Construction Management Plan

Chalumbin Wind Farm

Prepared for:
Chalumbin Wind Farm Pty Ltd

October 2022

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1.0 Introduction

1.1 Background

Attexo Group Pty Ltd (Attexo) has been engaged by Chalumbin Wind Farm Pty Ltd (CWF) to prepare a Preliminary Construction Management Plan (CMP) for the Chalumbin Wind Farm Project (the Project) to support a Development Application (DA) for a Material Change of Use (MCU) for a Wind Farm and Operational Works (OPW) for Clearing of Native Vegetation under State Codes 23 and 16 respectively. The CMP is also to support an application for the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and complements the Public Environment Report prepared under this assessment process.

The Project area is located in Far North Queensland approximately 15 km south-west of Ravenshoe within the Tablelands Regional Council (TRC) local government area. The Project area spans two (2) land parcels and covers a total of 31,225 ha plus adjoining road reserves. That portion of the Project area that contains all permanent wind farm infrastructure and construction disturbance areas is referred to as the Project footprint and is approximately 1,071 ha in size. Project construction is anticipated to commence in mid-2023 and to extend for a period of 24-30 months.

1.2 Purpose and scope

This CMP is intended to demonstrate that the Performance Outcome (PO) identified for construction management within the Queensland State Code 23: Wind Farm Development (PO13) can be met by the Project and to establish the baseline requirements for Project construction environmental management. To this end, the following information is provided within this CMP:

- A brief outline of Project information relevant to construction environmental management.
- Details of site environmental conditions and sensitive environmental receptors present.
- A description of the environmental aspects and potential impacts arising from wind farm construction.
- High level environmental management requirements that will inform the development of detailed construction environmental management plans.
- A description of CWF's minimum expectations for the construction contractor's environmental management system (EMS) and details relating to key components of the EMS.

This CMP is intended to be read in conjunction with the Chalumbin Wind Farm Planning Assessment Report and associated documents, which provide detailed information relating to the Project proponent, background, location, works and other matters identified by State Code 23. For brevity, this information is not replicated within this CMP, other than where it relates directly to environmental aspect, impact or management measure identification, or where specifically identified for inclusion within the CMP by the State Code 23 Planning Guidelines 2018. Consequently, the following items are specifically excluded from the scope of this CMP:

- Cultural Heritage: separate regulatory process, beyond scope of State Code 23.
- Soil erosion and sediment control - refer to the Project *Preliminary Erosion and Sediment Control Plan*; **Appendix C** to this CMP.
- Stormwater impacts – refer to the Project *Stormwater Management Plan*; an attachment to the Planning Assessment Report.

- Ecological impacts and mitigation – refer to the Project *Ecological Assessment Report*, including *Preliminary Fauna Management Plan* and *Preliminary Vegetation Management Plan*; an attachment to the Planning Assessment Report.
- Visual amenity impacts – refer to the Project *Landscape and Visual Impact Assessment*, an attachment to the Planning Assessment Report.

This CMP applies to all construction works associated with wind farm development and applies to all Project personnel, including (but not limited to) employees, contractors and subcontractors. Targeted construction environmental management plans which provide direction for on-ground activities will be developed prior to commencement of works once a detailed construction methodology is known.

This CMP is also to be read in conjunction with the Public Environment Report prepared for the Project under the EPBC Act.

2.0 Project Overview

2.1 Site and facility description

The Project area is located approximately 15 km south-west of Ravenshoe between the small rural residential settlements of Millstream (approximately 3 km to the north) and Innot Hot Springs (approximately 9 km to the west). A detailed site map showing the Project area, Project footprint and the location of infrastructure within these areas is provided in **Figure 1**.

Key Project details are provided in the Public Environment Report.

ARK ENERGY

Attexo

Chalumbin Wind Farm

Project Layout

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Figure 1.1

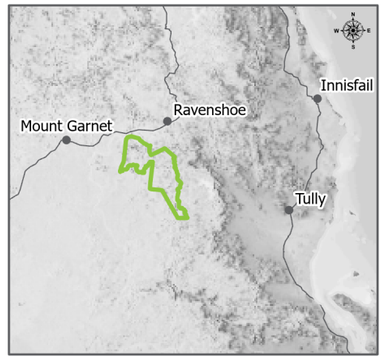
- Project Area Boundary
- Turbine
- Met-mast
- Access Road
- Facilities

Clearance Envelope

- Stage 1
- Stage 2
- Existing HV Transmission Line
- Watercourse
- WTQ Boundary
- WHA Buffer - 500m
- Lot Boundary
- Easement

Date: 13/10/2022 Author: TOD

Project: EPU-004 Reviewed: NOD



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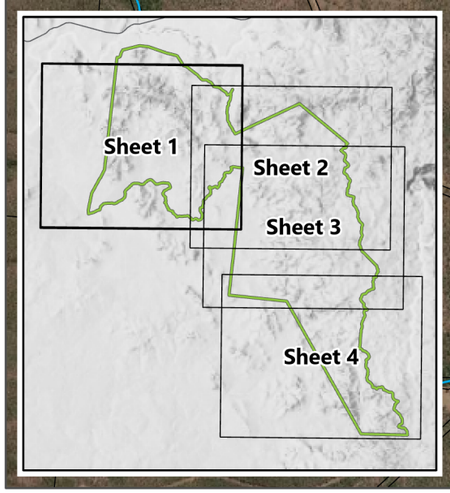

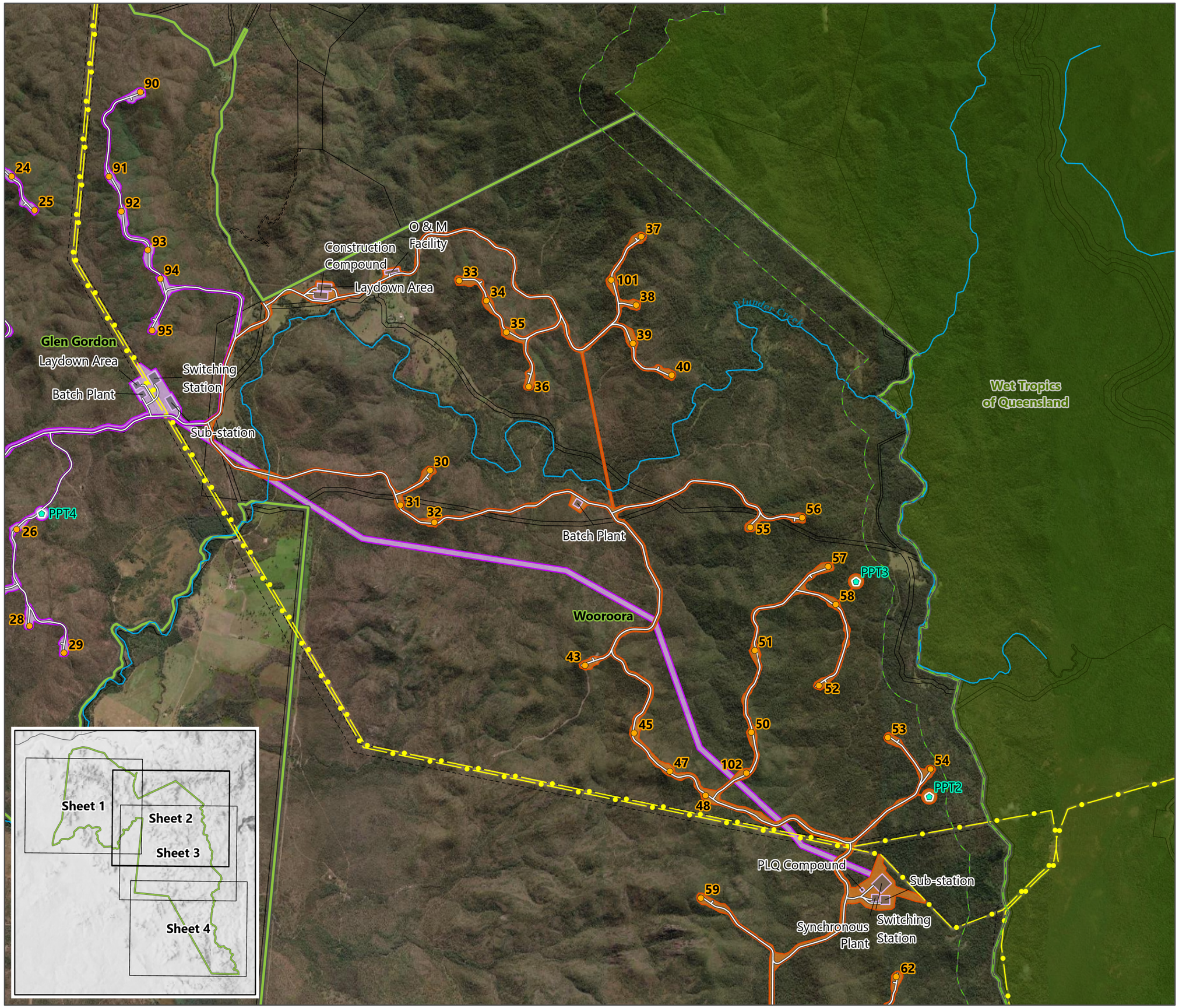

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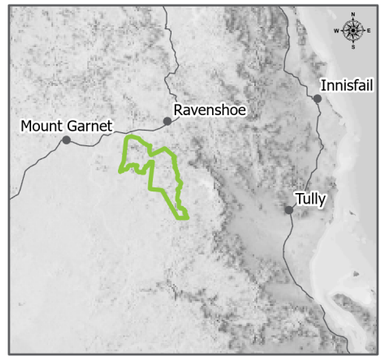

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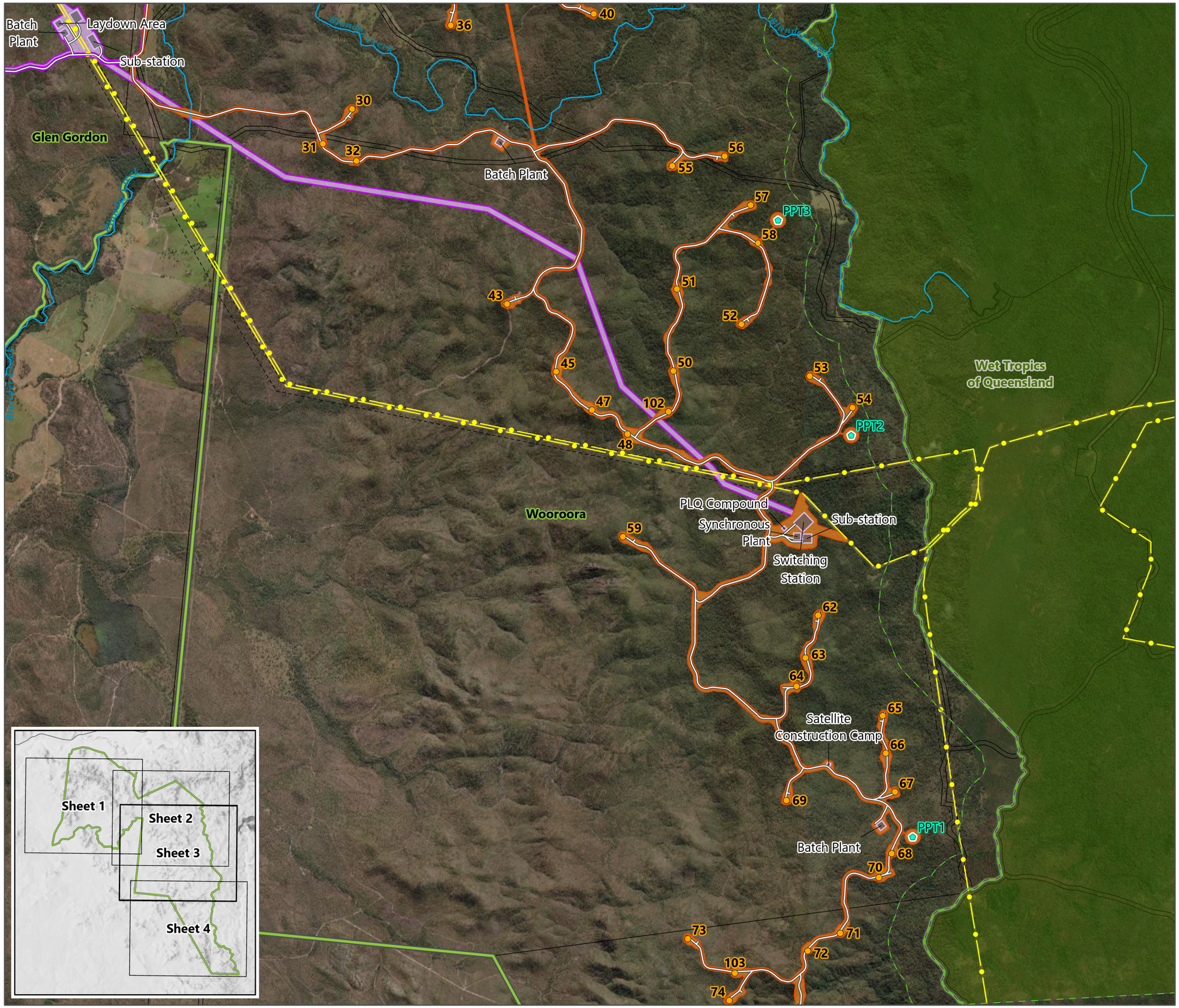

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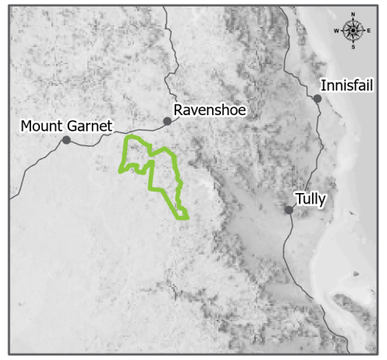

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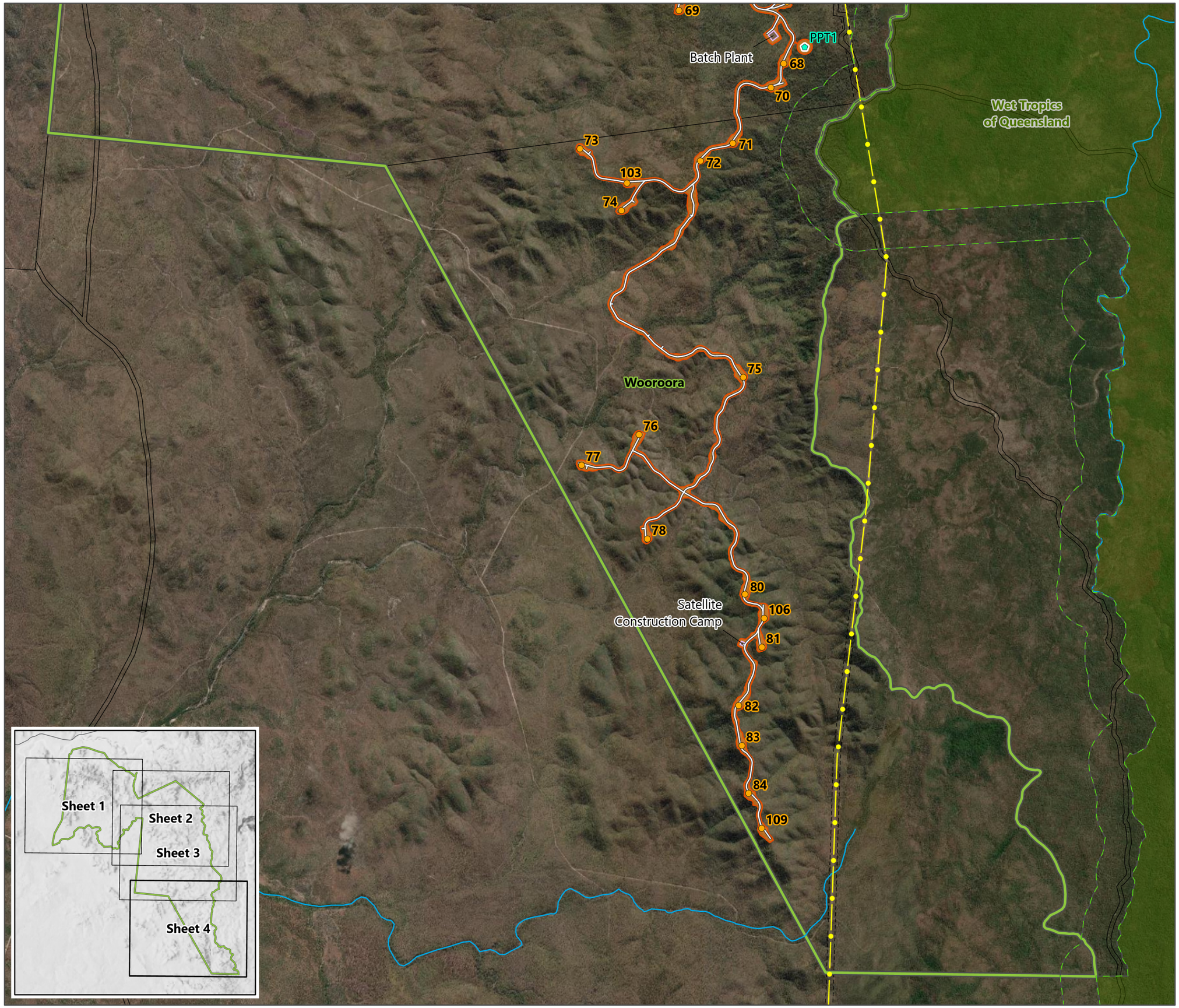

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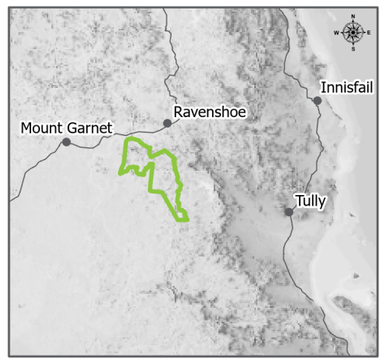

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2.2 Proposed construction works

Construction of the Project is anticipated to commence in mid-2023 and extend for a period of 24-30 months. A detailed construction methodology will be developed by the Project construction contractor upon award. Notwithstanding, it is anticipated that construction will include the activities listed below.

General:

- Mobilisation: of machinery and equipment to site (staggered throughout the construction phase as needed).
- Site establishment: installation of temporary construction compounds, workshops, warehouses, amenities, laydown and stockpiling areas.
- Vegetation clearing: the removal of up to 1,049.6 ha of remnant vegetation via mechanical means (staged in line with civil construction).
- Machinery and equipment maintenance: general servicing and minor repairs such as oil and filter changes, hose replacements, refuelling and other top ups (i.e. hydraulic fluids, lubricants, coolant, etc.).
- Site rehabilitation: revegetation and groundcover establishment to be completed progressively as individual sites or Project sections are completed.

Civil works:

- Bulk earthworks:
  - Cut and fill for the levelling of hardstand areas and the establishment of required track gradients.
  - Establishment of borrow pits within the construction footprint as required.
  - Excavation of up to 86 WTG footings and hardstand areas.
  - May include rock blasting depending on geology.
- Trenching: for sub-surface cable installation.
- Track and pad construction: compacted, unsealed tracks and hardstand areas.
- Installation of turbine footings: laying of formwork and concrete pouring, curing and cutting.
- Instream works: vehicle creek crossings to be established which will comprise a mix of bed level and culvert types. Major stream crossings may require bridge installation, subject to further design.

Wind turbine construction:

- Delivery of turbine parts to site.
- Crane set up.
- Erection of turbines: lifting, positioning and attachment of turbine pieces.
- Mechanical works for turbine assembly.

Installation of ancillary facilities and equipment:

- Underground (UG) cables: stringing and laying of conduit, pulling and joining of electrical and communications cable.
- OH powerlines: Installation of pole footings, standing of poles and stringing of electrical cable.
- Electrical works (OH and UG): cable joining, facility interconnection and grid connection.
- Meteorological masts: as described for wind turbines on a lesser scale.
- Permanent site offices: establishment of hardstand area (see civil works), installation of prefabricated buildings and associated control and communications equipment.
- Substation: The substation will consist of a large "bench" area with an earth grid buried underneath, and high specification drainage and clearances. All the electrical equipment can be installed on this bench. For the transformer, the heaviest infrastructure on the Project, special foundations are installed to ensure the safety and durability of the substation.

Commissioning

- Testing and commissioning of mechanical and electrical equipment

Demobilisation:

- Progressive disassembly and removal of all construction machinery, equipment and materials from site.
- Final site stabilisation and rehabilitation works.

2.3 Construction equipment and consumable items

A detailed list of equipment and consumable items used for Project construction will not be known until the construction contract is awarded. Anticipated requirements include (but are not limited to) the items listed below.

Machinery and equipment

- Mobilisation: trucks - various.
- Civil works (all): bulldozers, excavators, graders, scrapers, rollers, drill rig, rock crushers, blasting equipment (unconfirmed) dump trucks, vacuum trucks, trenchers, etc.
- Tower and mast installation: fixed and mobile cranes of various sizes.
- Conduit and cable / conductor installation: welder, cable laying machines, tractors, small cranes and other equipment depending on cable pulling method used.
- Construction compound: work sheds, temporary office buildings, crib room and ablutions.
- Throughout: water carts, light vehicles, generators, communications equipment, handheld tools, etc.

Consumable items

- Fuels and chemicals: diesel, petrol, oils, lubricants, coolant, hydraulic fluid, adhesives, paints, etc.
- Fill material: sourced from either onsite borrow pits or licensed quarry (i.e. for specialised trench backfill)

- Water (see **section 2.4**).

2.4 Construction water supply

Water supply for construction will be required for various uses including dust suppression, bushfire response (contingency), earthworks, watering of revegetated areas, staff amenities and drinking. Securing a water supply for these purposes will be the responsibility of the construction contractor, options include: the construction of bores and dams, installation of rainwater tanks and purchase of water from council or surrounding landholders.

2.5 Hours of work

Regular construction hours are anticipated to be six days per week, 12 hours per day (6:30 am to 6:30 pm), in line with the default noise standards for building work in Queensland under section 440R of the *Environmental Protection Act 1994*. It is likely that at times additional work will be required outside of these hours; mitigation and management measures for this will considered by the Project Construction Environmental Management Plan (CEMP) which is to be developed by the construction contractor once a detailed construction methodology and schedule is known.

Work undertaken during standard, or extended hours, may include any of the activities identified in **Section 2.2** of this CMP.

2.6 Construction workforce

It is anticipated that approximately 250 to 350 personnel will be required onsite during peak construction. Personnel will stay in local accommodation, most likely at Ravenshoe and surrounding townships. Alternatively, an off-site construction accommodation solution may be pursued.

2.7 Construction waste

Various waste streams will be generated by construction including:

- General waste – packaging, plastics, timber products and scrap metal.
- Spoil, rubble, debris and vegetative matter.
- Putrescible waste, e.g. waste food items.
- Chemicals – used oil, residual paints and chemicals in used containers, etc.
- Wastewater – sewage and other wastewater from construction compound kitchens and ablutions.

Management measures for responsible waste disposal will be identified by the Project construction environmental management plan in line with the principles identified in **Section 4.2.4** of this CMP.

3.0 Environmental Context

3.1 Site conditions

A high-level description of environmental conditions present at the Project site relevant to the identification of environmental aspects and impacts associated with Project construction works is provided in **Table 3-1**.

Table 3-1: Site conditions

Subject	Description
Climate / rainfall[1]	▪ Climate: hot and humid with a distinct wet season (Dec-March) and dry season (April-Nov). ▪ Mean annual rainfall: 1,216 mm (Ravenshoe). ▪ Highest mean monthly rainfall: Jan-Mar (225-280 mm per month). ▪ High windspeeds (hence site selection).
Topography	▪ Hilly with occasional steep terrain, elevation range 671 m to 990 m AHD. ▪ Turbine and met mast construction sites situated on rises / high points. ▪ Construction compounds, laydown areas and batching plants situated over flatter areas.
Soils and geology	▪ At higher elevations (majority of footprint): poor quality, shallow stony soils (Rudosols and Tenosols) over weathered, acid volcanic rocks (Glen Gordon Volcanics) with some areas of non-cracking clay or clay loam (Dermosols and Ferrosols). ▪ Mid-level (footprint area approx. 80 ha): basalt derived non-cracking cays and clay loams (Dermosols, Ferrosols) with some alluvial loams (Kandasols). ▪ Blunder Creek flood plain (footprint area approx. 30 ha): sand or loam over sodic clay (Sodosols and Kurosols) and seasonally wet soils (Hydrosols).
Flora and fauna	▪ The majority of the Project footprint contains vegetation which is mapped as remnant. Vegetation comprises a mix of woodland communities typically dominated by *Eucalypt* and *Corymbia* species. ▪ The Project footprint comprises a range of habitat values, as described within the Ecological Assessment Report (Attexo, 2021).
Surface hydrology	▪ The majority of the site comprises a single catchment whereby ephemeral high order streams drain to Blunder Creek, which meanders through the central portion of the Project area as a fourth and fifth order stream. ▪ A small area in the far northern portion of the Project footprint drains north to The Millstream which is located offsite. ▪ Both Blunder Creek and the Millstream drain to the Herbert River.
Surrounding land use	▪ Agricultural land to the north, west and south – largely grazing

1 Monthly rainfall: Ravenshoe Kuradilla St, accessed 11.05.2021 at: http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=031053

Subject	Description
	▪ Protected areas abut the eastern Project area boundary, including 2 Forest Reserves and 2 National Parks, the latter forming part of the Wet Tropics of Queensland World Heritage Area (WTWHA).

3.2 Sensitive uses

The Project is situated within a sparsely populated area. Sensitive land uses identified in proximity to the Project that may be affected by construction related noise, vibrations, dust and / or emissions, if not managed effectively, are shown in **Figure 1** and include:

- The Wooroora and Glen Gordon homesteads.
- Three additional residences situated within 2 km of the Project footprint.
- National Parks (Koombooloomba and Tully Falls) and forest reserves (Koombooloomba South and Ravenshoe) situated to the east of the Project footprint.

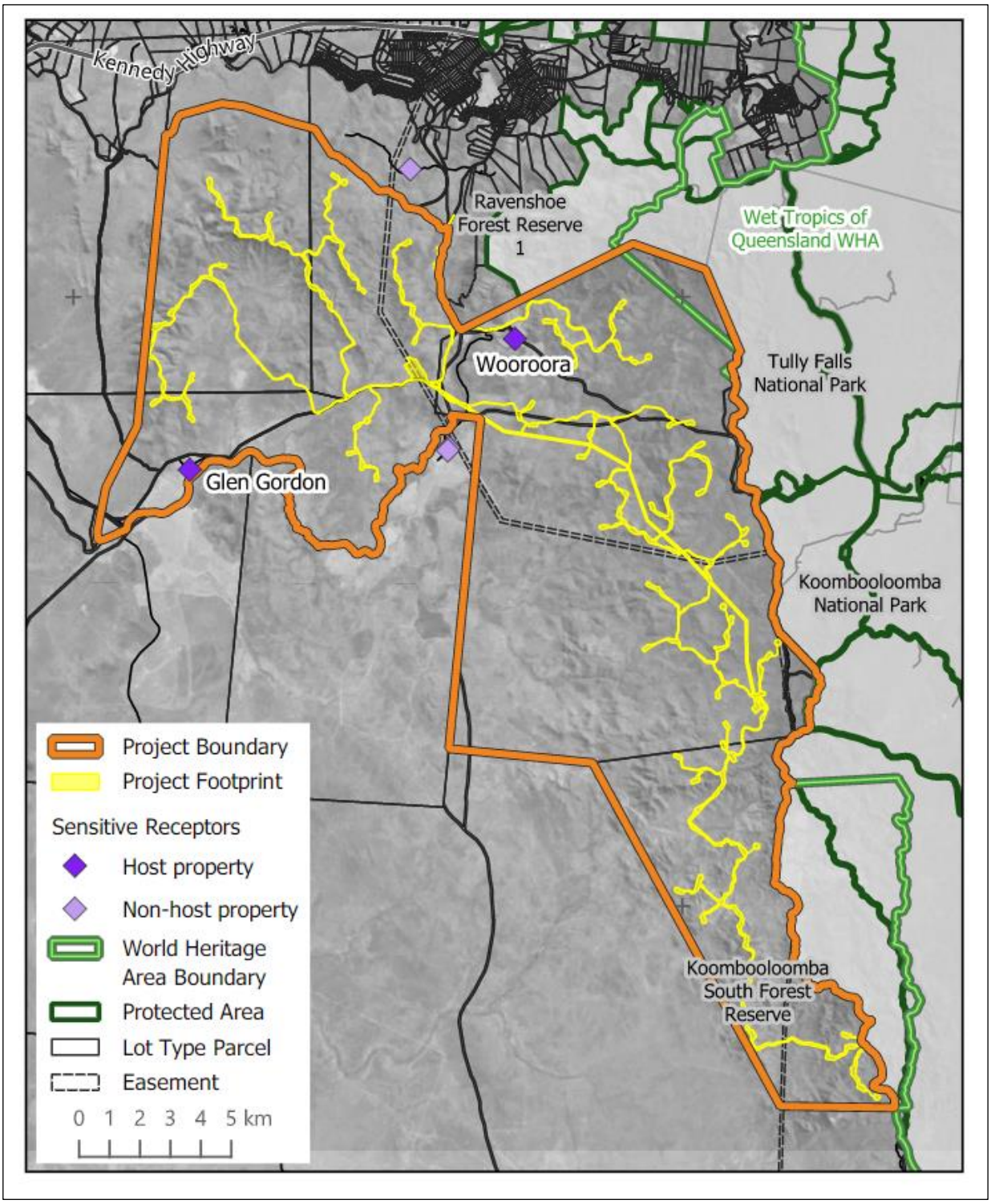

Figure 2: CWF Sensitive land uses

4.0 Environmental Aspects, Impacts and Controls

4.1 Construction environmental aspects and impacts

An assessment of the environmental aspects and potential impacts associated with wind farm construction is provided in **Table 4-1**. Measures to be adopted to prevent or mitigate potential impacts are described in **Section 4.2** of this CMP, **Table 4-2** through to **Table 4-9**.

Table 4-1: Construction environmental aspects and impacts

Activity	Aspect	Potential Impact
▪ Vegetation clearing	Loss of native vegetation	▪ Habitat fragmentation and / or reduction of habitat availability exposing local native fauna to predation and reduction of food availability. ▪ Loss of threatened flora / biodiversity.
	Disturbance of fauna habitat	▪ Death of / or harm to fauna due to physical impact ▪ Fauna displacement due to loss of habitat
▪ Operation of machinery and equipment (including rock breakers) ▪ Truck movement ▪ Blasting	Noise generation	▪ Temporary displacement of fauna. ▪ Short term nuisance to neighbouring households.
	Vibrations	▪ Impacts as listed above for noise. ▪ Damage to adjacent infrastructure e.g. cracking of walls, concrete, etc.
	Emissions	▪ Localised, temporary reduction in air quality. ▪ Greenhouse gas emissions to atmosphere contributing to greenhouse effect.
▪ Hot works ▪ Operation of vehicles, machinery and equipment	Ignition source	Bushfire causing: ▪ Loss of flora, habitat and other biodiversity values. ▪ Death, harm and / or displacement of native fauna. ▪ Loss of agricultural productivity. ▪ Soil exposure resulting in increased erosion potential.
▪ Earthworks ▪ Land clearing ▪ Grubbing ▪ Movement of vehicles and mobile equipment	Soil erosion	▪ Loss of productive topsoils and subsequent reduced agricultural productivity. ▪ Loss of access and land availability in the case of severe gullying. ▪ Sedimentation of watercourses / wetlands resulting in: - Harm to aquatic flora and fauna. - Sediment build up causing redirection of surface water flows and associated downstream impacts.

Activity	Aspect	Potential Impact
	Dust generation	▪ Smothering of flora causing harm or death. ▪ Respiratory harm to people and fauna.
▪ Surface re-profiling	Redirection of minor surface water flows	▪ As above for soil erosion, in particular gullying.
▪ Vehicle movement	Physical presence / movement	▪ Physical impact with fauna causing harm or death.
▪ Vehicle movement ▪ Import or export of biosecurity matter e.g. fill, spoil or vegetative material	Spread of weed material, disease, pests or pathogens.	▪ Loss of agricultural productivity. ▪ Biodiversity impacts: - Displacement of native flora via competitive influence. - Loss of native flora and fauna due to establishment of pathogens and disease. - Loss of native fauna due to ingestion of poisonous plants or pests. - Restriction of fauna movement due to barrier creation by weeds.
▪ Vehicle, equipment, machinery use and / or maintenance.	Chemical release	▪ Localised soil contamination ▪ Water contamination resulting in death of, or harm to, aquatic organisms (flora and fauna)
▪ Night works	Lighting	Temporary displacement of local fauna
▪ Material imports for facility installation	Inert waste generation	▪ Generation of litter causing: - Loss of visual amenity - Harm to native fauna and cattle ▪ Landfill impost.
▪ Presence of construction workforce	Generation of putrescible waste	Attraction of fauna – both native and pest species causing: ▪ Death of native fauna due to predation by feral animals (e.g. dogs and cats). ▪ Attraction of birds of prey to site (refer to the Project *Bird and Bat Management Plan*; an attachment to the Planning Assessment Report, for detailed description of potential impacts).
	Generation of sewage and black and grey wastewater from construction site amenities	▪ Surface water contamination by nutrient and bacteria causing harm to aquatic organisms and / or eutrophication of waterways. ▪ Contamination of soils and water by bacteria and / or pathogens causing health impacts for humans and fauna.

4.2 Environmental controls and mitigation measures

The sections to follow identify objectives for environmental management and high-level management strategies to address the potential impacts identified in **Table 4-1**. Subject matter addressed by separate, detailed studies undertaken for the Project has been deliberately omitted from this CMP where construction impacts and mitigation measures are captured, except where specifically identified for CMP inclusion by State Code 23. This is intended to reduce repetition and the overall bulk of documentation produced for the Project, thereby reducing implementation burden during the Project construction phase. Consequently, the following items are not addressed further by this CMP:

- Soil erosion and sediment control - refer to the Project *Preliminary Erosion and Sediment Control Plan* in **Appendix C**.
- Stormwater impacts – refer to the Project *Stormwater Management Plan*; an attachment to the Planning Assessment Report.
- Ecological Impacts – refer to the Project *Ecological Assessment Report*, including *Preliminary Fauna Management Plan* and *Preliminary Vegetation Management Plan*; an attachment to the Planning Assessment Report.
- Visual amenity impacts – refer to the Project *Landscape and Visual Impact Assessment*; an attachment to the Planning Assessment Report.

Responsibilities identified for the implementation of measures identified within this section are outlined in **Table 5-1** of this CMP. Assurance measures, such as monitoring and reviews, to ensure these management measures are implemented and achieving objectives are discussed in **Section 5.3**.

4.2.1 Noise and vibrations

A Noise Impact Assessment (NIA) has been completed for the Project and is provided as an attachment to the Project Planning and Assessment Report. The NIA assessed both operational and construction related noise impacts and concluded that the Project can meet State Code 23 requirements for noise via the implementation if a construction noise and vibration management plan.

Sources of noise and vibration generating during Project construction are likely to include, but are not limited to, the following:

- Vehicle movement, in particular engine noise from large trucks and reverse beepers.
- The operation of loud machinery such as earthmoving equipment, soil compactors, chainsaws, grinders, drilling equipment and that which is associated with the two proposed batching plants.
- The use of impact equipment such as rock breakers and piling hammers.
- The use of explosives.
- The use of diesel-powered generators.

The management of construction noise and vibrations generated by construction activities is addressed in **Table 4-2**.

Table 4-2: Management of construction noise and vibrations

Item	Details
Objectives:	▪ Minimise impacts to fauna and the local community associated with noise and vibrations generated by Project construction activities. ▪ Comply with *Environmental Protection (Noise) Policy 2019*
Mitigating factors:	▪ Project is situated within a sparsely populated area. ▪ Presence of alternative habitat in proximity to site provides opportunity for fauna to move away from construction noise if affected.
Management measures:	▪ Noise and vibrations are to be managed in line with the 1. Avoid 2. Minimise, 3. Manage hierarchy. ▪ Standard construction work hours for noise generating activities are Monday to Saturday (inclusive) between 6:30 am and 6:30 pm. ▪ Noise generating activities undertaken outside of standard construction hours will be done in accordance with dedicated protocols, in consultation with surrounding landholders, and in such a way that noise standards relevant to the site are met. ▪ Equipment is to be fitted with noise reduction devices where practicable. ▪ Vehicles, machinery and equipment is to be maintained in good working order in line with a maintenance schedule and associated service records maintained. ▪ Vehicles, machinery and equipment are to be switched off when not in use. ▪ Landholders are to be given notification of planned activities known to generate significant noise and / or vibration. ▪ Implementation of a construction noise and vibration management plan (as per Project NIA – may form part of CEMP) which identifies sources of construction noise, the location of sensitive noise and vibration receptors, hours of work and noise and vibration mitigation and monitoring measures.

4.2.2 Dust

Dust generation is a by-product of wind erosion of soils and hence will be addressed by the Project construction ESCP. Minimum requirements for dust management during construction are identified in **Table 4-3**.

Table 4-3: Dust management

Item	Details
Objectives:	▪ Minimise dust generation to the greatest extent practicable.
Mitigating factors:	▪ Nil.
Management measures:	▪ Soil erosion to be addressed by Project construction ESCP (refer **Appendix C**). ▪ Implement dust suppression techniques such as the use of water carts or application of soil binders as required during construction. ▪ Minimise dust generating activities during dry, windy conditions.

Item	Details
	▪ Stabilise / rehabilitate exposed soils in line with IECA 2008 best practice land clearing and rehabilitation requirements. ▪ Position soil stockpiles to minimise wind exposure. ▪ Implement speed limits on unsealed access tracks.

4.2.3 Hazardous chemicals

General direction for management of chemical use during Project construction is provided in **Table 4-4**. Detailed management measures to prevent and respond to chemical releases will be developed by the construction contractor within the Project CEMP once chemical requirements and stored quantities are better understood.

Table 4-4: Management of hazardous chemicals

Item	Details
Objectives:	▪ Prevent the release of chemicals in the first instance. ▪ In the event of a release, all spilled material, affected soils and other contaminated materials are to be recovered and disposed of to an appropriately licensed landfill facility.
Mitigating factors:	▪ Equipment required for clean-up (e.g. excavators, bins, etc.) is readily available onsite during construction.
Management measures:	Transport: ▪ Chemical transport by appropriately licensed Contractors (including for waste generated by spills). Storage: ▪ Storage of hazardous chemicals within dedicated, bunded areas or within self-bunded containers. ▪ Hazardous chemical storage areas are to be situated within hardstand construction areas away from watercourses and other sensitive receptors. Use: ▪ Refuelling and the maintenance of machinery and equipment to be undertaken over hardstand areas with containment measures in place ▪ Refuelling and other hazardous chemical transfers will be continuously manned and not left unattended. Administrative controls: ▪ Material safety data sheets (MSDS) are to be current and available onsite for all chemicals stored. ▪ Chemical spills are to be reported within internal incident reporting systems so that these events can be reviewed, and corrective action taken as appropriate. ▪ Chemical spills are to be reported to external regulators and to DES where serious or material environmental harm has been threatened or caused (refer to **Section 5.4** of this CMP for further information).

Item	Details
	▪ Performance monitoring program developed for the Project by the construction contractor. Spill preparedness and response: ▪ Spill kits are to be maintained onsite and located in proximity to chemical storage and handling areas. ▪ Spill kit contents are to be commensurate to the type and quantity of chemicals stored onsite. ▪ Spill response procedures are to be developed and implemented by the construction contractor in line with the following response hierarchy: **1.** Cut off the source of the spill. **2.** Contain the spread of the spill. **3.** Recover and contain spilled liquids, affected soils and materials used for clean-up. **4.** Dispose of associated waste. ▪ Recovered materials from a spill are to be stored within a suitable sealed container until removed from 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.

4.2.4 Bushfire prevention and response

A bushfire management plan addressing construction related bushfire threats will be developed for the Project prior to commencement of works. High level Project commitments relating to bushfire prevention and response are outlined in **Table 4-5**.

Table 4-5: Bushfire prevention and response

Item	Details
Objectives:	▪ Zero incidences of bushfire attributable to Project construction works
Mitigating factors:	▪ Nil.
Management measures:	▪ Project specific bushfire management plan to be developed prior to commencement of construction which: - 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.

Item	Details
	- 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.

4.2.5 Waste

General requirements for construction waste management are described in **Table 4-6**. A detailed waste management plan will be included developed by the construction contractor as part of the Project CEMP prior to commencement of works.

Table 4-6: Construction waste management

Item	Details
Objective:	▪ Zero instances of environmental nuisance or harm caused by construction waste management.
Mitigating factors:	▪ Nil.
Management measures:	▪ Construction waste management will follow the 'avoid, reduce, reuse, recycle, dispose' waste hierarchy. ▪ Onsite bin capacity will be sufficient to store waste generated until removal from site. ▪ Putrescible waste is to be stored within sealed bins. ▪ Construction waste stored outside of bins will only comprise items not prone to dispersal (i.e. wood pallets, large pieces of scrap metal, etc.) and will be neatly stacked at dedicated storage locations. ▪ Regulated waste will be appropriately stored and labelled for offsite disposal by an appropriately licensed waste contractor. ▪ All waste will be disposed of offsite to an appropriate landfill facility, onsite burial or burning of waste is not permitted. ▪ Excavated soils will be reused onsite wherever possible.

4.2.6 Biosecurity

Weed surveys have been completed as part of ecological surveys undertaken for the Project. The primary pest flora species of note was *Lantana camara* (a category 3 weed under the *Biosecurity Act 2014* and a Weed of National

Significance), which is prevalent along alluvial zones and in moist gullies. No other significant pest flora species were observed in the Project area. General requirements for biosecurity management within the Project area are described in **Table 4-7**.

Table 4-7: Biosecurity management

Item	Details
Objectives:	▪ Zero introduction weeds, pests, pathogens or disease resulting from Project construction. ▪ Prevent additional spread of pre-existing weeds identified within the Project area.
Mitigating factors:	▪ Nil.
Management measures:	▪ Weed mapping within the construction footprint will be undertaken prior to commencement of works. ▪ Restricted invasive plants present within the construction footprint will be treated prior to the commencement of works at that location. ▪ New weed infestations will be treated as soon as possible following detection. ▪ All vehicles and equipment accessing site must arrive in the first instance with a current weed hygiene inspection certificate. ▪ Vehicles and equipment departing weed infested areas must be washed down and confirmed as clean down prior to entering weed free areas. ▪ A comprehensive biosecurity management plan is to be developed prior to construction by the construction contractor prior to commencement of works which: - Communicates the locations of existing weeds within the construction footprint. - Identifies onsite machinery wash down locations. - Communicates requirements for the movement of vehicles and biosecurity matter between infected and non-infected areas. - Identifies specific requirements for weed monitoring and response including direction for weed control activities. - Captures requirements identified by the BBMP for avoiding feral animal attraction. ▪ A register of observed weeds and pest fauna will be maintained throughout construction with this information informing management. ▪ Domestic animals will not be brought to site by construction personnel.

4.2.7 Construction lighting

A description of the action to be taken to limit impacts associated with construction lighting is provided in **Table 4-8**.

Table 4-8: Management of construction lighting

Item	Details
Objectives:	▪ Minimise disturbance to fauna and residents associated with construction lighting.
Mitigating factors:	▪ Nil.
Management measures:	▪ Standard construction work hours (6.30 am to 6.30 pm) predominantly occur during times of daylight. ▪ Site lighting will be kept to the minimum required for safety. ▪ Where needed, construction lighting will be directed to required areas and light spill to surrounding areas contained using lighting shields or similar.

4.2.8 Air emissions

Management measures proposed to minimise construction related emissions to air are outlined in **Table 4-9**.

Table 4-9: Management of air emissions

Item	Details
Objectives:	▪ Minimise gaseous emissions generated by Project construction.
Mitigating factors:	▪ Site remote from heavily populated areas.
Management measures:	▪ Vehicles, machinery and equipment: - Will be turned off when not in use. - Will comply with Australian design standards. - Will be serviced and maintained as per manufacturer specifications in line with a maintenance schedule.

5.0 Management framework

Project construction works will be undertaken under the Construction Contractor's management systems which, as a minimum, will comprise:

- A corporate **policy** which demonstrates a commitment to responsible environmental management.
- A corporate **environmental management system** currently certified to, or able to be certified to, AS14001:2015 (or later).
- Clearly defined **roles and responsibilities** for personnel regarding environmental management.
- Provision for the appropriate **induction and training** of personnel.
- Identification, allocation and maintenance of **appropriate resourcing**, being sufficient and suitably qualified environmental management personnel, to manage construction, operational and environmental risk in accordance with Approvals and Regulatory Requirements.
- **Monitoring and auditing** programs to assess compliance with procedures and the achievement of objectives.
- Provisions for **continual review and improvement** of environmental performance.
- A system of **reporting** for recording data and notification of relevant personnel.
- Processes for document and records management.

Chalumbin Wind Farm Pty Ltd (the Project Owner) will ensure that the successful contractor has robust systems in place for environmental management as part of the contractor selection process. Key items to be incorporated into the successful contractor's environmental management framework are described in the following sections.

5.1 Responsibilities

The responsibility for Project construction environmental management is shared by the Project Owner (CWF) and the construction contractor (yet to be determined). Responsibilities for individual roles within the Project team are nominated in **Table 5-1**.

Table 5-1: Responsibilities for environmental management

Role	Responsibilities
Project Owner (CWF)	▪ Ensure that final Project design is consistent with the Approvals. ▪ Ensure that all relevant Approvals requirements: - Are communicated to construction contractors; - Are sufficiently addressed by construction tenders / bids; and - Are contractually binding. ▪ Approve construction contractor management plans prior to commencement of works to ensure that they achieve or exceed Approval and Regulatory requirements. ▪ Undertake regular assurance activities, including auditing, to ensure that environmental management is being properly undertaken by the Construction Contractor.

Role	Responsibilities
Construction Project Manager (Contractor)	▪ Ensure that adequate processes, plans and procedures are in place to manage construction environmental impacts in line with Project commitments, legislative requirements and permit conditions. ▪ Allocate sufficient resources for environmental management. ▪ Review environmental incidents as they occur and ensure that adequate corrective actions have been taken to prevent recurrence. ▪ Ensure that reportable environmental incidents are communicated to the Project Owner and the relevant regulatory authority. ▪ Ensure that sufficient training is provided to construction personnel to achieve awareness of environmental management requirements.
Construction Manager (Contractor)	▪ Take overall responsibility for the on-ground implementation of environmental management processes, procedures, controls and incident response, and allocate sufficient on-ground resources for the same. ▪ Consider to environmental outcomes when scheduling works and allocating resources (e.g. staged vegetation clearing, works appropriate for weather conditions, progressive rehabilitation, etc.). ▪ Ensure effective response to community complaints. ▪ Support the HSE Management team in achieving Project environmental outcomes.
Project HSE Manager (Contractor) Site based HSE personnel (Contractor)	▪ Develop, implement and continually improve environmental processes and management systems. ▪ Develop and maintain CEMPs, ESCPs and all other plans as required to achieve Project construction environmental management requirements. ▪ Roll out environmental training and awareness programs. ▪ Develop and implement an environmental assurance program, maintain associated records and initiate improvement actions as required. ▪ Establish, monitor, maintain and audit effective environmental controls onsite. ▪ Respond to, report and investigate environmental incidents as appropriate and identify corrective actions to prevent recurrence. ▪ Provide advice to the Project and Construction Managers in relation to environmental management and Project environmental performance. ▪ Develop and implement site rehabilitation plans.
Construction personnel	▪ Attend environmental training and maintain awareness regarding Project environmental management. ▪ Follow all processes in place for environmental management. ▪ Establish, monitor and maintain physical environmental controls as directed. ▪ Respond to and report environmental incidents and as they occur.

5.2 Environmental training and awareness

Environmental training for site personnel will be delivered in line with a training plan developed by the construction contractor. Training delivered will be sufficient to ensure that all personnel are aware of the environmental

management practices relevant to their role. It is anticipated that, as a minimum, all Project site personnel will be required to complete a general site environmental induction prior to commencing work onsite that speaks to:

- The contractor's environmental Policy.
- Legislative environmental obligations relevant at the site level.
- Project environmental objectives.
- Project personnel environmental responsibilities.
- Site access requirements including vehicle hygiene (biosecurity), access routes and no-go zones, speed limits and areas known to contain native fauna susceptible to vehicle strike.
- Sensitive environmental receptors in proximity to the Project footprint.
- An overview of the Project EMS including the incident management system and monitoring and reporting requirements.

Environmental awareness will be reinforced on a day-to-day basis at toolbox meetings, during informal interactions and in writing (e.g. emails, noticeboard messages, etc.).

5.3 Environmental assurance and corrective actions

Environmental monitoring will be undertaken throughout Project construction to ensure that all environmental management measures identified by the CEMP, ESCPs and other environmental management plans and standards are implemented. The environmental monitoring program for the Project will be determined by the construction contractor prior to commencement of works and assessed for adequacy by CWF. Records of non-conformances identified by monitoring activities and associated corrective actions will be maintained and tracked by the construction contractor.

The construction contractor will be required to undertake periodic reviews of its own environmental performance and report associated findings to CWF. The frequency of these reviews is yet to be determined; however, is anticipated to occur approximately quarterly.

CWF will also monitor contractor performance throughout construction to ensure that all Project legislative environmental obligations, commitments made during approvals processes and permit conditions are met. Environmental performance outcomes will form part of contractual arrangements between CWF and the construction contractor for Project delivery.

5.4 Incident management

All environmental incidents will be recorded within the construction contractor's incident management database. This database will provide for incident classification, allocation of responsibilities and progress tracking for incident investigations and the implementation of corrective actions.

5.5 Reporting

5.5.1 Internal

The construction contractor will be required to prepare and submit a monthly report to CWF which will include information pertaining to:

- The outcomes of environmental monitoring undertaken.
- Environmental training delivered.
- Complaints received from the community.
- Environmental incidents and the details of any corrective action taken.

5.5.2 External

External reporting relating to Project environmental performance will be undertaken in accordance with the *duty to notify of environmental harm* under section 320 of the *Environmental Protection Act 1994*, and otherwise as specified by permit conditions.

5.6 Community engagement

CWF recognises the importance of effective stakeholder engagement in the successful delivery of the Project and the realisation of positive outcomes. Community and stakeholder engagement will be undertaken in accordance with the Clean Energy Council Community Engagement Guidelines for the Australian Wind Industry, 'Best practice community engagement in wind development'.

The construction contractor will be responsible for continuing amicable relations with the local community throughout Project construction and responding to any complaints received. This will involve:

- Establishing a point (or points) of contact to receive communications from landholders and the local community.
- Establishing protocols for notifying surrounding landholders and the local community of works that may cause a temporary nuisance.
- Initiating a process for responding to requests and / or complaints from the community which includes a general understanding what can and cannot be accommodated and responsibilities for decision making in this regard.
- Maintaining records of interactions with the local community, especially relating to any commitments made or complaints received.

The Project will seek to work collaboratively with the local community and accommodate requests where practicable.

Appendix A

Definitions

Term / acronym	Meaning
Attexo	Attexo Group Pty. Ltd.
CMP	Construction Management Plan
CEMP	Construction Environmental Management Plan
CWF	Chalumbin Wind Farm Pty. Ltd.
DA	Development Approval
DES	Department of Environment and Science
ESCP	Erosion and sediment control plan
OH	Overhead
MCU	Material Change of Use
MSDS	Material Safety Data Sheets
NIA	Noise Impact Assessment
OPW	Operational Works
Project area	Refers to the entire area of the land parcels within which the Project is located
Project footprint	Refers to the maximum area potentially disturbed by construction
QFES	Queensland Fire and Emergency Services
The Project	The Chalumbin Wind Farm Project
UG	Underground
WTWHA	Wet Tropics World Heritage Area
WTG	Wind Turbine Generator

Appendix B

Legislation and standards

A list of the standards and legislation relevant to this CMP is provided below.

Commonwealth Legislation:

- *Aboriginal and Torres Strait Island Heritage Protection Act 1984.*
- *Environment Protection and Biodiversity Conservation Act 1999.*
- *Native Title Act 1993.*

State Legislation, Policies and Regulations:

- *Aboriginal Cultural Heritage Act 2003.*
- *Biosecurity Act 2014:*
  - Biosecurity Regulations 2016.
- *Environmental Protection Act 1994*:
  - Environmental Protection Regulations 2019.
  - Environmental (Waste Management) Regulation 2000.
  - Environmental Protection (Waste Management) Policy 2000.
  - Environmental Protection (Air) Policy 2019.
  - Environmental Protection (Water and Wetland Biodiversity) Policy 2019.
  - Environmental Protection (Noise) Policy 2019.
- *Fisheries Act 1994.*
- *Land Act 1994.*
- *Land Protection (Pest and Stock Route Management) Act 2002.*
  - Land Protection (Pest and Stock Route Management) Regulation 2003.
- *Native Title (Queensland) Act 1993.*
- *Nature Conservation Act 1992:*
  - Nature Conservation (Animals) Regulation 2020
  - Nature Conservation (Koala) Conservation Plan 2017
  - Nature Conservation (Macropod) Conservation Plan 2017
  - Nature Conservation (Plants) Regulation 2020
  - Nature Conservation (Protected Areas Management) and Other Legislation Amendment Regulation 2020
  - Nature Conservation (Protected Areas Management) Regulation 2017
  - Nature Conservation (Protected Areas) Regulation 1994

- *Planning Act 2016:*
  - Planning Regulation 2017.
- *Queensland Heritage Act 1992.*
- *Transport Infrastructure Act 1994.*
- *Vegetation Management Act 1999:*
  - Vegetation Management Regulation 2012.
- *Water Act 2000.*

Local (Government) Laws:

- Tablelands Regional Planning Scheme 2016 and relevant Local Laws.

Operational Standards:

International Erosion Control Association (IECA) (2008) Best Practice Erosion and Sediment Control

Appendix C

Preliminary Erosion and Sediment Control Plan

Preliminary Erosion and Sediment Control Plan

Chalumbin Wind Farm

Prepared for:
Chalumbin Wind Farm Pty Ltd

October 2022

Document Information

DOCUMENT	Preliminary Erosion and Sediment Control Plan
ATTEXO REF	EPU-004
DATE	16-10-2022
PREPARED BY	Shahn Nestor, Senior Consultant, CPESC; Justin Claridge, Principal Consultant
REVIEWED BY	Chris Cantwell, Principal Consultant

Quality Information

REVISION	DATE	DETAILS	AUTHORISATION	
			Name/Position	Signature
0	10-12-2021	Issued for use	Chris Cantwell Partner and Principal Consultant, CEnvP	
1	14-02-2022	Updated and reissued for use	Chris Cantwell Partner and Principal Consultant, CEnvP	
2	16-10-2022	Updated for PER Submission	Chris Cantwell Partner and Principal Consultant, CEnvP	

Prepared for:
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Appendices

Tables

1.0 Introduction

1.1 Background

Attexo Group Pty Ltd (Attexo) has been engaged by Chalumbin Wind Farm Pty Ltd (CWF) to prepare a Preliminary Erosion and Sediment Control Plan (P-ESCP) for the Chalumbin Wind Farm Project (the Project) to support a Development Application (DA) for a Material Change of Use (MCU) for a Wind Farm and Operational Works (OPW) for Clearing of Native Vegetation under State Codes 23 and 16 respectively.

The Project area is located in Far North Queensland approximately 15 km south-west of Ravenshoe within the Tablelands Regional Council (TRC) local government area. The Project area spans two (2) land parcels and covers a total of 31,225 ha plus adjoining road reserves.. That portion of the Project area that contains all permanent wind farm infrastructure and construction disturbance areas is referred to as the Project footprint and is approximately 1,132 ha in size. Project construction is anticipated to commence in mid-2023 and to extend for a period of 24 to 30 months.

1.2 Purpose, scope and objectives

This P-ESCP is intended to demonstrate that the Performance Outcome (PO) identified for construction management within the Queensland State code 23: Wind Farm Development (PO13) can be met by the Project and to establish the baseline requirements for soil Erosion and Sediment Control (ESC) to be applied throughout Project construction works. To achieve this, the following information is provided by this P-ESCP:

- A broad description of the Project area and construction works relevant to preliminary ESC planning.
- A description of the ESC standards relevant to the Project.
- An assessment of site environmental conditions as they relate to ESC constraints and potential threats.
- An assessment of Project construction erosion risk and a preliminary erosion hazard assessment.
- A description of the general approach to be applied to ESC throughout construction works.
- An outline of ESC monitoring and maintenance activities that will be undertaken during Project construction.

This P-ESCP is not intended for construction purposes and does not provide detailed information as to the design and placement of on-ground ESC controls. This level of planning requires a detailed knowledge of the construction method which will not be available until the construction contractor has been appointed. Project and site-specific construction ESCPs will be developed prior to the commencement of works and will be implemented throughout construction. Construction ESCPs will be developed to International Erosion Control Association (IECA) 2008 best practice standards and amended as required to meet discharge water quality objectives.

The overall objective of this P-ESCP, and all ESC for the Project, is as follows:

To take all reasonable and practicable measures to minimise short and long-term soil erosion and adverse effects of sediment transport (IECA, 2008, p2.1).

2.0 Project description

2.1 Site overview

The Project area is located approximately 15 km south-west of Ravenshoe between the small rural-residential settlements of Millstream (approximately 3 km to the north) and Innot Hot Springs (approximately 9 km to the west). Existing land use within the Project area comprises largely commercial grazing. A Project layout map showing the Project area, Project footprint, wind turbine locations and other Project infrastructure is provided in **Appendix B**.

2.2 Construction works

Construction of the Chalumbin Wind Farm is anticipated to commence in mid-2023 and extend for a period of 24-30 months. A detailed construction methodology will be developed by the Project construction contractor upon award. A general description of anticipated construction activities is provided within the Project CMP; a summary of those activities relevant to ESC planning is as follows:

- Construction timing: construction works to occur continuously over a 24-30 month period.
- Vegetation clearing: approximately 1,049.6 ha of vegetation clearing via mechanical means.
- Bulk earthworks:
  - Cut and fill for the levelling of hardstand areas and the establishment of required track gradients.
  - Establishment of borrow pits within the construction footprint as required.
  - Excavation of up to 94 turbine footings averaging 800 m^3 in size.
  - May include rock blasting depending on geology.
- Trenching: for subsurface cable installation.
- Instream works: approximately 34 vehicle creek crossings to be established which will most likely comprise a mix of bed level and culvert types. Bridges are being considered for the larger crossings.
- Ground disturbing works (collectively): assume entire Project footprint of approximately 1,071 ha for preliminary ESC planning purposes.
- Site stabilisation and rehabilitation: reestablishment of vegetative groundcovers over unsealed temporary construction areas, revegetation with non-groundcover species where required to re-stabilise creek banks.

2.3 Legislation and standards

A summary of the legislation and standards relevant to ESC that apply to the Project is provided in **Table 2-1**.

Table 2-1: Legislation and standards

Standard	Application	Administrator
The Australian and New Zealand	Now an online platform, the guidelines establish a broad set of physical and chemical water quality standards stressing the need to	Australian and New Zealand

Standard	Application	Administrator
Guidelines for Fresh and Marine Water Quality 2018	develop locally relevant guidelines. Provides a basis for which local standards can be developed and a guideline which can be used in the absence of the former.	Governments (ANZG)
Environmental Protection Act 1994 (EP Act)	Environmental protection, establishes an Environmental Duty of Care and specifically addresses the release of water contaminants (S440ZG).	QLD Department of Environment and Science (DES)
Environmental Protection Regulation 2008	Prescribes various matters pertaining to the *Environmental Protection Act 1994*, e.g. water contaminants (Schedule 10) including sediment.	DES
Environmental Protection (Water and Wetland Biodiversity) Policy 2019	Intended to achieve the object of the EP Act in relation to waters and wetlands. Identifies environmental values and management goals for waters, states water quality guidelines and objectives and provides a framework for decision making and monitoring and reporting on the condition of waters.	DES
IECA Best Practice Erosion and Sediment Control Guidelines	Erosion and sediment control standard applicable to the development.	IECA
QLD State Planning Policy (SPP)	Establishes water quality as a matter of State interest and defines the Queensland Government's policies and assessment benchmarks about matters of state interest for land use planning and development.	Department of State Development, Infrastructure, Local Government and Planning (DSDILGP)
Tablelands Regional Council Planning Scheme	Identifies both strategic and specific outcomes relating to water quality protection applicable to developments which are assessable under the Planning scheme. Note – the Chalumbin wind farm is assessable at the State and not the local level. Notwithstanding, TRC Planning Scheme outcomes have been considered by the Project.	Tablelands Regional Council
Herbert River Basin Environmental Values and Water Quality Objectives	Made under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. Identifies water quality objectives for surface and groundwaters of the Herbert River Basin and adjacent coastal waters.	DES
The Planning Act 1996, subsidiary legislation, State Codes	Refer to the Project Planning Report for a detailed description these items.	DSDILGP

3.0 Environmental values and threat analysis

Detailed descriptions of the environmental values identified for the Project are provided within the Planning Report and Ecological Assessment Report. For this P-ESCP, this information has been reviewed to identify values potentially affected by sediment transport. An analysis of the potential threats and impacts is provided in **Table 3-1**. The general ESC practices to be adopted to prevent and / or mitigate impacts are discussed in **Section 4** of this P-ESCP. Specific on-ground controls to be implemented during construction works will be identified within construction ESCPs.

Table 3-1: Environmental values and threat analysis

Environmental Value	Potential threats and impacts
Local surface waters including: ▪ Numerous higher order (1-3) ephemeral streams which are tributaries to the below watercourses. ▪ Blunder Creek (stream order 4) ▪ The Millstream (stream order 5) ▪ Herbert River (stream order 6) ▪ Approx. 95 ha of unnamed mapped HES wetlands within the Project area.	Threat: ▪ Sediment transport to natural surface waters Potential impacts: ▪ Increased opportunity for transport of pollutants via soil particles such as phosphorus and metals resulting in reduced water quality. – Subsequent impacts e.g. eutrophication, toxicity, changes to water chemistry. ▪ Death of / harm to aquatic organisms (flora and fauna) associated with: – Reduced overall water quality (see above). – Reduced light penetration through water column impacting visibility for fauna and plant photosynthesis. – Smothering of plants and animals by sediment causing suffocation. ▪ Sediment deposits within watercourses introducing barriers to fauna movement or altered flow paths. ▪ Recreational impacts associated with loss of visual amenity and fishing opportunity.
Sensitive native flora and fauna located in proximity to the Project footprint.	Threat: ▪ Dust generation Potential impacts: ▪ Smothering of plants causing harm or death ▪ Loss of habitat due to the above. ▪ Respiratory impacts for fauna.
Surrounding agricultural land-use.	Threat: ▪ Soil erosion Potential impacts: ▪ Loss of productive topsoils resulting in reduction of agricultural productivity. ▪ Physical impacts associated with significant gully, tunnel and channel erosion such as loss of access to portions of land. ▪ Undermining of access tracks and other built infrastructure.

4.0 ESC Planning

4.1 Guiding principles

IECA 2008 identifies ten (10) key principles for effective ESC. A discussion as to how these principles have, or will be, applied by the Project is provided in **Table 4-1**.

Table 4-1: ESC Principles

Principle	Project Response
1. Appropriately integrate the development into the site.	▪ The site has been selected specifically due to local wind speeds, the compatible surrounding land use and site topography which provides the opportunity to position wind turbines at high points in the landscape where wind speeds are greatest. ▪ The positioning of ancillary infrastructure such as permanent and temporary compounds, access tracks, powerlines, etc. has been undertaken to fit within the landscape and to minimise cut and fill requirements as far as practicable.
2. Integrate erosion and sediment control issues into site and construction planning.	▪ Project infrastructure and temporary construction areas are sited to minimise reprofiling requirements where practicable. ▪ Access routes have been selected to minimise watercourse crossings and instream works requirements. ▪ Where practical, the timing of ground disturbing activities will be prioritised to occur during lower rainfall periods. ▪ ESC standards to be applied during construction are established during the Project planning phase and included within construction tender packs and procurement contracts.
3. Develop effective and flexible ESCPs based on anticipated soil, weather and construction conditions.	▪ Construction ESCPs are developed and implemented by those with control over construction works (supported by a suitably qualified ESC professional). ▪ Soil sampling will be undertaken, and soil characteristics considered as part of the construction ESCP development. ▪ Weather monitoring and wet weather preparedness will be addressed by the construction ESCP. ▪ ESCs will be regularly monitored and modified as required to achieve water quality objectives.
4. Minimise the extent and duration of soil disturbance.	▪ Infrastructure footprints are co-located where practical to reduce the overall land disturbance, such as the colocation of access tracks with electricity and communications cables. ▪ To the extent practical, construction works will be staged such that individual sites or Project sections are completed or sufficiently stabilised prior to moving into new undisturbed areas.

Principle	Project Response
5. Control water movement through the site.	▪ Drainage will be managed in line with the Project stormwater management plan and construction ESCPs. ▪ Drainage control standards will be applied in line with those identified by the Project stormwater management plan and IECA 2008 section 4.3.
6. Minimise soil erosion.	▪ To the extent practical, construction works will be staged to minimise the overall area of unprotected soils at any one time. ▪ ESCPs will prioritise erosion prevention (over sediment control) by maintaining groundcover and effective drainage controls.
7. Promptly stabilise disturbed areas.	▪ To the extent practical, construction works will be staged to maximise opportunities for progressive rehabilitation. ▪ Progressive rehabilitation will be undertaken throughout construction. ▪ Land clearing, rehabilitation or interim stabilisation will be undertaken in line with IECA 2008 Table 4.4.7.
8. Maximise sediment retention on the site.	▪ Sediment control techniques will be applied based on the standards defined by IECA 2008 for estimated soil loss or monthly erosivity. ▪ Sediment traps will be designed and positioned by a suitably qualified person.
9. Maintain all ESC measures in proper working order at all times.	▪ Installed erosion, sediment and drainage controls will be monitored for condition at least weekly and prior to anticipated runoff producing rainfall. ▪ Controls found to be in disrepair will be restored as a priority and as a minimum prior to anticipated runoff producing rainfall.
10. Monitor the site and adjust ESC practices to maintain the required performance standard.	▪ Installed erosion, sediment and drainage controls will be monitored for effectiveness during and after rainfall events. ▪ Controls identified as not meeting performance criteria will be improved or alternatives sought.

4.2 Site environmental characteristics

4.2.1 Soils and geology

A description of the soil types and underlying geology intersected by the Project footprint based on available soils mapping is provided in **Table 4-2**. 1:100,000 scale soils mapping has been completed for the Ravenshoe – Mt Garnet area which captures approximately 75% of the Project footprint. The easternmost portion of the Project footprint (approximately 25%) reaches beyond the extent of the 1:100,000 mapping and available soils data is limited to

1:2,000,000 scale mapping available on the Australian Soil Resource Information System (ASRIS) for Australian Soil Classification (ASC) soil order. A comparison of the two datasets indicates that soils in the eastern footprint extent comprise:

- Dermosols comparable to those described for Bally (By) in **Table 4-2**; and
- Tenosols comparable to those described for Whelan (Wh) in **Table 4-2**.

A map showing the location of soils described in **Table 4-2** with respect to the Project area and footprint is provided in **Appendix C**.

Note: the information provided in **Table 4-2** is indicative and is intended for preliminary planning purposes only. Soil mapping data is of limited reliability and construction ESCPs should be informed by soil sampling data which is representative of soils present across the Project footprint.

Table 4-2: Site Soils and Geology[1]

Name (code)	Area (ha)[1]	Position within Landscape	Description
Soils derived from Permian and acid volcanic rocks (Glen Gordon Volcanics)			
Whelan (Wh)[2]	816.1	Undulating and rolling hills.	Soil Profile Class (SPC): shallow stony soils - Rudosols, Tenosols. Grey to dark sandy loam A1 horizon over bleached A2 horizon over acid grey or yellow-brown massive sandy loam AC horizon over weathered acid volcanic rocks.
Bally (By)[3]	117.7		SPC: friable non-cracking clay or clay loam soils - Dermosols, Ferrosols. Red-brown clay loam A1 horizon over pale A2 horizon over acid red pedal medium clay B horizon.
Soils derived from carboniferous granitic rocks			
Nettle (Nt)	50.3	Undulating and rolling hills	SPC: shallow stony soils - Rudosols, Tenosols Brown coarse sand to coarse sandy loam A1 horizon over bleached A2 horizon over acid yellow-brown apedal coarse sand to coarse sandy loam AC horizon over C horizon.
Soils derived from Tertiary-Quaternary Basaltic Rocks			
Ironbark (Ib)	25.5	Level to gently undulating rises.	SPC: friable non-cracking clay or clay loam soils - Dermosols, Ferrosols. Red or dark clay loam to light clay pedal A1 horizon over neutral red or red brown light to light medium clay moderately to strongly pedal B horizon to 90 cm over decomposing basalt.

[1] Data from: Soil and land suitability survey of the Ravenshoe-Mt Garnet area, Far North Queensland, accessed online 14.04.2021 at: https://qldglobe.information.qld.gov.au/

Name (code)	Area (ha)[1]	Position within Landscape	Description
Soils derived from tertiary-quaternary alluvia			
Sludge (Sl)	9.9		SPC: sand or loam over friable or earthy clay - Chromosols, Kurosols. Dark to brown sandy loam to sandy clay loam A1 horizon over pale A2 horizon over acid yellow clay loam to light clay apedal upper B horizon over acid to neutral mottled yellow-brown light to light medium clay apedal lower B horizon.
Glengordon (Gg)	11.6		SPC: red, yellow or grey loam or earth soils – Kandosols. Dark or grey sandy clay loam to clay loam sandy A1/Ap horizon over pale or bleached A2 horizon to 20 cm over acid mottled yellow or yellow-brown sandy light to light medium clay apedal B horizon to 90 cm with many ferromanganiferous nodules throughout over grey medium heavy to heavy clay D horizon to 1.2 m over decomposing basalt.
Soils derived from non-basaltic Quaternary alluvia			
Blunder (Bd)	14.8	Level plains	SPC: sand or loam over sodic clay - Sodosols, Kurosols. Grey, grey-brown or dark sandy loam to silty clay loam A1 horizon over bleached A2 horizon to 30 cm over acid mottled grey, yellow-brown or yellow light medium to medium heavy clay pedal B horizon to 1.2 m+ commonly over buried soloths.
Wooroora (Wr)	25.4		SPC: seasonally wet soils requiring drainage or special management – Hydrosols. 5cm organic horizon over dark silty loam to silty clay loam A1 horizon over acid mottled grey-brown or grey medium to heavy clay pedal B horizon to 1.5 m+.

[1] Area of soils within Project footprint
[2] Area includes eastern footprint extent mapped by ASRIS as Tenosols
[3] Area includes eastern footprint extent mapped by ASRIS as Dermosols

4.2.2 Topography

The Project area is located on the southern edge of the Atherton Tablelands, a plateau forming part of the northern extent of the Great Dividing Range in Queensland. Surface elevation within the Project footprint ranges from approximately 990 m AHD in the hills to the north, to approximately 671 m AHD over alluvial plains associated with Blunder Creek.

Wind turbines are positioned at high points in the landscape, along ridgelines and on some isolated hills at elevations ranging between 730 m and 990 m AHD, to achieve best access to wind resources. Whilst there is a considerable difference in elevation across the Project footprint, interconnecting infrastructure such as access tracks and cables have been positioned to minimise slope grades where practicable.

A summary of site slope averages broken up using the ranges applied by IECA 2008 for erosion hazard assessment is provided in **Table 4-3**. A topographic map, showing wind turbine locations and the Project footprint with respect to elevation is provided in **Appendix D**.

Table 4-3: Site slope details

Average slope	% of Project footprint
0-3%	6%
3-5%	7%
5-10%	25%
10-15%	21%
>15%	42%

4.2.3 Vegetation

The majority of the Project area contains vegetation which is mapped as remnant. Ground-truthed vegetation within the Project area largely comprises mixed woodlands dominated by white mahogany (*Eucalyptus portuensis*) and spotted gum (*Corymbia citriodora* subsp. *citriodora*) (27.6%), white mahogany with co-dominant turpentine tree (*Syncarpia glomulifera*) (16.58%), red mahogany (*Eucalyptus resinifera*) (10.63%) and Queensland stringybark (*Eucalyptus reducta*) (9.53%) woodland communities, primarily on igneous hills, or granite or rhyolitic soils. Creeks and other alluvial areas typically consist of forest red gum (*Eucalyptus tereticornis*) communities with long-fruited bloodwood (*Corymbia clarksoniana*) and poplar gum (*Eucalyptus platyphylla*).

4.2.4 Hydrology and drainage

The Project site can be divided into two broad catchments, the vast majority draining to Blunder Creek, with a small portion of the Project area in the far north draining to The Millstream.

Drainage within the Project area is dominated by numerous ephemeral streams, predominantly of first and second order. Third order streams present include Lily, Pandanus, Oaky and Kara Creeks; all of which are tributaries to Blunder Creek. Blunder Creek meanders through the central portion of the Project area before aligning with the southern boundary of Lot 31 SP288862, and eventually draining to the Herbert River approximately 8.5 km west of the north-western Project boundary. The Millstream is located outside of the Project area receiving drainage from the site via unnamed first and second order streams.

Both Blunder Creek and the Millstream are defined watercourses under the *Water Act 2000* and tributaries of the Herbert River, which forms approximately 6 km west of the Project area at the confluence of Wild River and The Millstream.

4.3 Rainfall and erosion risk

Rainfall data from the BoM Ravenshoe Alert weather station (Site ID: 031200) located approximately 20 km north east of the Project area was reviewed to inform this P-ESCP. The monthly erosion risk has been determined based on mean monthly rainfall depth in accordance with IECA 2008 (Table 4.4.2) in **Table 4-4**. The monthly erosion risk ranges from very low to extreme, with the latter corresponding to the highest rainfall months of January to March inclusive.

The erosion risk ratings are used to determine the erosion control standard for the Project discussed in **Section 4.6.1** of this P-ESCP.

Table 4-4: BoM Ravenshoe Alert Weather Station – summary of rainfall (mm) statistics[2]

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall depth (mm)	243	287	272	125	65	59	46	27	22	47	53	138	1462
Erosion risk rating	E	E	E	H	M	M	M	VL	VL	M	M	H	-

Key: E = extreme, H = high, M = moderate, VL = very low

4.4 Erosion hazard assessment

An erosion hazard assessment for the Project, using the erosion hazard assessment form provided by IECA 2008 Table F4, has been completed and is provided in **Appendix E**. The erosion hazard score arrived at by the assessment is 35, which is greater than the default score of 17 applied by IECA 2008 to determine a high erosion hazard. Consequently, the erosion hazard for the Project is considered high and detailed site specific ESCPs developed to IECA 2008 standards should be applied during Project construction.

4.5 Site constraints

Project site constraints have been identified with reference to the IECA Best Practice Erosion and Sediment Control Manuals (Book 1, section 3.4) and are discussed in **Table 4-5**.

[2] BoM, accessed 19 May 2021

Table 4-5: Site constraints

Constraint	Limitation	Description	Recommendations / Management
Soils	Sodosols	▪ Mapped as present on plains associated with Blunder Creek. ▪ Indicates presence of sodic (dispersive) soils in B horizon. ▪ Sodic soils are structurally unstable in water and susceptible to rilling and tunnel erosion. ▪ Sodic soils are readily dispersed by surface water flows and clay fraction does not settle out of water without the aid of a flocculant. ▪ Soil properties present challenges for vehicle access, load bearing and revegetation.	▪ Undertake soil sampling to confirm extent of sodic soils within Project footprint. ▪ Treatment of sodic soils to be addressed by the construction ESCP. ▪ Avoid earthworks during wet conditions in areas where sodic soils are present. ▪ Top dress dispersive soils with a layer of non-dispersive soil prior to installing scour protection (including vegetation). ▪ Undertake soil amelioration and careful plant selection for revegetation. ▪ Avoid direct revegetation into dispersive soils.
	Rudosols, Tenosols	▪ Shallow, stony soils with low nutrient value present across a large portion of the site. ▪ Presents challenges for revegetation.	▪ Undertake soil sampling to identify nutrient deficiencies. ▪ Undertake soil amelioration informed by soil sampling prior to revegetation.
Topography / Landform	Steep slopes	▪ Vegetation clearing and earthworks is required on slopes >15% ▪ Vegetation clearing on steep slopes may result in landslip hazard. ▪ Steep slopes are prone to high velocity channel flows and subsequent erosion.	▪ Works on steep slopes to be addressed by the construction ESCP, with a focus on drainage and erosion controls. ▪ Avoid working on steep slopes during wet conditions. ▪ Vegetation clearing on steep slopes to be minimised where practicable. ▪ Consider using rock protection where steepness prevents successful revegetation.
	Drainage	▪ Presence of hydrosols in low lying areas associated with Blunder Creek flood plain indicates poor drainage conditions. ▪ May present difficulties for access, load bearing and revegetation. ▪ Dewatering may be required.	▪ Undertake soil sampling to confirm extent of hydrosols within Project footprint. ▪ Avoid earthworks during wet conditions in areas where hydrosols are present. ▪ Undertake careful plant selection for revegetation.

Constraint	Limitation	Description	Recommendations / Management
Wind	Revegetation Dust	▪ Windy site conditions increase potential for dust generation and present challenges for revegetation.	▪ Dust management measures, including the use of soil binders and / or water application, are to be identified within the construction ESCP. ▪ Undertake careful plant selection for revegetation preferencing species that are resilient in windy conditions. ▪ Consider the use of wind breaks to protect revegetated areas during establishment.

4.6 Erosion, drainage and sediment controls

4.6.1 Erosion control

4.6.1.1 Erosion Control Standard

The monthly erosion risk values for the site range between very low and extreme (**Table 4-4**), the latter occurring during the highest rainfall months of January to March inclusive. The construction schedule for the Project has not yet been determined; thus it must be assumed that construction may take place at any time of the year, and all risk ratings must be considered.

Erosion control relies heavily on the maintenance and reestablishment of groundcover. The best practice land clearing and rehabilitation requirements identified for erosion risk rankings specified in IECA 2008, Table 4.4.7 pg. 4.16 will be applied during Project construction. IECA best practice land clearing and rehabilitation requirements for the risk values attributed to the Project in **Table 4-4** are reproduced in **Table 4-6** for ease of reference.

Table 4-6: Best practice land clearing and rehabilitation requirements for low, moderate, high and extreme erosion risks.

Erosion Risk[1]	Best Practice Requirement[1]
All Cases	▪ All reasonable and practicable steps will be taken to apply best practice erosion control measures to completed earthworks, or otherwise stabilise such works, prior to anticipated rainfall – including existing unstable, undisturbed, soil surfaces under management or control of the building / construction works.
Very Low	▪ Land clearing limited to 8 weeks of work if rainfall is reasonably possible.[3] ▪ Disturbed soil surfaces stabilised with a minimum 60% cover[2] within 30 days of completion of works if rainfall is reasonably possible. ▪ Unfinished earthworks are suitable stabilised if rainfall is reasonably possible, and disturbance is expected to be suspended for a period exceeding 30 days.
Moderate	▪ Land clearing limited to a maximum 6 weeks of work.[3]

Erosion Risk[1]	Best Practice Requirement[1]
	▪ Disturbed soil surfaces stabilised with a minimum 70% groundcover[2] within 20 days of completion of works within any area of a work site. ▪ All planned garden beds protected with a minimum 75mm layer of organic mulching, heavy erosion control blanket, rock mulching, or the equivalent. ▪ Staged construction and stabilisation of earth batters (steeper than 6H:1V) in maximum 3 m vertical increments wherever reasonable and practicable. ▪ Unfinished earthworks are suitably stabilised if rainfall is reasonable possible, and disturbance is expected to be suspended for a period exceeding 20 days.
High	▪ Land clearing limited to a maximum 4 weeks of work.[3] ▪ Disturbed soil surfaces stabilised with a minimum 75% groundcover[2] within 10 days of completion of works within any area of a work site. ▪ All planned garden beds protected with a minimum 75 mm layer of organic mulching, heavy erosion control blanket, rock mulching, or the equivalent. ▪ Staged construction and stabilisation of earth batters (steeper than 6H:1V) in maximum 3 m vertical increments wherever reasonable and practicable. ▪ The use of turf to form grassed surfaces given appropriate consideration. ▪ Soil stockpiles and unfinished earthworks are suitably stabilised if disturbance is expected to be suspended for a period exceeding 10 days.
Extreme	▪ Land clearing limited to a maximum 2 weeks of work.[3] ▪ Disturbed soil surfaces stabilised with a minimum 80% groundcover[2] within 5 days of completion of works within any area of a work site. ▪ All planned garden beds protected with a minimum 75mm layer of organic mulching, heavy erosion control blanket, rock mulching, or the equivalent. ▪ Staged construction and stabilisation of earth batters (steeper than 6H:1V) in maximum 2 m vertical increments wherever reasonable and practicable. ▪ High priority given to the use of turf to form grassed surfaces. ▪ Soil stockpiles and unfinished earthworks are suitably stabilised if disturbance is expected to be suspended for a period exceeding 5 days.

[1] Erosion risk based on the average monthly rainfall depths shown in **Table 4-4** of this plan, with best practice requirements as seen in IECA 2008, Table 4.4.7, pg. 4.16.
[2] May be reduced if the natural cover present is less that the nominated value.
[3] Refers to the amount of time ahead of the associated works.

4.6.1.2 Erosion control strategy

Erosion controls are prioritised over sediment controls to minimise the area of soils exposed and therefore susceptible to sedimentation in the first instance. Strategies that will be used to prevent unnecessary disturbance, and minimise the length of time soils are left unprotected by groundcover include:

1. Staging of works so that:

- Vegetation clearing and grubbing occurs as close as practicable prior to commencement of civil works within that area.
- The overall area of soils exposed at any one time is minimised.

- The stockpiling and double handling of soils is minimised.
- Progressive site rehabilitation can take place throughout the construction period.

2. The establishment and demarcation of no-go zones, within which access or work is not permitted.
3. Protection of groundcover in temporary disturbance areas via their inclusion within the above no-go zones until works are to commence and then re-incorporating them back into the no-go zone as soon as work is complete and the area is stabilised.
4. Remediation of temporary disturbance areas within the timeframes specified for best practice land clearing and rehabilitation in **Table 4-6**.
5. Utilisation of temporary groundcovers such as hydraulically applied soil binders, roll on blankets, mulch, gravel or other, to protect exposed soils not ready to be permanently stabilised.
6. Amelioration of soils in-situ prior to excavation where practicable, to minimise mixing requirements.
7. The establishment of groundcovers such as rock or gravel over site office, parking and laydown areas.

Dust control will be undertaken via the application of water or an appropriate soil binder where conditions require.

4.6.2 Drainage controls

4.6.2.1 Drainage control standard

Temporary drainage controls will be required during construction to control surface flows around the site. Where not otherwise specified in RPEQ approved stormwater management plans, drainage controls used for ESC purposes will be designed as per IECA 2008 recommendations for temporary drainage structures in Queensland which are summarised as follows:

- Design life <12 months: 1 in 2-year event.
- Design life 12-24 months: 1 in 5-year event.
- Design life >24 months: 1 in 10-year event.

(IECA, 2008 pg. 4.3 Table 4.3.1).

Whilst the entire construction period is expected to extend for up to 24 months, works will be staged meaning standards for lesser design timeframes may be able to be applied.

The positioning and design of drainage controls requires an in-depth understanding of local surface profiles and a detailed knowledge of final civil designs of the construction methodology. Much of this information will not be available until the construction contract is awarded, hence ESC drainage controls cannot yet be designed. This work will be completed as part of the construction ESCP and will be consistent with site stormwater management plans.

4.6.2.2 Drainage control strategy

The following strategies will be applied for drainage controls within the Project footprint during construction works:

1. Prevent mixing of clean and dirty water where practicable.

2. Divert clean water away from work areas wherever practicable, where this cannot be achieved, control clean water flows through the site to avoid contamination.
3. Divide unstable slopes using catch drains or flow diversion banks, at the intervals recommended by IECA 2008 Table 4.3.2 for slope length and steepness considering groundcover percentage.
4. Ensure that installed drainage features are suitable for the slope, appropriately sized and sufficiently lined to prevent scour. Utilise rock check dams (or equivalent) to maintain flow velocity in line with channel and drain limitations (e.g. size and shape, lining type, etc.).
5. Allow water to shed from unsealed access tracks at regular intervals.
6. Utilise appropriate outlet structures at discharge points to prevent scour.

4.6.3 Sediment controls

4.6.3.1 Sediment control standard

The sediment control standards to be applied across the various catchment areas within the Project footprint will be determined during construction ESCP development when sufficient information is available to meaningfully apply the Revised Universal Soil Loss Equation (RUSLE). At this time, the default classification of sediment control techniques (IECA, 2008 Table 4.5.3) will be applied as per IECA, 2008 Table 4.5.1.

Given the size of the Project footprint, the monthly erosion risk ratings identified in **Table 4-4** and site topography, it is expected that Type 1 sediment controls may be required in some cases.

4.6.3.2 Sediment control strategy

The following strategies will be applied for sediment control during Project construction works:

1. All reasonable and practicable measures will be taken to prevent or minimise the release of sediment from the site.
2. Sediment controls will be applied only after all reasonable and practicable measures to prevent erosion have been adopted.
3. Sediment laden runoff from construction areas will be directed to an appropriate sediment control device in accordance with the required treatment standard.
4. All reasonable measures will be taken to trap sediment as close to its source as practicable.
5. Stabilised site exits will be established to prevent the tracking of soils offsite by vehicles.
6. All sediment control measures will be designed, installed, operated and maintained in accordance with IECA, 2008.
7. All material removed from sediment traps during maintenance will be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

4.7 Stockpile Management

Best practice soil stockpile management comprises a mix of drainage, erosion and sediment controls. Soil stockpiles will be managed as follows:

- Wherever practicable, topsoils will be stockpiled separately from subsoils for use in site rehabilitation (though this can be at the same location).
- Stockpiles will be located:
  - Within the sediment control envelope.
  - Away from areas subjected to concentrated overland flow where practicable.
  - As far as practicable from sensitive receiving environmental receptors such as watercourses and wetlands.
- Upslope overland flows will be directed around stockpiles where the upslope catchment exceeds 1,500 m^2 and the average monthly rainfall exceeds 45 mm.
- Stormwater runoff originating from stockpiles will be directed to a suitable sediment trap.
- Soil stockpiles will be covered where the displacement of stockpiled materials has the potential to cause environmental harm.

4.8 Instream Works

Instream works will be required for the installation of approximately 34 creek vehicle crossings. Instream works will be undertaken in line with site-specific ESCPs developed to IECA 2008 standards which as a minimum:

- Consider scheduling of works to occur during periods of no or low flow where practicable.
- Establish measures to minimise channel and vegetation disturbance during works.
- Identify isolation requirements and techniques to prevent clean water entering the instream work areas.
- Identify requirements for the use of temporary groundcovers to protect disturbed areas during works.
- Identify flow diversion techniques which appropriately consider fish passage requirements.
- Identify management measures for dewatering activities which prevent sediment-laden water from entering the watercourse.
- Identify the erosion risk for the works based on either:
  - Expected channel flow conditions as described in IECA 2008 Table I9; or
  - Expected daily and average monthly rainfall as described in IECA 2008 Table I10.
- Establish channel clearing and stabilisation requirements for the work in line with the best practice channel clearing and stabilisation requirements identified in IECA 2008 Table I11.

4.9 Rainfall / storm preparedness

Weather monitoring will be undertaken on a daily basis during construction. Storm preparedness requirements will depend largely on the erosion, sediment and drainage controls in place and will be addressed by the construction ESCP. If a single rainfall event in excess of 25 mm is forecast, the following will be undertaken:

- A thorough inspection of all ESC control measures within 24 hours of the event.
- Maintenance and rectification of ESC controls to ensure that they are in proper working order prior to the rainfall occurring.

5.0 ESC Monitoring, Maintenance and Reporting

5.1 ESC inspections

A formal ESC monitoring and maintenance program will be developed by the construction contractor prior to commencement of works. This will include the development of inspection check sheets and other aids to facilitate thorough checks of all controls in place and discharge points. The minimum ESC monitoring requirements for the Project are summarised in **Table 5-1**.

Table 5-1: Minimum ESC monitoring requirements[3]

Frequency	Inspection requirement
Regular inspections	
Weekly site inspections	▪ Checks of all drainage, erosion and sediment control measures. ▪ Occurrence of excessive sediment deposition (whether on or off-site). ▪ Checks of all site discharge points (e.g. for scour or sediment deposition). ▪ Occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements. ▪ Litter and waste receptors.
Monthly inspections	▪ Surface coverage of finished surfaces (both area and percentage cover) ▪ Health of recently established vegetation ▪ Proposed staging of future land clearing, earthworks and site / soil stabilisation.
Rainfall related inspections	
Prior to anticipated runoff-producing rainfall (within 24 hours of rainfall occurring)	▪ All drainage, erosion and sediment control measures. ▪ All temporary flow diversion and drainage works.
Daily site inspections during runoff producing rainfall	▪ Checks of all drainage, erosion and sediment control measures. ▪ Occurrence of excessive sediment deposition (whether on or off-site). ▪ Checks of all site discharge points (e.g. for scour or sediment deposition).
Following run-off producing rainfall (within 18 hours)	▪ Treatment and dewatering requirements for sediment basins ▪ Sediment deposition within sediment basins and the need for its removal ▪ All drainage, erosion and sediment controls ▪ Occurrences of excessive sediment deposition (whether on or offsite) ▪ Occurrences of construction materials, litter or sediment placed, deposited, washed, or blown from the sites, including deposition by vehicle movements. ▪ Occurrences of excessive erosion, sedimentation or mud generation around the site office, car park and / or material storage areas

[3] As per IECA, 2008 section 7.4

5.2 Water quality monitoring

The frequency and locations of water quality monitoring will be determined by construction ESCPs. Water quality monitoring programs will consider:

- The location of sensitive environmental receptors and areas where the potential for soil erosion is high (e.g. due to soils present, difficult terrain or the types of work being undertaken).
- The monitoring of water quality before, during and after the completion of construction to assess the effectiveness of controls.
- The monitoring of water quality during rainfall events where safe to do so, especially at points of concentrated discharge from the site.
- The monitoring of water quality both up and downstream of instream works.

5.3 Discharge Water Quality Standards

Locally derived discharge water quality objectives may be developed as part of construction ESCP development. These would consider baseline data acquired relating to pre-existing site conditions, and water quality objectives identified for the Herbert River Basin made pursuant to the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*. In the absence of locally derived water quality objectives, the default standard offered by IECA, 2008 of the 90th percentile suspended solids not exceeding 50 mg/L will be adopted as the water quality objective for discharges of stormwater from site.

5.4 ESC Maintenance

ESC measures will be maintained as follows:

- The adequacy of controls will be reviewed considering water quality outcomes and ESCPs updated as required to achieve ESCP objectives.
- As a minimum, ESCs will be maintained so that they are in proper working order prior to forecast rainfall events.
- To the extent practicable, controls will be maintained in proper working order to provide protection for unanticipated rainfall events.
- Sediment traps will be cleaned out and maintained in line with the operational standard for that device.

5.5 Incidents, corrective actions and reporting

ESC related incidents will be logged, responded to, and reported on in line with processes described in the Project CMP.

6.0 References

- Australian Soil Resource Information System (ASRIS), accessed online 24/6/21 at: http://www.asris.csiro.au/mapping/viewer.htm
- Heiner I. J. & Grundy M.J (1994) *Land resources of the Ravenshoe – Mt Garnet area north Queensland, Vol 1 – Land resource inventory.* State of Queensland, Department of Primary Industries, Brisbane QLD.
- IECA (2008) *Best Practice Erosion and Sediment Control*. International Erosion Control Association (Australasia), Picton, NSW.

Appendix A

Definitions

Acronym / term	Definition
AHD	Australian Height Datum
ANZG	Australian and New Zealand Governments
Clean water	Refers to water that enters the work area from offsite and has not been contaminated by sediment from within the work area, or water that has originated from the work site that meets water quality objectives (IECA, 2008).
CMP	Construction Management Plan
CWF	Chalumbin Wind Farm Pty Ltd
DA	Development Application
DES	Department of Environment and Science
Dirty water	Water not classified as clean water (IECA, 2008).
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
ESC	Erosion and sediment control
ESCP	Erosion and sediment control plan
IECA	International Erosion Control Association
MCU	Material change of use
OPW	Operational Works
P-ESCP	Preliminary Erosion and Sediment Control Plan
PO	Performance outcome
RUSLE	Revised Universal Soil Loss Equation
SPC	Soil Profile Class
SPP	State Planning Policy
The Project	The Chalumbin Wind Farm Project
TRC	Tablelands Regional Council

Appendix B

Project Layout Map

ARK ENERGY

Attexo

Chalumbin Wind Farm

Project Layout

Sheet 1 of 4

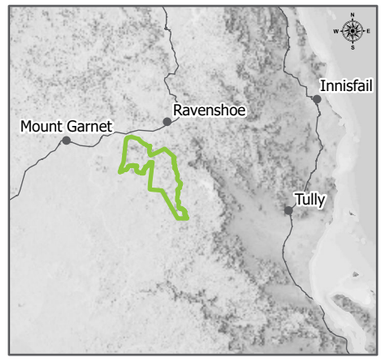
- Project Area Boundary
- Turbine
- Met-mast
- Access Road
- Facilities

Clearance Envelope

- Stage 1
- Stage 2
- Existing HV Transmission Line
- Watercourse
- Lot Boundary
- Easement

Date: 14/10/2022 Author: TOD

Project: EPU-004 Reviewed: NOD



0 0.5 1 1.5 2 Km

Scale: 1:50,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022)
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