a suitably qualified ecologist to:</p> <ul style="list-style-type: none"> • identify GPS locations of any protected plants within the proposed disturbance areas noting details for each individual, including a health assessment; • identify and mark all hollow-bearing trees; • identify and mark any other active breeding places such as nests, burrows etc.; • identify suitable release sites; and • identify presence of weed species 	<p>Pending approval and conditions of approval, the Project is likely to be subject to undertaking pre-clearance surveys to identify MSES under <i>State Planning Policy</i>, and MNES listed under the EPBC Act.</p> <p>Under the NC Act, a protected plant survey following the <i>Protected Plant Survey Guideline version 2.01</i>, to identify any Endangered, Vulnerable or Near Threatened (EVNT) flora species within the Project footprint will be undertaken and form part of the pre-clearance surveys.</p> <p>Pre-clearance surveys will be undertaken in accordance with <i>Survey Guidelines for Survey Guidelines for Australia's Threatened Mammals</i> (DSEWPC 2011) and/or <i>Terrestrial Vertebrate Fauna Survey Guidelines for Queensland</i> (Eyre et al. 2018).</p> <p>Active breeding places (nests, burrows, hollow-bearing trees) will be recorded in an electronic register and maintained throughout construction activities that identifies the animal breeding places confirmed during pre-clearance surveys or FSC during on-site activities. The register will be established to meet <i>Guideline – Completing the Animal breeding place register for a Species Management Program</i> (DTMR 2017).</p> <p>Pre-clearance surveys will also include surveying for the presence of Weeds of National Significance (WoNS) and/or target weeds listed as restricted or prohibited matter under the <i>Biosecurity Act 2014</i> following random meander survey as described by Cropper (1993).</p>	Highly effective: substantial avoidance of known occurrences and/or habitat for threatened flora and fauna species



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>These surveys were implemented for major coal seam gas pipeline projects in Central Queensland with a high level of effectiveness.</p>	
<p>A suitably qualified fauna spotter-catcher will be present during all clearing activities, working under an approved SMP. The fauna spotter-catcher will be responsible to check an area immediately prior to any clearing (i.e. slashing, minor vegetation clearing or ground disturbance) for; presence of any native fauna including searches of all potential habitats such as terrestrial microhabitats and hollows, animal breeding places (nests, dens and fallen logs). Any captured species (excluding koalas) will be relocated to an agreed release site. The fauna spotter-catcher will then advise the ground staff as to measures that need to be taken to avoid impacts on breeding places and fauna species. Specific threatened species pre-clearance activities within the Project footprint will include:</p> <ul style="list-style-type: none"> ● canopy searches in suitable foraging tree species for koala; and ● inspections of suitably sized hollows for the presence of greater glider. 	<p>As part of the approved SMP, it will be required that a fauna spotter-catcher will be on site immediately prior to, and during vegetation clearing, and all fauna handling will be undertaken by a qualified, licenced, and experienced fauna spotter-catcher in accordance with a valid Rehabilitation Permit issued by the Department of Environment and Science, under the <i>Nature Conservation (Animals) Regulation 2020</i>.</p> <p>If an animal is injured during any stage of works, it will be taken to a licenced wildlife carer in accordance with the <i>Code of Practice for Care of Sick, Injured or Orphaned Protected Animals in Queensland</i> (DES 2013).</p> <p>This is a common practice for a range of projects involving clearing in Queensland.</p>	<p>Highly effective in preventing injury and mortality of medium to large mammals such as the greater glider.</p> <p>Low effectiveness for small, cryptic species such as the magnificent brood frog.</p>
<p>Habitat Fragmentation</p>		
<p>Install fauna exclusion fencing around some infrastructure such as the</p>	<p>Fauna fencing is referenced in the Queensland Department of Transport and Main Roads' <i>Fauna Sensitive Road Design Manual Volume 2: Preferred Practices</i> as an</p>	<p>Highly effective at deterring mobile, ground-dwelling mammals</p>



Mitigation Measure	Justification	Anticipated Effectiveness
<p>substation if there is a high risk of fauna species being impacted.</p> <p>Minimise clearing widths and where feasible install measures to assist fauna safely move across these areas to adjacent habitats. This may be reducing vehicle speeds to minimise chance of vehicle strike, establish rope crossings at key fauna corridors (such as watercourse crossings).</p> <p>Fencing design will allow for the movement of fauna through and over it, avoiding the use of barbed wire on the top strand of fences.</p>	<p>effective management measure to reduce vehicle collisions with fauna on linear infrastructure.</p> <p>Escape poles will be installed in the construction corridor to facilitate fauna exiting the Project footprint into adjacent undisturbed areas. Fencing around infrastructure such as the substation will not have escape poles installed so that fauna are excluded to avoid impacts. No barbed wire will be used in future fencing, and where existing barbed wire occurs, this will be removed and replaced with either fauna friendly fencing or plain wire.</p> <p>Fencing must touch the ground with no gaps between the ground and the fence. Fencing on undulating ground, in particular, must include a 'skirt' of chain link wire attached to the bottom of the fence and lying on the ground to ensure that fauna cannot push under the fence. Where plain wire fencing is not a suitable option, fauna friendly fencing will be established to prevent vehicle access.</p>	
<p>Installation of glider rope crossings and glider poles in areas of confirmed glider habitat with a clearance width of 50 m or greater to maintain habitat connectivity.</p> <p>Minimise clearing widths and where feasible install measures to assist fauna safely move across these areas to adjacent habitats. This may be reducing vehicle speeds to minimise chance of vehicle strike, establish rope crossings at key fauna corridors (such as watercourse crossings).</p> <p>Rehabilitation will be undertaken in areas of glider habitat to reduce gliding width requirements (refer Appendix K).</p>	<p>GHD (2017) monitored the effectiveness of glider pole linkages and found more usage by <i>P. volans</i> in an area where surrounding vegetation was more intact and connected compared to an area where surrounding vegetation had several large, cleared areas nearby. Average glide lengths range from 25-35 m; however, the species is known to be able to glide up to 60-70 m (DTMR 2010; van der Ree et al. 2004) with maximum gliding distance reported as 100 m (Menkhorst and Knight 2011; Harris and Maloney 2010). Greater gliders generally launch from a horizontal branch with an average height of approximately 12 m above the ground, and with an average land height of between 1.5 to 2.0 m above the ground. On average the glide angle for greater gliders is between 26 and 30% from horizontal, which equates to a horizontal glide distance of between 1.7 to 2.0 m for each vertical metre of elevation.</p> <p>Based on industry information on available wooden pole heights, the longest standard poles available are 23 m, and require 2.9 m depth in the ground. As a result, standard heights available allow for wooden poles to be approximately 20 m above ground level. Using average glide lengths outlined previously, poles would</p>	<p>Moderately effective – indirect impacts to behaviours are minimised within the type of environment found within the Project area, with the incorporation of the specific listed design features.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>need to be spaced no more than 34 m apart. Poles need to be installed either side of the construction corridor, and adjacent vegetation so that gliders can move from the next tallest tree to the pole in the corridor (and vice versa).</p> <p>A potential risk of glider poles in cleared areas is that they create artificial perches for predatory birds and other predators. Poles should have a metal sleeve attached at about 1.5 m above ground level to prevent predators from ascending the poles. Predation refuges consisting of PVC pipes (100 x 380 mm) should be added at regular intervals from the top of the pole (suggestion to have at least three refuges, spaced at approximately 2 m intervals from the cross bars). Cross bars for the gliders to launch from should be provided towards the top of the pole, and extend at least 50 cm from each side of the pole.</p>	
<p>Nest box / artificial hollow installation / hollow translocation to be undertaken where active dens are identified within the Project footprint to compensate for loss of denning resources</p>	<p>Nest boxes can provide additional value as denning habitat in the medium-term whilst hollows develop (Beyer and Goldingay 2006; Durant et al. 2009; Goldingay et al 2015; Lindenmayer et al 2015).</p> <p>An alternative for habitat enhancement in the long-term and a recommended management action outlined in the Commonwealth Conservation Advice for <i>Petauroides volans</i>, is supplementing hollow availability (denning resources) with artificial hollows. As described by Griffiths et al. (2018) mechanically cut hollows effectively mimic natural hollows and temperature fluctuation compared to nest boxes. Cavities carved into trees mimic both the internal and external physical characteristics of natural hollows used by target fauna hence are more likely to be recognised and inhabited (Hurley and Harris 2015; Hooper et al. 2004; Saenz et al. 2001; Hurley and Stark 2015; Isaac et al 2008; Terry et al 2021).</p> <p>The re-use (translocation) of large hollows has also been demonstrated to have potential for uptake success when compared to artificial nest boxes with owl species in particular showing a clear preference for natural hollows (Central Coast Council, 2016). When specifically targeting masked owl, the relocation of a complete trunk section (rather than just a large hollow section) may be a suitable option if the cavity of the hollow extends a long way down the trunk, as this species is known to utilise deep trunk hollows (Central Coast Council, 2016).</p>	<p>Moderately effective – indirect impacts to behaviours are minimised.</p>
<p>Implement weed and pest control across the Project area to reduce degradation of</p>	<p>See below under 'Pests and Weeds'</p>	<p>See below under 'Pests and Weeds'</p>



Mitigation Measure	Justification	Anticipated Effectiveness
habitats and edge effects as a result of the Project		
Fauna Injury and Mortality		
<p>All vehicles associated with construction activities will travel at slow speeds to minimise the chance of any fauna strikes occurring. Speed limit signage will be placed at the entrance to the site and along key access roads.</p> <p>Escape ramps or planks and/or shelter (e.g. sawdust filled bags) for trapped fauna will be installed in open trenches.</p>	<p>In addition to signage, fauna friendly fencing and one-way permeable fencing will be installed to help facilitate fauna movement out of the construction corridor and into bushland and temporary fencing directly around trenches for personnel safety and fauna.</p> <p>Escape ramps, shelter, and additional management actions proved effective in reducing fauna mortality in open trenches to 0 % on the Neerabup Pipeline Project compared to DBNGP Stage 4 pipeline (4.8 %), Port Hedland to Telfer pipeline construction (38.2 %) Nifty pipeline (3.5 %) and Eastern Gas Pipeline (3 %). Additional management actions, and 100 % compliance of these, included:</p> <ul style="list-style-type: none"> • Clear trench of fauna within 3 hours of sunrise; clear trench of fauna before sunset; • Fauna shelters not exceeding 100 m distance in trench; • Fauna exit ramps no greater than 1200 m distance in trench; • Raps to be on an angle no greater than 45 degrees; • Entire base of trench to be inspected for fauna by a licenced FSC; • Open trench lengths shall not exceed those capable of being inspected by the resources available; • Trenches shall not be left open during construction breaks for longer than 3 days; • The occurrence of water in trenches shall be managed to ensure the water bodies are no longer than 100 m; • Trench that contains water and is not de-watered shall not be open for longer than 7 days; • Trench shall be inspected for fauna 30 min before backfilling; and • BoM forecast to be monitored daily for adverse weather. <p>If an animal is injured during any stage of works, it will be taken to a licenced wildlife carer in accordance with the <i>Code of Practice for Care of Sick, Injured or Orphaned Protected Animals in Queensland</i> (DES 2020b).</p>	<p>Highly effective at minimising impacts to listed threatened species</p>



Mitigation Measure	Justification	Anticipated Effectiveness
<p>Appropriate procedures for managing injured wildlife should be developed and included in the Project EMP.</p>	<p>This measure is a standard practice for contemporary construction projects.</p> <p>If an animal is injured during any stage of works, it will be handled and taken to a licenced wildlife carer in accordance with the <i>Code of Practice for Care of Sick, Injured or Orphaned Protected Animals in Queensland</i> (DES 2020b).</p> <p>This measure is a standard practice for contemporary construction projects.</p>	<p>Low effectiveness: mitigation of impacts through implementation of the EMP.</p> <p>This measure is considered to be a last resort and the other measures identified in this table are designed to avoid wildlife injury and mortality.</p>
<p>Dust Emissions</p>		
<p>Dust suppression techniques such as the use of water carts or application of soil binders will be implemented as required during construction.</p>	<p>Dust emissions and overall air quality will be managed in accordance with the requirements of the Subordinate Legislation No. 153 <i>Environmental Protection (Air) Policy 2019</i> (EPP Air) made under the <i>Environmental Protection Act 1994</i> (EP Act).</p> <p>Construction will be temporary activity and it is anticipated that the following detailed measures will be required to mitigate potential impacts from dust emissions;</p> <p>Earthworks: To Ensure that all significant earthworks are avoided where practicable during unfavourable meteorological conditions (e.g. strong winds)</p> <ul style="list-style-type: none"> • Watering of haul roads to minimise wheel-generated dust • Watering of exposed areas including cleared areas and stockpiles to minimise dust lift-off during strong winds from the north, northeast and east • For exposed areas and stockpiles that will not be used or accessed for long durations, and haul roads with low traffic volumes, consideration of the use of hydraulically applied tackifier (polymer agents) and organic mulch to protect the surfaces and reduce the need of constant wetting • Designation of appropriate maximum speed limits during construction 	<p>Moderately effective at reducing the likelihood of habitat degradation and edge effects. This is particularly important for herbivorous mammals such as the northern greater glider, as dust may reduce the quality of foraging habitat, and aquatic species such as the magnificent brood frog.</p> <p>The measure is likely to be effective in the short term until the next rain event.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
	<ul style="list-style-type: none"> Erection of physical barriers such as bunds and/or wind breaks around long-term stockpiles. <p>Embankment construction:</p> <ul style="list-style-type: none"> Following construction of the embankments, top sides and external batters will be either topsoiled and seeded, or hydro-mulched Watering embankments to minimum dust lift-off during strong winds. <p>Monitoring:</p> <ul style="list-style-type: none"> Dust emissions and potential dust generating activities and areas will be monitored visually during construction Vehicular speeds and loads will be monitored to ensure compliance with site requirements Routine monitoring of vegetation for presence of excessive dust. <p>These measures are standard practice for contemporary construction projects.</p>	
<p>Areas of exposed soils will be stabilised / rehabilitated as soon as practicable, in line with best practice requirements</p>	<p>Depending on site conditions (i.e. slope, weather) and soil characteristics (i.e. percentage of silt, clay, loam or gravel), the following stabilisation and rehabilitation methods in accordance with <i>Best Practice Erosion and Sediment Control</i> (IECA 2009):</p> <ul style="list-style-type: none"> Geotextiles (i.e. Erosion Control Blankets, Turf Reinforcement Mats, Bonded Fibre Matrix) Mulching (i.e. rock, gravel, compost, woodchips, sugarcane) Revegetation via hydroseeding and hydromulching. Plant selection and methods of revegetation are provided in <i>Appendix C – Soils and revegetation</i> Suppressants or soil binders (chemical surface stabilisers) 	<p>Low effectiveness: mitigation of impacts through implementation of the EMP.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>Covering soil surface with a 30% cover of non-erodible material will reduce soil loss by approximately 80% (USDA 1983).</p> <p>These measures are standard and common practice on construction sites in Far North Queensland. The central process being to divert clean water away from the construction site, have captured water in the disturbed areas directed to ESC devices to remove the sediment, with water flowing out of the sediment basins and spreading out via overland flow over vegetated areas (to encourage deposition) rather than into any watercourses.</p>	
Noise and Vibration		
<p>Standard construction work hours for noise-generating activities will generally be between 6.30am and 6.30pm, reducing the risk of disturbance to nocturnal and crepuscular fauna</p> <p>Equipment is to be fitted with noise reduction devices where practicable and switched off when not in use.</p>	<p>Operations during construction will be undertaken in accordance with the <i>Environmental Protection Act 1994</i> and <i>Environmental Protection (Noise) Policy 2019</i> and methods outlined in the <i>Noise Measurement Manual</i> (DES 2013), following the avoid, minimise and manage hierarchy.</p> <p>Noise reduction equipment and strategies to that may be employed:</p> <ul style="list-style-type: none"> • Screening/fencing; • Noise dampening mats; • Maintaining equipment and vehicles to Australian Industry Standards • Substitution of equipment (e.g. replacing spur gears with helical gears results in 10 dB noise reduction) <p>See <i>Engineering Noise Control</i> (Hansen and Goelzer).</p> <p>The noise impacts associated with the construction activities are temporary across the Project area and will be considerably shorter at each individual construction area.</p>	<p>Moderately effective at mitigating the indirect impacts of noise on sensitive fauna, particularly nocturnal species such as the northern greater glider.</p>
Light Emissions		
<p>Site lighting will be kept to the minimum required for safety designed to minimise</p>	<p>Construction will largely occur during daylight hours, with exceptions being where specific activities such as turbine lifts, etc. must occur after hours during favourable weather conditions. Construction lighting will only be utilised during low-light</p>	<p>Highly effective for nocturnal species, such as the northern greater glider.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
light spill to surrounding areas through the use of shields or similar	daytime conditions and during these infrequent out-of-hours events. Where construction lighting is utilised, it will be directed away from retained vegetation.	
Erosion and Sedimentation		
<p>As part of the construction planning, a certified Erosion and Sediment Control Plan (ESCP) will be prepared prior to construction and implemented during on-site activities. The ESCP will form part of the overall CEMP. Particular focus will be given to managing runoff in the vicinity of watercourses.</p> <p>Furthermore, no ground-disturbing works will be undertaken during the highest rainfall period (between January and March).</p>	<p>Erosion and sediment mitigation measures will be developed and undertaken in accordance with <i>Best Practice Erosion and Sediment Control</i> (IECA 2009) document.</p> <p>The avoidance of construction activities during the wettest three months of the year significantly decreases the risks associated with erosion and sedimentation.</p>	Moderate effectiveness: mitigation of impacts through appropriate design of the construction activities and through implementation of the EMP.
Access tracks will be constructed in accordance with EHP publication: "Erosion control on property roads and tracks—managing runoff"	Access tracks will be constructed in accordance with <i>Erosion control on property roads and tracks – managing runoff</i> (Queensland Government 2013) and follow measures developed by <i>Best Practice Erosion and Sediment Control</i> (IECA 2009).	Moderate effectiveness: mitigation of impacts through appropriate design of the construction activities and through implementation of the EMP.
Watercourse crossings will be designed to maintain flow and minimise the increase in flow volume or velocity	<p>Where access tracks or roads cross drainage lines or creeks, an invert, floodway, causeway, culvert or bridge is required and will be constructed in accordance with the Science Notes – Land Series 239 (Queensland Government 2013b). The guideline includes construction methods and appropriate placement principles for on-farm roads and tracks. Applying these principles helps reduce erosion and maintenance costs.</p> <p>Inverts are constructed by removing the soil in the crossing and replacing it with a heavy gravel that resists flows. A sheet of geo-fabric below the gravel ensures that the soil and gravel remain as separate layers, which increases the effective life of the invert. Culverts (pipes) need to be sized according to the area drained as they can be susceptible to blockage from siltation, which hinders the natural flow of runoff. By selecting a suitable location for crossing a watercourse it is possible to reduce</p>	Moderate effectiveness: mitigation of impacts through appropriate design of the construction activities and through implementation of the EMP.



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>construction and maintenance costs as well as minimise any adverse effects on the watercourse (Queensland Government 2018). The following considerations will be adhered to:</p> <ul style="list-style-type: none"> • avoid steep banks as they are an erosion risk and require considerable excavation; • use whoa-boys on the approaches into the drainage line where necessary; • cross drainage lines at right angles and avoid sites where clearing of vegetation would be required. 	
Hazardous Materials		
<p>Hazardous chemicals will be stored within dedicated, bunded areas or within self-bunded containers away from watercourses and other sensitive receptors</p>	<p>Chemical storage (other than petroleum products or oil) – storing more than 10 t of chemicals (other than compressed air or liquefied gases) that are dangerous goods under the dangerous goods code is deemed a notifiable activity under the <i>Environmental Protection Act 1999</i>. Hazardous chemicals will be stored in accordance with requirements of the <i>Australian Code for the Transport of Dangerous Goods by Road and Rail edition 7.7, 2020</i> and accompanied with material safety datasheet (MSDS) in accordance with the <i>Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice</i> (Safe Work Australia 2011).</p>	<p>Moderate effectiveness: mitigation of impacts through appropriate design of the construction activities and through implementation of the EMP.</p>
Pests and Weeds		
<p>A Weed and Pest Management Plan will be developed for the Project with specific advice for key identified species and in line with the legislative obligations under Queensland And Commonwealth law. The plan will include management of weed spread, management of pest infestations, and monitoring effectiveness of control measures.</p>	<p>The Weed and Pest Management Plan (WPMP) (Appendix F) will be implemented, with weed control methods to be undertaken within the Project area, which include:</p> <ul style="list-style-type: none"> • Prior to any works, pre-clearance surveys will include a weed survey which will include presence of species and inform weed mapping; • Strict hygiene protocols specifically for <i>Phytophthora cinnamomi</i> (root rot), <i>Batrachochytrium dendrobatidis</i> (Chytrid fungus), and <i>Austropuccinia psidii</i> (Myrtle rust) (Phillot et al. 2010); • All identified WoNS and high-risk weeds will be treated within 12 months of the commencement of each stage of clearing; 	<p>Highly effective in preventing new infestations and/or the spread of existing weeds by ensuring weeds are monitored and managed appropriately.</p>



Mitigation Measure	Justification	Anticipated Effectiveness
	<ul style="list-style-type: none"> ● Treatment will be undertaken by a suitably qualified and licenced bush regeneration contractor and will follow weed species-specific recommended applications provided by Department of Agriculture and Fisheries (DAF) Fact Sheets; ● WoNS and high-risk weeds will be monitored annually until not detected, at which point monitoring will be carried out every 2 years until weed cover is <10% of baseline mapping. <p>The WPMP incorporates management procedures to specifically prevent the introduction and spread of <i>Phytophthora cinnamomi</i> (root rot) including;</p> <p>Procedures during construction:</p> <ul style="list-style-type: none"> ● Stay within the construction zone and on designated access track – avoid accessing areas that are wet and muddy. ● When grading: grade from upslope to downslope (when applicable), grading equipment is to be clean before commencing work, the angle of grader blade is to be adjusted to avoid carrying soil/gravel long distances and do not grade wider than prescribed. ● Minimise the number of tracks, ensure they have hard, dry and well-drained surfaces ● Proposed tracks should not travel from infested to uninfested and mapping of <i>P. cinnamomi</i> prior to development <p>Procedures during weed/restoration/fire management:</p> <ul style="list-style-type: none"> ● If weeds are being manually removed, they should be immediately placed in a container, so plant material or soil is not dropped into other parts of the site ● Revegetation has a high risk of introducing <i>P. cinnamomi</i>, but if required: <ul style="list-style-type: none"> ○ Direct seeding rather than planting seedlings. 	



Mitigation Measure	Justification	Anticipated Effectiveness
	<ul style="list-style-type: none"> ○ Purchase plants from nurseries by NIASA, or nurseries with excellent hygiene procedures. ○ If using mulch, ensure that it has been well composted (the heating part of the composting process kills <i>P. cinnamomi</i>). ● When maintaining firebreaks by grading, do not grade wider than the existing area and mow, slash or use herbicide rather than plough or grade <p>The WPMP incorporates management procedures to specifically prevent the introduction and spread of <i>Batrachochytrium dendrobatidis</i> (Chytrid fungus).</p> <p>There is no evidence that the amphibian chytrid fungus or other pathogens of amphibians have been transmitted between water catchments by vehicles, footwear or clothing (Speare et al. 2004).</p> <p>Nevertheless, vehicles, machinery and personal hygiene will be undertaken between movement of sites to reduce the risk of spreading other pathogens (Myrtle rust and <i>P. cinnamomi</i>).</p> <p>The WPMP includes management practices to specifically prevent the introduction and spread of <i>Austropuccinia psidii</i> (Myrtle rust) and monitoring the effectiveness of control measures. Rusts are highly transportable – spores can be spread by contaminated clothing, infected plant material, equipment and hand tools. Management for prevention and treatment include biological controls, life-cycle interruption, microclimate manipulation, the use of chemical controls, and a combination of these.</p> <p>Mitigation measures include;</p> <ul style="list-style-type: none"> ● Weeding of infected plants and fire management of pest infestations of myrtle rust prove to be ineffective. ● Containment is only likely to be successful in cases of geographic isolation from other areas of infection, coupled with very early detection and a rapid and well-organised response with the aim of eradication. 	



Mitigation Measure	Justification	Anticipated Effectiveness
	No chemical treatment identified to eradicate <i>A. pisidii</i> /Resistance promoters (similar to Phosphite for <i>P. cinnamomi</i>) are yet to be evaluated for Myrtle rust. Fungicides and chemicals to be used under the Emergency Permit (PER12156):	
Restricted invasive plants present within the construction footprint will be treated prior to the commencement of works at that location	Department of Agriculture and Fisheries – factsheets are developed for each restricted and prohibited matter prescribed by the <i>Biosecurity Act 2014</i> and recommended species-specific controls will be employed.	Highly effective in preventing the spread of existing weeds.
Weeds will be identified during pre-clearing surveys. Clean and dirty zones will be demarcated on site to facilitate weed management.	Weed surveys will follow methods as described by Cropper (1993) and results will be used to inform weed mapping and demarcate (low-high) priority areas to target within the Project area.	Highly effective in preventing new infestations and/or the spread of existing weeds.
All vehicles, equipment and materials brought into site (such as gravel) will be certified as weed and disease free	All landscaping material will be sourced from suppliers that are accredited by the Nursery Industry Accreditation Scheme Australia (NIASA) and a weed certificate (i.e. Weed Hygiene Declaration) following the <i>Vehicle and Machinery Inspection Procedure, Biosecurity Queensland Checklists 2013</i> (DAF 2013) completed upon entry to the site.	Highly effective in preventing new infestations.
Bushfire Risk		
As part of the construction planning a certified Bushfire Management Plan will be prepared prior to construction and implemented during on-site activities. During the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website.	<p>A Bushfire management Plan (BMP) will be developed to protect works, biodiversity and habitats, minimise potential damage or loss of machinery, equipment or infrastructure, minimise the risk of bushfire, control the spread of bushfire in the event of ignition, and to provide adequate response in the event of ignition (Queensland Government 2021). The BMP will be developed in accordance with the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act), <i>Environmental Protection Act 1994</i> (EP Act), <i>Nature Conservation Act 1992</i>, <i>Work Health, Safety Act 2011</i> and <i>State Planning Policy 2017</i>.</p> <p>A range of weather variables influencing fire behaviour will be monitored including recent precipitation, current wind speed, relative humidity and temperature. The McArthur (1973) Forest Fire Danger Index will be monitored daily through the Rural Fire Service (RFS) website and national fire weather warnings monitored through the Bureau of Meteorology (BOM) website.</p>	Highly effective



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>Project specific bushfire management plan to be developed prior to commencement of construction which:</p> <ul style="list-style-type: none">• Is developed by a person who has suitable experience in bushfire prevention and response.• Is developed in consultation with local firefighting and other emergency response services.• Is provided to the Queensland Fire and Emergency Services (QFES).• Identifies suitable locations and controls for high-risk activities (i.e. hot works, storage of flammable and combustible materials, etc.)• Includes a site layout plan which identifies the locations of high-risk activities, fire response equipment and firefighting water supply.• Identifies specific clearance requirements around construction areas to maintain sufficient fuel buffers.• Communicates firefighting access routes.• Provides detailed fire response procedures.• Provides contact details for bushfire response support.• Identifies firefighting equipment requirements for both fixed sites and within vehicles and mobile plant.• All requirements of the bushfire management plan will be followed.• All restrictions associated with fire danger levels will be adhered to. <p>Tailored actions undertaken such as fire regimes specific to the management of the regional ecosystem are highly practical and can reduce fire-related threats to biodiversity as per the Fire Management Guidelines (Queensland Herbarium 2021).</p>	



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>General site-based bushfire management and mitigation measures include:</p> <ul style="list-style-type: none"> • Development of a site layout which will include inventory and location of all hazardous and combustible chemicals on site, location of water connection and assembly points; • Ensure all site personnel are familiar with fire prevention and emergency response actions; • Provision of appropriate fire-fighting equipment on site, including fire extinguishers, firefighting water supply, and other suitable equipment for initial response; • Ensure local firefighting services have access to the site; • Updating local firefighting services of Tablelands Regional Council of any changes to work schedules or access agreements. <p>During periods of high fire danger:</p> <ul style="list-style-type: none"> • Firebreaks should be created around each turbine site, OHTL tower site, substation site and facilities building; • The use of explosives or hot work will be banned. • All built infrastructure, excluding roads and fences, will require a 20 m buffer area, or 1.5 times the tallest adjacent tree to allow for a fire break area; • Preparation of an Emergency Plan and submission to Queensland Fire and Emergency Services (QFES); • Construction operations shall adhere to regulatory and local fire authorities and comply with fire restrictions (e.g high fire danger and total fire ban days). <p>Vehicle:</p> <ul style="list-style-type: none"> • Ensure spark-arrestors are installed and maintained on all vehicles, plant and equipment; 	



Mitigation Measure	Justification	Anticipated Effectiveness
	<ul style="list-style-type: none"> ● Ensure flashback arrestors are fitted to oxygen/acetylene equipment; ● All vehicles on site are to be equipped with: <ul style="list-style-type: none"> ○ Dry chemical extinguisher; ○ Appropriately equipped first aid kit; ○ Tow rope or snatch strap; ○ Sufficient fire blankets. <p>Monitoring efforts will be conducted as follows;</p> <ul style="list-style-type: none"> ● Daily monitoring of fire danger at the site and site water levels ● Regular inspection and maintenance of fire breaks; ● Weekly vehicle inspections to ensure mandatory equipment is maintained. 	
<p>For “hot-work” activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions</p>	<ul style="list-style-type: none"> ● Ensure a hot works permit is obtained from the site Manager, and only those with the permit undertake hot works; ● A fire-resistant shield be used to prevent sparks leaving the hot works area; ● Hot works to be undertaken away from flammable material; ● Appropriate firefighting equipment is kept on hand. 	Highly effective
<p>Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management</p>	<p>Potential Fuel Load is a key driver of fire behaviour, fire-line intensity and bushfire hazard. Potential Fuel Loads represent the approximate mass (measured in tonnes/ha) of combustible fuel material that would typically accumulate if vegetation is not regularly burnt or subject to fuel reduction practices.</p> <p>Potential Fuel Loads are assigned to vegetation categories (Vegetation Hazard Classes) formed by amalgamating land use and vegetation types with a moderately consistent fuel load and structure. Potential Fuel Load estimates for the Project will be derived from a combination of expert appraisals and field measurements using the upper range of fuel loads for each fuel element (i.e. surface, near surface, elevated and bark as per the Victorian Government Department of Sustainability and Environment’s ‘Overall Fuel Hazard Assessment Guideline, 4th Edn.’).</p>	Highly effective



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>Bushfire hazard assessments will be conducted to determine appropriate bushfire prevention and management strategies to protect infrastructure assets and property and maintain natural ecosystem function and biodiversity habitat.</p> <ul style="list-style-type: none">Controlled grazing: <p>Biomass levels will be managed through a strategic grazing regime. This regime will play an important role in reducing fuel loads (and in managing exotic pasture grasses) and will be implemented in accordance with the following:</p> <ul style="list-style-type: none">Fencing to control livestock access to areas within the Project. Annual inspections of all fencing will be undertaken, and damaged fences repaired, to ensure stock are excluded from areas outside of strategic grazing events.No grazing will occur when biomass levels are <1500 kg/ha, as assessed using the "Dry Season Pasture Budget" worksheet.Adaptive management through monitoring of strategic livestock grazing will reduce impacts particularly in the vicinity of watering points (natural or artificial). <p>The suitability of conditions for undertaking a grazing event will be informed by monitoring events. This includes a feed budgeting assessment which will be completed prior to each strategic grazing event within the Project area. A feed budgeting assessment is a recognised method of determining the number of grazing days based on the amount of feed available, the number of stock, the type of stock and the amount of feed desired at the end of the grazing event.</p> <p>The amount of feed available prior to the grazing event will be estimated using the appropriate photo standards available on the Future Beef website. The "Dry Season Feed Budget" worksheet provided will then be used to calculate the required stocking rate for the grazing event. At the completion of the grazing event, photo standards will be used to assess ground cover and associated biomass. Should the grazing event be required to be extended (e.g. as a result of additional rainfall and</p>	



Mitigation Measure	Justification	Anticipated Effectiveness
	<p>resultant grass growth), the feed budget assessment would be recalculated at that time using the “Dry Season Feed Budget” worksheet.</p> <ul style="list-style-type: none">• Cool mosaic burns <p>Cool mosaic burning techniques have long been utilised by Australian Indigenous people as a contributor to bushfire mitigation that involves lighting the “cool” fires in selected areas between March and July, during the early dry season (Skiba 2020). The fires burn gradually, reducing fuel loads and creating fire breaks. Late in the dry season, when the weather is very hot, the method removes fuel for larger fires while maintaining and protecting habitat for biodiversity (Skiba 2020). Following the guidelines for the community and the methods available for the safe reduction of coarse woody debris, a cool burn prevents life threatening wildfires, rejuvenates local flora, protects native wildlife habitats, preserves the tree canopy, triggers seed germination for soil retention and provides a source of food for wildlife (Watarrka Foundation, 2022).</p> <ul style="list-style-type: none">• Weed management: <p>Control of weeds is a major focus of planned burning in most areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics (Neldner et al. 2019).</p>	



6.3 Operational Phase

6.3.1 Vehicle Strike

The following measures will be implemented to prevent species mortality through collision with vehicles during the operational phase:

- All vehicles associated with operational and maintenance activities will travel at slow speeds to minimise the chance of any fauna strikes occurring. Speed limit signage will be placed at the entrance to the site and other key access tracks.
- All contractors will be educated on the presence of native fauna including threatened species and need to travel slowly and look out for fauna when driving. This training will form part of mandatory inductions.
- Vehicle traffic will be confined to designated roads and access tracks.
- All fauna encountered will be recorded in a central register by the Project Environment Manager. Any injured fauna will be reported as required in the Species Management Program that will be in place for the Project.
- Appropriate procedures for managing injured wildlife will be developed and included in the Project EMP, which is to be based on the EMP Outline (**Appendix H**).

6.3.2 Collision Risk

The following measures will be implemented to mitigate and manage impacts from bird and bat collision risks as much as practicable during the operational phase:

- A Bird and Bat Management Plan (BBMP) is prepared and provided in **Appendix G** for implementation prior to the operation of the wind turbines. The BBMP outlines a monitoring program, identifies if any threatened species are significantly impacted and defines a strategy that manages and mitigates any significant impacts on these species.
- The availability of perches in the vicinity of turbines will be reduced.
- Lighting of turbines will be limited – it is the advice of a specialist aviation consultant that wind turbines associated with the Project do not require lighting.
- Use of onsite deterrents such as ultrasonic devices will be investigated.
- The presence of standing water in the vicinity of turbines will be minimised.
- Operational monitoring for the site utilisation of birds and bats will be undertaken and compared to baseline data. Triggers for adaptive management will be included. Annual bird and bat utilisation surveys will be undertaken in line with Project approval conditions as part of monitoring to assess whether the Project area continues to be used by species and assess any changes in abundance that may influence BBMP risk ratings.
- A regular carrion removal program will be implemented.

The effectiveness of the mitigation measures proposed for collision risk is assessed in Table 6 2.



Table 6-3 Effectiveness of Collision Risk Mitigation Measures

Mitigation Measure	Justification	Expected Effectiveness
<p>Use of onsite deterrents such as ultrasonic devices will be investigated</p>	<p>The effectiveness of artificial deterrents can be quickly undermined through habituation and are unlikely to present certainty in terms of mitigation (SNH 2016).</p> <p>Studies of auditory warning devices have found that birds become habituated to these devices and fail to respond, although habituation is slower with auditory devices that utilize bird alarm and distress calls (Thompson et al. 1968; Johnson et al. 1985; Bomford and O'Brien 1990; Morrison 2005). There are no studies that recommend using audio devices to warn birds away from wind turbines, and no studies that correlate audio warning devices in wind energy facilities with lower collision mortality.</p>	<p>Moderately effective</p>
<p>Operational monitoring for the site utilisation of birds and bats will be undertaken and compared to baseline data. Triggers for adaptive management will be included. Annual bird and bat utilisation surveys will be undertaken in line with Project approval conditions as part of monitoring to assess whether the Project area continues to be used by species and assess any changes in abundance that may influence BBMP risk ratings</p>	<p>Six Bird Utilisation Surveys (BUS) have been undertaken in accordance with the following:</p> <ul style="list-style-type: none"> • Wind Farms and Birds: Interim Standards for Risk Assessment Australian Wind Energy Association Report (Brett Lane and Associates 2005); and • Clean Energy Council's Best Practice Guidelines (CEC 2018). <p>The BUS followed a BACI design as per the requirements of State Code 23. Counts were undertaken at 21 locations across the Project area, comprising 17 impact sites and four control sites to maximise coverage of potential wind turbine locations as listed within the Bird and Bat Management Plan.</p> <p>The Impact Trigger for Threatened Species occurs if a bird or bat species listed as threatened or migratory under the EPBC Act (as defined within the Project approval conditions) or NC Act is found to have been killed or injured as a result of the</p>	<p>Highly effective</p>



Mitigation Measure	Justification	Expected Effectiveness
	<p>Project. Specifically, this will be a carcass find under or within 200m of a turbine during an active search or incidentally.</p> <p>When a threatened species impact trigger occurs, the adaptive management framework is actioned. This framework is defined by broad steps “Notify, Investigate and Respond” and will include the following activities:</p> <ul style="list-style-type: none">• Reporting of the occurrence of an impact trigger to the Project’s Responsible Officer, who will communicate the incident to DES and/or DCCEEW within two business days;• Turbine carcass searches will be increased to include all turbines within 2km of the confirmed strike. This intensification will be continued fortnightly for 6 weeks at which time it will return to the standard schedule;• Interim mitigation measures to be implemented in consultation with a suitably qualified ecologist, DES and DCCEEW;• An investigation being undertaken by a suitably qualified ecologist to determine the circumstances that lead to the death or injury within ten business days of an incident. In instances where the cause of death is a direct result of turbine blade collision, an investigation will be undertaken to identify the specific risk behaviours that likely resulted in the collision, and the likelihood of recurrence will be evaluated;• The incident will be assessed as a significant impact (with reference to the <i>EPBC Act Significant Impact Guidelines 1.1</i> or the relevant Queensland Government Significant Residual Impact Guideline), and to assess if it is likely to be a one-off event or is a recurring risk;• In the event that the incident is potentially a recurring risk, the following activities will be undertaken:	



Mitigation Measure	Justification	Expected Effectiveness
	<ul style="list-style-type: none"> ○ A species-specific monitoring and mitigation program will be undertaken, with periodic reports provided to DES and DCCEEW; ○ A review of the most effective practicable mitigation to address any confirmed recurring risks, with the approved mitigation to be implemented as soon as feasible; and ○ If, once additional mitigation measures are implemented the impact trigger is recurring, operational may be considered in consultation with relevant regulators. ● If, in consultation with the relevant regulators, a fatality or injury is deemed to be a one-off occurrence or the ongoing impact to the species is not considered to be significant, further action will not be considered necessary; ● Any required investigation, and recommended mitigation measures will be summarised in the annual reports. <p>The Impact Trigger for non-threatened species is defined as four or more bird or bat carcasses of a single species, or parts thereof, being found in two successive carcass searches at the same turbine.</p> <p>The definition of a significant impact on non-threatened species is any impact that is likely to reduce the viability of the population of the affected species in the bioregion. This is only relevant where the population numbers for a species are known, where habitat extent is known, and where this information has been formally reported by DES.</p> <p>When a non-threatened species impact trigger occurs, the adaptive management framework is actioned. This framework is defined by broad steps “Notify, Investigate and Respond”.</p>	



Mitigation Measure	Justification	Expected Effectiveness
	<p>This framework will include the following activities:</p> <ul style="list-style-type: none"> • Within seven days of recording the impact trigger, DES will be notified; • An evaluation of impacts to the bioregional population of the target non-threatened species' will be undertaken; and • An investigation report will be provided to DES within three weeks of the impact trigger. <p>If the impact trigger event is deemed to be a recurring risk, or likely to lead to a significant impact on the target species, species-specific monitoring will be implemented. If it is confirmed that impacts are likely to lead to a significant impact on the species, additional mitigation measures will be assessed against the risk. Potential mitigation measures are outlined in the BBMP (Appendix G) however, the final mitigation measures will be determined based on the specific circumstances.</p> <p>If the impact trigger event is classified as a one-off occurrence or is not a significant impact, no further action will be required.</p> <p>Any required investigation, and recommended mitigation measures, will be undertaken in consultation with DES and detailed in annual reports.</p>	
<p>A regular carrion removal program will be implemented.</p>	<p>To reduce the concentration of raptor species including the wedge-tailed eagle being influenced by the anthropogenic activities described above, and to reduce the risk of raptors colliding with turbines, a regular carrion removal program will be implemented during operations focused on a minimum of 200m around turbines (Bispo et al. 2013). A Carrion Removal Coordinator (CRC) will be appointed to implement the program, and will be responsible for:</p>	<p>Highly effective</p>



Mitigation Measure	Justification	Expected Effectiveness
	<ul style="list-style-type: none">• Monthly targeted inspections of the Project site to search for any carcasses of livestock, mammal species or bird species that may attract raptors or other scavengers. Any finds of bird species are recorded. These searches will be focused within 200m of each turbine, with additional efforts to occur along gazetted roads such as Wooroora Road and access tracks. <p>Incidental and opportunistic observations occurring during general operational activities will provide regular information on the presence of carcasses so that collection can be undertaken to remove them in a timely manner. Owing to the size and rugged terrain of the two host properties, it is not considered likely that the landholders will be able to contribute to this process.</p> <ul style="list-style-type: none">• <p>Coordinating with the landholder with regard to attractant activities such as cattle feed distribution and hunting. This includes commitments to ensure that feed is not distributed, and trapping does not occur, within 200 m of turbine sites.</p> <ul style="list-style-type: none">• <p>All personnel will be required to notify the CRC within 24 hours of identification of a carcass within the Project area. All reported occurrences of a carcass and its removal will be recorded in a carcass removal register that will be maintained by the Project's Responsible Officer.</p>	



Mitigation Measure	Justification	Expected Effectiveness
	<p>The carcass removal program will be implemented for a minimum of one year and its continuation will be assessed after one year of operation. The key criteria for continuation will be based on the frequency of carcass finds. As a guide, if carcass frequency is considered low (one or two per quarter/turbine) outside of turbine search zones the program may be discontinued or reduced based on input from a suitably qualified person. Seasonal or geographical concentrations of carcass finds may also result in modification of the program to focus searches at key times or at key locations.</p>	



6.3.3 Noise and Light Emissions

The following measures will be implemented to mitigate and manage impacts from noise and lighting as much as practicable during the operational phase:

- Night lighting will mainly be limited to that required for safety and security. Project lighting will be minimised (i.e. low luminance) as far as practicable. Night lighting will be required for security and operational purposes on the switchyard and operations and maintenance buildings. The wind turbines (aside from any aviation lighting that might be mandated by the Civil Aviation Safety Authority) and access tracks will not be lit.
- Directional lighting will be limited to emergency exits and only be used for emergency access/egress at wind turbines and facilities. This lighting will be directed away from environmentally sensitive areas.

6.3.4 Pests and Weeds

The following measures will be implemented to mitigate and manage impacts from weeds and pest animals as much as practicable during the operational phase:

- All vehicles and plant will be washed and certified prior to arrival onsite.
- The Weed and Pest Management Plan in **Appendix F** provides specific advice for key identified species. This includes management of weed spread, management of pest infestations, and monitoring effectiveness of control measures. This will be further developed as the construction contractor is engaged.
- A pest animal monitoring program will be developed for the Project.
- Any herbicides used on site must be dispensed by an appropriately trained and qualified weed sprayer.
- Management of pests and weeds will be undertaken as a key aspect of the Offset Management Strategy (**Appendix O**) and will also extend to restricting the movement of pests between the Project area and the WTQWHA. Pests are present throughout the Project area and evidently these pests are contributors to a key threat applicable to the WTQWHA.

6.3.5 Bushfire Risk

The following measures will be implemented to mitigate and manage impacts from bushfire risks as much as practicable during the operational phase:

- A certified Bushfire Management Plan prepared by a suitably qualified professional will be implemented during on-site activities. During the bushfire season, the fire danger status will be monitored daily through the Rural Fire Service website.
- For “hot-work” activities, a risk assessment will be completed considering forecast weather, fire hazard ratings and site conditions.
- Vehicles may not idle or be parked in areas of long grass.
- Access tracks and fencelines will be used as firebreaks within the Project area and regularly maintained during construction and operation of the Project.
- Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management. This will be identified in a Project-wide fire management regime to be prepared in consultation with WTMA and QFES.



- Smoking will not be permitted on site.

6.4 Decommissioning

The following measures will be implemented to facilitate decommissioning of the Project area:

- Implement site planning and management requirements in accordance with a developed decommissioning and rehabilitation plan;
- Undertake swept-path analysis for remobilising large equipment through rehabilitated areas; and
- Sequential rehabilitation will be practiced as soon as practicable following decommissioning activities.