Powerlink Queensland

Environmental Assessment Report

Ministerial Infrastructure Designation for Meandu Mine Transmission Line Relocation Project

December 2022

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Environmental Assessment Report
Ministerial Infrastructure Designation for Meandu Mine Transmission Line Relocation Project

Powerlink Queensland

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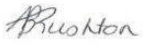
Prepared by:	Christine Chang, Allison Rushton	19 December 2022	
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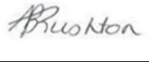
Approved by:	Allison Rushton	19 December 2022	
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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Glossary and abbreviations

ACH Act	*Aboriginal Cultural Heritage Act 2003* (Queensland)
AHD	Australian Height Datum
ASRIS	Australian Soil Resource Information System
ASS	Acid sulfate soils
Acquisition of Land Act	*Acquisition of Land Act 1967* (Queensland)
Biosecurity Act	*Biosecurity Act 2014* (Queensland)
BoM	Bureau of Meteorology (Commonwealth)
BPA	Biodiversity Planning Assessment
CHMA	Cultural heritage management agreement
CLR	Contaminated Land Register
CSR	Corridor Selection Report
DAMS	Development Assessment Mapping System
DAF	Department of Agriculture and Fisheries (Queensland)
DSDSATSIP	Department of Senior, Disability Services and Aboriginal and Torres Strait Islander Partnerships (Queensland)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DDRP	Darling Downs Regional Plan
DEHP	Department of Environment and Heritage Protection (Queensland) (former)
DES	Department of Environment and Science (Queensland)
DNRME	Department of Natural Resources, Mines and Energy (Queensland) (former)
DoR	Department of Resources (Queensland)
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning (Queensland)
DTMR	Department of Transport and Main Roads (Queensland)
Duty of Care Guidelines	*Aboriginal Cultural Heritage Act 2003: Duty of Care Guidelines* (Queensland)
EAR	Environmental Assessment Report
EMP	Environmental Management Plan
Electricity Act	*Electricity Act 1994* (Queensland)
Electrical Safety Act	*Electrical Safety Act 2002* (Queensland)
Electrical Safety Regulation	Electrical Safety Regulation 2013 (Queensland)

ELF	Extra low frequency
EMF	Electromagnetic fields
EMP	Environmental Management Plan
EMR	Environmental Management Register
EO Act	*Environmental Offsets Act 2014* (Queensland)
EP Act	*Environmental Protection Act 1994* (Queensland)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPP	Environmental Protection Policy (Queensland)
EPP (Air)	Environmental Protection (Air) Policy 2019 (Queensland)
EPP (Noise)	Environmental Protection (Noise) Policy 2019 (Queensland)
EPP (Water and Wetland Biodiversity)	Environmental Protection (Water and Wetland Biodiversity) Policy 2009 (Queensland)
ERA	Environmentally relevant activity
ERP	Emergency Response Plan
ESP	Ecological Service Professionals Pty Ltd
ESR	Powerlink's Electrical Safety Rules
EV	Environmental value
Ergon	Ergon Energy
Flora Survey Guidelines	*Flora Survey Guidelines – Protected Plants*
GIS	Geographic Information System
ha	hectares
HQPlantations	HQPlantations Pty Ltd, Hoop Pine Plantation Licence (PLP0289) holder
HVR	High value regrowth
Infrastructure Entity	The entity proposing the Ministerial Infrastructure Designation under the *Planning Act 2016*.
IAR	Initial Advice Request report for the Project, submitted to the DSDILGP in February 2022
IECA	International Erosion Control Association
IPCC	Intergovernmental Panel on Climate Change
K2E ASA	King 2 East additional surface area
K2E Project	King 2 East Project
Katestone	Katestone Environmental Pty Ltd
km	kilometres

kV	kilovolt
Land Act	*Land Act 1994* (Queensland)
LiDAR	A system which works on the principle of radar, but uses light from a laser
LOS	Level of Service
LGA	Local Government Area
NC Act	*Nature Conservation Act 1992* (Queensland)
MGR	Minister's Guidelines and Rules (Queensland)
MID	Ministerial Infrastructure Designation
ML	Mining Lease
MNES	Matters of national environmental significance
MSES	Matters of state environmental significance
Native Title Act	*Native Title Act 1993* (Commonwealth)
NC Act	*Nature Conservation Act 1992* (Queensland)
OPGW	Optical Ground Wire Optical fibre composite overhead ground wire, is a type of cable that is used in transmission line
PAA	Priority Agricultural Area
Planning Act	*Planning Act 2016* (Queensland)
Planning Regulation	Planning Regulation 2017 (Queensland)
PMST	Protected Matters Search Tool
Powerlink	Powerlink Queensland, are trading names of Queensland Electricity Transmission Corporation
Preferred alignment	Transmission line including 60m (typical for 275kV) wide easement that the subject of consultation and environmental assessment.
Project area	Area surrounding the proposed infrastructure which may experience direct or indirect impacts
RE	Regional ecosystems
SCL	Stanwell Corporation Limited
SDS	Safety Data Sheet
SEVT	Semi-evergreen vine thickets
Significant Impact Guidelines	*Matters of National Environmental Significance: Significant Impact Guidelines 1.1*
SPP	*State Planning Policy 2017* (Queensland)
Stanwell	Stanwell Corporation Limited
Tarong power stations	Tarong and Tarong North power stations

TECs	Threatened ecological communities
TEC Coal	TEC Coal Pty Ltd
The Project	The Meandu Mine Transmission Line Relocation Project - Approximate 5km section of Feeder 831 275kV transmission line between H018 Tarong and H014 Middle Ridge substations to be relocated
TIA	Traffic Impact Assessment
TI Act	*Transport Infrastructure Act 1994* (Queensland)
UXO	Unexploded ordnance
VM Act	*Vegetation Management Act 1999* (Queensland)
Water Act	*Water Act 2000* (Queensland)
WBBRP	Wide Bay Burnett Regional Plan
WoNS	Weed of National Significance
WQOs	Water quality objectives
WSP	WSP Australia Pty Ltd

Executive summary

Project overview

A portion of the Feeder 831, 275 kilovolt (kV) transmission line between H018 Tarong and H014 Middle Ridge Substations (approximately 5 kilometres (km)) is proposed to be relocated (the Project) (Figure 1.1). The proposed transmission line relocation is located to the east of Stanwell Corporation Limited (Stanwell)'s Meandu Mine. Relocation of this portion of Feeder 831 is required to overcome potential geotechnical instability issues in a section of the current Feeder 831 corridor. The relocation is also required to safely accommodate future mining activities within the approved surface rights area of the Meandu Mine, which requires that a section of land underneath this line is mined.

The affected portion of transmission line is owned and operated by Powerlink Queensland (Powerlink).

TEC Coal Pty Ltd (TEC Coal) (a wholly owned subsidiary of Stanwell) is also currently seeking approval to increase the approved surface rights area at the Meandu Mine. The King 2 East (K2E) Project involves increasing the approved surface rights area within mining lease (ML) 6674 by an additional 186 hectares (ha) which will allow progression of the K2E pit to the east. Planning for relocation of the portion of the Feeder 831 transmission line has been undertaken with consideration of the K2E Project.

Environment and planning approval for the Project is being sought via the Ministerial Infrastructure Designation (MID) process under the *Planning Act 2016* (Queensland) (Planning Act). To obtain a MID, an Infrastructure Entity is required to prepare an Environmental Assessment Report (EAR) taking into account the potential environmental, social and economic impacts associated with the construction, operation and maintenance of the Project. This EAR has been prepared to support the MID of the Project. To demonstrate mitigation and management measures, this EAR includes an Environmental Management Plan (EMP) for the relevant construction elements of the Project.

Project justification and feasible alternatives

Relocation of a portion of the Feeder 831 transmission line is required to safely accommodate two aspects of mining activity within the approved surface rights area of Meandu Mine. The first is along a section of the highwall where there is mining related geotechnical instability, located near two towers (9012 and 9013) of Feeder 831. The second, is that TEC Coal are proposing to mine a section of land under Feeder 831 where it crosses the approved surface rights area of the Meandu Mine.

In addition, TEC Coal is currently seeking approval to increase the approved surface rights area of Meandu Mine. The K2E Project involves increasing the approval surface rights area within ML6674 by an additional 186 ha. This will allow progression of the K2E pit to the east, over the route of Feeder 831. Planning for the relocation of the portion of Feeder 831 transmission line has been undertaken with consideration of the K2E Project.

A Corridor Selection Report (CSR) was prepared which identified a preferred corridor for the Project. The selected corridor, on balance, offered the most appropriate location for the proposed transmission infrastructure when taking into account social, economic and environmental factors, which also incorporated stakeholder and landholder feedback. The preferred corridor for the Project was located on the eastern boundary of the K2E additional surface area (ASA) of the Meandu Mine.

Project description

The preferred alignment for the proposed transmission line relocation traverses two Local Government Areas (LGAs), being Toowoomba Regional Council and South Burnett Regional Council. The preferred alignment crosses sections of HQPlantations Pty Ltd (HQPlantations) forestry operations in Yarraman State Forest and is also located within the mining lease for Meandu Mine (ML6674). The northern portion of the preferred alignment (between structures D1 and D5) traverses the approved surface rights area of the Meandu Mine, while the remainder of the preferred alignment is located immediate to the east of the boundary of the proposed K2E ASA. Agreements have been reached with Stanwell Corporation Limited (as owner of the Meandu Mine) and HQPlantations to allow the relocation project to proceed.

Powerlink estimates a construction period of 10 months for the Project. Phase 1 of the Project includes completing the diversion component and will span from March 2023 to August 2023. Phase 2 of the Project includes the cut in of the new circuit. Depending on outage availability, Phase 2 will be between August 2023 and September 2023.

Environmental Assessment

Land

Topography

The topography along the preferred alignment is heavily undulating and well drained. The existing alignment of the portion of Feeder 831 to be relocated runs along a north-south ridgeline, parallel to Ridge Road. This ridgeline has been formed along the crest of a deeply weathered basalt ridge. The ridge is reasonably level, with upper slopes typically between 5 and 10%, mid slopes between 15 and 20%, and more gentle gradients at the toe of the slope towards the ephemeral drainage line known as Rocky Creek. The slopes are dissected by gullies draining to the east. The preferred alignment is located along the mid slopes of this ridge line and traverses the ridge itself between structures D5 and D6 at an elevation of 560m Australian Height Datum (AHD). Structures between D6 and D15 are to the east of this ridge line with elevation generally ranging from 490 – 560m AHD.

Some of the proposed transmission line structure sites are likely to require cut and fill earthworks where the topography is steep or undulating to establish safe working areas for assembly and erection of structures. It is anticipated that earthworks associated with pad and footing construction for support structures will generally be restricted to an area of approximately 40m by 40m.

The earthwork noted above will occur at a number of relatively small, discrete locations. No other changes to the geomorphic landscape are anticipated. The impact of construction on the existing topography of the area is therefore anticipated to be negligible. No operational impacts to topography are anticipated.

Soils

The soil classification along the preferred alignment includes Ferrosols, Rudosols, Sodosols and Grey Dermosols. Any activity which exposes the ground surface, such as vegetation clearing or earthworks, may potentially result in soil erosion. Potential impacts may also occur from soil compaction, including a decline in soil structural stability; a decrease in water entering the soil either as rain or irrigation; and subsequent issues with poor root growth, soil cultivation and seedbed preparation.

The soil types present along the preferred alignment are not particularly erosion susceptible. While some potential dispersive behaviour was identified for the Grey Dermosols, within the Project area these soils are overlain by basaltic materials originating from topographically higher areas. This material may potentially moderate the dispersive behaviour of this soil type (Jamstone, 2020). The preferred alignment is not mapped as occurring within a coastal erosion prone area. As such, the potential impact of soil erosion is considered to be ‘low’ for the Project.

Where possible, preference has been given to using existing forestry access tracks over the creation of new tracks. Erosion and sediment control measures will be implemented, and reinstatement will occur as soon as practicable.

Acid sulfate soils

The preferred alignment is mapped as having "low to extremely low probability of occurrence" of acid sulfate soils (ASS). This is reflective of the preferred alignment being located at the elevation range from 490 – 560m AHD as it is unlikely for ASS to be present at this altitude. The likelihood of ASS is also reduced as the preferred alignment does not traverse, and is not adjacent to, any major watercourses defined by *Water Act 2000* (Queensland) (Water Act). The potential for ASS to impact on the environment or infrastructure is considered to be low.

Contaminated land

Two lots were identified on the environmental management register (EMR) for a 'notifiable activity' (activities that have the potential to cause land contamination). The notifiable activities listed are associated with agricultural (Lot 289 on FTY1859) and mining (Lot 10 on SP305494) activities. None of the lots traversed by the preferred alignment are listed on the contaminated land register (CLR).

In the case of Lot 10 on SP305494 the preferred alignment does not traverse areas where the notifiable activities have occurred (i.e. Meandu Mine operations). For Lot 289 on FTY1859, past and present land uses along the preferred alignment (native vegetation and plantation forestry) make it highly unlikely that identified notifiable activities (i.e., chemical use in livestock dips and spray races) have occurred in the vicinity of the proposed transmission line. As such, the risk of encountering contaminated land during construction of the proposed transmission line is considered low.

Where the presence of contamination is known or suspected, geotechnical investigations will be undertaken prior to construction which may include testing for the presence of contaminants. Geotechnical investigations undertaken to date along the preferred alignment have not identified any areas of potential contamination concern.

Air quality

Background levels of particulate matter in the region are directly affected by anthropogenic activities such as the operation of the Tarong and Tarong North power stations (Tarong power stations), existing Meandu Mine operations, local traffic, wood fires during the cooler months, hazard reduction burns, forestry, and agricultural activities. Natural sources of particulate matter are also significant contributors to existing levels of particulate matter including bushfires, windblown dust, pollens, and grass seeds. The nearest sensitive receptors to the preferred alignment are rural residential properties around Munt and Rocky Creek roads, with the closest being approximately 1.5km to the north/north-east of the preferred alignment. Higher-density zones are present to the south-east of the preferred alignment around Yarraman, particularly the Tarong Yarraman Road.

The construction and operational phases of the Project are likely to include activities that have the potential to impact the local air quality, mainly resulting from potential dust emissions. During the construction phase, air quality impacts in the form of dust and vehicle emissions are expected from site preparation activities; structure foundation excavation and installation; stockpiling of excavated soil; construction vehicle movements, particularly on unsealed roads; and exhaust emissions from vehicle and machinery operations. The potential for construction related emissions to air to cause nuisance or annoyance to nearby sensitive receptor is considered low.

Potential impacts to air quality during operation and maintenance of the Project and associated infrastructure are expected to be negligible and associated with maintenance activities such as vegetation regrowth control, movement of maintenance vehicles and exhaust emissions from operating maintenance vehicles and machinery. As with the construction phase, potential air quality impacts associated with maintenance activities are expected to be low level, localised and short–term due to the linear nature of the Project and time-spaced maintenance regimes.

Mitigation and management measures proposed for both the construction and operation/maintenance phases are in line with Powerlink's standard environmental controls.

Noise and vibration

Existing background sources of noise within the surrounding area include the Meandu Mine and Tarong power stations. Other sources contributing to background noise include harvesting operations within the Yarraman State Forest, road traffic noise, domestic/farm noise, and noise of nature (for example birds, wind, and insects).

Noise impacts during construction of the Project are likely to be associated with site preparation activities, erection of and assembly of transmission line structures, concrete trucks for structure footings, vehicle movements and helicopter stringing. While elevated noise levels can be expected at locations close to the work areas and/or in the vicinity of the roads used for access, these are likely to be insignificant due to the limited nature of the proposed works, the existing noise environment, and the distance to sensitive receptors (the closest being around 1.5km).

The only vibration-intensive works expected to take place would be pile boring and the use of vibratory rollers for construction of structure footings. Given the soil types present along the preferred alignment (weathered and low strength rock), and the temporary and short-duration nature of such activities, the risk of vibration impacts for sensitive receptors is considered low.

Operation and maintenance of the transmission line should have minimal impacts on ambient noise levels. Any noise experienced (e.g. from aerial (helicopter) or vehicle maintenance inspections) are likely to be similar in nature to that already experienced from the existing Feeder 831 transmission line as well as other transmission infrastructure in the area. Audible noise from operation of the transmission line (wind on the line and transmission structures and corona discharge) are unlikely to be noticeable at the closest sensitive receptors.

Management measures will be implemented in line with Powerlink Queensland's standard environmental controls for noise management.

Hydrology

Surface water

The preferred alignment is located in both the Barker and Barambah Creeks sub-basin of the Burnett River Basin (structures D1 to D5) and the Brisbane River sub-basin (structures D6 to D15). The main waterways within the Brisbane River sub-basin of relevance to the Project are Rocky Creek and its tributaries, which are located within, upstream of, adjacent to, and downstream of the Project. The headwaters and tributaries of Rocky Creek are ephemeral channels and persistently dry, except following heavy rainfall and are not mapped as watercourses under the Water Act. These tributaries are considered unnamed drainage lines based on advice from the former Queensland Department of Natural Resources, Mines and Energy (DNRME) (now Department of Resources). Rocky Creek and its tributaries are mapped as stream order one, two, three and four waterways, with some of the drainage features traversed by the preferred alignment being mapped as stream order one and two.

The waterways within the Barker and Barambah Creeks sub-basin of relevance to the Project are unnamed tributaries of Black Gully (formally known as Black Creek). Black Gully has been substantially modified from its natural state through construction of the Tarong Ash Dam, Black Creek Dam and the Black Creek Dam overflow diversion channel (which are located on the site of the Tarong power stations). Black Gully flows to Meandu Creek, approximately 2km downstream of the Meandu Creek Dam. Black Gully (Black Creek) was de-gazetted as a watercourse in 2000 under the Water Act by the former DNRME (now Department of Resources). Although there are two mapped lacustrine wetlands within the Black Gully catchment, these are artificial dams that form part of the water management system for Meandu Mine and the Tarong power stations. The unnamed tributaries of Black Gully in the vicinity of the preferred alignment are mapped as stream order one and two waterways.

Vegetation clearing and earthworks for the Project have the potential to influence bank stability and erosion, which can increase turbidity, sedimentation, and nutrients in downstream waterways. Risks are greatest during times of high flow when there is a greater potential for erosion and stormwater runoff. Risks are also greatest close to the disturbance area and decrease with distance downstream. A Project specific Erosion and Sediment Control Plan will be developed and implemented to minimise and manage impact related from erosion and sedimentation. Development of this plan will be

in accordance with the *International Erosion Control Association* (IECA) *Best Practice Erosion and Sediment Control Guidelines 2008* and the Powerlink's standard environmental controls for erosion and sediment control. With these measures, impacts of bank instability, erosion and sediment-laden stormwater runoff are expected to be minor.

There is a potential risk of fuels, oils and other chemicals required for vehicles and equipment used during construction and maintenance activities to spill and enter waterways, impacting water quality, aquatic ecology and other environmental values. Herbicides may also be used to manage vegetation during construction and maintenance. Appropriate storage of chemicals and hydrocarbons, and implementation of appropriate containment and spill response procedures will avoid and/or minimise any potential impacts associated with leaks and spills. These procedures are outlined in Powerlink's standard environmental controls.

Waterway barrier works

Waterway crossings have the potential to prevent or restrict the movement of aquatic fauna, such as fish. The preferred alignment crosses three mapped waterways for waterway barrier works, including:

- two tributaries of Rocky Creek mapped as low (green) and moderate (amber) risk
- one tributary of Black Gully mapped as a low (green) risk.

The proposed on-easement access track between structures D1 and D2 also crosses the tributary of Black Gully. Waterway crossings will be located high in the catchments, where fish habitat and passage are limited due to the ephemeral nature of the waterways. Furthermore, the waterways do not connect to any important breeding, feeding or refuge area. As such, potential impacts to fish passage are considered minor.

Flooding

The Project is located outside of the 'high-risk" flood hazard areas under both the Toowoomba and South Burnett Regional Council Planning Schemes. Within the *Toowoomba Regional Council Planning Scheme*, the Flood Risk Category for the Project area is classified as 'Balance (riverine/creek flooding with a mixed flood risk)'. As the Project is outside of the flood envelope for the 'high-risk' categories of flood hazard area under both planning schemes there will be no impact on flood levels from construction of the Project. Construction of the transmission line is also unlikely to alter the landscape to such an extent that it would influence flood levels along Rocky Creek.

Groundwater

Excavation of footings for the transmission line structures pose a minor risk to groundwater resources. Footing depths for the proposed transmission structures are expected to be in the order of 10 m. No groundwater was encountered within the depths augered as part of the geotechnical investigation. However, water was added to the boreholes to facilitate rotary washboring below the auger depths which precluded further groundwater observations. Based on the generally elevated nature of the alignment, and the predominantly clayey subsurface soils, significant groundwater inflows are not anticipated during Project construction.

Protected areas

The Project does not traverse any protected areas as defined by the *Nature Conservation Act 1992* (Queensland) (NC Act). The nearest identified protected area is the Tarong National Park, approximately 5km west of the preferred alignment. All other identified protected areas are located greater than 5km from the preferred alignment. Whilst not specifically afforded protection under the NC Act, protected areas can also include areas managed for production of forest resources, including timber and quarry material such as State forests. The Project is located within the Yarraman State Forest.

The Project has been designed to ensure that clearing of remnant vegetation within the Yarraman State Forest will not be required. As such, direct impacts on protected areas are anticipated to be limited to minor and restricted to indirect impacts associated with noise and dust. Mitigation measures as per Powerlink's standard environmental controls will be implemented to minimise potential dust and noise impacts on protected areas.

Biodiversity

Regulated vegetation

Most of the transmission line easement for the preferred alignment comprises field verified non-remnant vegetation in the form of Hoop Pine (*Araucaria cunninghamii*) and areas high value regrowth (HVR) regulated vegetation. Vegetation within the proposed easement includes:

- Remnant field verified vegetation associated with regional ecosystem (RE) 12.5.13c (Endangered) (3.6 ha).
- Mixed Acacia spp. high value regrowth vegetation associated with RE12.5.13c (Endangered) (4.2 ha) and RE12.11.11 (Least Concern) (3.1 ha).
- Non-remnant Hoop Pine plantation (13.1 ha).
- Non-remnant mixed hardwood plantation (2.2 ha).

The proposed access tracks also traverse areas of remnant field verified associated with RE12.11.18 (Least Concern).

Through the incorporation of mitigation measures into the design process, clearing of remnant vegetation (RE12.5.13c) has been avoided. These mitigation measures include siting transmission structures outside of sensitive areas, spanning and helicopter stringing of the line over areas of remnant vegetation. No widening of existing forestry access tracks has been proposed within remnant vegetation communities. New access tracks have been sited to avoid areas of remnant vegetation.

Conservation significant flora species

The desktop assessment identified 27 conservation significant flora species with the potential to occur within the Study area. Of these, two species *Haloragis exalata* subsp. *velutina* (Vulnerable – *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) and NC Act) and *Rhodamnia dumicola* (Endangered – NC Act) were identified within the Project area during field surveys for either the Project or the adjacent K2E Project. Neither of these species will be directly impacted by the Project. An additional, three threatened flora species were identified as having a moderate likelihood of occurring within the Project area, based on recent/nearby records and/or the presence of suitable habitat. None of these species were recorded during the field survey and potential habitat for these species will not be directly impacted by the Project. The risk of the Project impacting threatened flora species has been assessed as low.

As the preferred alignment traverses areas mapped as high-risk for protected plants, a protected plant flora survey has been undertaken in accordance with the Flora Survey Guidelines – Protected Plants. The protected plant flora survey was undertaken on 15 to 18 August 2022. As this flora survey confirmed the presence of *Rhodamnia dumicola* (Rib-fruited Malletwood) (listed as Endangered under the NC Act) within the clearing buffer zone, a Protected Plants Clearing Permit is required for the Project.

Conservation significant fauna species

Seven conservation significant fauna species were recorded during the field surveys for the Project or the K2E Project:

- Grey Falcon (*Falco hypoleucos)*, listed as Vulnerable under the EPBC Act and the NC Act
- Powerful Owl (*Ninox strenua*), listed as Vulnerable under the NC Act (not listed under the EPBC Act)
- Black-breasted Button Quail (*Turnix melanogaster*), listed as Vulnerable under the EPBC Act and the NC Act
- Greater Glider (*Petauroides volans (P. armillatus)*), listed as Vulnerable under the EPBC Act and Endangered under the NC Act
- Short-beaked Echidna (*Tachyglossus aculeatus*), listed as Special Least Concern under the NC Act (not listed under the EPBC Act)
- Black-faced Monarch (*Monarcha melanopsis*), listed as Migratory under the EPBC Act and Special Least Concern under the NC Act
- Rufous Fantail (*Rhipidura rufifrons*), listed as Migratory under the EPBC Act and Special Least Concern under the NC Act.

An additional eight conservation significant fauna species are considered to have a moderate or high likelihood of occurring within the Project area, based on recent/nearby records and/or the presence of suitable habitat.

The Project avoids clearing of remnant vegetation by siting transmission line structures outside of area of remnant vegetation, increasing the height of transmission line structures to span remnant vegetation, helicopter stringing of the transmission line over areas of remnant vegetation and avoiding areas of remnant vegetation for access track widening or new access tracks. Through these measures, as well as Powerlink's standard environmental controls for vegetation management and minimisation of interactions with wildlife (Appendix G), the Project has been assessed as unlikely to have a significant impact on biodiversity values.

Matters of Environmental Significance

This section discusses matters of environmental significance, their presence and legislative framework, as they relate to the Project. Matters of environmental significant present within the Project area include both matters of national environmental significance (MNES) under the EPBC Act and matters of state environmental significance (MSES) under the *Environmental Offsets Act 2014* (Queensland) (EO Act). No matters of local environmental significance are identified in any of the relevant Local Planning Instruments.

Matters of national environmental significance (MNES)

MNES identified as potentially relevant to the Project include:

- Nationally threatened ecological communities (TEC): While the Protected Maters Search Tool returned five TECs as having potential to occurring within 10km of the Project, their potential occurrence within the Study area was assessed as low. No EPBC Act-listed TECs are at risk from Project-related impacts.
- Threatened flora species: Three threatened flora species (*Rhaponticum australe* – Vulnerable; *Haloragis exalata* subsp. *velutina* – Vulnerable; and *Cossinia australiana* – Endangered) were either known from the Study area or assessed as having a moderate likelihood of occurrence. None of these threatened flora species, are at potential risk from Project-related impacts.
- Threatened fauna species: Four threatened fauna species (Black-breasted Button-quail – Vulnerable; Spotted-tail Quoll – Endangered; Grey Falcon – Vulnerable; and Greater Glider – Vulnerable) were recorded from the Study area. A further four threatened species were considered to have a moderate or higher likelihood of occurring. Of these species the Black-breasted Button-quail was considered potentially at risk from Project-related impacts due to the removal of approximately 7.1ha of regenerating Acacia and low vine forest habitat and 1.2ha of Hoop Pine plantation buffer zone habitat that provides potential supplementary foraging resources for the species. A significant impact assessment was prepared for this species which determined that the loss of this potential supplementary foraging habitat is of no consequence to the species over the medium to long-term and the proposed action is unlikely to have a significant impact on the Black-breasted Button-quail within the meaning of the Significant Impact Guidelines.
- Migratory species: Two migratory species (Rufous Fantail and Black-faced Monarch) were recorded from the Study area. A further three migratory species (including the Spectacled Monarch) were considered to have a moderate or higher likelihood of occurring. The Black-faced Monarch, Rufous Fantail and Spectacled Monarch were considered potentially at risk from Project-related impacts due to the removal of approximately 7.1ha of regenerating Acacia and low vine forest habitat. A significant impact assessment was prepared for these species which determined that the Project is unlikely to substantially modify, by means of fragmentation beyond that already present, or destroy or isolate important habitat that supports (i.e. recorded Black-faced Monarch and Rufous Fantail) or may support (i.e. high likelihood of occurring Spectacled Monarch), local populations of these highly mobile migratory bird species.

In summary, the Project is unlikely to have a significant impact on MNES within the meaning of the Significant Impact Guidelines.

Matters of state environmental significance (MSES)

MSES are defined under the *Environmental Offsets Regulation 2014* (Queensland). MSES that are applicable to the Project includes regulated vegetation under the *Vegetation Management Act 1999* (Queensland) (VM Act); and habitat for Endangered, Vulnerable or Special Least Concern fauna species managed under the NC Act. The Infrastructure Designation process under the Planning Act is not considered a prescribed activity for the purposes of providing an offset under this EO Act.

Regardless of the above, Powerlink Queensland have employed the 'avoid, minimise, and mitigate' approach throughout the Project, including the corridor selection process; employing mitigation through design (currently being undertaken by Powerlink Queensland to reduce impacts where possible) and mitigating environmental impacts through implementation of the EMP. With implementation of these measures, the Project is unlikely to have a significant impact on MSES within the meaning of the Significant Residual Impact Guidelines.

Regulated vegetation

Regulated vegetation within the Project area includes:

- Endangered RE 12.5.13c (Category B)
- High value regrowth (HVR) regulated vegetation comprising Endangered HVR regional ecosystem 12.5.13/12.5.1 (Category C)
- Great Barrier Reef riverine vegetation comprising Endangered HVR regional ecosystem 12.5.13/12.5.1 managed under the VM Act (Category R)
- Remnant vegetation intersecting within a 10m buffer distance of a stream order 1 – 4 managed under the VM Act.

Through sensitive design of the transmission line, impacts to Endangered RE 12.5.13c have been avoided. In addition, Powerlink is exempt from impacts to regulated vegetation under the VM Act.

Connectivity areas:

As State-mapped connectivity areas are present within the Study area, the significance of the ecosystem tract in the context of the local and regional landscape was assessed. The assessment determined that any impact on connectivity is not significant and therefore offsets for connectivity areas were not required.

Protected wildlife habitat:

A mapped area of protected wildlife habitat for the Short-beaked Echidna is traversed by the preferred alignment. While direct impacts to this habitat are avoided by the Project, the Short-beaked Echidna was recorded from the regenerating Acacia and low vine forest habitat where direct Project impacts are proposed, resulting in a significant residual impact assessment being undertaken for the species. As the Acacia and low vine forest habitat also potentially provides support foraging habitat for the Powerful Owl, which was previously recorded as part of the K2E Project field surveys from the open forest to woodland habitat within the Study area, a significant residual impact assessment was undertaken for this species. These significant residual impact assessments concluded that the 7.1ha of habitat to be impacted by the Project is not likely to further fragment or isolate Short-beaked Echidna or Powerful Owl habitat or be detrimental to the long-term persistence of a local population of the species.

Essential habitat:

The preferred alignment intersects mapped essential habitat for the Black-breasted Button-quail, and Greater Glider which were assessed previously as MNES, and *Rhodamnia dumicola* (Rib-fruited Malletwood) – Endangered under the NC Act. The area of State mapped essential habitat for *Rhodamnia dumicola* is associated with regenerating Acacia and low vine forest habitat, which had been previously cleared and is in a degraded state compared to adjacent remnant habitats. Targeted surveys for the species, confirmed the presence of *Rhodamnia dumicola* within the clearing buffer zone. A Protected Plants Clearing Permit is required for the Project. A significant residual impact assessment was undertaken and concluded that the Project is unlikely to have a significant residual impact on *Rhodamnia dumicola* within the meaning of the SRI Guideline

Biosecurity

The Project area is within three existing biosecurity zones: Sugar cane pest biosecurity zone 6, Papaya ringspot biosecurity zone 1, and Grape phylloxera risk zone. Three restricted plants under the *Biosecurity Act 2014* (Queensland) (Biosecurity Act) were recorded during the field survey (Lantana, Mother of Millions and Velvety tree pear), of which Lantana is also a Weed of National Significance. The field survey also recorded three introduced fauna species (feral dog, feral cat and red fox) all of which are restricted under the Biosecurity Act.

The EAR has identified a number of potential impacts including the introduction of weed species, edge effects and habitat degradation through exacerbation or introduction of pests and weed. A detailed pre-construction weed survey will be undertaken prior to construction activities commencing and a post-construction weed survey will be undertaken after the first wet season once construction is finalised. A Biosecurity Management Plan will be developed to support construction and operation of the Project and to achieve Powerlink Queensland's general biosecurity obligation under the Biosecurity Act.

Land use and existing services

The preferred alignment traverses three land parcels (two freehold and one State land) and one local road parcel. Two LGAs (Toowoomba Regional Council and South Burnett Regional Council) with individual Local Planning Instruments are traversed by the preferred alignment. The land traversed by the preferred alignment is zoned Rural under the *South Burnett Planning Scheme*, with a land use intent of maintenance of rural character and amenity. Additionally, the land traversed by the preferred alignment is zoned as Open Space in the *Toowoomba Planning Scheme*, with a land use intent of management resource protection, production forestry and plantation forestry.

The primary land use within the Project area is State forest (Yarraman State Forest) used for forestry plantation. The Project is also located within the mining lease for the Meandu Mine (ML6674). The preferred alignment also traverses Class A and B agricultural land (within the approved surface rights area of the Meandu Mine is not used for agricultural purposes) as well as a designated Priority Agricultural Area under the *Darling Downs Regional Plan* (2013), currently used for plantation forestry purposes.

Existing built infrastructure in the Project area includes the Meandu Mine, Tarong power station and associated infrastructure, existing Powerlink Tarong Substation and transmission lines, local and State-controlled roads and gravel forestry access tracks.

The Project will change the current land use from mining/State forest/plantation to infrastructure. As the preferred alignment will be in proximity (within 1km) from the existing portion of transmission line of Feeder 831 (to be decommissioned) and will be located adjacent to proposed mining activities within the K2E ASA, the Project is considered to be compatible with, and will not impact, the existing character and amenity of the current zones (i.e., Rural and Open Space). Powerlink has worked, and will continue to work, collaboratively with key stakeholders including Stanwell, DES and HQPlantations during development of the Project to minimise impacts on surrounding land uses, including the Meandu Mine and plantation forestry operations.

No impacts will occur to other infrastructure in the area from construction and operation of the Project, and no relocation of existing infrastructure is required to facilitate the Project.

Native Title

The preferred alignment does not traverse any current Native Title claims. However, the northern section of the alignment between structures D1 and D5 is adjacent to the Wakka Wakka People #3 Native Title claim (QCD2022/003). Yarraman State Forest, being State Forest tenure, is also land subject to Native Title.

To be considered valid, any acts or dealings in relation to land and waters that affect Native Title must comply with the *Native Title Act 1993* (Commonwealth) (Native Title Act). To the extent that Native Title exists or may exist in the area of the Project, Powerlink will comply with the requirements of the Native Title Act to secure an easement for the transmission line. Powerlink typically complies with section 24KA of the Native Title Act, which applies to facilities for services to the public, for its transmission line easements. Under section 24KA of the Native Title Act, Native Title is not extinguished but is 'suppressed' while the easement remains in place.

Visual and public amenity

The preferred alignment and surrounding area contain a variety of landscape features including plantation forestry, native forest areas, agricultural land and industrial uses associated with the Meandu Mine and Tarong power stations. The preferred alignment traverses dense vegetation comprising plantation forestry (Hoop Pine) and native vegetation. Yarraman State Forest offers a public amenity to the community as it is open to the public for recreational purposes including hiking, cycling, horse riding and trail bike riding.

Visual amenity impacts from the Project are considered negligible. Potential impacts to the visual amenity of sensitive receptors to the north, east and south of the Project will be mitigated through the screening provided by the remaining hoop pine plantation forestry and native vegetation within Yarraman State Forest. In addition, the State Forest in the area of the preferred alignment is relatively low use and generally unoccupied for the most part, with the exception of HQPlantations' planting, thinning or harvesting activities.

Indigenous and non-Indigenous cultural heritage

No known places of Indigenous cultural heritage significance were identified from desktop searches within the preferred alignment. A search of the Queensland Department of Senior, Disability Services and Aboriginal and Torres Strait Islander Partnerships (DSDSDATSIP) cultural heritage database and register identifies one Aboriginal Party whose Native Title determinations/claims are in proximity of the Project, namely Wakka Wakka People #3, located to the northern side of the proposed alignment. Powerlink has established processes for, and significant experience in, working closely with Traditional Owners for the management of cultural heritage risks in transmission line and substation development. Powerlink is actively engaging with each of the Native Title groups to develop cultural heritage management agreements (CHMA), which will include agreed methodology for the identification and management of Aboriginal cultural heritage sites and values within, and in the vicinity of, the preferred alignment. This will include detailed cultural heritage surveys of the preferred alignment with the Traditional Owners.

There are no registered historical heritage places within or directly adjacent to the Project area, and so no impacts are anticipated to known non-indigenous cultural heritage values. There is some potential for the Project to impact unidentified historical heritage places.

Residual risk across the remainder of the Project will be mitigated by the following general construction phase environmental management measures, including cultural heritage inductions and unexpected find procedures.

Transport and traffic

During construction, the Project is expected to generate a peak daily traffic generation of 24 heavy and 38 light vehicles trips (in and out) accessing the construction site. This includes a maximum peak hour flow of 5 heavy and 38 light vehicles (in or out) movements. During operation, an average of 3 vehicle trips (in and out) per year are expected. Due to the low traffic volumes generated by the construction and operation of the Project, no impacts to the State Controlled Road network, intersections, pavement condition or public and active transport facilities are expected.

To mitigate the identified increased road safety risk from increased Project construction traffic, Powerlink will introduce temporary warning signs on the D'Aguilar Highway (in the vicinity of the intersection with Tarong Power Station Road). This will provide road users advanced warning of additional turning vehicles during the construction stages. Due to the low generated traffic volumes associated with the Project's operational activities (an average of 3 vehicle trips per year), no mitigation measures are required during operation.

Electric and magnetic fields

Expected electric and magnetic fields (EMFs) were calculated for the Project at its lowest expected clearance to the ground. The calculated field strength was then compared to the *International Commission on Non-Ionizing Radiation Protection* (ICNIRP) *2010 Guidelines* field strength reference levels for general public to time varying electric and magnetic fields. When taking into consideration the edge of the easement, the results of this assessment found that both the electric field and magnetic field strength for the proposed 275kV transmission line are well below the ICNIRP 2010 Guidelines reference levels for general public exposure to time varying electric and magnetic fields. Therefore, there are no areas of concern within and around the transmission line easement.

The closest sensitive receptor is located approximately 1.5km from the preferred alignment. EMF concerns from the preferred alignment at this sensitive receptor are therefore unlikely. It is not expected that any persons other than Powerlink Queensland employees or contractors would spend any significant periods of time close to the transmission infrastructure.

Powerlink has adopted the policy of prudent avoidance with regards to EMF. This includes providing advice and, if required, signal amplification equipment to community members experiencing television or radio reception problems caused by transmission lines. Due to the distance of the preferred alignment to the closest sensitive receptors (over 1.5km) and the proximity of other transmission line infrastructure to this sensitive receptor, interference with telephone or radio reception is not expected to be an issue for the Project. There is no other infrastructure (e.g. electrical fence) near to the proposed easement which could cause induced charge issues. If any items or objects are location through further work, Powerlink will assess the potential for induced charge in proximal conductive objects and propose mitigation measures for any objects in or near the easement that may be affected.

Bushfire risk

The preferred alignment is not located within a bushfire prone area which is mapped as ‘high’, ‘very high’ or ‘extreme’. The preferred alignment crosses a mapped ‘medium’ risk bushfire prone area associated with steep terrain between structures D10A and D11.

The bushfire risk from the vegetation types in the vicinity of the preferred alignment ranged from low for non-remnant Hoop Pine plantation (Vegetation Hazard Class (VHC) 15) and remnant semi-evergreen vine thicket and dry rainforest communities (VHC 14) through to high for the juvenile hardwood plantation (VHC 5) and *Eucalyptus moluccana* mixed open forest (VHC 3) along Rocky Creek.

The Hoop Pine plantation within the proposed transmission line easement and to the west of the preferred alignment will be cleared as part of harvesting activities by HQPlantations. Remaining vegetated areas to the west of the preferred alignment, including the mixed hardwood plantation, will be cleared by Stanwell or its contractors for the K2E Project. All vegetation, apart from the semi-evergreen vine thicket communities, will be cleared from the proposed easement.

Removing higher risk vegetation from within the proposed alignment, and to the west of the preferred alignment, removes a high portion of the fire risk associated with the Project. Based on the assessment undertaken, Powerlink’s standard measures as outlined in the Bushfire Mitigation – Plan (ASM-PLN-A3285085) are deemed appropriate for the Project.

Hazards, health and safety

The Project will comply with the *Electrical Safety Act 2002* (Queensland) (Electrical Safety Act), *Work Health and Safety Act 2011* (Queensland) (WHS Act) and *Work Health and Safety Regulation 2011* (Queensland) (WHS Reg). Risk identification has been done for the Project, and only significant or high-risk interactions are documented for the Project for the aspects of health, safety and environment during construction, operation and decommissioning.

The pre-mitigated risks are assessed at this stage and during detailed design. The construction risk assessment will be undertaken to identify critical controls to mitigate risks and maintain residual risk to acceptable levels. This preliminary risk assessment forms part of the larger risk management process which will continue throughout the lifecycle of the Project and has sought to identify hazards which may presently exist prior to construction. The Project will continuously monitor identified risks and conduct future risk assessments to identify and assess emergent risks throughout the Project lifecycle.

Proposed controls will be considered during detailed design and through the construction risk assessment process. The controls will be based on existing Powerlink safety management systems.

The management strategies practiced by Powerlink will be in place for the duration of the Project and are not limited to the control measures discussed in this EAR.

Waste Management

Anticipated waste streams have been identified for the construction, operation and maintenance phases of the Project. Construction activities are expected to produce green waste, general waste, regulated waste, and wastewater. Construction waste will be avoided, minimised, and managed in accordance with the waste and resource management hierarchy, and Powerlink's standard environmental controls. A detailed Waste Management Plan is to be developed prior to construction, including all actions needed to effectively implement the waste and resource management hierarchy.

The types of waste generated by transmission line operation and maintenance are similar to those generated as construction wastes, although in much smaller quantities. A detailed Waste Management Plan is to be developed prior to operation and maintenance, including all actions needed to effectively implement the waste and resource management hierarchy and a waste monitoring program.

Environmental management

Powerlink is committed to the protection of the environment, which includes avoiding, minimising, mitigating and managing adverse environmental impacts from its activities. Every Powerlink individual is responsible and accountable for environmental management, and Powerlink's leaders are active role models of this commitment.

The mitigation and management measures for this Project have been proposed in line with Powerlink's standard environmental controls. Additional measures have been proposed where required to provide further mitigation and management measures specifically for the Project.

Planning and approval requirements

A number of Commonwealth, State and local pieces of legislation and policy applies to the development of the Project. As the Project is being assessed under the Planning Act MID process, a range of typical approvals under this Act will no longer apply to this Project. This is because the MID makes the development 'accepted development'. Approvals outside of the Planning Act have been identified and will be obtained by Powerlink in the subsequent stages of the Project.

Community and stakeholder consultation

Powerlink is committed to effective and genuine stakeholder and landholder engagement practices. Powerlink's activities are guided by a Stakeholder Engagement Framework which is underpinned by the key principles of integrity, openness, responsiveness, accountability and inclusiveness.

During the consultation processes to date, Powerlink has considered and responded to all key matters and issues raised by stakeholders. Where required, Powerlink has entered into agreements with stakeholders and landholders.

Powerlink is continuing its direct engagement activities with stakeholders and landholders as part of the public consultation process for this EAR. Section 3 outlines Powerlink's proposed consultation strategy for the Minister's consideration.

Conclusion

This EAR has identified that the Project has the potential to impact a range of environmental, social and economic values positively and negatively in the Project area and surrounds. However, through the implementation of design mitigation and standard and project-specific mitigation and management measures, these potential impacts can be minimised and mitigated.

1 Introduction

Section 1 provides a broad overview of the Meandu Mine Transmission Line Relocation Project, the proponent, describes the assessment approach used to prepare this Environmental Assessment Report (EAR) and sets out the structure of the document.

1.1 Project overview

A portion of the Feeder 831, 275 kilovolt (kV) transmission line between H018 Tarong and H014 Middle Ridge Substations (approximately 5 kilometres (km)), is proposed to be relocated (the Project) (Figure 1.1). The proposed transmission line relocation is located to the east of Stanwell Corporation Limited (Stanwell)'s Meandu Mine. Relocation of this portion of Feeder 831 is required to overcome potential geotechnical instability issues in a section of the current Feeder 831 corridor and to safely accommodate future mining activities within the approved surface rights area of the Meandu Mine, which requires that a section of land underneath this line is mined. The affected portion of transmission line is owned and operated by Powerlink Queensland (Powerlink).

TEC Coal Pty Ltd (TEC Coal) (a wholly owned subsidiary of Stanwell) is also currently seeking approval to increase the approved surface rights area at the Meandu Mine. The King 2 East (K2E) Project involves increasing the approved surface rights area within mining lease (ML) 6674 by an additional 186 hectares (ha) which will allow progression of the K2E pit to the east. Planning for relocation of the portion of the Feeder 831 transmission line has been undertaken with consideration of the K2E Project.

1.2 Project proponent

The owner, developer, operator and maintainer of the Project is:

Powerlink Queensland

33 Harold Street, Virginia

PO Box 1193, Virginia QLD 4014

Telephone: (07) 3860 2111, Facsimile: (07) 3860 2100

Website: https://www.powerlink.com.au/

Powerlink Queensland is the registered business name of the Queensland Electricity Transmission Corporation Limited (ABN: 82 078 849 233), a Queensland Government Owned Corporation. It was established under the *Government Owned Corporations Act 1993* (Queensland) and is a Transmission Entity under the *Electricity Act 1994* (Queensland) (Electricity Act).

Powerlink Queensland owns, operates and maintains Queensland's high voltage electricity transmission network. As a Transmission Network Service Provider in the national electricity market, Powerlink Queensland's primary role is to provide a secure and reliable network to transport high voltage electricity from generators to electricity distribution networks. These networks are owned by Energex, Ergon Energy (Ergon) and Country Energy, which supply electricity to nearly 4 million Queenslanders. Powerlink Queensland also transports electricity directly to large Queensland customers such as mines, gas producers, industrial smelters, rail network operators and to New South Wales via the QLD/NSW Interconnector.

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 1.1

Project Overview

NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3
RP176969
D5
D6
Lot 10
SP305494
Ridge Road
reserve
D7
D8
D9
D10
Lot 289
FTY1859
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 12/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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1.3 Approval framework

Approval for the Project is being sought via the Ministerial Infrastructure Designation Process (MID) under the *Planning Act 2016* (Queensland) Planning Act.

1.3.1 Proposed infrastructure designation

Infrastructure Designation is a planning process under Chapter 2, Part 5 of the Planning Act that allows the Minister to designate premises for a type of infrastructure. The process provides infrastructure entities a streamlined, considered whole-of government response on a request for infrastructure.

The three statuary instruments support the Infrastructure Designation function are:

- Planning Act, which includes provisions for making, amending, extending or repealing Infrastructure Designations
- Planning Regulation 2017 (Queensland) (Planning Regulation), which identifies the types of infrastructure that may be designated
- Ministers Guidelines and Rules (MGR), which includes processes for making or amending ministerial designations (Chapter 7 of the MGR).

Section 36 of the Planning Act provides criteria for making infrastructure designations, stating:

> *(1) To make a designation, a designator must be satisfied that –*
>
> *(a) the infrastructure will satisfy statutory requirements, or budgetary commitments, for the supply of the infrastructure; or*
>
> *(b) there is or will be a need for the efficient and timely supply of the infrastructure.*

The Project achieves the requirements of section 36(1) of the Planning Act through providing for the efficient and timely supply of infrastructure as it will enable:

- better infrastructure integration by removing potential geotechnical instability in the existing transmission line between the H018 Tarong and H014 Middle Ridge substations
- the long-term and stable supply of electricity by avoiding interaction with current and proposed mining activities in relation to the Meandu Mine.

Section 35 of the Planning Act identifies that the Planning Regulation describes the types of infrastructure that may be designated by the Minister. 'Electrical operating works', being operating works under the Electricity Act, is identified as infrastructure may be designated under Schedule 5, Part 2, Item 7 of the Planning Regulation.

To make a designation under section 36 of the Planning Act the Minister must also be satisfied that adequate environmental assessment, including adequate consultation has been carried out in relation to the Project. This Environmental Assessment Report (EAR) has been developed to address the MGR requirements prescribed under the Planning Regulation to satisfy the requirements of the Minister.

1.3.2 Intent of designation

The Infrastructure Designation will affirm the Project as a site for electricity operating works and will provide a streamlined, considered whole-of-government response which avoids the need for later approvals under the Planning Act. Delivery of the Project via the MID process will support the fulfillment of Powerlink's legislative obligations as a transmission authority under section 31 of the Electricity Act including that "the transmission entity must properly take into account the environmental effects of its activities under the authority".

1.3.3 *Environmental Assessment Report (EAR) process*

The MGR specifies the need for an Infrastructure Entity to prepare an EAR in support of an application for an MID. For the purpose of this EAR, 'environment' is defined in section 8 of the *Environmental Protection Act 1994* (Queensland) (EP Act) and includes:

a. ecosystems and their constituent parts, including people and communities; and

b. all natural and physical resources; and

c. the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and

d. the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

This EAR considers the potential environmental effects relating to the construction, operation, maintenance and eventual decommissioning of the Project. In particular, this EAR:

- identifies the environmental values within the Project area
- assesses the potential impact of the Project on those environmental values.

Chapter 7, Part 1 of the MGR outlines the process for making a MID in accordance with section 36(3) of the Planning Act. This process is shown in Figure 1.2 and outlined further in the Queensland Department of State Development, Infrastructure, Local Government and Planning's (DSDILGP) (2021) *Making or Amending a Ministerial Infrastructure Designation (MID) Operational Guidance*.

Table 1.1 provides an overview of the process along with the Project status.

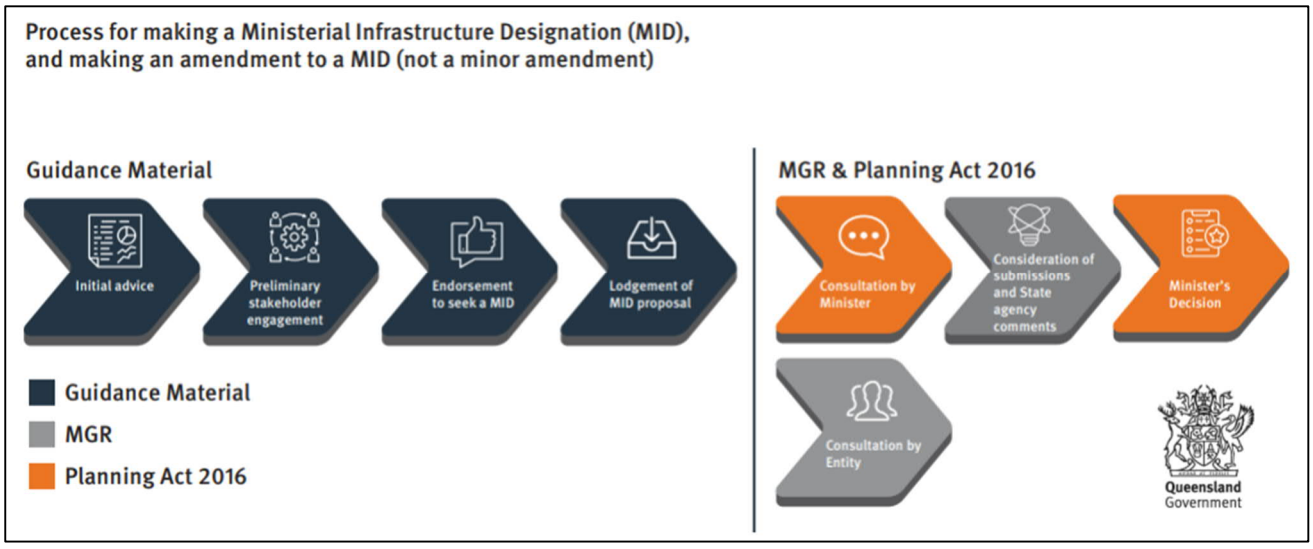


Figure 1.2 Ministerial Infrastructure Designation process (Queensland Treasury, 2020)

Table 1.1 Ministerial Infrastructure Designation process

Step	Description	Project status
1 **Initial advice**	An Initial Advice Request (IAR) was submitted to DSDILGP in February 2022 to confirm the Project detail and seek pre-lodgement advice. DSDILGP provided pre-lodgement advice for the Project on 11 March 2022 (refer Appendix A) which included a summary of relevant matters based on the supporting information provided in the EAR.	Complete
2 **Preliminary stakeholder engagement**	Powerlink has been engaging with Stanwell and other directly affected landholders to examine the most appropriate corridor to relocate the short section of transmission line. The preferred corridor is directly to the east of Stanwell's proposed K2E Project to minimise impacts on surrounding landholders and the wider community and ensure the long-term suitability of transmission infrastructure in the area. The Draft Corridor Selection Report (CSR) was released for public review and comment on 12 July 2022, with the period for feedback closing on 1 August 2022 (refer further to Section 3). A copy of the Draft CSR can be found at: https://www.powerlink.com.au/projects/meandu-mine-transmission-line-relocation-project	Complete
3 **Endorsement to lodge a MID proposal**	Following preliminary stakeholder engagement and prior to seeking a MID, Powerlink must write to the Minister seeking their endorsement to lodge a MID proposal (endorsement request). The purpose of the endorsement step is to ensure entities only progress to preparing a MID proposal where it is considered that a MID is the appropriate planning assessment pathway for the proposed infrastructure. The endorsement request was submitted by Powerlink to the Minister on 4 November 2022 and the endorsement receipt was received on 29 November 2022.	Complete
4 **Lodgement of MID proposal**	Following the receipt of endorsement to lodge a MID proposal, Powerlink will be required to prepare the material identified in Schedule 3 of the MGR, and any additional material outlined in the initial advice. This information is provided within this EAR, which has been draft in accordance with Chapter 7 of the MGR.	Complete
5 **Consultation by Minister**	Following receipt of the MID proposal, the Minister will commence consultation by writing to the local government and the landowner/s, inviting submissions on the MID.	Future step
6 **Consultation by Entity**	A consultation strategy is included in Section 3 of this EAR. Powerlink will be responsible for undertaking public consultation in accordance with the consultation strategy. DSDILGP will liaise with Powerlink regarding any amendments required to be made to the consultation strategy prior to public consultation commencing. The commencement of consultation by the Minister is to be taken as the Minister having endorsed the consultation strategy provided by Powerlink. Submissions regarding the proposed MID must be made to the Minister.	Future step
7 **Consideration of submissions**	Following Powerlink advising the Minister of the completion of consultation, the Minister must give the entity a copy of any submissions received, or a notice that no submissions were received.	Future step

Step	Description	Project status
	After considering any submissions, the entity must provide to the Minister evidence of consultation undertaken, a summary of the matters raised in the submissions and how these matters have been addressed.	
8 **State agency comments**	While consultation is being undertaken, DSDILGP will seek comments on the entity's proposal from state agencies as relevant. The Minister will provide Powerlink with any state agency comments the Minister determines should be responded to by Powerlink at the same time as the Minister provides the entity with a copy of any submissions received during consultation on the MID. Powerlink must provide the Minister with a summary of how any state agency comments provided have been addressed as part of the summary of matters raised in submissions.	Future step
9 **Change to the entity's proposal**	If a change is made to the proposed infrastructure (that is considered to warrant further consultation), either as a consequence of a submission made during consultation or another circumstance, or where the Minister determines that consultation wasn't adequately completed, further consultation may apply to the proposal. Following the completion of any subsequent consultation by Powerlink, Powerlink will again be provided with a copy of any submissions for their consideration and the entity must again give the Minister a summary of the matters raised in the subsequent consultation, and how these matters have been addressed.	Future step
10 **Decision by the Minister**	The Minister makes a decision whether to grant designation under section 37 of the Planning Act. The decision notice and gazette notice is to be provided by the Minister to relevant stakeholders and made publicly available.	Future step

1.4 Assessment approach

The assessment approach taken to support the proposed MID for the Project and to inform preparation of the EAR is as follows:

- **Desktop GIS analysis:** Characteristics of the Project area were initially identified via a desktop review of available electronic mapping and database resources. This included Commonwealth, State and local government sources that provide information in relation to the physical, natural and social/human environment. A variety of web-based sources was used to conduct reviews and comparisons of various constraints.
- **Initial Advice Request report:** An Initial Advice Request (IAR) was submitted to DSDILGP in February 2022 which triggered the commencement of the MID process for the Project. Following the submission of the IAR, Powerlink received pre-lodgement advice (refer to Appendix A) from DSDILGP. The pre-lodgement advice provides a summary of relevant matters for Powerlink to consider in preparing this EAR.
- **Corridor Selection:** A preferred corridor for the Project was determined, based on the process described in Section 2.2 in this EAR. This included identification of several potentially suitable corridor options, followed by comparative assessment based on a range of quantitative and qualitative criteria. Feedback on the preferred corridor was sought via release of the Draft Corridor Selection Report (CSR) for public review and comment (refer Section 3).

- **Field assessment:** Field surveys of the Project area were undertaken in June 2019 and again in January 2022 (refer Section 4.7 for details). The objective of the field survey was to confirm the nature and extent of ecological constraints and verify the outcomes of the desktop assessment.
- **Stakeholder consultation and notification of adjacent landholders:** Powerlink has undertaken tailored engagement activities with identified stakeholders and landholders (i.e. letters to directly affected landholders and local government authorities, signage erection on site, local advertisements, and engagement on the Draft CSR and EAR) to comply with MID requirements. Engagement activities will be ongoing throughout the Project delivery (refer Section 3).
- **EAR Preparation:** This EAR has been prepared to support a MID for the Project. It has been prepared in accordance with the MGR and includes details of the Project; an assessment of environmental, social and economic impacts; and outlines the measures to be implemented to avoid, mitigate and offset negative impacts.

1.4.1 Information sources

This EAR desktop study has considered the applicable environmental and planning legislation, previous assessment for both the Project and the K2E Project and information held on government databases. The following sources have been consulted in preparing this EAR:

- Previous reports:
  - K2E Project – Environmental Authority Supporting Information (WSP Australia Pty Ltd, 2021a)
  - K2E Project – Surface Water Quality and Aquatic Ecology (Ecological Services Professionals, 2001)
  - K2E Project – Air Quality Assessment (Katestone Environmental Pty Ltd, 2021)
  - K2E Project – Terrestrial Ecological Assessment (WSP, 2021b)
  - Meandu Mine K2E Project – MNES (Preliminary Documentation) Assessment Report (EPBC 2021/8999) (WSP, 2022)
- Applicable mapping layers in:
  - Queensland Globe
  - Queensland Government Development Assessment Mapping System (DAMS)
  - South Burnett Regional Planning Scheme v1.4 (2017)
  - 'Smart maps' of the Toowoomba Regional Planning Scheme v.26 (2021)
- Australia Soil Resource Information System (ASRIS)
- Atlas of Australian Sulfate Soils (ASS)
- Environmental Management Register/Contaminated Land Register (EMR/CLR)
- UXO Mapping Application, Department of Defence
- Bureau of Meteorology (BoM) Weather Station data (BoM, 2022)
- BoM website resources for extreme climate conditions (BoM, 2016)
- Global Warming of 1.5 °C – Intergovernmental Panel on Climate Change (IPCC) Special Report (Intergovernmental Panel on Climate Change, 2018)
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST)
- State Planning Policy 2017 (Queensland) (SPP) and SPP Matters of State Environmental Significance Mapping Database

- DSDSATSIP Cultural heritage database and register
- Heritage Register searches that include World, National and Commonwealth Heritage Registers, Queensland Heritage Register and Local Heritage Registers.

1.5 Structure of the environmental assessment report

Table 1.2 provides a detailed overview of the information addressed as part of each chapter of the EAR.

Table 1.2 Structure of the Draft Environmental Assessment Report (EAR)

Report Section	Description
Executive summary	Provides a summary of the Project and overall findings from the environmental assessment.
Section 1 – Introduction	Provides a brief summary of the Project, identifies the proponent and their role providing electricity within Queensland, legislative context of the designation process and the structure of the EAR.
Section 2 – Project description	Describes the Project including background, justification, program, considered alternatives and relationship to other projects, details the land proposed to be subject to the designation and describes the infrastructure which is to be constructed and the method by which this would occur.
Section 3 – Community and stakeholder consultation	Describes Powerlink's Stakeholder Engagement Framework and the engagement activities undertake for the Project along with proposed future engagement activities.
Section 4 – Environmental assessment	Assesses the potential environmental impacts of the Project to various environmental values and discusses likely management and mitigation measures to be employed to avoid and/or minimise these impacts.
Section 5 – Legislative and planning framework	Provides an assessment of the Project against relevant State and local planning instruments and policies. Summarises the associated Commonwealth, State and local legislation and approval requirements which may apply to the Project.
Section 6 – Environmental management	Provides an outline of Powerlink's commitment to achievement of environmental best practice and a summary of the Environmental Management Plan (EMP) which will be prepared for the Project.
Section 7 – Conclusion	Summarises the outcomes of the EAR.
Reference list	Provides a list of references used to compile the EAR.

Report Section	Description
Appendices	Contains the appendices to this EAR including: — Appendix A: Pre-lodgement Advice and MID Checklist — Appendix B: Layout and clearing profile — Appendix C: Environmental database search results — Appendix D: Aquatic ecology technical memo — Appendix E: Ecological Assessment Report — Appendix F: Traffic Impact Assessment Report — Appendix G: Environmental Management Plan — Appendix H: Powerlink Guidelines — Appendix I: Bushfire Mitigation Plan

2 PROJECT DESCRIPTION

Section 2 describes the Project, which is the subject to the proposed Infrastructure Designation, discusses potential alternatives which were considered, and sets out the relationship of the Project to other Powerlink infrastructure. It identifies the land proposed to be subject to the Infrastructure Designation, the infrastructure to be constructed and the method by which construction is likely to occur.

2.1 Project justification

Relocation of a portion of the Feeder 831 transmission line between H018 Tarong and H014 Middle Ridge substations (approximately 5 km) is required to safely accommodate future mining activities within the approved surface rights area of the Meandu Mine which requires that a section of land underneath the current Feeder 831 is mined. In addition, TEC Coal is currently seeking approval to increase the approved surface rights area at the Meandu Mine. The K2E Project involves increasing the approval surface rights area within ML6674 by an additional 186ha which will allow progress of the K2E pit to the east, over the route of Feeder 831. Planning for the relocation of the portion of Feeder 831 transmission line has been undertaken with consideration of the K2E Project.

The Project aims to eliminate these potential constraints and allow for continuation of the reliable provision and operation of electricity infrastructure between the H018 Tarong and H014 Middle Ridge substations. This will enable the continued provision of electricity to meet the anticipated population growth and enhance and service the liveability of the Wide-Bay Burnett and Darling Downs Regions, and greater Queensland.

2.2 Feasible alternatives

Powerlink has undertaken studies to identify feasible network solutions to address the connection requirements between the H018 Tarong and H014 Middle Ridge substations. The solution presented in this EAR has been identified as the most cost-effective solution to addressing these requirements.

2.2.1 Preferred corridor selection process

A Corridor Selection Report (CSR) was prepared in July 2022 which identified a preferred corridor and preliminary alignment for the construction and operation of the proposed relocation of the portion of Powerlink's existing Feeder 831 transmission line between the H018 Tarong and H014 Middle Ridge substations. The CSR is available to view on Powerlink's website at Meandu Mine Transmission Line Relocation Project | Powerlink.

The objective of the CSR was to identify a preferred corridor and preliminary alignment that, on balance, offered the most appropriate location for the proposed transmission infrastructure, taking into account social, economic and environmental factors. Based on the desktop analysis of the investigation area, the following key constraints and opportunities were considered:

- existing land use particularly to mining and plantation forestry
- potential agricultural land use
- property size and tenure type
- resource interest
- remnant vegetation and fauna habitat
- topography and soils.

Matters relating to economic costs associated with construction of and access to the proposed transmission line corridor were also considered.

The CSR considered and evaluated five potential options for relocation of the Feeder 831 transmission line. These options were:

- Option 1: 250m offset to the north and 900m to the east of the current Meandu Mine surface rights area; or
- Option 2: through the Meandu Mine; or
- Option 3: 250m offset to the east from the K2E pit; or
- Option 4: eastern boundary of ML6674; or
- Option 5: eastern boundary of K2E ASA.

Based on the information assessed, Options 1, 4 and 5 were considered viable solutions to safely accommodate proposed mining activities at the Meandu Mine. Option 2 and Option 3 would either interfere with the current mining activities or prevent TEC Coal from extending the surface rights area of the Meandu Mine or require further relocation should the K2E Project proceed. Therefore, Options 2 and 3 were not considered for further assessment.

2.2.2 *Results of the preferred corridor selection process*

The outcomes of the CSR assessment against the constraint / opportunity criteria are:

- Option 4 (Eastern boundary of mining lease ML6674) corridor has the longest distance and imposes the most impact to the social and natural environment and is therefore not recommended.
- Option 1 (250m offset to the north from the Meandu Mine Surface Rights Area) and the Option 5 (Eastern boundary of K2E additional surface area) have very similar impact to the social and natural environment.
- Both Option 1 and Option 5 will avoid the potential impacts to and from mining activities by the Meandu Mine including the K2E Project.
- Option 5 (Eastern boundary of K2E additional surface area) is recommended over Option 1 due to:
  - the corridor is relatively shorter and with fewer bend points
  - the corridor has relatively less extent of impacts to protected flora, fauna habits and potentially watercourses.

2.3 Project program

Powerlink estimates a construction period of 10 months for the Project spanning March 2023 to August 2023 (Phase 1) to complete the diversion component, then depending on outage availability, the cut in of the new circuit will be between August 2023 and September 2023 (Phase 2).

The Project is planned to be progressed in accordance with the indicative Project key milestones outlined in Table 2.1.

Table 2.1 Indicative Project milestones

Date	Milestone
March 2023	Site access works
April 2023	Foundations
May 2023	Assembly and erection of transmission line structures
August 2023	Stringing
September 2023	Redundant Asset Decommissioning

2.4 Relationship to other infrastructure and land uses

Feeder 831 was commissioned in 1987 forming a 275kV connection between Powerlink's Tarong and Middle Ridge substations. It provides an integral element in Powerlink's prescribed electricity transmission network. The existing alignment of the portion of the transmission line to be relocated is adjacent to the K2E pit within the approved surface rights area of the Meandu Mine.

The preferred alignment for the relocated transmission line will be immediately to the east of the boundary of the K2E Project.

The preferred alignment for the relocated transmission line crosses sections of HQPlantations forestry operations in Yarraman State Forest. Agreements have been reached with HQPlantations to allow the Project to proceed.

2.5 Site description summary

2.5.1 Location

The existing Feeder 831 transmission line is located immediately to the east of the existing surface rights area of the Meandu Mine and within ML6674, located near Yarraman, within the Darling Downs region. The preferred alignment will be relocated further to the east to adjoin the proposed K2E pit boundary, currently proposed by TEC Coal. The location of the Project is shown on Figure 2.1

2.5.2 Tenure and ownership

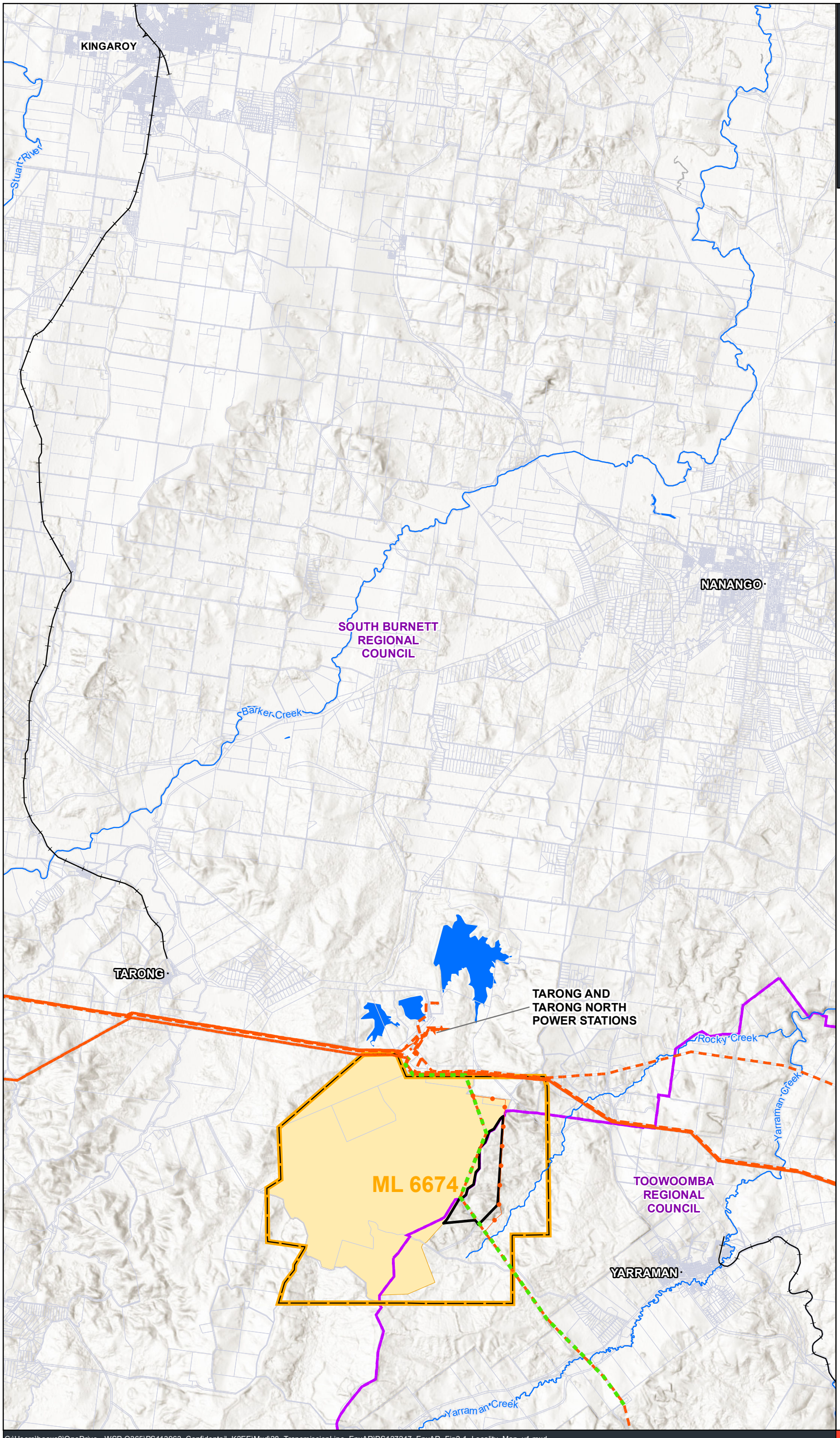
The property details of the proposed transmission line are presented in Table 2.2 and shown on Figure 2.2.

Table 2.2 Property details

Lot/Plan	Owner	Tenure	Rights/Interests
Lot 10 on SP305494	Stanwell	Freehold	— Easement C on RP194488 (Powerlink) at the proposed D1 tower structure. — Surface rights area for the Meandu Mine
Lot 3 on RP176969	Stanwell	Freehold	— Surface rights area for the Meandu Mine
Ridge Road	The State of Queensland (Represented by the Department of Resources) owns the road. Toowoomba Regional Council/South Burnett Regional Council are trustees.	Road reserve	— Local Government
Lot 289 on FTY1859	The State of Queensland (Represented by the Department of Environment and Science) owns the land. HQPlantations Pty Ltd (HQPlantations) is the Plantation licence holder for PLP0289.	State Forest	— Plantation Licence (HQPlantations and Licence holder)

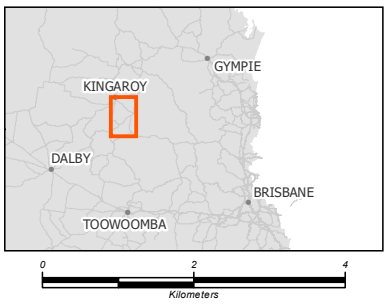
Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 2.1
Locality Map



Legend

- Proposed Feeder
- Rail Line
- Watercourse
- Feeder
- Existing Feeder 831 Centerline
- Cadastre
- King 2 East Additional Surface Area
- Local Government Areas
- Mining Lease (ML6674)
- Approved Surface Rights Area



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2.5.3 Surrounding land uses

In addition to the nearby Meandu Mine, the regional area surrounding the Project contains a variety of landscape features. This includes native forest areas, plantation forestry, arable plains, and undulating terrain with large pastoral holdings which contribute to the visual amenity and rural setting.

Yarraman State Forest offers a public amenity to the community as it is open to the public for recreational purposes including hiking, cycling, horse riding and trail bike riding. A picnic area is located within Yarraman State Forest, known as Rogers Park (refer Figure 2.3).

Sensitive places could include, but are not limited to:

- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises
- a motel, hotel or hostel
- an educational institution
- a medical centre or hospital
- a protected area under the *Nature Conservation Act* 1992 (NC Act), the *Marine Parks Act* 1992 or a World Heritage Area; or
- a public park or gardens
- for noise, a place defined as a sensitive receptor for the purposes of the Environmental Protection (Noise) Policy 2019.

The nearest sensitive receptors to the Project are residential dwelling that occur to the north and north-east, with the closest being approximately 1.5km from the preferred alignment (off Munt Road). The location of these sensitive receptors is shown in Figure 2.3. The nearest town to the Project is Yarraman, located 4km south-east. Yarraman has a population of approximately 1,000 people, with approximately 550 private dwellings (Australian Bureau of Statistics, 2019).

All sensitive receptors are separated from the preferred alignment by the Yarraman State Forest.

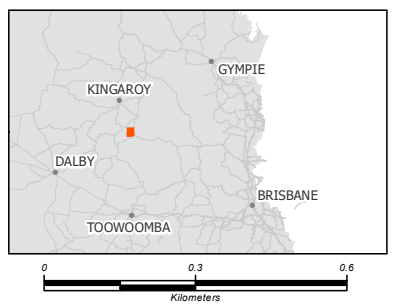
Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 2.2
Alignment Details and Property Map

NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3
RP176969
D5
D6
Lot 10
SP305494
Ridge Road
reserve
D7
D8
D9
D10
D10A
Lot 289
FTY1859
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed access during construction
- Proposed access during operation-maintenance
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- King 2 East Additional Surface Area
- Helicopter stringing Emergency trim-cut only
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)



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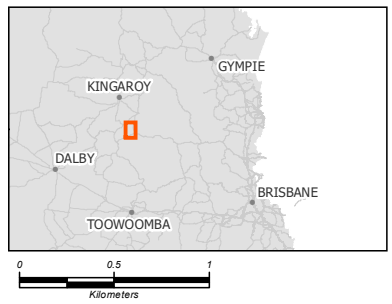
Meandu Mine Transmission Line Relocation Project
Environmental Assessment Report
Figure 2.3
Sensitive receptors

TARONG AND TARONG NORTH POWER STATIONS
MEANDU MINE
ROGERS PARK
YARRAMAN
1030-STR-9008
1030-STR-9009
1030-STR-9018
1030-STR-9019
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D10A
D11
D13
D14
D15
Lot 3 RP176969
Ridge Road reserve
Lot 10 SP305494
Lot 289 FTY1859
TARONG POWER STATION ROAD
NANANGO NEUMGNA ROAD
REEVE ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
TARONG YARRAMAN ROAD

Legend

- Sensitive Receptors
- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Highways
- Secondary Roads
- Local roads
- Forestry access tracks
- King 2 East Additional Surface Area
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)
- Tarong Substation



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2.6 Transmission line

2.6.1 Physical details of the transmission line

2.6.1.1 Structures and requirements

Support structures are used to keep the high voltage conductors separate from each other, and clear of the ground and other obstacles. Requirements for minimum clearance between energised conductors and various types of obstacles are specified in the Electricity Safety Regulation 2013, which is subordinate legislation to the Electrical Safety Act. The distance or span between structures and their height is determined by the topography, average temperatures, sensitive environmental areas, clearance requirements and structure loading limits.

Structures are fabricated in a range of heights to allow optimum height to be provided at each site. Typically, shorter structures are found on elevated areas such as hills, with taller structures in gullies, or where additional clearance is required over a mid–span obstacle such as a road.

Various designs of conventional self-supporting towers have been used in Queensland for over 50 years and are the standard form of support structure for high voltage construction observed throughout the state. For self-supporting towers, individual components are fabricated from galvanised steel angle sections (members) and steel plate and are assembled onsite. Individual foundations support the four legs of the tower. Treatments can be applied to the galvanised surfaces of the towers and poles to reduce visual impact where necessary. For self-supporting poles, individual components are fabricated from galvanised steel plate and bolted or sleeved together onsite. A large single foundation supports the pole.

Structure duties

There are two specific duties of structures - suspension and tension.

Suspension structures

Suspension structures are used where the transmission line follows a straight line or has a very small deviation angle (up to 2 degrees). They are designed to carry the weight (vertical load) of the conductors and transverse (horizontal) load from wind on the conductors. Features of the suspension structures are relatively light construction, with cross–arms on each side of the upper part of the structure (superstructure) and insulator strings supporting the conductors.

Tension structures

Tension structures are characterised by a ‘heavier’ appearance due to the larger steel section sizes and conductors ‘terminated’ onto the cross–arms using insulators in a near horizontal orientation. Tension structures are designed to carry the weight (vertical load) of the conductors, and transverse (horizontal) load from wind on the conductors and conductor and earth wire tension loads. These structures are required at all changes in direction of the line greater than two degrees or where termination sites have been predetermined to facilitate line construction and operation. These structures are designed to withstand high longitudinal loading on the structure, which cannot be accommodated by the lighter suspension structures. Tension structures are also used in conductor ‘uplift’ positions. Conductor uplift is a term used to describe the loading condition where in the absence of sufficient vertical loading, the suspension insulator string will swing unacceptably close to the body of the tower under certain loading conditions, thus reducing electrical clearance. This situation can occur on a structure located at the base of a hill or steep terrain and is resolved by using a tension structure with its different insulation configuration even though the loading conditions would not normally require one at this location. Another use is for terminations at the end of the line.

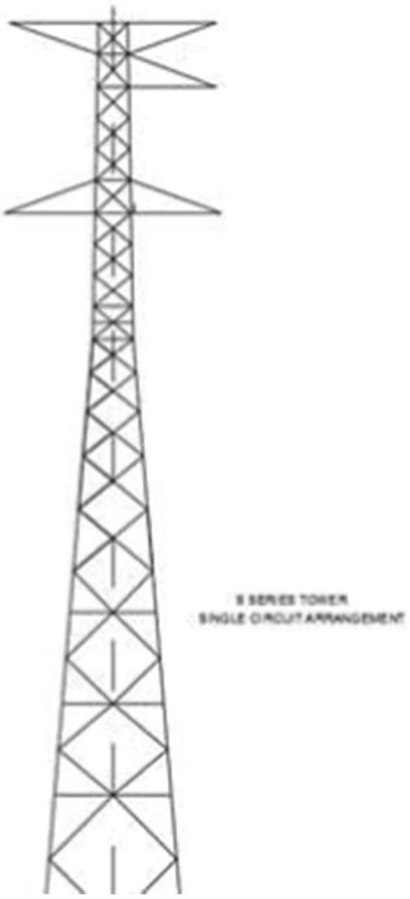
A suite of structures may be designed for a particular project to cover a range of angle duties. For example, an intermediate type may be designed for angles up to 40° and a ‘heavy duty’ type provided for angles up to 90 degrees and termination positions.

The transmission line works include the design, procurement, construction and commissioning of a new segment of 275kV single circuit transmission line following the proposed realignment (see Figure 2.2). A preliminary design for the proposed realignment has been prepared by Powerlink based on the LiDAR data provided by Stanwell capturing the ground survey and vegetation survey (refer Appendix B). The preliminary design includes 19 structures and spans approximately 5km. Table 2.3 outlines the proposed structure locations and details.

The new segment of transmission line will be cut into the existing feeder at both ends, and the redundant assets will be decommissioned. Steel poles will be utilised to cut-over the feeder from the existing transmission assets to the proposed assets. The arrangement of these poles will allow them to be constructed without an outage and cut-over during a short outage. The remaining structures are modified single-circuit forms of Powerlink's existing 'S' series towers (see Figure 2.4). These include seven suspension towers (D2, D3, D5, D6, D7, D8, D9), and seven tension towers (D2, D4, D10, D10A, D11, D13, D14 (refer Table 2.3).

Table 2.3 Proposed structure locations and details

Structure number	Chainage (m)	Deviation Angle (deg)	Structure description	Structure height (m)	Comment
1030-STR-9008	0		S2S2	32.98	Existing tower & span
D1L	247.87	-59	25m single phase strain poles		
D1C		-65		25	
D1R		-65			
D2	375.92		D2T90S1 +3	46.8	
D3	789.92		D2S2S1 +9	53.3	
D4	1137.92	86	D2T90S1 +3	46.8	
D5	1462.92		D2S2S1 +6	50.3	
D6	1772.92		D2S2S1 +6	50.3	
D7	2320.92		D2S2S1 +12	56.3	
D8	2810.92		D2S2S1 +12	56.3	
D9	3268.49		D2S2S1 +21	65.3	
D10	3639.72	-3.36	D2T40S1 +36	79.8	
D10A	3948.77	-12.73	D2T40S1 +12	55.8	
D11	4229.57	62.17	D2T90S1 +12	55.8	
D13	4463.64	-10.15	D2T40S1 +9	52.8	
D14	4788.92		D2T90S1 +0	43.8	
D15L	4903.36	-71	25m single phase strain poles		
D15C		-78		25	
D15R		-78			
1030-STR-9019	5067.58		S2S2	38.1	Existing tower & span



S SERIES TOWER
SINGLE CIRCUIT
ARRANGEMENT

Figure 2.4 Modified 'S' Series

2.6.1.2 Conductors, earth wires, insulators and fittings

Conductors

For single circuit configuration, each structure will support 6 individual conductors, configured as three twin conductors and two smaller diameter earth wires. The line is intended to be strung with Sulphur conductors.

Earth wires

Overhead earth wires provide protection to the conductors from direct lightning strikes to safely dissipate earth fault currents and are also used as a support for optical fibre cables for communication purposes.

Insulators and fittings

Insulators are used to provide a connection between conductors and structures and to provide electrical insulation between the high voltage electricity and the (earthed) structure. The length of insulators in a string is determined by line voltage, clearance requirements and environmental (e.g. pollution) considerations. For this Project, insulators will be ceramic disc type. Special galvanised steel or aluminium fittings connect both the line end of the insulator to the conductors and the tower end to the structure. A typical insulator string is shown in Figure 2.5.

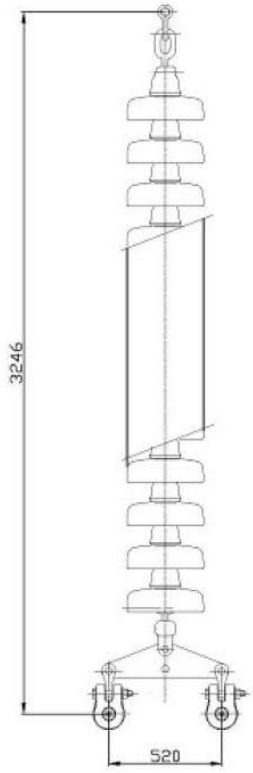


Figure 2.5 Typical insulator string

Telecommunications

No telecommunications infrastructure (OPGW) is proposed for the relocated transmission line.

2.6.2 Easements and access

2.6.2.1 Easement

For the majority of cases, Powerlink Queensland transmission lines are constructed on easements. An easement is a registered interest in a parcel of land providing Powerlink Queensland with a right of way allowing the transmission line to be built, operated and maintained on part of a property with ownership of the land remaining with the landholder. Restrictions are placed on activities permitted on an easement to maintain public safety and ensure the line can operate reliably. Compensation is paid to directly affected landholders in accordance with the heads of compensation in the *Acquisition of Land Act 1967* (Queensland) (Acquisition of Land Act).

Easement width is determined by the size and type of line, and the need to maintain safe electrical clearance between the high voltage conductors and any object or structure adjacent to the line under all conditions. This includes safe electrical clearance to vegetation in and adjacent to the easement. For a 275kV transmission line, a 60m wide easement will be acquired. Within the Yarraman State Forest, Powerlink intend to obtain easements via the ‘Governor In Council’ process.

2.6.2.2 Access tracks

Heavy vehicle access to the transmission line is required during construction and for ongoing operation and maintenance. In steeper terrain or where creeks or gullies intersect the easement, tracks may need to detour off the easement. Where access is generally available from adjacent public roads, limited access track construction to the structure site is normally all that is required for both construction and maintenance activities. In all cases, maximum use is made of existing public and privately owned roads and tracks.

For this Project access to each structure location will be either from existing HQPlantations access tracks or new access tracks. Figure 2.2 shows the proposed access track locations. The existing tracks may require upgrading to make them suitable for construction vehicle access, but it has been assumed that these works will be minor. Also, it is understood that the tracks within the area mapped as 'King 2 East Additional Surface Area' in Figure 2.2 will be available during the transmission line construction period, but no longer available after the Project is completed.

The cleared width for new access tracks will be required to be approximately 8.6m depending on the terrain and required road formations. Access tracks will be constructed in accordance with Powerlink Transmission Line Access Track – Guideline (ASM-GDL-A576804) included in Appendix H.

2.6.3 Construction methodology

Construction of a transmission line involves a series of field activities which are broadly grouped as follows:

- site set out (refer Section 2.6.3.1)
- flora and fauna surveys (refer Section 2.6.3.2)
- mobilisation, including establishment of accommodation camps, laydowns and offices
- installation of gates, grids, cleandown bays and access tracks
- vegetation clearing (refer Section 2.6.3.3)
- tower site benching
- foundation installation (refer Section 2.6.3.4)
- structure assembly and erection (refer Section 2.6.3.5)
- conductor and earth wire stringing (refer Section 2.6.3.6)
- road crossings (refer Section 2.6.3.7)
- watercourse crossings (refer Section 2.6.3.8)
- laydown areas (refer Section 2.6.3.9)
- site reinstatement (refer Section 2.6.3.10)
- demobilisation.

2.6.3.1 Site set out

Following cadastral survey of the easement, the location of the transmission line (within the easement) is then set out. Structure sites are marked and orientated using design information. Structure locations are based on the technical characteristics of the structures and conductors, topographical constraints, landholder requirements and environmental considerations.

Easement boundaries will be identified and marked prior to vegetation clearing.

2.6.3.2 Flora and fauna surveys

A pre-construction weed survey will be undertaken prior to construction activities commencing, and a post-construction weed survey will be undertaken after the first wet season once construction is finalised. The surveys will occur along the easement and access tracks and will identify weeds of national significance, restricted and invasive matters and regionally declared weed species.

Pre-clearance habitat surveys will be undertaken immediately prior to clearing to identify any active breeding places and where possible, relocate fauna to an undisturbed location.

2.6.3.3 Vegetation clearing

The amount of vegetation clearing required is dependent on terrain, vegetation type and significance, and landholder requirements (where feasible). The aim is to clear vegetation sufficient to meet Powerlink's safety, reliability and operational requirements for the transmission line.

In non–sensitive areas, the most effective and efficient clearing method for large scale clearing is by bulldozer, often fitted with a 'stick rake' or 'tree spear' to push over larger trees or use of a mega-mulcher. Timber of commercial value may be recovered prior to clearing. Depending on land use, landholder requirements, environmental constraints and maintenance requirements, cleared vegetation may be dealt with in the following ways:

- chipped or mulched on site and used for easement revegetation
- stacked and windrowed - any stacked and windrowed vegetation must be placed in a manner which does not concentrate overland flow or create erosion
- stacked and burnt - any burning of cleared vegetation may only occur in accordance with a permit from the Queensland Fire and Emergency Services, and so as not to create any additional hazard to the surrounding environment or transmission line.

In sensitive areas, such as steep or erosion prone terrain, near watercourses or other environmentally sensitive areas, alternative methods of clearing such as hand clearing (chainsaw) or the use of a fella-buncher (or excavator with cutting attachment) may be appropriate. These techniques are more labour intensive and time consuming than other mechanical means but achieve the desired clearing outcome. In steep terrain or environmentally sensitive areas, trees may be cut above ground level, felled along the contour, and allowed to decompose naturally or mulched. In areas where hand clearing is required, stump heights will be discussed and agreed with the landholder. Where visual impacts are identified, lower vegetation is typically retained along road corridors to provide a visual screen. In these areas, supplementary planting of suitable species may be used to improve screening.

Chemical treatment may also be used for selective treatment of incompatible vegetation while minimising ground disturbance. The method is mostly suitable for regrowth vegetation and may be through stump injection, cut stump, or overall spray technique.

Clearing for the Project will be carried out in accordance with the requirements specified in the Environmental Management Plan (refer Appendix G) and the general arrangement for transmission line vegetation management (Appendix H). Specific clearing considerations for the Project are detailed below.

Structure pads

Nominally, each structure pad will require a 40m x 40m cleared area. This area may require earthworks to make the site suitable for construction and maintenance. From the 14 March 2019 site visit, it was determined that a number of tower sites require moderate and major benching earthworks.

Easement clearing

The new land access rights area will be cleared using the governing principle that vegetation removal is of minimum disturbance, consistent with the safe operation of the transmission line. This involves removing all vegetation within the proposed new land access rights area that will pose a threat to the integrity of the transmission line, including when fully grown. Clearing of remnant vegetation within the transmission line easement has been minimised by siting transmission structures outside of remnant vegetation and through the use of helicopter stringing of the transmission line in areas of remnant vegetation. Consideration has also been given to minimising clearing of regrowth native vegetation through the implementation of draw path clearing (approximately 40m wide) as opposed to full easement clearing.

No clearing of the remnant semi-evergreen vine thicket and dry rainforest communities (RE12.5.13c) within the transmission line easement is proposed, and stringing of the transmission line in these locations will take place via helicopter (refer further to Figure 2.2 and Section 2.6.1). Clearing of the high value regrowth vegetation (RE12.5.13c and RE12.11.11) between structures D1 and D5 will also be restricted to that required for the draw path (approximately 40m wide easement clearing), apart from at proposed break and winch sites where full easement clearing will occur.

Harvesting of the Hoop Pine plantation areas with the easement is being undertaken by HQPlantations prior to Powerlink's works.

Brake/Winch Sites

It is envisaged that the new section of transmission line will be strung in two main pulls, plus the cut-overs between the existing and new lines. Each of the two main pulls will require a brake and winch site at either side of the pull. The main pulls are expected to be D1 to D4, and D4 to D15. Full clearing of these easement at the brake and winch sites for these pulls is proposed.

Access tracks

Existing HQPlantations forestry access tracks are proposed to be used for access to the transmission structures during construction and operation (refer Figure 2.2). In areas where new access tracks are required, it is proposed that these are located within areas of Hoop Pine plantation to avoiding clearing of remnant vegetation. Required widening of existing access tracks will also occur in areas of Hoop Pine plantation. Widening of access tracks is not planned within areas of semi-evergreen vine thicket, woodlands, dry rainforest communities, and gullies and ridges north of Rocky Creek.

2.6.3.4 Foundation installation

Geotechnical assessments are undertaken prior to construction to determine the appropriate foundation type for each structure. Bored foundations are often used and are shown on Figure 2.6. Alternative foundation types (i.e. mass concrete, micro-piles, mini-piles) are used in situations where ground conditions are not suitable for bored foundations.

The choice of foundation type is dependent on the specific nature of the soil and rock and takes into account soil/concrete friction strength, water levels, soil bearing capacity, construction constraints, rock levels, and soil properties.

Construction of tower foundations usually consists of the following steps:

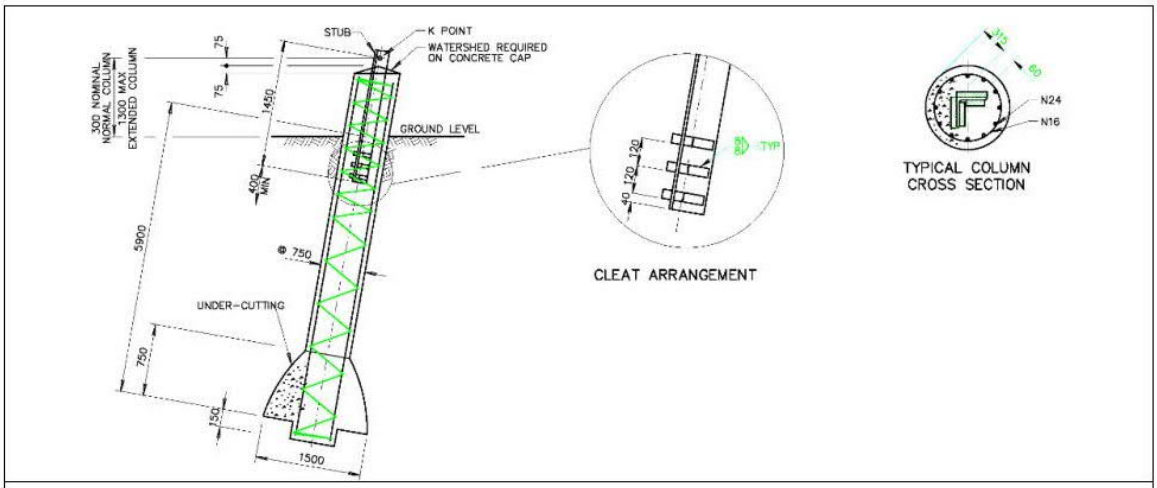
- setting out
- excavation/boring
- leg stub/base set up
- placement of reinforcing steel/concreting
- concreting of excavated foundations
- installation of earthing.

Setting out involves the placement of temporary pegs on site to mark the location of the excavation. Dimensions of foundations are determined by structure type and height and site soil conditions. Excavation of bored foundations may be by truck mounted auger, backhoe or track mounted excavator. The excavation is bored at the same inclination as the structure leg. In unstable ground conditions, the excavation may be stabilised by the insertion of a steel 'liner' in a bored foundation and shoring or timbering for a mass concrete foundation. Although dependent upon the geology of the surrounding soil, foundations are typically excavated to approximately 8–12 m.

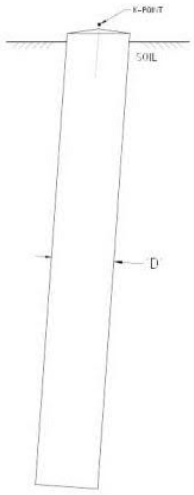
Micro or mini piles involve small diameter 50-300 mm diameter drilled holes which are designed to have a centrally placed steel reinforming member. Subject to ground conditions, the foundation design and the size of the drilling equipment being used, a range of piles from 3-12 are drilled per leg. These small and grouped piles are then bonded and tied back into a pile cap and/or column forming a tower leg foundation. Micro or mini pile foundations are the preferred foundation for difficult drilling conditions including hard rock, saturated and collapsing soils.

Leg stub setup is the process of placing an extension of the tower leg (the 'stub') in the correct position and inclination within the excavation, in preparation for concreting in place. A temporary jig or template is used to hold the stub firmly in place in the correct horizontal and vertical alignment and is removed after concreting. Reinforcing steel is required in tower foundations, with the amount varying with tower and foundation type. Temporary formwork is also used for the foundation column above ground (bored foundations) and above the base (mass concrete foundations). Concrete is placed in accordance with normal construction procedures and formwork removed after an appropriate curing time.

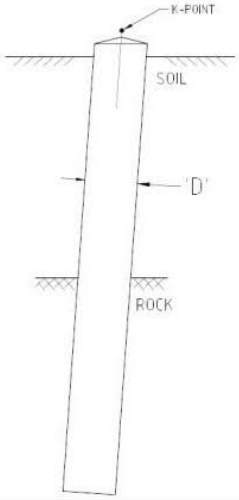
Backfilling of mass concrete foundations is completed using the excavated material (if suitable) or imported fill. Surplus material is spread evenly about the site or removed, depending on quantity and suitability.



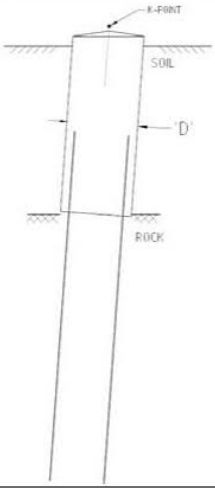
Bored undercut foundation



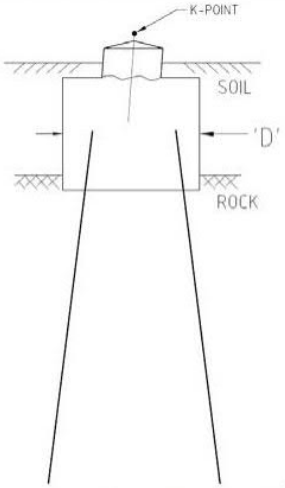
Bored straight side



Bored rock socket (low to hard strength rock)



Bored rock anchor (medium to hard strength rock)



Bored rock anchor (medium to hard strength rock)

Figure 2.6 Typical bored foundation types

2.6.3.5 Structure assembly and erection

The term ‘structure assembly and erection’ refers to a sequence of activities from delivery to site, preassembly, erection, tightening and inspection tower components of each structure.

Steel for lattice towers is fabricated, galvanised, sorted and bundled ready for delivery at a contractor’s facility off site and transported to the final location in two or more pieces, typically by semi-trailer. Preassembly of the tower is usually carried out adjacent to its final site and involves assembly of several sections, which will allow convenient erection in the following stage.

Where practical, bolts holding the members together are tightened at this stage. Larger or heavy towers may require the use of a small mobile crane at this stage to move members and sections about the site. A large mobile crane is used to erect the tower in sections with a work crew installing and tightening all bolts and checking that the structure is complete.

2.6.3.6 Conductor and earth wire stringing

Depending on constraints, terrain, and access, conductor and earth wire stringing is usually carried out in sections of varying lengths of up to 10km between termination structures. Existing infrastructure such as buildings, roads and fences may require hurdling which is a method that adopts a protective barrier to prevent contact and potential damage. Additionally, existing distribution and transmission feeders which intersect the preferred alignment may require other electrical entity works to facilitate stringing. This may include but is not limited to:

- undergrounding existing distribution feeders
- supply of additional generation to impacted feeders
- network outages
- live line hurdling which involves the installation of a portable undercrossing protective barrier.

The conductor and earth wire stringing process requires the use of specialised equipment and is briefly described as follows:

- A powerful winch (puller) is set up at one end of the stringing section, and a braking device (tensioner) at the other. These designated ‘brake and winch’ sites are typically 40m x 40m and predominately on-easement. In some instances, off-easement brake and winch sites may be required due to topographical constraints and constructability requirements. These brake and winch sites are generally cleared and stripped of the topsoil layer, which is stockpiled separately and used for rehabilitation of the site at completion of stringing. Off-easement brake and winch sites are not currently proposed for this Project.
- Specially designed pulleys (stringing sheaves) are fixed at each conductor and earth wire attachment point on each structure in the section.
- Multiple high strength, non–rotating steel winch ropes are threaded continuously through the corresponding sheave on each structure between the winch and the tensioner. This is often facilitated by threading light polypropylene ropes through the sheaves as they are installed. These ropes are used to pull the winch rope through the sheaves at each structure without the requirement for a worker to climb the structure.
- For each stringing section for each conductor and earth wire, individual winch ropes will be runout.
- The conductors (electrical cables) are then pulled out under tension through the stringing sheaves on each structure and through to the winch. The tension in the winch ropes is continuously monitored to avoid over tensioning. Workers carry out visual checks through the stringing section to ensure that the conductor run out proceeds smoothly and wires remain clear of all obstructions.
- At the completion of the run out of all conductors and earth wires, they are attached to structures or temporary anchorages.
- Conductor and earth wire tensions are adjusted to give the design sag (i.e. the correct ground clearance).

- Conductors are clamped in final positions at the end of insulator strings at each suspension structure and are terminated on insulator strings at each tension structure.
- Conductor spacers are installed between sub–conductors (sometimes from a helicopter).
- Earth wires are clamped or terminated as required at each structure earth wire peak.
- Equipment is repositioned and the above process is repeated for subsequent stringing sections.

A variation of the above process uses a helicopter to undertake the direct run-out of conductor and/or earth wire. It is similar to the above process but differs in that no steel winch rope is used. Helicopter string is proposed between structures D5 and D6 and D9 and D10A to minimise impacts to the remnant semi-evergreen vine thicket and dry rainforest communities present along the alignment in these locations.

2.6.3.7 Road crossings

Where transmission lines cross road reserves, approval will be sought from the relevant road authority under Section 102 of the Electricity Act.

2.6.3.8 Watercourse crossings

Where possible, structures will be located 50m from watercourses. Where the transmission line crosses watercourses, previously cleared tracks for existing crossings will be preferentially used to minimise new watercourse crossings. Where new crossings are required, the construction methodology will be dependent upon the size of the watercourse. However, these are generally developed in line with Planning Act accepted development requirements for operational work that is constructing or raising waterway barrier works.

The construction of bed-level crossings typically involves the excavation of the crossing bed to an appropriate depth to provide a stable base. The excavation is then lined with a heavy-duty geo-fabric and filled with aggregate using a combination of rock sizes up to150 mm to lock the rock into place. In some instances where it is not practical to undertake excavation works due to unfavourable soil properties, alternative solutions may be required. This may include, but may not be limited to:

- installation of bog mats
- installation of geomaterials.

2.6.3.9 Laydown areas

Laydown and staging area requirements will be determined by the Project contractor. However, it is anticipated that a laydown area will be required for each structure. A site office and staging laydown area is proposed to be located in the Yarraman township.

2.6.3.10 Site reinstatement

Reinstatement will be undertaken progressively during construction, where practicable. Powerlink will ensure that all disturbed areas impacted from construction are reinstated at the end of the Project. The short-term goal of reinstatement is the stabilisation of soils to provide a suitable matrix for vegetation establishment to aid in preventing erosion. Reinstatement also includes the replacement of topography, topsoil, and fences where disturbed.

2.6.4 Operation and maintenance

2.6.4.1 Operation

After completion of construction and commissioning of the transmission line, the amount of activity on site decreases substantially. During operation, normal practice is for maintenance staff to carry out scheduled inspections of the line, easement, and access tracks on average twice per year.

These inspections (patrols) are either by vehicle or helicopter. Additional inspections may be required to perform such activities as emergency repairs. Powerlink maintains access tracks suitable for dry weather 4WD vehicles use (refer to Powerlink Transmission Line Access Track Guidelines (ASM-GDL-A576805) in Appendix H).

2.6.4.2 Maintenance

Structures, conductors and fittings

Structures, conductors and fittings are inspected for any signs of unusual wear, corrosion or damage. Transmission lines are designed for a 50-year in-service life and are very reliable under most conditions. Maintenance staff normally conduct a detailed visual inspection about once every two to three years.

Provision may be made for some structure and conductor maintenance tasks to be carried out from a helicopter, with the line either energised or de-energised. Typically, insulators are replaced every 25 years with the majority of the remaining equipment designed to last the life of the line.

Easements

Inspection of the easements is carried out on each scheduled line patrol, with the main aim to record the type, density and height of vegetation regrowth. Additional matters of interest include new under-crossings (e.g. distribution powerlines), or other activity or construction within the easement which may affect operation or maintenance of the line.

Powerlink's policy is for the landholder to be contacted prior to any vegetation control work on a property and the landholder's agreement obtained regarding the treatment method to be employed. This is particularly important if herbicides are involved for withholding periods for meat production.

Easement vegetation management is important to ensure the safe operation of the transmission line. Vegetation management is undertaken in accordance with Powerlink's standards and procedures.

Three techniques for vegetation management are employed:

- mechanical
- hand clearing
- chemical (herbicides).

The technique adopted for each area takes into account a number of issues such as landholder requirements, type of regrowth, terrain and the local environmental conditions. Mechanical clearing is usually by a tractor driven slasher or similar vehicle, and is suitable for shrubs and smaller trees. It is limited to relatively flat and accessible terrain due to the type of vehicle used.

Hand clearing is labour intensive but allows the vegetation clearing to be quite selective and ensures that disturbance to non-target species is minimised. Hand clearing can be employed in areas where vehicle access is not available. Lopping of larger trees is also an option near urban or in visually sensitive areas.

Chemical treatment may be used for selective treatment of incompatible vegetation while minimising ground disturbance. The method may be through stump injection, cut stump or overall spray technique and is mostly suitable for regrowth vegetation.

Access tracks

Maintenance of access tracks is required to ensure that vehicle access to structure sites is available for inspections and structure maintenance. Techniques employed should be appropriate for the area. For example, a grader may be required in hilly terrain where some reshaping of drainage is necessary, but a slasher could be preferred in open grasslands.

The work should minimise disturbance to natural groundcover, thus reducing erosion potential and subsequent maintenance requirements. Maintenance of access provided by others is undertaken in consultation with the appropriate authority.

2.6.5 Decommissioning

Typically, a transmission line has a 50-year operational life. After this time it may:

- be replaced with a transmission line designed for the revised environmental constraints and electrical system requirements at the time
- if the line were no longer required, be dismantled and the easements may be surrendered to the property owner.

At the time when the transmission line is decommissioned, it will be de-energised, dismantled and removed. The existing transmission line between structures D1 and D15 will be de-energised, dismantled and removed in line with the process outlined in the following sub-sections.

2.6.5.1 Dismantling and removal of the transmission line

The process of dismantling and removal of the transmission line is staged and includes the following:

- Lowering the overhead conductors and earth wires to the ground and cutting them into manageable lengths to roll onto drums or reels. These are removed from the site and sold as scrap metal. Some minor damage to vegetation results, but other clearing is not normally required for this operation.
- Removing insulators and line hardware from structures at the site and disposal at a waste facility that is authorised to accept the waste.
- Dismantling towers in manageable sections and removing from site. The steel is usually sold as scrap metal. Steel poles are cut into pieces small enough to be handled and transported, then removed from site.
- Demolition of foundations is normally carried out as follows:
- the ground surrounding each foundation (tower leg/holding down bolts and encasing concrete) is excavated to a depth of approximately 600 mm below the natural surface level
- the concrete is broken away and the tower leg or holding down bolts and reinforcing steel is cut off about 500/600 mm below ground
- demolished concrete and steel are removed from site for disposal or recycling at a waste facility that is authorised to accept the waste
- the excavation is backfilled and compacted with suitable (imported, if necessary) material.
- In specific situations such as cultivation, some variation would be necessary. For example, foundations may be cut off deeper (to avoid any potential interference with ploughing machinery) and backfilled with better quality soil.

2.6.5.2 Environmental management, easement restoration and rehabilitation

For the sections of the existing Feeder 831 alignment within both the existing surface rights area of the Meandu Mine and the K2E ASA, easement restoration and rehabilitation is not proposed following dismantling and removal as these areas will be subject to future mining operations. Easement restoration and rehabilitation will be undertaken for the sections of easement outside of the K2E ASA in accordance with the process outlined below.

Given the typical operational life span of a transmission line is 50 years, it is considered unnecessary at this stage to identify specific environmental management, easement restoration and rehabilitation measures which will be undertaken at the time of decommissioning.

It is expected that legislative frameworks, regulatory provisions and best practice strategies with regard to environmental management will continually improve. Therefore, identifying and committing to current environmental management standards for decommissioning works would likely be contemporary at the time of decommissioning.

Powerlink is committed to employing environmental management strategies during the decommissioning phase which meet or exceed legislative, regulatory and best practice requirements current at the time. All necessary permits and/or approvals which are required to undertake decommissioning works will be sought and received prior to decommissioning works commencing. Broad environmental management strategies that will be employed during decommissioning are discussed below:

- Soils – both temporary and permanent erosion and sediment control strategies and/or devices will be implemented during decommissioning works to ensure that transmission line structure sites are left as stable landforms. Surface stabilisation (e.g. mulching or grass seeding) may be undertaken where necessary to ensure that large scale erosion does not occur and sites are returned to the equivalent surrounding landscape. All excavations made to remove structure footings to a depth of 1m below ground level will be filled and covered over.
- Water quality – as for construction phase works, water quality protection measures will be implemented during decommissioning works. For access tracks across drainage lines and/or watercourses, the access tracks will be removed if not required by the landholder after decommissioning. Associated water structures will also be removed, and the bed and bank profiles will be returned to the surrounding waterway profile.
- Air quality – decommissioning works will involve land surface disturbance, excavation, use of machinery and possibly clearing of vegetation regrowth. These activities have the potential to cause impacts to local air environments and nuisance to sensitive receivers. Therefore, as for construction phase works, management measures to reduce the occurrence, duration and intensity of potential air quality impacts will be implemented.
- Noise – as with air quality considerations, decommissioning works will involve activities which have the potential to impact on local acoustic quality and sensitive receivers. Therefore, management measures will be implemented to reduce actual or potential acoustic impacts. All decommissioning works will comply with operational hours specified by relevant authorities and legislation.
- Infrastructure – during decommissioning, assets will be dismantled and/or cut on site into manageable sections which can be loaded and removed from the easement. The decommissioning process will generate traffic on local roads comprising standard vehicles utilised for staff movement; trucks and heavy vehicles for collection of dismantled assets; and heavy vehicle movements to deliver and remove machinery required to undertake decommissioning works. Whilst traffic movements associated with decommissioning are not expected to exceed those associated with construction works, traffic management on local roads will be employed where required.
- Vegetation – clearing of vegetation regrowth along sections of easements and access tracks may be required to gain appropriate access to transmission line assets.
- Easement rehabilitation – should the easements no longer be required, passive rehabilitation such as natural regrowth of vegetation over the easements would be allowed and encouraged. Active rehabilitation including planting of native, endemic species, including control of significant weed infestations may be undertaken. Monitoring of rehabilitation will be undertaken to ensure success.
- Access track rehabilitation – access tracks not required by landholders would be allowed to passively rehabilitate. In some circumstances, light scarifying and seeding may be undertaken to promote vegetative regeneration.

- Waste – decommissioning of the transmission line will result in waste material including cleared vegetation, steel, concrete, cable, insulators, conductors etc. Where recycling facilities for these waste materials exist at the time of decommissioning, these waste materials will either be re-used or recycled. If no recycling facilities exist, waste materials will be disposed of in accordance with regulatory requirements.

2.6.5.3 Decommissioning Management Plan

Prior to decommissioning of the transmission line, a Decommissioning Management Plan will be prepared. This will provide detail regarding the proposed decommissioning works, environmental risks associated with decommissioning, and management and mitigation measures. This plan will utilise environmental management strategies, practices and technologies current at the time of decommissioning to comply with regulatory provisions and to appropriately manage environmental issues.

2.7 Temporary infrastructure requirements

The following temporary infrastructure is anticipated to be required:

- staging laydown for each structure (included within the clearance footprint for each structure)
- site office and laydown area.

The location of the site office and laydown area will be defined during detailed design and will be subject to assessment and approval by the relevant local council, if required. It is likely that these areas will be located in Yarraman. Approvals for these facilities will not form part of the Infrastructure Designation process.

2.8 Workforce

The anticipated peak construction workforce will be approximately 45 persons (average 25 persons), occurring over a one-to-two-month peak period. Accommodation camps for the Project workforce are not proposed as accommodation requirements can be met in regional towns (i.e. Yarraman, Nanango, Kingaroy).

2.9 Materials

2.9.1 Concrete batching

Temporary concrete batching plants are not proposed for construction of this Project. Concrete required for the foundations will be sourced from existing ready-mix concrete facilities at either Nanango or Kingaroy.

2.9.2 Quarry material

The Project will require access to quarry materials during construction for access tracks, waterway crossings, erosion and sediment controls, foundations. Quarry materials will also be required for ongoing maintenance. These materials include, but are not limited to, rock, gravel, sand and soils.

Where available, these materials will be sourced from local registered quarries. In the absence of available registered quarries, permits will be sought for the extraction of required materials. If required, such permits will occur outside of the Infrastructure Designation process.

2.9.3 Water supply

General construction water to be used for dust suppression, access track construction and other activities will be sourced from local dams and bores in consultation with landholders. Extraction of water from local rivers and creeks will be undertaken in accordance with the requirements under the Water Act.

Water used for the batching of concrete requires specific parameters, for example salinity and pH.

Potable water for human consumption will be sourced from tested and treated water sources.

2.9.4 Power generation

Generators are required to power the site offices.

2.9.4.1 Project fuel requirements

Vehicles, machinery and equipment required for the project are anticipated to be fuelled by either diesel or unleaded petrol. Refuelling of vehicles will occur at local petrol stations. No refuelling will occur on-site.

3 COMMUNITY AND STAKEHOLDER CONSULTATION

Section 3 describes Powerlink's Stakeholder Engagement Framework. It describes the engagement activities undertaken for the Project along with proposed future engagement activities.

3.1 Engagement framework

Powerlink is committed to effective and genuine stakeholder and landholder engagement practices. Powerlink's activities are guided by a Stakeholder Engagement Framework which is underpinned by the key principles of integrity, openness, responsiveness, accountability and inclusiveness. These principles are consistent with Powerlink's values of – accountability, customer, teamwork and safety. Powerlink's Stakeholder Engagement Framework is available online at: Stakeholder Engagement Framework | Powerlink.

The aim of Powerlink's engagement with landholders, the community and other stakeholders is to:

- collaborate and partner with a range of key stakeholders to incorporate their advice and feedback during key stages of decision-making
- gather information to identify the proposed land acquisition approach and associated timeframes for delivery
- facilitate discussions with landholders to gain access to properties to complete the required environmental and technical studies which support information analysis and decision-making
- provide timely, relevant and meaningful information about the project, reflective of the scale and complexity of project activities
- ensure landholders, the community and other stakeholders are aware of key project activities and how they can genuinely provide input within the scope of consultation processes to contribute to decision-making
- listen to and understand what landholders, the community and other stakeholders value and actively consider how this can be taken into account when analysing alternatives and determining solutions
- provide feedback on and demonstrate where landholder, community and other stakeholder input has informed decision-making
- promote the project need and benefits to secure stakeholder support
- monitor, understand and consider landholder sentiment towards the project, working alongside landholders to address potential concerns and aspirations they may have
- identify potential risks and management strategies which acknowledge feedback from landholders, the community and other stakeholders.

3.2 Landholders, the community and other stakeholders

For this Project, Powerlink has identified and categorised stakeholders and their roles in decision-making processes in accordance with an engagement framework from the International Association for Public Participation (IAP2) (Figure 3.1). Powerlink has used this spectrum to guide the frequency, nature and scope of stakeholder engagement carried out for the Project. Table 3.1 provides an overview of the key stakeholders engaged and the associated type of engagement activities Powerlink has conducted with them for the Project to date.

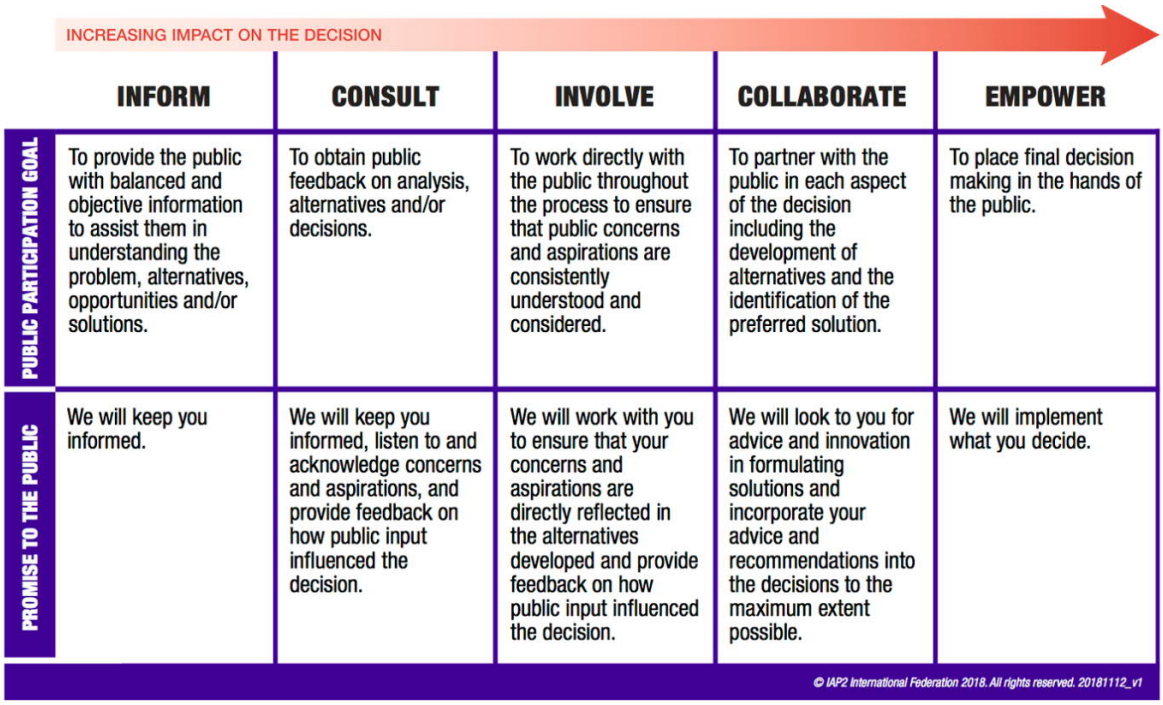


Figure 3.1 IAP2 Engagement spectrum

Table 3.1 Key stakeholders and scope of engagement

Group	STAKEHOLDER	Engagement focus			
		INFORM	CONSULT	INVOLVE	COLLABORATE
Federal Government	Department of Climate Change, Energy, the Environment and Water (DCCEEW)		✓		
State Government	State Member of Parliament (MP)	✓			
	Department of Resources			✓	
	Department of State Development, Infrastructure, Local Government and Planning			✓	
	Department of Environment and Science				✓
Local Government	Toowoomba Regional Council			✓	
	South Burnett Regional Council			✓	
Peak bodies	Yarraman Business Group (Chamber of Commerce)	✓			
	Local environment/community groups		✓		
Industry	Ergon Energy	✓			
	Stanwell Corporation Limited				✓
	HQPlantations Pty Ltd				✓
Cultural heritage	Wakka Wakka People			✓	
Landholders	Nearby landholders in Yarraman community (with potential to be impacted by construction of the relocated transmission line)		✓		

3.2.1 Landholders and trustees/lesses

The proposed transmission line relocation does not directly affect any private homes as it only traverses Stanwell-owned industrial land, State forest and a local government road reserve. There are six directly affected landholders:

- Stanwell – Freehold tenure over the existing mine site and ML6674 covering the existing mine site and the K2E ASA over the State forest.
- Queensland Department of Environment and Science (DES) – Yarraman State Forest tenure with HQPlantations as licence holder. HQPlantations manages, harvests and re-grows plantation timber in the State Forest for sawn timber, plywood, reconstituted panels and woodchip products.
- Queensland Department of Resources – Owns the road reserve (called Ridge Road), while Toowoomba and South Burnett Regional Councils are trustees.

3.2.2 Cultural heritage and Native Title

Powerlink is committed to establishing and maintaining respectful and cooperative engagement with Aboriginal Parties (Native Title parties) potentially impacted by the Project. In doing so, Powerlink also strives to provide effective recognition, protection and conservation of Aboriginal and Torres Strait Islander Cultural Heritage.

Powerlink intends to meet its duty of care under the *Aboriginal Cultural Heritage Act 2003* (Queensland) (ACH Act) by carrying out its Project activities in accordance with a Cultural Heritage Management Agreement to be negotiated with the relevant Aboriginal Party in the area, the Wakka Wakka People. This will include processes for detailed Cultural Heritage assessments and on-site cultural heritage surveys with Traditional Owners. Powerlink will also work closely with Stanwell to ensure a coordinated approach to cultural heritage management.

In relation to Native Title, Powerlink will engage with the Wakka Wakka People to understand their Native Title interests as well as provide notices under the Native Title Act to address Native Title matters over the impacted land. Powerlink will also include the Wakka Wakka People in its community engagement to understand any broader concerns or impacts of the relocation.

3.3 Results of consultation process

3.3.1 Preliminary stakeholder engagement

The following section provides the key messages that Powerlink has communicated to identified landholders, the community and other stakeholders during the preliminary stakeholder engagement process for the MID.

Powerlink messages:

- Powerlink is a leading provider of high voltage electricity transmission network services.
- We deliver electricity to more than five million Queenslanders and 238,000 businesses across the state.
- We own, develop, operate and maintain the high voltage electricity transmission network in Queensland.
- Our network extends 1,700km from north of Cairns to the New South Wales border.

Program messages:

- Powerlink has delivered more than 50 network connections for commercial customers. Our approach to project delivery ensures we secure the right outcomes for customers, the environment and the community – focusing on the following areas of performance: safety, commercial, operational, environmental and social.

- Our transmission network plays a vital role in providing access to the National Electricity Market for a range of customers, from large-scale renewable generators to large industrial customers such as mines, rail companies and mineral processing facilities.
- We are committed to genuine and timely engagement with landholders, the community and other stakeholders in planning our future network development in Queensland.

Project messages:

- Powerlink has been engaged by Stanwell to relocate a short section of the existing Tarong to Middle Ridge transmission line to safely accommodate future proposed mining activities at the Meandu Mine. Stanwell intends to conduct mining within the current 'surface rights area' located underneath the existing transmission line and is also currently seeking approval to increase the 'surface rights area' of the mine, known as the K2E Project. Stanwell has been engaging with landholders, the community and other stakeholders regarding the K2E Project since 2019 and is well-progressed with project approvals.
- This transmission line plays an important role in safely and efficiently transporting electricity generated at the Tarong power stations to the South-West Queensland area.
- Powerlink will be following a Ministerial Infrastructure Designation (MID) approvals process under the *Planning Act 2016* to finalise easement acquisition work to confirm the most appropriate location for this relocated section of transmission line.
- Powerlink has been engaging with Stanwell and other key directly affected landholders, in particular HQPlantations and the Department of Environment and Science, to examine the preferred option to relocate this short section of transmission line. The preferred alignment is directly to the east of Stanwell's proposed K2E Project to minimise impacts on surrounding landholders and the wider community, and ensure long-term suitability of transmission infrastructure. The preferred alignment will be the subject of further investigation and consultation with landholders, the community and other stakeholders through development of a Corridor Selection Report and subsequent Environmental Assessment Report (EAR), both of which will be released for public review and comment.
- These documents will explore the potential social, environmental and economic impacts of the proposed relocated transmission line and how those impacts will be managed and mitigated. Powerlink has engaged WSP to undertake these investigations and prepare the associated reports.
- Ultimately, Powerlink will submit the EAR to the Planning Minister when seeking planning approval for the Project.
- Powerlink is committed to establishing and maintaining respectful and cooperative engagement with Aboriginal Parties (Native Title Holders) potentially impacted by this project. In doing so, Powerlink also strives to provide effective recognition, protection and conservation of Aboriginal and Torres Strait Islander Cultural Heritage.
- Following the identification of some species and potential habitat listed under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in the vicinity of the proposed relocated transmission line, Powerlink is currently exploring any additional environmental assessments which may be required. Powerlink has assessed that the Project is unlikely to have a significant impact on a matter protected under the EPBC Act.

3.3.2 Engagement outcomes

The key outcomes from preliminary stakeholder engagement are included in Table 3.2.

Table 3.2 Summary of Outcomes from Preliminary Stakeholder Engagement

Stakeholder		Engagement		Key matters and issues	
Name	**Interest**	**Activities**	**Commenced**	**Raised by stakeholder**	**Proponent response**
Technical					
DSDILGP	Assessment manager	Pre-lodgement	Late February 2022	Pre-lodgement advice letter, dated 11 March 2022	Address requirements of Pre-lodgement letter in the MID application.
South Burnett Regional Council	Project impacts on local properties; benefits of Project for community	Invitation to comment or make submissions to the Draft Corridor Selection Report.	21 July to 1 August 2022	No issues raised	Nil
Toowoomba Regional Council	Project impacts on local properties; benefits of Project for community; Ridge Road (see Table 2.2)	Invitation to comment or make submissions to the Draft Corridor Selection Report.	21 July to 1 August 2022	Toowoomba Regional Council requested for Powerlink to "appropriately consider": — Minimising clearing works impacts on native flora and fauna (including developing a management plan). — Soil and topographical suitability. — Placing the transmission line over previously disturbed land and. — Avoid clearing remnant vegetation.	Council was advised that these matters would be adequately addressed through the MID process.

Stakeholder		Engagement		Key matters and issues	
Name	**Interest**	**Activities**	**Commenced**	**Raised by stakeholder**	**Proponent response**
Stanwell / TEC Coal	Owner of the Meandu Mine (see Table 2.2)	Meetings	Late February 2022	Determine a suitable proposed alignment in Stanwell land (Lot 10 on SP305494 & Lot 3 on RP176969) and Yarraman State Forest Lot 289 on FTY1859	Powerlink holds monthly meetings with Stanwell. These meetings have resulted in a proposed alignment acceptable to Stanwell, DES, HQPlantations and DCCEEW.
DES	Landholder for Yarraman State Forest (see Table 2.2)	Meetings	Late February 2022	Powerlink to seek an easement in Yarraman State Forest using standard DES policies and procedures. Easements to be created under s116A of the Electricity Act.	Powerlink has prepared a draft Environmental Work Plan (EWP), concept alignment and draft Cadastral Plans. QPWS has acknowledged Powerlink's approach to obtaining easements and MID.
DAF	Land trustee – Yarraman State Forest (see Table 2.2)	Meetings	Late February 2022	DES requested that HQPlantations would reach agreements to its satisfaction with SCL.	HQPlantations has formalised an agreement with Stanwell in regard to location for the transmission line that is acceptable to HQPlantations and to Powerlink.
HQPlantations	Plantation licence holder - Yarraman State Forest (see Table 2.2)	Meetings	Late February 2022	Powerlink to minimise as far as practicable additional long term public access to the alignment.	HQPlantations has formalised an agreement with Stanwell in regard to location for the transmission line that is acceptable to HQPlantations and to Powerlink. Powerlink is finalising long-term access arrangements to the proposed transmission line.
DCCEEW	Administers EPBC Act approvals process	Briefing from Stanwell of their EPBC Referral Process for the K2E Project and their meetings with DCCEEW	Mid March 2022	No issues were raised with Powerlink by DCCEEW.	Nil response from Powerlink. Powerlink design is to span all MNES habitat. Significant Impact Assessments undertaken for the Project determined that the Project was unlikely to have a significant impact on MNES protected under the EPBC Act.

Stakeholder		Engagement		Key matters and issues	
Name	**Interest**	**Activities**	**Commenced**	**Raised by stakeholder**	**Proponent response**
Political					
Toowoomba Regional Council Mayor and CEO	Project impacts on local properties; benefits of Project for community	Briefings with elected representatives	May - June 2022	No issues were raised with Powerlink by Toowoomba Regional Council.	No response required
South Burnett Regional Council Mayor and CEO	Project impacts on local properties; benefits of Project for community	Briefings with elected representatives	May - June 2022	No issues were raised with Powerlink by South Burnett Regional Council	No response required
Member for Nanango	Project impacts on local properties; benefits of Project for community	Briefings with elected representatives	28 June 2022	No issues were raised with Powerlink by the Member.	No response required
General community					
Adjacent landholders	Impacts of the Proposal on their land and in their local community; Social and environmental interest in the Project	Invitation to comment or make submissions to the Draft Corridor Selection Report.	21 July to 1 August, 2022	One submission by an adjacent landholder, regarding access to the project work sites from the New England Highway.	The route raised by the submitter is not to be used as part of the project Traffic Management Plan.
Wider community	Impacts of the Proposal in their local community; Social and environmental interest in the Project.	Project web page content	21 July to 1 August, 2022	No issues raised by non-adjacent parties.	Nil required

Stakeholder		Engagement		Key matters and issues	
Name	**Interest**	**Activities**	**Commenced**	**Raised by stakeholder**	**Proponent response**
Indigenous groups/Native title party					
Relevant Aboriginal Parties: Wakka Wakka #3 People.	Cultural Heritage Management Agreement between Powerlink and Traditional Owners	Meetings – ongoing On-site cultural heritage survey	Late February 2022	Cultural heritage protection. Community benefits.	Powerlink and the Wakka Wakka People have reached an agreement to enter into a formal cultural heritage agreement under the *Aboriginal Cultural Heritage Act 2003*. This will include an on-site cultural heritage survey by Wakka Wakka People. Discussions will also continue to develop social and economic partnerships with the Wakka Wakka People in relation to Powerlink's overall infrastructure footprint within their Native Title area.

3.4 Further consultation and engagement

Ongoing engagement with landholders, the community and other stakeholders remains a key focus during all phases of Powerlink's projects. This delivers Powerlink the opportunity to strengthen and leverage relationships across all relevant stakeholders well into the future for the entire Project lifecycle. Accordingly, Powerlink is continuing its direct engagement activities with landholders, the community and other stakeholders as part of the public consultation process for this EAR.

The MGR states that Powerlink must undertake consultation with all stakeholders in a manner outlined in a consultation strategy endorsed by the Minister. The MGR further states that the consultation strategy must include:

- the requirements prescribed in Schedule 4, Part 7 of the MGR and any other matter the Minister considerers relevant for the MID proposal
- the period for undertaking consultation (the consultation period).

The *Operational guidance for making or amending a MID* states that:

- Queensland Treasury (assumed to now mean DSDILGP) will liaise with the entity regarding any amendments required to be made to the consultation strategy prior to public consultation commencing.
- The commencement of consultation by the Minister is to be taken as the Minister having endorsed the consultation strategy provided by the entity.
- The entity may commence consultation on the same day or following the Minister commencing consultation.

Powerlink's proposed consultation strategy, and how it meets the requirements of the MGR, is included in Table 3.3. The Entity Consultation Templates provided to Powerlink by DSDILGP on 29 November 2022 will also be used within the consultation process.

Table 3.3 MID Consultation Strategy and MGR public notice requirements

Consultation Strategy	**Relevant MGR Requirements**
Public notices will be published in local newspapers including *The Chronicle*, *BurnettToday* and *High Country Herald* (the notices). The notices will include the information stated in the rows below.	**1** The entity must publish a public notice that must state:
A summary of Powerlink's proposal will be stated in the notices.	**a** the entity's proposal
The Project is proposed to be carried out on Lot 10 on SP305494, Lot 3 on RP176969, Lot 289 on FTY1859, and Ridge Road.	**b** a description of the land to which the proposal applies
The infrastructure type is a transmission line (land for electricity operating works).	**c** the type of infrastructure to which the proposal applies
Hard copies of the Project proposal will be placed in the following locations for landholders, the community and other stakeholders to access: — Toowoomba Regional Council's main office at 4 Little Street, Toowoomba; Yarraman library; Toowoomba City library; and mobile library. — South Burnett Regional Council's office at 45 Glendon Street, Kingaroy; office at 48 Drayton Street, Nanango; Kingaroy library; and Nanango library.	**d** how the proposal can be viewed or accessed
Electronic (soft) copies of the Project proposal will be placed in the following locations for landholders, the community and other stakeholders to access: — The Powerlink Project webpage, accessible: https://www.powerlink.com.au/meandu	

Consultation Strategy	Relevant MGR Requirements
— DSDILGP's Ministerial Infrastructure Designations Public Register webpage, accessible: https://planning.statedevelopment.qld.gov.au/planning-framework/infrastructure-planning/ministerial-infrastructure-designations	
Submissions can be made to the Minister via DSDILGP: — Online via the Ministerial Infrastructure Designations Public Register, accessible: https://planning.statedevelopment.qld.gov.au/planning-framework/infrastructure-planning/ministerial-infrastructure-designations. — Via email to infrastructuredesignation@dsdilgp.qld.gov.au.	**e** how to make a submission about the proposal;
— Consultation will commence on, or after, the day the Minister endorses the consultation strategy. — A 20-day public *consultation period* will occur. — The consultation period will commence the day after all of the above and below-mentioned notices have occurred. — It is proposed that the Minister does not need to give notice to directly affected landholders (refer to Section 3.4.13.4.1).	**f** the day by when submissions may be made to the Minister
Signs with public notice information will be placed Lot 10 on SP305494, Lot 3 on RP176969, Lot 289 on FTY1859, and along Ridge Road.	**2** Place a sign(s) on the site as established in the endorsed consultation strategy.
Notices with the above information will be sent to the landholders, trustees, and Native Title parties discussed in Sections 3.2.1 and 3.2.2. An electronic copy of this EAR on USB will also be provided to all of these stakeholders and directly affected landholders.	**3** Send a notice to stakeholders identified in the endorsed consultation strategy.

3.4.1 Notice to directly affected landholders

Section 37(3) of the Planning Act states that the Minister does not need to give notice to an owner of a premises if a notice has already been given to the owner as part of the consultation for an assessment under section 36(2) of the Planning Act. Section 36(2) of the Planning Act states:

> *"To make or amend a designation, if the designator is the Minister, the Minister must also be satisfied that adequate environmental assessment, including adequate consultation, has been carried out in relation to the development that is the subject of the designation or amendment".*

3.4.2 Consideration of submissions

Following the completion of consultation, it is understood that the Minister (DSDILGP) will provide Powerlink with copies of any submissions received, or a notice that no submissions were received. If submissions are received, Powerlink will consider and address matters raised in the submissions. If necessary and appropriate, changes will be made to Powerlink's proposal. Powerlink will then provide a written response to each submitter explaining how their submissions have been considered and addressed.

Powerlink understands that while consultation is being undertaken, the Minister (DSDILGP) will provide relevant State agencies with the Proposal for comment. The Minister (DSDILGP) will determine which State agency comments will be provided to Powerlink. Once Powerlink reviews the submissions, we will provide the Minister with a summary of how any State agency comments provided have been addressed as part of the consideration of submissions.

It is also noted that further consultation may be required if Powerlink proposes to change its Proposal after considering submissions, or as directed by the Minister.

4 ENVIRONMENTAL ASSESSMENT

Section 40 provides a broad description of the environmental values of the Project area, the likely impacts from the Project on these environmental values along with the proposed mitigation and management measures to reduce the extent of potential impact.

4.1 Land

A desktop assessment was undertaken to identify land features along the preferred alignment and within the surrounding Project area, including topography, geology, soil types, acid sulfate soils (ASS), resource interests and contaminated land. This desktop assessment was supported by the results from a geotechnical investigation comprising the drilling of six boreholes along the preferred alignment. Due to earthworks occurring in a number of relatively small and discrete locations, impacts to the topography of the area are anticipated to be negligible. The soil types present along the preferred alignment are not particularly erosion susceptible and the Project is not within a mapped erosion prone area. As such, the potential for soil erosion impacts is considered low. The risks from encountering ASS, contaminated land or unexploded ordnance are also assessed to be low.

Mitigation and management measures proposed for the construction and operation/maintenance phases are in accordance with Powerlink's standard environmental controls as outlined in the Project EMP (refer Appendix G).

4.1.1 Existing environment

4.1.1.1 Topography

The topography along the preferred alignment is heavily undulating and well drained. The existing alignment of the portion of Feeder 831 that is to be relocated runs along a north-south ridgeline, parallel to Ridge Road. This ridgeline has been formed along the crest of a deeply weathered basalt ridge. The ridge is reasonably level, with upper slopes typically between 5 and 10%; mid slopes between 15 and 20%; and more gentle gradients at the toe of the slope towards the ephemeral drainage line known as Rocky Creek. The slopes are dissected by gullies draining to the east. The preferred alignment traverses this ridge between structures D5 and D6 at the elevation of 560m Australian Height Datum (AHD). Structures between D6 and D15 are to the east of this ridge line with elevation generally ranging from 490 – 560m AHD (Department of Resources, 2016).

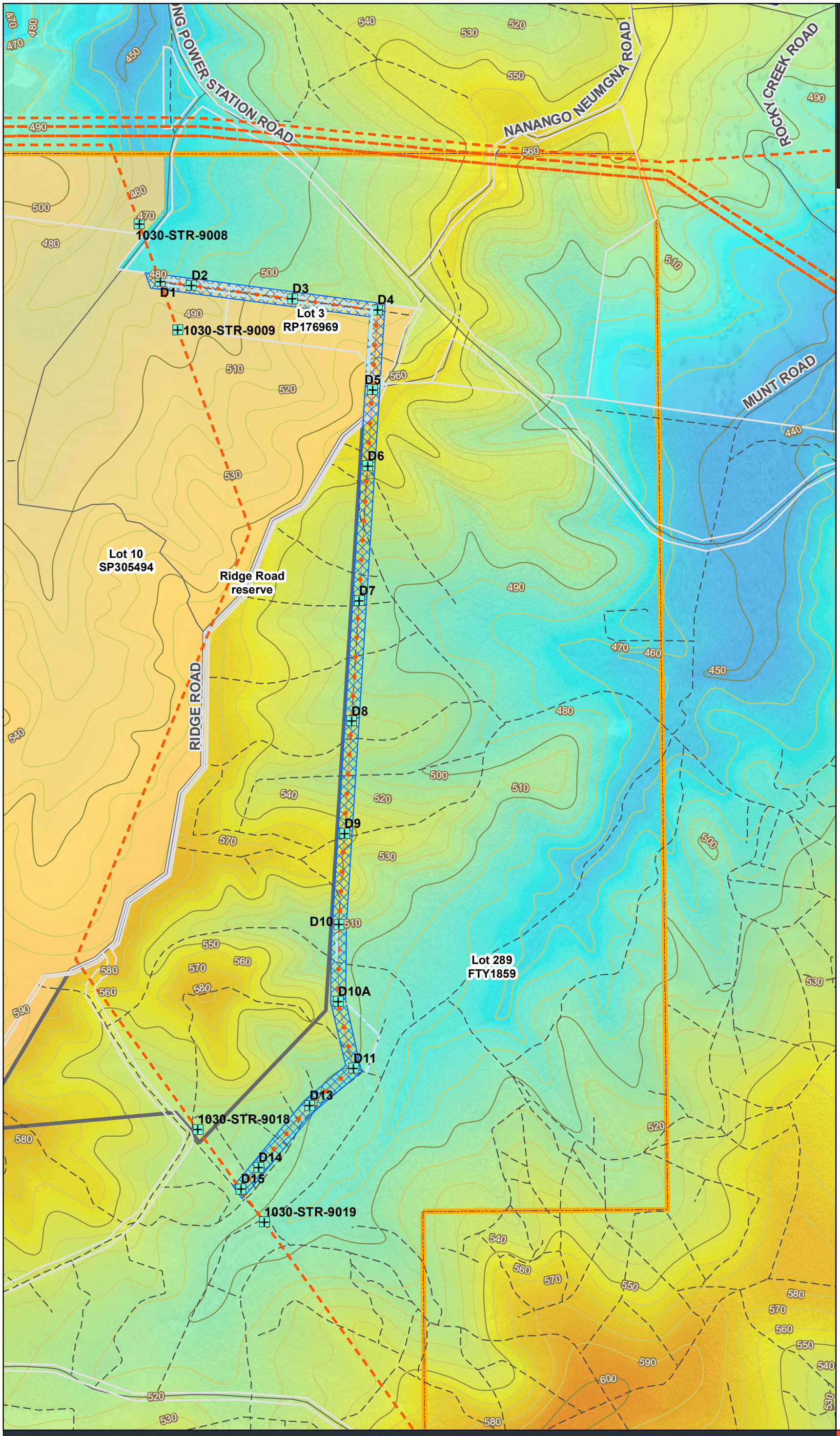
The topography along the preferred alignment and throughout the Project area is illustrated in Figure 4.1.

Landslides are a type of soil erosion which transports soil at a short time and very large volume. Landslides in Queensland are generally caused by heavy rain when rain saturates the soil on a hillside past the point where any remaining vegetation can support the soil's weight against the force of gravity (Queensland Government, 2017a). The preferred alignment includes an area identified as High Landslide Hazard by the *Toowoomba Regional Planning Scheme* (2021, v. 26) in the vicinity of structure D10 (refer Figure 4.3).

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.1

Topography



Legend

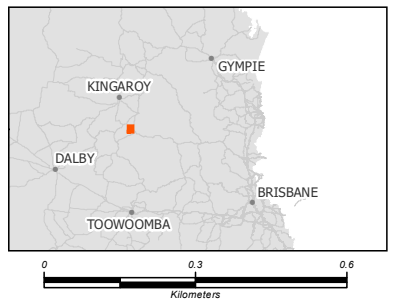
- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- Index Contour
- Intermediate Contour
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)

Elevation (m)

Value

High : 640

Low : 390



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 12/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.1.1.2 Geology

Regional geology units (1:100k) present along the preferred alignment are described in Table 4.1 and shown on Figure 4.2.

Table 4.1 Surface geology units (1:100k) along the preferred alignment

Geology unit	Lithological summary	Dominant rock	Location
Ro(w) (Tarong beds(w))	The Tarong beds consist of a main lithology of labile (arkosic to sub-arkosic), fine to very coarse grained, poorly sorted sandstones and matrix supported conglomerates. The conglomerates tend to be dominant towards the basin margins and the lower parts of the sequence (Pegrem, 1986). Beneath this are minor lithologies that include shale, siltstone, mudstone and coal.	Sandstone/siltstone	Meandu Mine and adjacent areas. The majority of the preferred alignment is located within this geology unit.
Td\r>Tm (Main Range Volcanics)	The Main Range Volanics comprise olivine basaltic flows and lesser pyroclastics. Basaltic flows are interbedded with minor siltstones, shales, sandstone, silcrete. The basalts tend to occur as ridge-cap deposits which tend to be deeply weathered.	Basalt	The Main Range Volcanics are located along the ridgeline and through two portions (between structures D5 and D6; D8 and D10) of the preferred alignment. They are generally found in the topographically high areas associated with the preferred alignment.

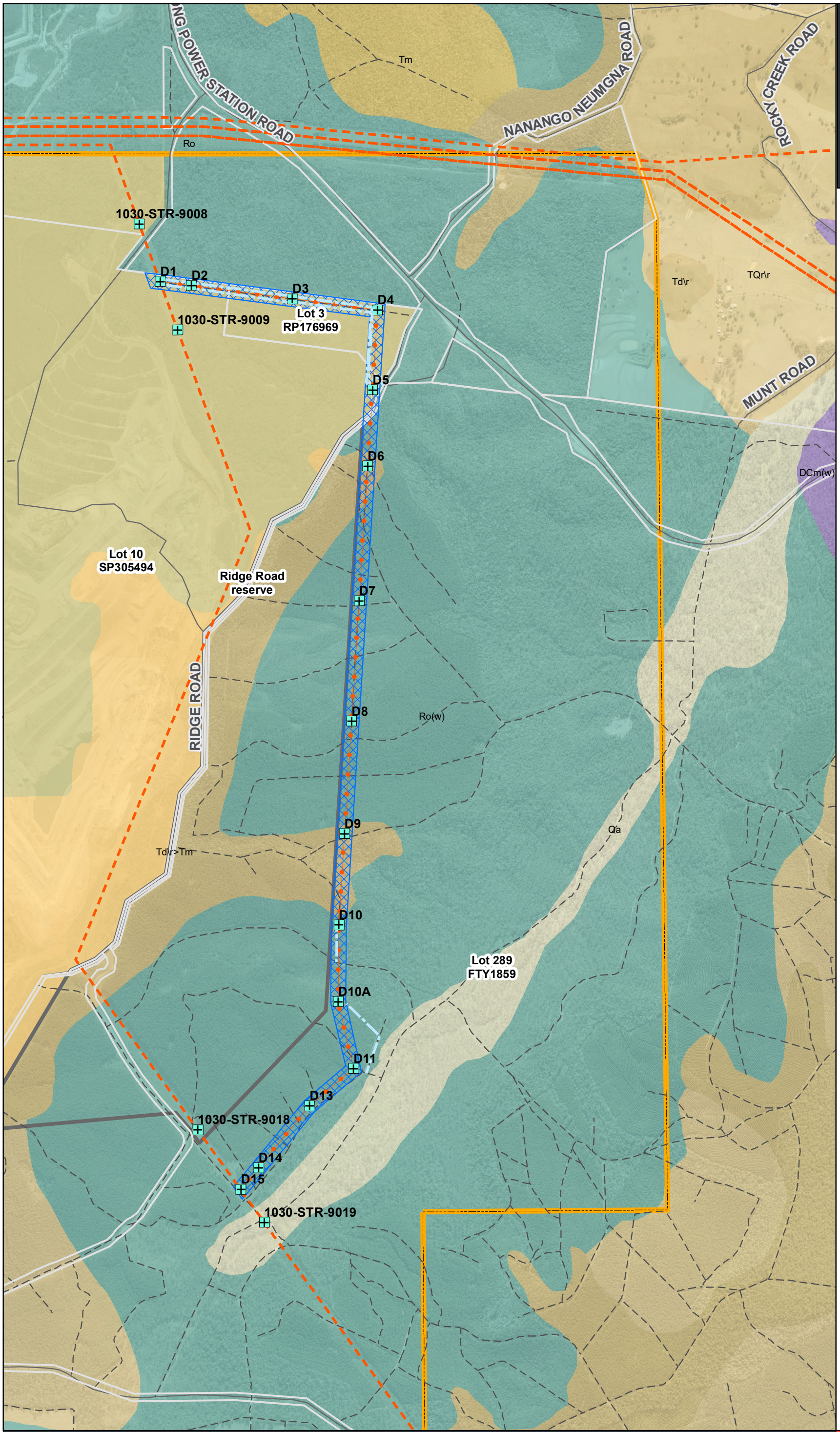
Source: Department of Resources (2018)

A geotechnical investigation comprising the drilling of six boreholes along the preferred alignment and laboratory testing of selected samples was undertaken by Douglas Partners in May 2022. The boreholes were located at structures D1A, D1B, D6, D9, D15A and D15B. The geotechnical investigation found the subsurface conditions along the preferred alignment to be relatively uniform and comprised of shallow topsoil/fill/disturbed ground over apparently localised dense and very dense clayey sand at Bore D1A, then generally very stiff grading hard residual clay. The hard residual clays often tended to include extremely weathered rock with depth, and very low strength rock conditions encountered in Bores D1A, D1B, D15A and D15B (Douglas Partners, 2022).

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.2

Surface Geology

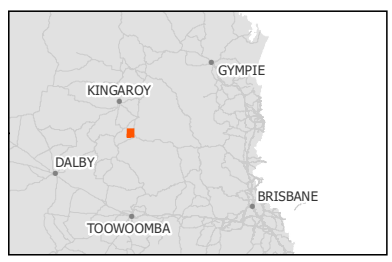


Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- King 2 East Additional Surface Area
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)

Detailed Surface Geology

- Main Range Volcanics
- Maronghi Creek beds(w)
- Qa-QLD
- TQr\r-SEQ
- Tarong beds
- Tarong beds(w)
- Td\r-QLD
- Td\r-QLD>Main Range Volcanics



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.1.1.3 Soils

The Australian Soil Classification is the system currently used to describe and classify soils in Australia. It is a general-purpose, hierarchical classification system, and consist of five categorical levels from the most general to the most specific: order, suborder, great group, subgroup, and family. Soil orders that are relevant to the Project area include:

- Ferrosols: Soils with B2 horizons which are high in free iron oxide and lacking a strong texture-contrast between the A and B horizons.
- Rudosols: This order is designed to accommodate soils that have little, if any, pedologic organisation. They are usually young soils in the sense that soil forming factors have had little time to pedologically modify parent rocks or sediments. The component soils can obviously vary widely in terms of texture and depth; many are stratified and some are highly saline. Data on some of them are very limited.
- Sodosols: Soils with strong texture contrast between A horizons and sodic B horizons which are not strongly acid. Australia is noteworthy for the extent and diversity of sodic soils (Isbell, 1995).

Table 4.2 and Figure 4.3 present the ASRIS soil types, and corresponding soil orders, mapped along the preferred alignment.

Table 4.2 Soil classification in the preferred alignment (ASRIS, 2013)

ASRIS Map Unit	Soil Order	Type and Description	Dominant soil class/Codominant Soil class
Mp4 - Plateaux and plateau remnants of laterised basalt with undulating to rolling relief	Ferrosols Rudosols Sodosols	Gradational red, no A2 horizon, acid smooth-ped whole col B horizon. Red smooth-ped earths.	Gn3.11

Soil field surveys undertaken by Jamstone (2020) for the K2E Project in January 2018 and August 2019 identified three soil variants across the K2E ASA as described in Table 4.3. Given the proximity of the Project to the K2E ASA, it is likely that these soil types are also present along the preferred alignment.

Table 4.3 Soil types within the K2E ASA

Soil type	description
Soil A – Red Ferrosol	Basalt soils or shallow variant was encountered in the upper-most, western part of the K2E ASA, underlain by weathered and lateritised basaltic rocks. This soil type appears to have acidic A and B horizons with varying nutrient levels and low potential for dispersive behaviour. It typically occurs above RL 550 m
Soil B – Red Ferrosol	A deeper variant of the Red Ferrosol and was encountered in the upper to lower mid slopes within the K2E ASA. This soil type appears to have acidic A and B horizons with varying nutrient levels and low potential for dispersive behaviour.
Soil C – Grey Dermosol	Encountered on the lower slopes of the K2E ASA, below approximately 520m in the area underlain by the sedimentary rocks of the Tarong beds. Both acidic and alkali soils were encountered within this soil group and a potential for dispersive behaviour was also indicated.

The preferred alignment is not mapped within erosion prone area in accordance with DAMS (Queensland Government, 2019).

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report
Figure 4.3
Soils

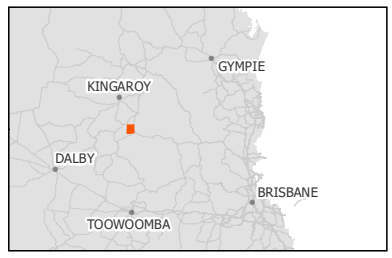
NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3
RP176969
D5
D6
Lot 10
SP305494
Ridge Road
reserve
D7
D8
D9
D10
Lot 289
FTY1859
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)
- Landslide high risk area

Atlas of Australian soils Queensland

- Mp4
- Sj5



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 14/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.1.1.4 Acid sulfate soils (ASS)

ASS are soils that contain iron sulfides and are generally found in low-lying coastal areas below 5m AHD (ASRIS, 2013). ASS are mapped on the Atlas of Australian Sulfate Soils, available on ASRIS. The probability of occurrence of ASS is categorised on the mapping as follows:

- high probability of occurrence: > 70% chance of occurrence in mapping unit
- low probability of occurrence: 6-70% chance of occurrence in mapping unit
- extremely low probability of occurrence: 1-5% chance of occurrence in mapping unit.

While ASS can form in parts of inland Queensland where there are appropriate conditions, the preferred alignment is mapped as having "low to extremely low probability of occurrence" (ASRIS, 2013). This is reflective of the preferred alignment being:

- located at the elevation range from 490 – 560m AHD and it is unlikely for ASS to be present at this altitude
- not traversing or adjacent to any major watercourses defined by *Water Act 2000* (refer further to Section 4.5).

4.1.1.5 Resource interests

Resource interests in Queensland are generally governed by the *Petroleum and Gas (Production and Safety) Act 2004* (Queensland) and *Mineral Resources Act 1989* (Queensland). No interests under the *Petroleum and Gas (Production and Safety) Act 2004* (Queensland) have been identified along the preferred alignment.

The preferred alignment is located within the mining lease for Meandu Mine (ML6674). The northern portion of the preferred alignment (between structures D1 and D5) traverses the approved surface rights area of the Meandu Mine, while the remainder of the preferred alignment is located immediate to the east of the boundary of the proposed K2E ASA.

4.1.1.6 Contaminated land

Searches of the Environmental Management Register (EMR) and Contaminated Land Register (CLR) were undertaken for all cadastral lots directly impacted by the preferred alignment on 22 June 2022. Table 4.4 identifies those land parcels listed on the EMR. No parcels of land are recorded on the CLR.

Table 4.4 Land parcels listed on the EMR

Lot on Plan	EMR Ssite ID	Notifiable activity
10 SP305494	194973	**Engine Reconditioning Works** - carrying out engine reconditioning work at a place where more than 500L of the following are stored – (a) halogenated and non-halogenated hydrocarbon solvents (b) dangerous goods in class 6.1 under the dangerous goods code (c) industrial degreasing solutions. **Landfill** - disposing of waste (excluding inert construction and demolition waste). **Mine Wastes** - (a) storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or (b) exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants. While sites are listed on the EMR using the lot and plan description, a mining lease may affect only a limited area of the lot. In many instances with rural properties, only a small

Lot on Plan	EMR Ssite ID	Notifiable activity
		area may be potentially affected by the mining activities and the ongoing land use is unaffected. More detailed information relating to the location of the mining activities may be held by the DES or the Department of Resources. **Petroleum Product or Oil Storage** - storing petroleum products or oil – (a) in underground tanks with more than 200L capacity; or (b) in above ground tanks with – (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code - more than 2,500L capacity; or (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code - more than 5,000L capacity; or (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia - more than 25, 000L capacity. **Scrap Yards** - operating a scrap yard including automotive dismantling or wrecking yard or scrap metal yard. **Abrasive Blasting** - carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material. **Chemical Manufacture or Formulation** - manufacturing, blending, mixing or formulating chemicals if - (a) the chemicals are designated dangerous goods under the dangerous goods code; and (b) the facility used to manufacture, blend, mix or formulate the chemicals has a design production capacity of more than 1 tonne per week. **Chemical Storage** - (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code. **Explosives Production or Storage** - operating a factory under the *Explosives Act 1952*. **Metal Treatment or Coating** - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).
289 FTY 1859	75620	**Livestock Dip or Spray Race** - operating a livestock dip or spray race facility. For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. DES may hold further information relating to the location of the dip site within this property. **Waste Storage, Treatment or Disposal** - storing, treating, reprocessing or disposing of regulated waste (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50,000 persons having sludge drying beds or on-site disposal facilities.

With respect to Lot 10 on SP305494, TEC Coal has confirmed that the Engine Reconditioning Works, Landfill and Mine Wastes notifiable activities have not occurred at Meandu Mine in the vicinity of the preferred alignment. Figure 4.4 shows the location of occurrence of the relevant notifiable environmental relevant activities at the Meandu Mine.

Notifiable activities relevant to Lot 289 on FTY1859, which comprises 6,970ha of land, include livestock dip or spray race, and waste storage, treatment or disposal. These activities are unlikely to be located within the Project area as most of the area covered by the preferred alignment is within the Yarraman State Forest. Apart from natural vegetation, the dominant activities in the area are plantation forestry production and harvesting by HQPlantations as authorised under its Plantation Licence. Historical aerial imagery (Photo 4.1 and Photo 4.2) shows that the area has been used for forestry plantation since at least 1982 and contained native vegetation prior to that.

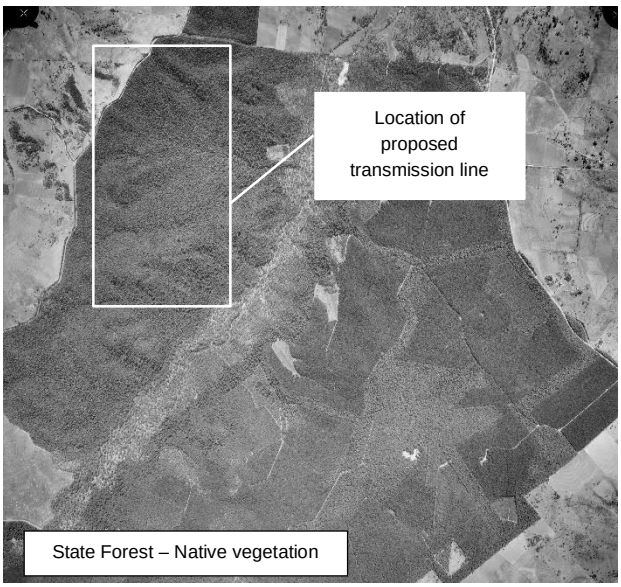


Photo 4.1 Historical Aerial Photography – 1 May 1971

Source: State of Queensland (2020a)

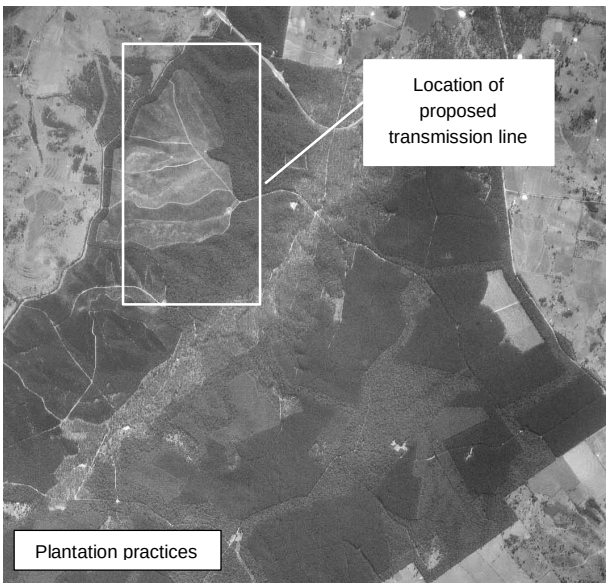


Photo 4.2 Historical Aerial Photography – 1 May 1982

Source: State of Queensland (2020b)

4.1.1.7 Unexploded ordnance

The preferred alignment does not traverse areas at risk of containing unexploded ordnance (UXO) as identified from mapping provided by the Commonwealth Department of Defence (2019) and on DAMS (Queensland Government, 2019).

Meandu Mine Transmission Line Relocation Project
Environmental Assessment Report Figure 4.4
Location of notifiable Environmental Relevant Activities (ERAs) at the Meandu Mine

TARONG AND TARONG NORTH POWER STATIONS
MEANDU MINE
Lot 10 SP305494
Lot 289 FTY1859
1030-STR-9008
1030-STR-9009
1030-STR-9018
1030-STR-9019
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D10A
D11
D13
D14
D15
Lot 3 RP176969
Ridge Road reserve
REEVE ROAD
TARONG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
TARONG-TARRAMAN ROAD

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Highways
- Secondary Roads
- Local roads
- Forestry access tracks
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)
- Meandu Mine Environmental Relevant Activities
- Tarong Substation

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:40,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

C:\Users\haaxs0\OneDrive - WSP O365\PS113963_Confidentail_K2EE\Mxd\28_TransmissionLine_EnvAR\PS127247_EnvAR_Fig4-4 Location_of_notifiable_Environmental_Relevant_Activities_ERAs_at_the_Meandu_Mine.mxd

4.1.2 Potential impacts

Proposed activities that involve disturbance to soil, such as vegetation clearing, excavation and civil works have the potential to impact on the land. Potential impacts related to topography, soils, ASS, resource interests and contaminated land are outlined in the following subsections.

4.1.2.1 Topography

Construction of the Project may involve cut and fill earthworks for transmission line structure sites and the establishment of access tracks. As outlined in Section 2.6.2.2, access tracks will be required to service each transmission line structure site. In most instances access tracks will involve an extension of existing forestry tracks to the new structure locations. In a couple of locations, new access tracks will be required (refer Figure 2.2). Whilst in most instances these new access tracks will be within the proposed 60m wide easement for the transmission line, off-easement access will be required for structure 10A.

Some transmission line structure sites are likely to require cut and fill earthworks where the topography is steep or undulating to establish safe working areas for assembly and erection of structures. It is anticipated that earthworks associated with pad and footing construction for support structures will generally be restricted to an area of approximately 40m by 40m. No earthworks or clearing of vegetation are proposed in the High Landslide Hazard area mapped by the *Toowoomba Regional Planning Scheme*.

The earthwork noted above will occur at a number of relatively small, discrete locations. No other changes to the geomorphic landscape are anticipated. The impact of construction on the existing topography of the area is therefore anticipated to be negligible. No operational impacts to topography are anticipated.

4.1.2.2 Soils

Erosion

Due to the potential for geology and soils to affect the integrity of the infrastructure, a complex set of matters are required to be considered as part of the design and construction process. These matters include acidity, erosivity and dispersiveness. Areas with high-risk of erosion are often associated with the presence of alluvial soils, which usually occur within the low-lying coastal plain. These soils are comprised of loose materials or sediments such as clay, silt, sand and gravel. They are typically unconsolidated and can be picked up and transported when disturbed, meaning they are prone to erosion and dispersion. In some instances, alluvial deposits can result in poor ground conditions, necessitating deeper foundations to ensure the integrity of structures in these areas.

The soil types present along the preferred alignment are not particularly erosion susceptible. While some potential dispersive behaviour was identified for the Grey Dermosols, within the Project area these soils are overlain by basaltic materials originating from topographically higher areas and which may potentially moderate the dispersive behaviour of this soil type (Jamstone, 2020). The preferred alignment is also not mapped as occurring within an erosion prone area. As such, the potential for the Project to results impact associated with soil erosion is considered low.

Compaction

Soil compaction may occur during construction of the Project through increased frequency of light vehicles on access tracks, the introduction of heavy machinery during construction, and the storage of materials. Potential impacts associated with soil compaction include a decline in soil structural stability; a decrease in water entering the soil either as rain or irrigation; and subsequent issues with poor root growth, soil cultivation and seedbed preparation.

Subsoil conditions

As outlined in Section 4.1.1.2, a geotechnical investigation involving boreholes and laboratory testing of selected samples was undertaken along the preferred alignment to obtain detailed geology and soil information. The information from this investigation will be used to inform the design of the Project, particularly the identification of suitable foundations for transmission structures. The choice of foundation type is dependent on the nature of the soil and rock and takes into consideration soil/concrete friction strength, water levels, soil bearing capacity, construction constraints, rock levels, and soil properties.

Footings

The recommended structure footing types based on the subsurface conditions encountered are summarised in Table 4.5. Powerlink uses a combination of standard footings and special footings for their transmission infrastructure. Standard footings include bored piers (undercut, straight-sided and rock socketed) or mass footings, while special footings include micropile anchors with pile caps, or bored piers with steel liners through water bearing or unstable strata.

Table 4.5 Recommended footing types

Bore	Footing type		Subgrade conditions / notes
D1A	Standard	High level*or bored pile	Dense / very dense clayey sand below 0.6m depth, then hard clay to 6.5m depth with very low strength rock below.
D1B	Standard	Bored pile	Hard clay from 0.4m to 2.5m depth, then very stiff to 7m depth with weathered rock below.
D6	Standard	Bored pile	Very stiff clay to 2.5m depth over hard clay.
D9	Standard	High level or bored pile*	Hard clay and extremely weathered rock below 0.5m depth.
D15A	Standard	Bored pile	Very stiff clay to 4m depth over hard clay then very low strength rock below 9.5m depth.
D15B	Standard	Bored pile	Very stiff clay to 2.7m depth over hard clay then very low strength rock below 7m depth.

Note: * indicates assumed preferrable, either could be adopted.

Douglas Partners, 2022

Soil aggressivity

The encountered conditions are considered to be ‘non-aggressive’ for buried steel, and ‘moderately’ aggressive for buried concrete (Douglas Partners, 2022).

Acid sulfate soils

When disturbed, ASS can generate large amounts of sulfuric acid, iron, aluminium and sometimes heavy metals, which has the potential to impact on the environment and infrastructure. Available mapping information and site conditions (refer Section 4.1.1.4) indicate that the potential for ASS to impact on the environment or infrastructure is considered low for the Project.

4.1.2.3 Resource interests

Where infrastructure is proposed to cross or traverse a resource interest, consent from the respective authority holders may be required for construction of the transmission line, as well as any heavy vehicle and plant movements which have the potential to impact any existing infrastructure.

The preferred alignment traverses ML6674 which pertains to the Meandu Mine operation. There is an active Environmental Authority (EPML00709113) over the site which regulates the environmental performance for the site. The ML and Environmental Authority holder for the site is TEC Coal. All siting of infrastructure within the boundary of the ML has been undertaken in consultation with TEC Coal and will not contravene the requirements of the Environmental Authority.

4.1.2.4 Contaminated land

As noted in Section 4.1.1.6, two lots identified on the EMR for a "notifiable activity' (activities that have the potential to cause land contamination) are traversed by the preferred alignment. In the case of Lot 10 on SP305494, the preferred alignment does not traverse areas where the notifiable activities have occurred (refer Figure 4.4). For Lot 289 on FTY1859, past and present land uses along the preferred alignment make it highly unlikely that identified notifiable activities have occurred in the vicinity of the proposed transmission line. As such, the risk of encountering contaminated land during construction of the proposed transmission line is considered low.

Geotechnical investigations undertaken to date along the preferred alignment have also not identified any areas of potential concern.

The chemicals used during the construction, operation and decommissioning phases of the Project will include fuel (predominantly diesel), unleaded petrol, electrical equipment transformer oil, lubricants, oils, minor quantities of solvents and acids, degreasers, and domestic cleaning agents. Accidental release of these materials during storage, use or transport has the potential to result in land contamination. The management of these materials is discussed in Section 4.16: Hazards, health and safety risk.

Waste management, including potential impacts to land, is discussed in Section 4.17:4.17 Waste generation and management.

4.1.3 Mitigation and management measures

Potential impacts to land will be managed in accordance with Powerlink's standard environmental controls as outlined in the EMP for the Project (Appendix G). These include:

- Using existing access tracks for the Project with upgrading or extension, where practicable, in preference to the creation of new tracks. Where possible, these existing access tracks will include established and maintained erosion and control measures (culverts, whoa boys and spoon drains), minimising vegetation clearing and disturbance to soil structures.
- Structures will be located a minimum of 50m from watercourses, where possible, to avoid areas mapped as high probability ASS during construction.
- Testing for the presence of contamination prior to excavation or other earthworks will be undertaken based upon a risk assessment for sites listed on the EMR and where known or suspected contamination exists. Excavated soil material will be reused where possible and any contaminated material unable to be remediated must be disposed of by an appropriately licensed waste contractor to a licensed waste facility.
- Reinstatement will be undertaken progressively during construction, where practicable, and Powerlink will ensure that all disturbed areas impacted from construction are reinstated at the end of the construction works. The short-term goal of reinstatement is the stabilisation of soils to provide a suitable matrix for vegetation establishment to aid in preventing erosion. Reinstatement also includes the replacement of topography, topsoil, and fences.

4.2 Climate

This section presents climate statistics for the Project area along with the potential risks to the Project from extreme climatic conditions (i.e. thunderstorms, cyclones, drought, flooding). Climate change projections for the area are also discussed.

4.2.1 Existing environment

The preferred alignment lies within the subtropical climate zone, as classified by the Commonwealth Bureau of Meteorology (BoM, 2001). The Australian subtropical climate is seasonal with the highest temperature, rainfall and evaporation occurring during summer months of November to February. Climate data has been obtained from the closest BoM weather stations located in the area surrounding the preferred alignment, namely:

- **Temperature**: recorded at the:
  - Nanango Wills Street station (040158), approximately 15km north-east of the preferred alignment (Latitude: 26.68°S | Longitude: 151.99°E)
  - Kingaroy Airport station (040922), approximately 29km north north-west of the preferred alignment (Latitude: 26.57°S | Longitude: 151.84 °E).
- **Rainfall**: recorded at the:
  - Yarraman Post Office station (040258), approximately 5km south-east of the preferred alignment (Latitude: 26.84°S | Longitude:151.98°E)
  - Tarong station (040199), approximately 12km north-west of the preferred alignment (Latitude: 26.74°S | Longitude: 151.84°E).

4.2.1.1 Temperature

Temperature statistics from the Nanango Wills Street weather station are available for the period 1913 to 1992. This data has been supplemented with more recent records from the Kingaroy Airport weather station which has records from 2001 to 2020.

Annual average maximum temperatures for the region range from 24.8°C (Nanango) to 25.9°C (Kingaroy). January is the hottest month of the year with a mean maximum temperature of between 30.4°C (Nanango) to 31.1°C (Kingaroy) and a mean minimum temperature of between 17.3°C (Nanango) and 18.0°C (Kingaroy) (BoM, 2022). July is the coolest month of the year with a mean minimum temperature of between 2.7°C (Nanango) to 3.7°C (Kingaroy) and a mean maximum temperature of between 19.3°C (Nanango) and 19.8°C (Kingaroy) (BoM, 2022).

4.2.1.2 Rainfall

Rainfall in the region is seasonal and highly variable. Annual rainfall is more than 800 mm at Yarraman Post Office BoM Station and approximately 700 mm at the Tarong BoM station. The majority of rainfall generally falls between October and March (i.e. the wet season) when approximately 560 mm of rainfall is typically recorded at Yarraman Post Office BoM Station and 500 mm at the Tarong BoM Station (Table 4.6 and Table 4.7). The wet season is characterised by short-lived intense rainfall events (i.e. high daily totals) while drier conditions are experienced throughout the rest of the year (when average monthly rainfall is less than 50 mm). Recharge and stream run-off potential is highest during the wet season months when most rainfall occurs. Similarly, evaporation is higher between October and March (i.e. in the warmer months) and typically exceeds rainfall.

Table 4.6 Monthly rainfall statistics for Yarraman Post Office BoM Station from 1913 – 2019 (BoM, 2022)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)												
Mean	114	105	83	49	44	42	39	30	37	71	81	109
Median	103	89	77	32	35	29	30	26	32	61	73	93
Minimum	0.4	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Maximum	534	438	270	246	190	175	224	124	224	192	241	344
90th percentile	198	199	145	114	88	89	78	65	71	140	143	202
10th percentile	30	19	15	6	6	6	5	2	4	20	20	44
Highest Daily	165	142	114	109	78	90	122	67	95	97	86	124
Pan Evaporation (mm)												
Regional average	125	175	175	150	100	80	100	125	150	200	200	250

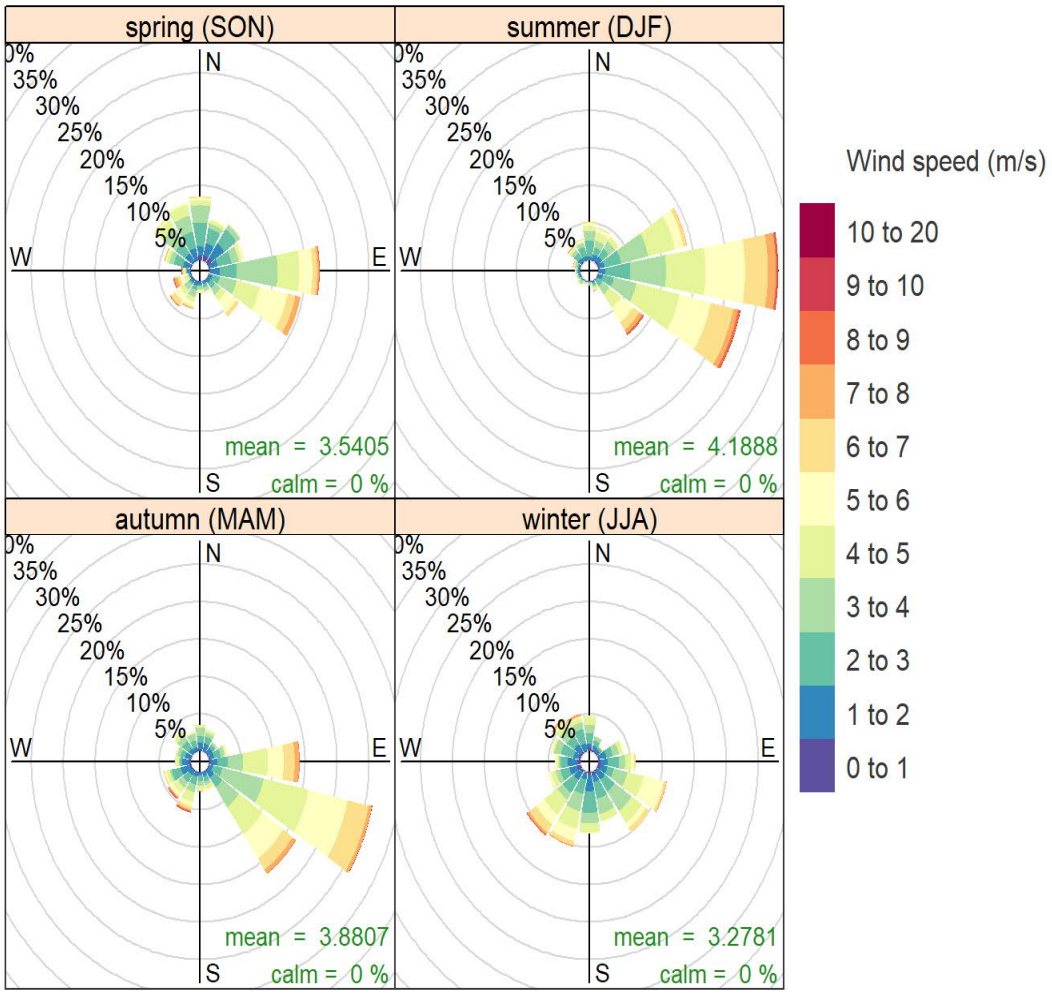
Table 4.7 Monthly rainfall statistics for Tarong BoM Station from 1920 – 2019 (BoM, 2022)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)												
Mean	99	92	65	40	39	39	36	27	31	65	76	106
Median	86	77	56	29	28	27	30	20	25	57	64	88
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4
Maximum	366	387	214	205	187	227	193	113	136	208	268	472
90th percentile	173	179	133	95	81	85	69	60	70	123	153	195
10th percentile	29	11	12	0	5	2	0	0	0	17	13	36
Highest Daily	177	130	113	102	74	82	101	79	68	105	112	137
Pan Evaporation (mm)												
Regional average	125	175	175	150	100	80	100	125	150	200	200	250

4.2.1.3 Wind direction

Seasonal wind direction shows that east/south-easterly winds occur throughout the year, with very few westerly winds occurring at the site of the preferred alignment. Winds are moderately strong, with an average speed of 3.7 m/s. During summer and autumn, wind direction tends to be east to south-easterly. In winter, southerly winds are dominant, and in spring the wind is characterised by more frequent easterly winds.

Seasonal wind direction for the Project area is shown in Figure 4.5.



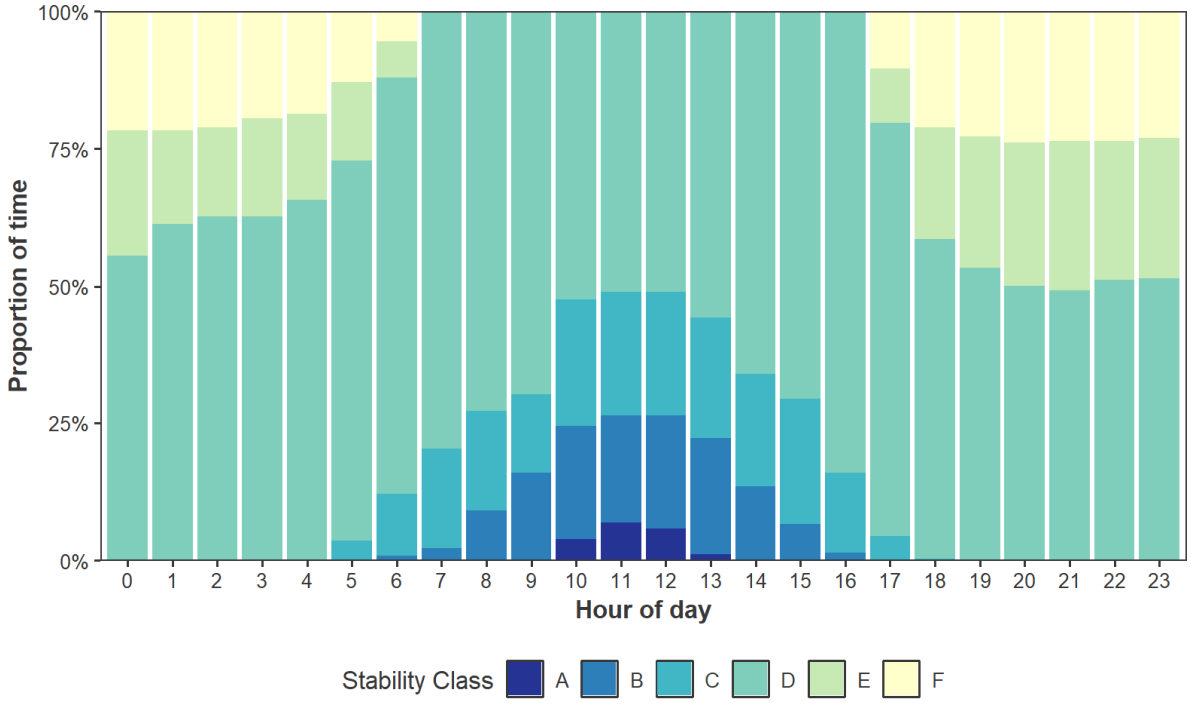
Source: *King 2 East Project – Air Quality Assessment (Katestone, 2021)*

Figure 4.5 Seasonal wind distribution predicted by TAPM/CALMET for the Project area from 2018/19

4.2.1.4 Atmospheric stability

Stability classification is a measure of the stability of the atmosphere and can be determined from wind measurements and other atmospheric observations. The stability classes range from A Class, which represents very unstable atmospheric conditions that may typically occur on a sunny day, to F Class stability which represents very stable atmospheric conditions that typically occur during light wind conditions at night. Unstable conditions (Classes A to C) are characterised by strong solar heating of the ground that induces turbulent mixing in the atmosphere close to the ground. This turbulent mixing is the main driver of dispersion during unstable conditions. Dispersion processes for Class D conditions are dominated by mechanical turbulence generated as the wind passes over irregularities in the local surface. During the night, the atmospheric conditions are generally stable (often Classes E and F).

Figure 4.6 shows the distribution of stability classes for the Project area extracted from the TAPM/CALMET dataset, where Class A represents the most unstable conditions and Class F represents the most stable. Overall, the Project area is neutral (62% of total time), with a small proportion (<1% of total time) of very unstable conditions present from 10 am to 1 pm. Stable conditions only occur between 5 pm and 6 am, comprising 22% of the total time.



Source: *King 2 East Project – Air Quality Assessment (Katestone, 2021)*

Figure 4.6 Atmospheric stability predicted by TAPM/CALMET at the Project area for 2018/19

4.2.2 Potential impacts of climate conditions

4.2.2.1 Extreme climatic conditions

Extreme weather or atypical meteorological conditions have the potential to adversely affect the Project during any phase of its lifecycle. Their occurrence may result in construction and operation ceasing, damage to structures or the environment and subsequent maintenance. The history of extreme weather for the Project area is an important consideration and will allow for any risks to be identified and assessed.

Droughts

Droughts are an increasingly common occurrence in Australia and affect grazing and agricultural land most significantly. Prolonged periods of water shortage can have negative effects on vegetation growth, erosion and overall land quality. Information about climate risk, including droughts, for rural Queensland is provided by the Queensland Government's 'The Long Paddock' initiative (DES, 2021).

A review of recent Queensland Drought Situation maps generated by DES indicates that, as of 12 May 2022, the Project area (Western Downs and South Burnett local government areas) are not drought-declared.

It is likely that during the Project's life-cycle, drought conditions of various severity will be experienced and the associated risks should therefore be considered. Both Toowoomba Regional Council and South Burnett Regional Council have established management plans (incorporated in the Local Disaster Management Plan) that address this ongoing issue.

Cyclones

Tropical cyclones generally develop from tropical lows between November and April, and can cause damaging winds, flood–producing rainfall, and coastal storm surges. The preferred alignment is located outside of the regions where tropical cyclones are more likely to occur based on the data of a 48-year period from the 1969 – 2018 (BoM, 2018). Consequently, the tropical cyclone risks associated with the Project is assessed to be low.

Thunderstorms

Thunderstorm activity is a common meteorological occurrence in southeast Queensland, particularly during the summer months. Thunderstorm activity can result in environmental, social or economic impacts, especially severe storms that include heavy rains, strong winds, hail, and flash flooding. Information sourced from BoM (2016) indicates that the preferred alignment and surrounds can expect an annual average of 20 days of thunder activity (refer Figure 4.7).

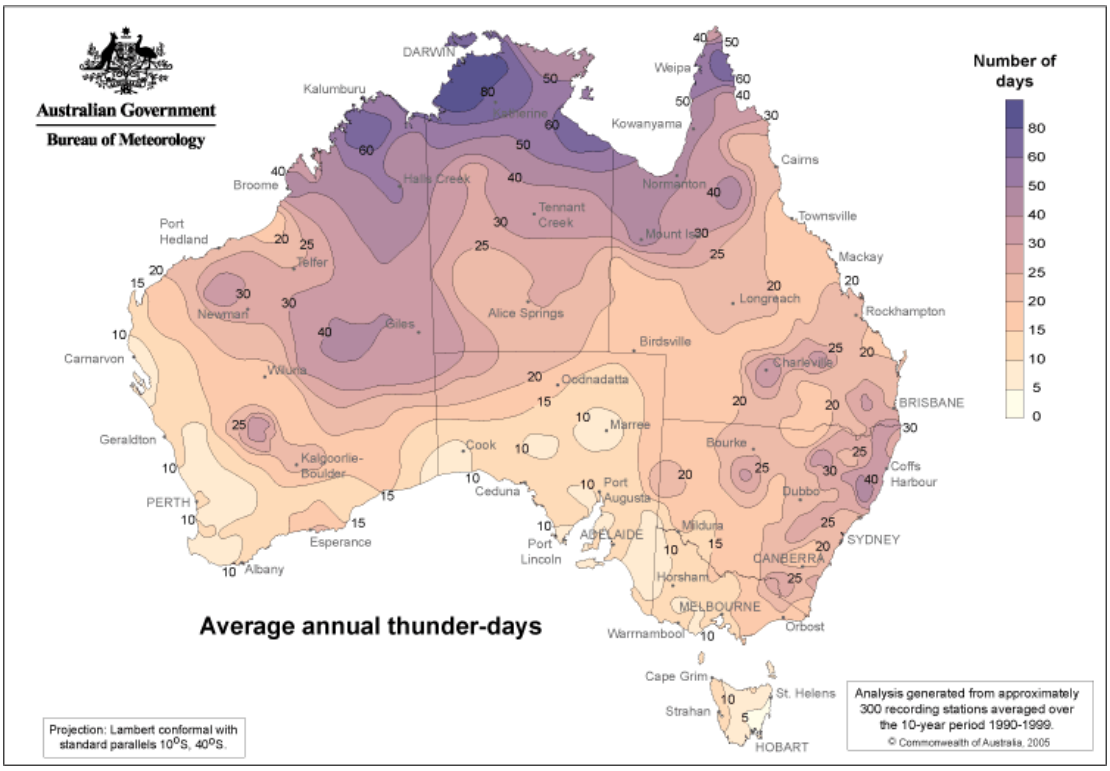


Figure 4.7 Average annual days of thunder activity (BoM, 2016)

Flooding

Rainfall across Queensland varies considerably both spatially and over time, and increasing rainfall is known to occur in south-east Queensland from strengthened monsoonal influence and can lead to flooding. Impacts from flooding events can include damage to infrastructure foundations, increased erosion and general land degradation. Elevated water levels can result in major road closures and restrict access especially in rural areas.

In accordance with both the Queensland Floodplain Assessment Overlay data and the local government mapping (Department of Resources, 2013), the preferred alignment is not located within the flood hazard area. Consequently, the flooding risks associated with the Project is considered low (refer further to Sections 4.5.1.1 and 4.5.1.2).

4.2.2.2 Climate change

Increasingly reliable regional climate change projections are now available for many regions of the world due to advances in modelling and understanding of the physical processes of the climate system. An assessment of projected climate change for Australia and New Zealand has been undertaken by the IPCC and the results are summarised in Chapter 11 of the IPCC special report entitled “Global Warming of 1.5°C” (IPCC, 2018).

Based on the climate modelling findings of the IPCC, the projected median warming, to the year 2100, averaged over the region where the preferred alignment is located (north of 30°S) is approximately 3°C (range of 2.8°C to 3.5°C). Changes in rainfall in this region are uncertain, however, extremes of daily precipitation are very likely to increase. An increase in potential evaporation is also likely. Overall, hotter and drier conditions, with increased frequency of extreme rainfall events are expected in the Project area for the near future.

4.2.3 Mitigation and manage management measures

4.2.3.1 Climate influence on design and construction

The preferred alignment is located within a Subtropical Climate Zone characterised by warm humid summers and mild winters. The region experiences a low to moderate frequency of meteorological conditions such as flooding and thunderstorm activity. These conditions have the potential to affect the operation of transmission lines through power outages, physical damage to the infrastructure, soil erosion of unsealed access tracks or vegetation, and other materials being blown into conductors. Localised flooding could limit access for critical maintenance and repairs following such events.

The electricity transmission infrastructure will be designed and constructed to reasonably withstand severe weather events. Consideration will also be given to other impacts associated with flooding such as soil erosion and land degradation, which can lead to reduced or limited access to areas for construction and maintenance. As the Project is the replacement of an existing transmission line, Powerlink are familiar with the extent of such impacts on the existing line and able to factor these into the design of the Project.

4.2.3.2 Proposed climate change mitigation measures

Proposed mitigation measures for the potential impacts of climatic changes may have on the Project on a regional basis have been identified in Table 4.8.

Table 4.8 Potential impacts of climate change and proposed mitigation measures

Potential Climate Change Impacts	Risk Scenario	Risk to the Project	Mitigation Measures (if required)
Increase in annual average temperature	High temperatures lead to increased demand for electricity while also negatively affecting reliability and efficiency of infrastructure and/or equipment.	Low	Not applicable
Change in seasonal average rainfall	Decrease in rainfall especially during winter and spring may lead to greater potential for erosion.	Medium	Monitoring of erosion during routine service maintenance.
	Decrease in rainfall in conjunction with increased temperatures will also increase bushfire risk.	Medium	Emergency response procedures for bushfire (refer to Section 4.15.2.44.15 and Appendix I).
Increase in annual average potential evaporation	Increased dust emissions due to drier surface conditions, resulting in increased water demand for dust suppression during construction. Increased dry foliage and vegetation will increase amount of fuel available for bushfires.	Low	Dust control measures including watering of access tracks/roads, work sites and stockpiles during construction. Regular routine service maintenance of vegetation for transmission line access rights area buffers.
Increased risk of tropical cyclone impact	Increased impacts from gale force winds and flooding	Low	Emergency response procedures for natural disasters.
	Increased risk of erosion especially from exposed areas due to increase in rainfall intensity.	Low	Adaptive management as soon as practical to minimise risk.

4.3 Air quality

This section describes the potential for the Project to impact the air quality of the surrounding area. The location of the sensitive receptors to the preferred alignment are approximately 1.5km to the north/north-east; the prevailing wind direction is east/south-easterly winds, with very few westerly winds; and there will be a staged approach to construction with the minimum area of disturbed ground exposed at any one-time. Accordingly, potential air quality impacts associated with the construction, operation and maintenance of the Project are anticipated to be low to negligible.

Mitigation and management measures proposed for the construction and operation/maintenance phases are in accordance with Powerlink's standard environmental controls as outlined in the Project EMP (refer Appendix G).

4.3.1 Existing environment

4.3.1.1 Local emission sources and existing air quality

Background levels of particulate matter in the region are directly affected by anthropogenic activities such as the operation of the Tarong power stations, existing Meandu Mine operations, local traffic, wood fires during the cooler months, hazard reduction burns, forestry, and agricultural activities. Natural sources of particulate matter are also significant contributors to existing levels of particulate matter including bushfires, windblown dust, pollens and grass seeds.

4.3.1.2 Sensitive receptors

The nearest sensitive receptors to the preferred alignment are rural residential properties around Munt and Rocky Creek roads with the closest being approximately 1.5km from the preferred alignment (refer Figure 2.3). High-density residential zones are present to the south-east of the preferred alignment around Yarraman, particularly the Tarong Yarraman Road.

4.3.2 Potential impacts to local air quality

Air quality impacts are expected during the construction phase from dust and vehicle emissions. However, these impacts are expected to be low level, localised and short-term. Air quality impacts from operational and maintenance activities are also expected to be minimal.

4.3.2.1 Construction phase

Impacts to local air quality potentially occurring during the construction phase would primarily be associated with the following activities:

- site preparation such as vegetation clearing (to establish transmission structure pad and access tracks), topsoil stripping, chipping/mulching and ground surface levelling
- transmission structure foundation excavation and installation
- stockpiling of excavated soil
- wind erosion from stockpiles
- construction vehicle and equipment movements over access tracks and work sites, particularly on unsealed surfaces or where ground is exposed
- exhaust emissions from vehicle and machinery operations.

The potential for construction related emissions to air to cause nuisance or annoyance to nearby sensitive receptor is considered low. Construction will be conducted in a staged approach with the minimum area of disturbed ground exposed at any one time. This coupled with the low intensity nature of the construction activity, and the proposed mitigation measures to control emissions (refer Section 4.3.3), means that any impacts to air are expected to be localised to the immediate area under construction and for a short duration per work area.

With most sensitive receptors located to the east of the preferred alignment, with the closest being approximately 1.5km to the north/north-east and the prevailing winds being predominantly from the east/south-east, it is unlikely that air quality impacts would be experienced at the sensitive receptors to the Project.

4.3.2.2 Operation and maintenance phase

Potential impacts to air quality during operation and maintenance of the Project and associated infrastructure are expected to be negligible and associated with maintenance activities such as:

- control of regrowth vegetation in the easements
- movement of maintenance vehicles and machinery over access tracks and the easements
- exhaust emissions from operating maintenance vehicles and machinery.

As with the construction phase, potential air quality impacts associated with maintenance activities are expected to be low level, localised and short–term due to the linear nature of the Project and time spaced maintenance regimes. Any impacts will be similar to those generated by maintenance activities associated with the existing Feeder 831 transmission line.

4.3.2.3 Decommissioning phase

The design life of the proposed transmission line infrastructure is typically 50 years. It is possible that after this period, the infrastructure may be decommissioned, dismantled and removed. Potential impacts to local air quality may occur during the decommissioning phase and would primarily be associated with the following activities:

- clearing and chipping of regrowth vegetation in the easements to allow access for vehicles and machinery
- vehicle and machinery movement over access roads and the easements
- exhaust emissions associated with vehicle and machinery operation during decommissioning works
- ground surface levelling or grading to better facilitate passive rehabilitation of the easements and transmission line structure locations.

Potential impacts to air quality associated with decommissioning activities are expected to be localised and short–term, and similar in occurrence and magnitude to potential impacts associated with construction phase activities.

Following construction and commissioning of the Project, the existing portion of the Feeder 831 transmission line will be decommissioned, and the impacts outlined in Section 2.6.5 are also applicable to air quality.

4.3.3 Mitigation and management measures

Potential air quality impacts from construction, operation and maintenance and decommissioning activities associated with the Project will be managed in accordance with Powerlink's standard environmental controls as outlined in the EMP (refer to Appendix K of Appendix G). These measures include:

- Dust and particulate matter:
  - restricting vehicle movements to within designated access tracks and enforce speed limits (<40km/h) where tracks are unsealed
  - applying water or dust suppressants to work areas, stockpiles and access tracks, as required, to prevent dust nuisance
  - scheduling dust generating activities in proximity to sensitive receptors (i.e. avoiding dry, windy conditions), where possible
  - adequately storing bulk materials, and ensuring vehicles transporting materials to and from site, are covered
  - orientating material stockpiles (or cover) in a direction that reduces exposed surfaces to prevailing winds (east/south-east)
  - stabilising or revegetate disturbed areas or bare earth as soon as practical to minimise wind-blown dust.

- Vehicle and machinery emissions:
  - ensuring stationary plant, construction vehicles and equipment (especially diesel motors) are working correctly and maintained as per manufacturers recommendations (this will also aid in the mitigation of potential odour emissions)
  - shutting down plant and equipment idling for excessive periods (i.e. longer than 5 minutes) where possible
  - avoiding or minimising queuing in roadways approaching the worksites or adjacent to other sensitive activities
  - minimising queuing of construction vehicles and idling for excessive periods (e.g. more than 5 minutes).

In addition to these measures, burning of vegetation will not to be undertaken.

4.4 Noise and vibration

This section describes the potential for the Project to impact the noise character of the surrounding area. The location of the sensitive receptors to the preferred alignment are approximately 1.5km to the north/north-east; the prevailing wind direction is east/south-easterly winds, with very few westerly winds; and the activities will be localised and of a short duration. Accordingly, the construction and operation/maintenance of the Project is unlikely to impact on the acoustic amenity of the surrounding area to any significant extent. Audible noise from operation of the transmission line (wind on the line and transmission structures and corona discharge) are unlikely to be noticeable at the closest sensitive receptors.

Mitigation and management measures proposed for the construction and operation/maintenance phases are in accordance with Powerlink's standard environmental controls as outlined in the Project EMP (refer Appendix G).

4.4.1 Existing environment

4.4.1.1 Existing noise sources

The following industrial noise sources are present within the Project area:

- operations from the Meandu Mine
- operation of the Tarong power stations.

In addition to these noise sources, other sources of background noise include harvesting operations within the Yarraman State Forest, road traffic noise, domestic/farm noise, and natural sources (for example birds, wind, and insects).

Background noise monitoring was undertaken in June and December 2019 at sensitive receptors surrounding the Meandu Mine and Tarong power stations for the adjacent K2E Project. The measured background noise levels were found to be typical of a rural environment with natural noise sources and intermittent contributions from nearby industrial sources (albeit weather condition dependent). Road traffic noise was audible at most monitoring locations. However, similar to the industrial sources, its audibility and contribution to the background noise levels was weather dependent (WSP Australia Pty Ltd, 2021a).

4.4.1.2 Sensitive receptors

Relevant noise sensitive receptors defined by the Environmental Protection (Noise) Policy 2019 (Queensland) (EPP (Noise)) include:

- residences
- libraries and education institutions (including schools (including playgrounds), colleges and universities)
- childcare centres or kindergartens
- hospital, surgery or other medical institution
- commercial and retail activity
- protected areas, or areas identified under a conservation plan as critical habitat or areas of major interest under the *Nature Conservation Act 1992* (NC Act)

- marine park under the *Marine Parks Act 2004*
- parks or gardens that are open to the public for use other than for sport or organised entertainment.

Based on the definition of sensitive receptors within the EPP (Noise), noise sensitive receptors surrounding the preferred alignment have been identified in Figure 2.3. This includes residences in the vicinity of the preferred alignment, the closest of which is approximately 1.5km away, and mapped areas of essential habitat within Yarraman State Forest.

4.4.2 Potential impacts

The noise character of the Project area will not be significantly impacted by the construction and operation of the transmission line. During the construction phase, elevated noise levels for periods of time during the day can be expected when erecting the structures and stringing the lines, as well as from plant and machinery travelling to and working within the easement. These impacts will be localised and of short duration.

4.4.2.1 Construction noise

Noise impacts during construction are likely to be associated with the following activities and equipment:

- site preparation (including vegetation clearing, access/maintenance track construction, cut and fill and foundation excavation activities) involving heavy machinery (e.g. bulldozers), chainsaws, wood chippers/mulchers
- erection of transmission line structures involving cranes
- assemblage of transmission line structure components using manual and power tools
- concrete trucks for transmission line structure and substation equipment footings
- vehicle movement associated with delivery or removal of construction materials from the work areas
- activities at laydown and construction material stockpile areas (e.g. loading/unloading of materials etc)
- helicopter noise associated with aerial stringing of lines between transmission line structures.

During the construction phase, elevated noise levels can be expected at locations close to the work areas and/or in vicinity of the roads used for access. Sensitive receptors in proximity to these work areas and/or access roads may experience some elevated noise levels during construction. However, these are unlikely to be significant due to the limited nature of the proposed works, the existing noise environment, and the distance to sensitive receptors.

Clearing of the Hoop Pine plantation from within the proposed easement will be undertaken by HQPlantations as part of its normal harvesting operations. The noise generated from vegetation clearing activities undertaken by Powerlink within the proposed easement is unlikely to differ significantly from the noise generated by the harvesting operations. The most significant noise impact is likely to be from helicopter stringing of the transmission line and this is likely to be of short duration.

Noise impacts to biodiversity values within the Yarraman State Forest from the Project are discussed in Section 4.7.2.10.

4.4.2.2 Construction vibration

During construction the only vibration-intensive works expected to take place would be pile boring and the use of vibratory rollers for construction of structure footings. Given the soil types present along the preferred alignment (weathered and low strength rock), and the temporary and short-duration nature of such activities, the risk of vibration impacts for sensitive receptors is considered low.

4.4.2.3 Operational and maintenance phase

Operation and maintenance of the transmission line should have minimal impacts on ambient noise levels and any noise experienced is likely to be similar in nature to that already experienced from the existing Feeder 831 transmission line as well as other transmission infrastructure in the area.

During the operational phase, aerial (via helicopter) and/or vehicular maintenance inspections of the proposed transmission line will be conducted. Aerial inspection is expected to occur approximately once every 12 months on average. These activities will result in occasional brief noise emissions. As maintenance inspections are already undertaken for the existing transmission line, the noise generated is likely to be similar to that already experienced.

Audible noise may also result from transmission line operation including the following:

- wind on the lines and transmission line structures (whistling)
- corona discharge (buzzing, crackling or humming).

Typically, the proposed access rights area provides an adequate noise buffer under normal operating conditions. Noise from wind effects is expected to be incidental and should only occur during periods of higher wind speeds, with the impacts reduced by any surrounding vegetation and topography (i.e. shielding). Corona discharge may cause noise emissions such as a crackling sound, which is due to ionisation of air at the surface of the conductors and generally occurs during periods of wet weather or high levels of humidity. Vegetation within the Yarraman State Forest is likely to screen the closest sensitive receptors from operational noise impacts. In addition, these sensitive receptors are closer to other existing Powerlink Queensland transmission lines and operation noise from these lines is likely to be more audible than from the proposed transmission line.

It is noted that although corona discharge noise may cause a nuisance to sensitive receptors, the incremental increase to the surrounding acoustic environment is not expected to be significant. Further, it should be noted that modern transmission line design which uses bundled conductors produces much less corona discharge noise than older lines, which have a single conductor per phase. Corona noise from the proposed transmission line is therefore expected to be less than that currently experienced from the existing line and unlikely to be noticeable at the closest sensitive receptors.

4.4.2.4 Decommissioning phase

Decommissioning, dismantling and removing the proposed transmission line at the end of its design life has potential to generate noise impacts from the following activities:

- vehicle and machinery movement over access roads and existing easement
- exhaust emissions associated with vehicle and machinery operation during decommissioning works
- dismantling of transmission line structures involving cranes
- disassembly of transmission line structure components using manual and power tools
- ground surface levelling or grading to better facilitate passive rehabilitation of the easements and transmission line structure locations.

Potential noise impacts associated with decommissioning activities are expected to be localised and short-term, and similar in occurrence and magnitude to potential impacts associated with construction phase activities. Following construction and commissioning of the Project, the existing transmission line will be decommissioned, and the impacts outlined above are also applicable those decommissioning activities.

4.4.3 Mitigation and management measures

Potential noise impacts from construction, operation and maintenance and decommissioning activities associated with the Project will be managed in accordance with Powerlink's standard environmental controls as outlined in the EMP (refer to Appendix L of Appendix G). These measures include:

- Limiting work hours to between 6.30 am to 6.30 pm Monday to Saturday (excluding public holidays) for construction work sites. Work is not to occur outside these hours unless it is in an emergency, due to limited line outages, maintenance activity, or other exceptional circumstances.

- Restricting use of regulated devices during construction to between 7am and 7pm Monday to Saturday (excluding public holidays). Regulated devices include compressors or generators; grass cutters; impact tools; leaf-blowers or mulchers; oxyacetylene burners; electrical, and mechanical or pneumatic power tools (chainsaws, drills, sanders, electric grinder, nail gun).
- Notifying landholders prior to commencement of the activity, of work occurring outside normal working hours (other than work required during an emergency, a limited outage, maintenance activity or other exceptional circumstance).
- Selecting appropriate plant and equipment for each task to minimise the noise contributions.
- Ensuring machinery is fitted with appropriate noise attenuation devices and is maintained in accordance with the manufacturer's recommendations.
- Shutting down any LPG/petrol/diesel powered equipment generating loud, extraneous (unusual) noise until the source of the noise can be identified and rectified.
- Programming loud noise activities to occur at times to minimise noise nuisance to surrounding sensitive receptors. Physical noise barriers such as earth mounds, mobile screens, or noise attenuation devices should be used, where necessary.
- Delivering and/or removing materials and equipment to and from the site within the approved hours for construction. All transport vehicles will be in good working order and will avoid using exhaust brakes in built up areas adjacent to the work site.
- Ensuring transport routes to and from the site are located to limit the impact of traffic noise on potentially sensitive areas, where possible.
- Turning off plant and equipment when not in use.
- Regularly maintaining, repairing or replacing plant if it becomes noisier.
- Placing emphasis during site inductions on the potential adverse impact of reversing alarms and exhaust brakes.
- Using non-tonal reversing alarms where practicable.

4.5 Hydrology

The potential for the Project to impact on existing surface and groundwater hydrological values of the surrounding area is described in this section. Significant impacts to these values are considered unlikely as:

- *The waterways in the area are dry for most of the year.*
- *Waterway crossings are located high in the catchments, where fish habitat and passage are limited due to the ephemeral nature of the waterways.*
- *Waterways do not connect to any important breeding, feeding or refuge areas.*
- *Groundwater was not encountered during drilling undertaken for the geotechnical investigation. Based on the generally elevated nature of the alignment and predominantly clayey subsurface soils, significant groundwater inflows are not anticipated.*
- *The Project is not located within a 'high-risk' flood hazard area.*
- *Construction of the transmission line is unlikely to alter the landscape to such an extent that it would influence flood levels along Rocky Creek.*

Mitigation and management measures proposed for the construction and operation/maintenance phases are in accordance with Powerlink's standard environmental controls as outlined in the Project EMP (refer Appendix G).

4.5.1 Existing environment

4.5.1.1 Surface water

Surface water features within the Project were determined through a comprehensive desktop review and from field survey results undertaken to support the K2E Project.

The preferred alignment is in the Brisbane River sub-basin and the Barker and Barambah Creeks sub-basin of the Burnett River Basin; structures D1 to D5 are in the Barker and Barambah Creeks sub-basin; and structures D6 to D15 within the Brisbane River sub-basin.

For the K2E Project approvals, 12 sites within the Brisbane River sub-basin were surveyed for water quality (ESP, 2021) which included:

- one site on an unnamed tributary of Rocky Creek within the K2E ASA
- five sites on Rocky Creek, downstream of the K2E ASA
- three sites on Yarraman Creek: two upstream and one downstream (i.e. downstream of the confluence with Rocky Creek) of the K2E ASA
- one site on Cooyar Creek, upstream of the confluence with Yarraman Creek
- two sites on the Brisbane River, downstream of the confluence with Cooyar Creek.

All water quality sampling was undertaken in accordance with the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009* (DES, 2018).

Baseline monitoring was not completed on waterways within the Barker and Barambah Creeks sub-basin as these waterways are comprehensively monitored as part of the existing Meandu Mine and Tarong power stations compliance requirements. As such a significant amount of baseline data already exists and was used to assess water quality and aquatic ecological values of the relevant waterways within this sub-basin.

Description of environmental values

Brisbane River sub-basin

Structures D6 through to D15 of the preferred alignment are located in the Upper Brisbane River catchment within the Brisbane River sub-basin which covers an area of approximately 5,483 square kilometres (km^2). The Brisbane River is 309km in length. From its origin, it flows in a southerly direction, through Wivenhoe Dam (approximately 140km downstream of the Project), and then flows east until it eventually discharges into Moreton Bay, which is a marine park and RAMSAR wetland (approximately 310km downstream of the Project).

The main waterways within the Brisbane River sub-basin of relevance to the Project are Rocky Creek and its tributaries, which are located within, upstream of, adjacent to and downstream of the Project (Figure 4.8). Approximately 9km downstream of the preferred alignment, Rocky Creek flows into Yarraman Creek, which in turn flows into Cooyar Creek, approximately 15.5km downstream of the preferred alignment.

The headwaters and tributaries of Rocky Creek are ephemeral channels and persistently dry, except following heavy rainfall. These waterways are not mapped as watercourses under the Water Act. Based on advice from the former DNRME (now Department of Resources), they are considered unnamed drainage lines.

Rocky Creek and its tributaries are mapped as stream order one, two, three and four waterways. Some of the drainage features that are traversed by the preferred alignment are mapped as stream order one and two.

Two mapped lacustrine wetlands occur in the vicinity of the Project; one riverine wetland located within the small-order tributaries on the eastern boundary of the Project (though ground-truthing during a site reconnaissance for the Project in March 2018 found that there was no wetland in this area), and the other (a farm dam – Rocky Creek Dam) located on Rocky Creek proper approximately 6km downstream of the Project.

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.8
Hydrology

NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3
RP176969
D5
D6
Lot 10
SP305494
Ridge Road
reserve
D7
D8
D9
D10
Lot 289
FTY1859
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks

Queensland Waterways For Waterway Barrier Works

- 1 - Low
- 2 - Moderate
- 3 - High
- Watercourse *[defined by Water Act 2000]*
- Drainage Feature *[defined by Water Act 2000]*
- King 2 East Additional Surface Area
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)

0 0.3 0.6
Kilometers

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

C:\Users\haaxs0\OneDrive - WSP O365\PS113963_Confidentail_K2EE\Mxd\28_TransmissionLine_EnvAR\PS127247_EnvAR_Fig4-8_Hydrology_v1.mxd

Surface waters and sediment of the Brisbane River sub-basin in the vicinity of the Project are typical of moderately disturbed ecosystems. They are influenced primarily by surrounding land uses but considered suitable for supporting the assigned environmental values of the waterways. Overall, water quality was poor in areas high in the catchment in the vicinity of the Project and improved with distance downstream. Sediment quality was typically good, with concentrations of most metal and metalloid parameters below the default guideline values for toxicants in sediments.

Barker and Barambah Creeks sub-basin

The northern section of the Project (between structures D1 and D5) is located in the Barker and Barambah Creeks sub-basin. The Barker and Barambah Creeks sub-basin covers an area of approximately 5,930 km^2. Barker Creek originates below the Stuart Range and flows in a north-easterly direction eventually flowing into the Bjelke-Petersen Dam approximately 100km downstream. Downstream of Bjelke-Petersen Dam, Barker Creek turns into Barambah Creek, which eventually flows into the Burnett River, which discharges into the Coral Sea at Bundaberg.

The waterways within the Barker and Barambah Creeks sub-basin of relevance to the Project are unnamed tributaries of Black Gully (formally known as Black Creek) (Figure 4.8). Black Creek has been substantially modified from its natural state through construction of the Tarong Ash Dam, Black Creek Dam, and the Black Creek Dam overflow diversion channel (which are located on the site of the Tarong power stations). Approximately 450m downstream of the preferred alignment, the waterway joins with another tributary of Black Creek, which is contains mine affected water from Meandu Mine. Mine affected water from retention dam RD17B is released to Black Creek via the CP2 spillway or release valve in accordance with the Meandu Mine Environmental Authority. Black Creek flows into Black Creek Dam, approximately 2km downstream of the preferred alignment. Black Creek Dam is a large water storage dam that also contains water from catchments draining remnant forest/bush land and forestry/pine plantation and a small area of Tarong power station. Water (including mine affected water) in Black Creek Dam can be used at the Tarong power stations, pumped to the adjacent Meandu Creek Dam or overflow to the Meandu Creek Diversion Channel, which was constructed in 2015. Black Creek Dam only overflows during extreme rain events, with water from the Black Creek Diversion Channel entering Meandu Creek approximately 2km downstream of Meandu Creek Dam.

Black Creek was de-gazetted as a watercourse in 2000 under the Water Act by the former DNRME (now Department of Resources). Although there are two mapped lacustrine wetlands within Black Creek catchment, these are artificial dams that form part of the water management system for Meandu Mine and the Tarong power stations.

The unnamed tributaries of Black Gully crossed by the preferred alignment are mapped as stream order one and two waterways. Approximately 320m downstream of the preferred alignment, Black Creek is an order three waterway, and approximately 450m downstream it is an order four waterway which extends to Black Creek Dam

Environmental values and water quality objectives

The quality of natural waters in Queensland is protected under the Environmental Protection (Water and Wetland) Policy EPP 2019 (Queensland) (EPP (Water and Wetland Biodiversity)). Section 6 of the EPP (Water and Wetland Biodiversity) lists the categories into which waters can be classified and their associated environmental values (EVs). The EVs and water quality objectives (WQOs) assigned to maintain the identified EVs, are progressively being determined for each water basin in Queensland. Queensland waters with defined EVs and WQOs are listed in Schedule 1 of the EPP (Water and Wetland Biodiversity).

The EPP (Water and Wetland Biodiversity) for the Upper Brisbane River (DEHP, 2010; DES, 2022) assigns EVs to freshwaters within the Cooyar Creek sub-catchment (which comprises the waterways of Rocky, Yarraman and Cooyar creeks). While listed as an EV for the Upper Brisbane River, review of the current water licences issued for surface water users indicated that the EV of aquaculture is not relevant to waterways in the vicinity of the Project.

Waters in the vicinity of the Project in the Burnett River Basin are not listed in Schedule 1 of the EPP (Water and Wetland Biodiversity). Relevant EVs and associated WQOs have been assigned in the Meandu Mine Receiving Environment Monitoring Program (REMP) with reference to the Burnett Mary River Water Quality Improvement Plan (WQIP) (Burnett Mary Regional Group 2015), findings from available literature, previous technical reports, and the results of monitoring assessments. Based on this, Black Creek has been assigned the industrial use EV only, but given the

direct connectivity, is also managed to protect the downstream EVs of Meandu Creek. While the Burnett Mary WQIP, identifies drinking water as an EV for Barker Creek from Nanango Weir to the Bjelke-Peterson Dam storage and Barambah Creek, this was not considered relevant to Meandu Creek given the distance downstream.

The environmental values assigned to waterways surrounding the Project are outlined in Table 4.9.

Table 4.9 Environmental values assigned for waterways surrounding the Project

Environmental Value	Brisbane River Sub-Basin	Barker and Barambah Creeks sub-basin	
	Cooyar Creek sub-catchment (Rocky, Yarraman and Cooyar creeks) [a]	Black Creek and Black Creek Dam	Meandu Creek downstream of Meandu Creek Dam [b]
Aquatic ecosystems	**Y (slightly to moderately disturbed)**	N/a	**Y (moderately disturbed)**
Irrigation	**Y**	N/a	**Y**
Farm supply / use	**Y**	N/a	**Y**
Stock watering	**Y**	N/a	**Y**
Aquaculture	**Y***	N/a	N/a
Human consumer	**Y**	N/a	N/a
Primary recreation	**Y**	N/a	**Y**
Secondary recreation	**Y**	N/a	**Y**
Visual appreciation	**Y**	N/a	**Y**
Drinking water	**Y**	N/a	N/a
Industrial use	**Y**	**Y**	**Y**
Cultural and spiritual values	**Y**	N/a	N/a

a Source: DES, 2022
b Source: Meandu Mine REMP (Stanwell, 2020)
Y Indicates applicable environmental value.
* Not relevant to the waters within vicinity of the Project.
N/a EV not applicable to the study area.

Water quality of Rocky Creek and the Brisbane River sub-basin

Waterways close to the Project in the headwaters of Rocky Creek only flow for a very short time and are unlikely to hold water following rainfall. Twelve months of monthly sampling (between April 2018 and March 2019) found waterway sites in this area were dry during all sampling events. Surface water quality in isolated dams in the vicinity of the preferred alignment and in downstream waterways of the Brisbane River sub-basin was typical of moderately disturbed ecosystems. These waterways and wetlands were influenced primarily by surrounding land uses such as Hoop Pine plantations surrounding the headwaters of Rocky Creek and agriculture surrounding the other waterways. However, they were considered suitable for supporting the environmental values of the waterways and were of low toxicity risk to flora and fauna.

Overall, water quality was poor in the isolated dams high in the Rocky Creek catchment (in the vicinity of the preferred alignment) and improved with distance downstream. Many water quality parameters were within or below available regional WQOs or default WQOs for the protection of the relevant environmental values, or occasionally exceeded the WQOs. However, some parameters were frequently outside of the WQOs, including levels of dissolved oxygen (which were often low); electrical conductivity (except in the Brisbane River, where it was low); total dissolved solids; sodium; nutrients (primarily ammonia, organic nitrogen and total nitrogen; and to a lesser extent total phosphorus); total petroleum hydrocarbons; and concentrations of some metals and metalloids (primarily manganese and iron). These parameters varied across the study area with differences likely based on a combination of local factors that would influence conditions of each waterway in addition to the surrounding land uses. These factors include water type (dam verse waterway), location within the catchment (upper catchment verse lower catchment), and surrounding geology.

Water quality of Rocky Creek in the isolated dams in the vicinity and immediately downstream of the Project was found to be the most degraded compared to other sites, with high concentrations of pH, nutrients (inorganic and organic), certain metals (manganese, aluminium and iron) and hydrocarbons. Further downstream, water quality of waterways of Rocky Creek (downstream of the lacustrine wetland) and Yarraman and Cooyar creeks (located further south-east from the Project) was characterised by very high electrical conductivity, total dissolved solids and concentrations of sodium, which are likely a result of the local geology of these waterways. Water quality of the upper Brisbane River was in the best condition, with lower electrical conductivity and concentrations of ions as well as lower concentrations of nitrogen, metals and hydrocarbons. However, water quality was still influenced by surrounding activities to a measurable degree.

Water quality of Black Gully (Black Creek)

Black Creek has been substantially modified from its natural state and is used for industrial purposes. Upstream of monitoring point CP2, the Black Creek catchment (361 ha) is wholly contained within the Meandu Mine mining lease. The mine-affected water (from active pits, un-rehabilitated waste dumps and rehabilitated landforms) in this catchment drains is released to Black Creek via release point CP2 in accordance with the Meandu Mine EA. The quality characteristics and release limits of mine-affected water under the Environmental Authority includes pH (5.5 – 9.0 pH units), turbidity (<1000 NTU) and electrical conductivity (<2,500 µS/cm). Regular monitoring of these parameters is completed during release to confirm compliance. Under current Meandu Mine operations, mine-affected waters are generally not released via CP2 to Black Creek (and were not released between 2017 and 2020), although releases to Black Creek are still an option if required.

The additional catchment draining to Black Creek Dam through this reach is 817ha (i.e. total catchment area of Black Creek Dam is 1178 ha), with land use predominantly remnant forest/bushland and forestry/pine plantation, with a small industrial area (Tarong power stations).

Other than compliance monitoring, there is limited data for Black Creek as it is not considered a waterway and is only managed for industrial use (for which no WQOs apply). However, two sites on Black Creek, one in Black Creek Dam and the other before the confluence with Meandu Creek were surveyed in 2017 for water and sediment quality. Water quality in Black Creek Dam during this survey was characterised by very high electrical conductivity, total dissolved solids, ions, nutrients, and some metals (although metals were typically below default guideline values). Water quality was typically better further downstream prior to the confluence of Meandu Creek Dam.

4.5.1.2 Queensland Waterway Barrier Works

In relation to the mapped risk of adverse impacts to fish movement from waterway barrier works, the waterways in the vicinity of the Project are mapped in the Queensland Department of Fisheries (DAF) Queensland Waterways for Waterway Barrier Works (DAF, 2017) as follows:

- the tributaries of Rocky Creek within the Project area are mapped as low (green) and moderate (amber) risk
- the tributary of Black Gully along the preferred alignment is mapped as a low (green) risk.

Tributaries of these creeks in the broader region include low (green), moderate (amber), high (red) and major (purple) risk waterways (Figure 4.8).

4.5.1.1 Flooding

The Project is in an area classified as ‘Balance (riverine/creek flooding with a mixed flood risk)’ Flood Risk Category under the *Toowoomba Regional Planning Scheme* (refer Figure 4.9).

The northern section of the Project which located within the South Burnett Regional Council does not traverse the Flood Hazard Overlay under the *South Burnett Regional Planning Scheme*.

4.5.2 Potential impacts

Infrastructure associated with the Project has the potential to impact on the hydrology of the area as well as cause impacts to water quality. However, the nature and location of the proposed transmission line means that the consequence of impacts occurring is low.

4.5.2.1 Water quality

The preferred alignment traverses unmapped tributaries of Rocky Creek and Black Gully.

Construction phase

Water quality impacts during the construction phase of the Project relate primarily to erosion and sediment issues. Additionally, potential impacts may occur from accidental spills of fuel or oil from construction equipment. Activities with the potential to create water quality impacts include:

- vegetation clearing
- excavation of foundations
- stormwater runoff from the construction site, including access tracks, which could be high in suspended solids or contain contaminants.

To minimise water quality impacts, construction of the proposed transmission line will be undertaken in a manner which:

- minimises the impact on riparian vegetation
- minimises soil disturbance
- ensures vegetation is re-established over disturbed ground
- avoids accidental spills
- refuelling of machinery and equipment offsite
- avoids high runoff periods during the wet season, where possible, with construction currently planned from March to September 2023 (noting the waterways in the area are dry for most of the year).

A specific-Erosion and Sediment Control Plan will be developed and implemented for the Project to minimise and manage impacts related to erosion. Development of this plan will be in accordance with the *IECA Best Practice Erosion and Sediment Control Guidelines 2008* and Powerlink's standard environmental controls as outlined in the EMP (refer Appendix C of Appendix G). These include:

- minimising ground disturbance and retaining ground cover to reduce the potential erosion surface area
- undertaking progressive rehabilitation of disturbed areas as soon as practicable to establish ground cover
- undertaking visual assessments for the presence and effectiveness of erosion and sediment control structures and measures, particularly preceding significant rainfall events, in areas where soil disturbance has taken place.

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Figure 4.9
Flood Hazard Risk

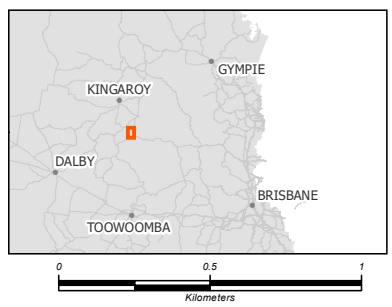
TARONG POWER STATION ROAD
NANANGO NEUMGNA ROAD
REEVE ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
TARONG YARRAMAN ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3
RP176969
D5
D6
Lot 10
SP305494
Ridge Road
reserve
D7
D8
D9
D10
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019
Lot 289
FTY1859

Legend

- Proposed transmission structure locations
- Existing Transmission Feeder
- Access track full clearing
- Highways
- Local roads
- Forestry access tracks
- Proposed Feeder
- Drainage Feature *[defined by Water Act 2000]*
- Watercourse *[defined by Water Act 2000]*
- Transmission structure footprint
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)
- Flood Hazard Balanced Mixed

Queensland Flood Hazard

- OFP1 – Overland Flow (Low)
- OFP2 – Overland Flow (High)
- FR4 – Extreme Flood Risk
- FR3 – High Flood Risk
- FR2 – Medium Flood Risk
- FR1 – Low Flood Risk



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:25,000 Date: 20/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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In addition, the following measures (in accordance with Appendix I and Appendix J of the EMP (Appendix G) will also be undertaken to ensure that the water quality of waterways in maintained:

- Refuelling of vehicles and machinery is not to take place within 100m of a watercourse or open drain. Where possible all refuelling will be off-site at an approved refuelling station.
- Vehicles will be well maintained avoid the risk of accidental fuel spillage. Any spillage will be cleaned up immediately.
- Spill kits are to be kept at the work area and monitored for restocking regularly. All machinery and vehicles carrying additional fuel/oil/diesel over 20 L will be equipped with a spill kit at all times.
- Routine or major servicing of vehicles will not be undertaken within the easement.
- The discarding of litter or cigarette butts to the ground or water body will be prohibited.
- Waste awaiting collection is to be left in a tidy and secure manner such that it does not have the potential to be windblown.

Powerlink, as an approved entity, will ensure that any excavation or placing of fill in a waterway is carried out in accordance with the *Riverine Protection Permit Exemption Requirements (WSS/2013/726)* or as otherwise authorised under relevant legislation.

Operation and maintenance phase

During the operational phase of the Project, water quality may be affected from erosion and sedimentation as a result of vegetation clearing for maintenance purposes, litter, and accidental fuel or chemical spillages of small quantities.

Maintenance equipment and vehicles will be well maintained to avoid the risk of accidental fuel spillage. Any spillage will be cleaned up immediately and in accordance with the measures outlined in the EMP (Appendix G). Maintenance and refuelling of vehicles will not be undertaken along the access rights areas during the operation phase.

Herbicides may be used in certain locations to control vegetation regrowth. Use of any agricultural chemicals will be undertaken in accordance with the procedures outlined in Appendix B of the EMP (refer Appendix G), including:

- ground distribution of herbicides is to be undertaken by or under the direct supervision of a licensed commercial operation
- distribution of herbicides is also only to be undertaken using equipment approved for weed spraying operations
- Powerlink is to liaise and notify landholders prior to the use of chemicals on properties.

4.5.2.2 Flooding

As the Project is outside of the flood envelope for the ‘high-risk’ categories of flood hazard area under both the Toowoomba and South Burnett planning schemes (refer Figure 4.9), there will be no impact on flood levels as a result of construction of the Project.

The Project crosses tributaries of Rocky Creek that are mapped as stream order one and stream order two waterways. These tributaries are not located within sections that comprised of localised high flow velocities. While localised flooding may occur during high rainfall events, this is unlikely to affect the overall integrity of the transmission line. Construction of the transmission line is also unlikely to alter the landscape to such an extent that it would influence flood levels along Rocky Creek.

4.5.2.3 Fish passage

The preferred alignment crosses three mapped waterways for waterway barrier works, including:

- Two tributaries of Rocky Creek mapped as low (green) and moderate (amber) risk, and
- One tributary of Black Gully mapped as a low (green) risk.

The proposed on-easement access track between structures D1 and D2 also crosses the tributary of Black Gully. Waterway crossings will be located high in the catchments. Fish habitat and passages are limited in these locations due to the ephemeral nature of the waterways. Furthermore, the waterways do not connect to any important breeding, feeding or refuge areas. As such, potential impacts to fish passage are considered minor and will be avoided and/or minimised by the following measures:

- Structures will be located at least 50m from watercourses, where possible.
- Previously cleared tracks for existing crossings will be preferentially used to minimise new watercourse crossings.
- Designing any waterway crossings in accordance with accepted development requirements.
- Where access tracks are not required by the landholder after decommissioning, these will be removed. The waterway bed and bank profiles will then be returned to be consistent with the surrounding waterway profile.

4.5.2.4 Groundwater

Excavation of footings for the transmission line structures poses a minor risk to groundwater resources. Footing depths for the proposed transmission structures are expected to be in the order of 10 m. No free groundwater was encountered within the depths augered as part of the geotechnical investigation. However, water was added to the boreholes to facilitate rotary washboring below the auger depths which precluded further groundwater observations. Based on the generally elevated nature of the alignment, and the predominantly clayey subsurface soils, significant groundwater inflows are not anticipated.

If groundwater is present during construction, it may need to be dewatered within the excavated area until the construction of footings is completed. This is expected to generate only a minimal impact on groundwater resources from the dewatering. Any groundwater that enters footing sumps may be exposed to pollutants associated with construction. This may include small amounts of hydrocarbons associated with construction machinery, excess sediment, concrete slurry, or fine particles. Water accumulated in the sumps will be monitored for contaminants of concern. Any contaminated waters would not be actively dewatered and will be treated or removed. In accordance with Powerlink's standard environmental control ESC4 of the EMP (refer Appendix C of Appendix G), a dewatering method is to be prepared and implemented for the Project. The objective of this dewatering method is to prevent contamination of land, surface waters or groundwater's by establishing suitable protocols to treat or remove contaminated water from the site.

4.6 Protected areas

This section describes the potential for the Project to impact on protected areas. While the preferred alignment does not traverse any protected areas as defined by the Nature Conservation Act 1992 (Queensland) (NC Act), it is located within the Yarraman State Forest. The design of the Project has ensured that clearing of remnant vegetation within the Yarraman State Forest will not be required. Potential impacts on protected areas are therefore anticipated to be limited to minor.

4.6.1 Existing environment

Protected areas refer to areas set aside for the conservation of natural and cultural values and are defined under section 14 of the *Nature Conservation Act 1992* (Queensland) (NC Act). Protect areas include national parks, conservation parks, resources reserves, special wildlife reserves, nature refuges, and coordinated conservation areas. This section does not discuss Indigenous and non-Indigenous cultural heritage places. Discussion on these is provided in Section 4.9.

The Project does not traverse any protected areas as defined by the NC Act. NC Act defined protected area in proximity to the Project are listed in Table 4.10.

Table 4.10 NC Act defined protected areas in proximity of the Project

Name	Type	Proximity to the Project
Tarong National Park	National Park (MSES protected area – estates)	Approx. 5km west
Pidna National Park	National Park (MSES protected area – estates)	Approx. 6.9km south-east
The Palms National Park	National Park (MSES protected area – estates)	Approx. 10.3km south-west

Whilst not specifically afforded protection under the NC Act, protected areas can also include areas managed for production of forest resources, including timber and quarry material such as State forests. The Project is located within the Yarraman State Forest.

Within the locality of the Project, areas of native vegetation are associated with the Yarraman State Forest (where the Project is located), the nearby Tarong State Forest, and Tarong National Park. A north-south wildlife corridor to the east of the preferred alignment connects Yarraman State Forest with Tarong National Park to the west, and Tarong State Forest to the north-west. These wildlife corridors would provide functional and viable movement and dispersal opportunities for all faunal groups.

4.6.2 Potential impacts and management measures

The Project does not affect any protected areas identified in Table 4.10. The nearest identified protected area is the Tarong National Park, approximately 5km west of the Project. The other two identified protected areas are located greater than 5km from the Project. However, the preferred alignment traverses Yarraman State Forest, which contains both plantation forestry and areas of remnant vegetation. The preferred alignment has been sited to avoid areas of remnant vegetation to the largest degree possible. In addition, design of the Project, has ensured that clearing of remnant vegetation within the Yarraman State Forest will not be required (refer further to Sections 4.6.2 and 4.74.7). Potential impacts on protected areas are therefore anticipated to be limited to minor.

Powerlink's standard environmental controls will be implemented to minimise potential indirect impacts on protected areas. These are outlined in the EMP (Appendix G) and discussed further in Section 4.74.7.

4.7 Biodiversity

The biodiversity (flora and fauna) values potentially impacted by the Project are discussed in this section. A detailed Ecological Assessment Report is provided in Appendix E. The Project area contains sensitive ecological values in the form of remnant semi-evergreen thicket and dry rainforest communities (RE12.5.13c). These vegetation communities provide known habitat for a number of conservation significant flora and fauna including the Black-breasted Button-quail. The Project avoids clearing of this remnant vegetation by siting transmission line structures outside of areas of remnant vegetation; increasing the height of transmission line structures to span remnant vegetation; helicopter string of the transmission line over areas of remnant vegetation; and avoiding areas of remnant vegetation for access track widening or new access tracks. The Project has been assessed as unlikely to have a significant impact on biodiversity values by implementing these measures, along with Powerlink's standard environmental controls for vegetation management and minimisation of wildlife interactions (Appendix G).

4.7.1 Existing environment

4.7.1.1 Methodology

Methodologies used to assess biodiversity values included:

- Desktop assessment to characterise and identify potential flora and fauna species and their habitat that may be present within the ecological Study area (defined as Study area throughout this section and shown on Figure 4.10). The desktop assessment included a review of literature, searches of publicly available datasets and online mapping, and work previously completed by WSP for the K2E Project.
- The field surveys for the Project were conducted over one dry season (August 2019) and one wet season (January 2022). The main purpose of the field surveys was to field verify the vegetation communities and habitats within the Study area which may be at risk of impact from the Project, and to identity threatened species that may be present. The survey methods and effort were developed in reference to State and Commonwealth survey guidelines to determine the level of adequate survey for the target threatened flora and fauna species. The fauna survey methods applied to the Project were limited to detection-based surveys only, with no fauna trapping undertaken. Targeted searches for animal breeding places were performed in habitats supported by the Project area to identify animal breeding places for threatened and Least Concern (colonial breeder) fauna species.
- A likelihood of occurrence assessment for conservation significant flora and fauna species identified during the desktop review was undertaken. The assessment considered known habitat and ecological requirements of the threatened species against the vegetation communities and habitat values identified in the field surveys.
- An assessment of the risk of impact to biodiversity values based upon the potential extent of habitat loss resulting from clearing activities and construction operations for the Project.
- Identification of mitigation measures for proposed impacts.

Further detail on the methodology is provided within Appendix E. Results are presented in the following sections.

4.7.1.2 Desktop assessment results

Bioregional context

The Project is located within the South Burnett subregion of the South-east Queensland bioregion. The South-east Queensland bioregion stretches along the coastline from Gladstone in the north to Coolangatta in the south, and extends as far west as Toowoomba on the Great Dividing Range. It covers a total area of approximately 22,420 km^2, with 83% of the region in private ownership and 13.3% of land occurring in protected areas such as National Parks (DEHP, 2016).

The South-east Queensland bioregion is recognised as one of Australia's biodiversity 'hotspots', boasting a rich diversity of native flora and fauna, as well as a dynamic coastline, mountain range and freshwater wetland ecosystems. It is also densely populated and one of the fastest growing metropolitan regions in Australia. From 1981–2011, the population doubled from approximately 1.5 million – 3.1 million, and the projected population growth for 2041 is expected to reach 5.5 million (DEHP, 2016). Rapid population growth in South-east Queensland is putting pressure on its biodiversity and ecosystems through habitat loss and fragmentation (Field et. al., 2012).

The South Burnett subregion covers an area of 5,638.7km^2, representing approximately 25% of the South-east Queensland Bioregion and 0.3% of the State of Queensland. Vegetation within the South Burnett subregion of the South-east Queensland bioregion is generally fragmented forming a mosaic of cleared land, patches of native vegetation and forestry plantations. The percentage of remnant vegetation remaining in the subregion is approximately 25% (Accad et al, 2019).

Mapped regulated vegetation

In Queensland, remnant and high value regrowth vegetation is described and mapped by the Queensland Herbarium as Regional Ecosystems (REs). REs are broad plant communities within a bioregion that consistently occur in association with a particular combination of geology, landform and soil (Neldner et al., 2012).

Remnant REs mapped as occurring within the Study area are identified in Table 4.11 and shown on Figure 4.10.

Table 4.11 Mapped regional ecosystems relevant to the Project

RE ID	Description	VM ACT Status	Biodiversity Status	Vegetation Management Category
12.5.13a	Microphyll to notophyll vine forest +/- *Araucaria cunninghamii* on Tertiary surfaces.	Endangered	Endangered	Category B
12.9-10.3	*Eucalyptus moluccana* open forest on sedimentary rocks.	Of concern	Of concern	Category B
12.5.13/12.5.1 (85/15%)	High-value Regrowth: 12.5.13: Microphyll to notophyll vine forest +/- *Araucaria cunninghamii* on Tertiary surfaces / 12.5.1: Open forest complex with *Corymbia citriodora* subsp. *variegata* on subcoastal remnant Tertiary surfaces. Usually deep red soils	Endangered/Least Concern	Endangered/No Concern at Present	Category C
12.5.13/12.5.1 (85/15%)	Reef regrowth watercourse vegetation: 12.5.13: Microphyll to notophyll vine forest +/- *Araucaria cunninghamii* on Tertiary surfaces / 12.5.1: Open forest complex with *Corymbia citriodora* subsp. *variegata* on subcoastal remnant Tertiary surfaces. Usually deep red soils	Endangered/Least Concern	Endangered/No Concern at Present	Category R

Category C high value regrowth (HVR) regulated vegetation comprising 12.5.13/12.5.1 (VM Act status of Endangered/Least Concern) is also mapped as occurring in the Study area. A small section of RE 12.5.13/12.5.1 HVR vegetation the north-west end of the preferred alignment is identified as Category R vegetation. Category R vegetation is defined as an area which is a regrowth watercourse and drainage feature area located within 50m of a watercourse located in the Burdekin, Burnett–Mary, Eastern Cape York, Fitzroy, Mackay–Whitsunday or Wet Tropics catchments identified on the vegetation management watercourse and drainage feature map.

Threatened ecological communities

The PMST returned five TECs, listed under the EPBC Act, as having potential to occur within 10km of the Project. None of these TECs were identified as occurring in the Project area (refer further to Section 4.8.1.1).

Conservation significant flora

The desktop assessment identified 27 conservation significant flora species with the potential to occur within the Study area. These species and their respective conservation status under the EPBC Act and NC Act are detailed in Table 4.12. of these, two species were recorded from the Study area and an additional three species were assessed as having a moderate or higher likelihood of occurrence within the Study area. Full details of the likelihood of occurrence assessment can be found in Attachment B of Appendix E.

Meandu Mine Transmission Line Relocation Project
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Figure 4.10
State Mapped Regulated Vegetation (Regional Ecosystems)

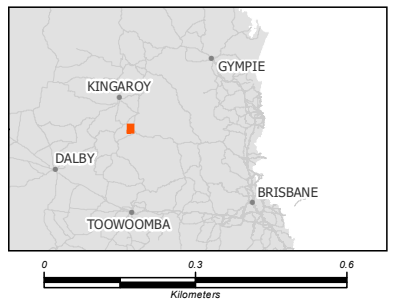
TARONG POWER STATION ROAD
Yarraman State Forest
NANANGO NEUMGNA ROAD
REEVE ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
D5
D6
D7
D8
D9
D10
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- Ecology Study Area
- Yarraman State Forest
- Mining Lease (ML6674)
- Proposed Easement
- King 2 East Additional Surface Area

Vegetation Management Regional Ecosystem

- Category A or B area containing endangered
- Category A or B area containing of concern
- Category A or B area that is least concern
- Category C or R area containing endangered
- Category C or R area containing of concern
- Category C or R area that is of least concern
- Water



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Kilometers

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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Table 4.12 Desktop results for conservation significant flora

Species Name	Common Name	NC ACT	EPBC ACT	Data Source	Likelihood of occurrence
Picris conyzoides	-	V	-	Wildlife Online	**Moderate**
Rhaponticum australe	Austral Cornflower	V	V	PMST	**Moderate**
Lepidium peregrinum	Wandering Pepper-cress	-	E	PMST	Low
Denhamia parvifolia	Small-leaved Denhamia	V	V	PMST	Low
Callitris baileyi	Bailey's Cypress	NT	-	Wildlife Online	Low
Fontainea venosa	-	V	V	PMST	Low
Sophora fraseri	Brush Sophora	V	V	PMST	Low
Haloragis exalata subsp. *velutina*	Tall Velvet Sea-berry	V	V	PMST, Wildlife Online	**Recorded**
Melaleuca formosa	White Cliff Bottlebrush	NT	-	Wildlife Online	Low
Rhodamnia dumicola	Rib-fruited Malletwood	E	-	Wildlife Online	**Recorded**
Rhodamnia rubescens	Scrub Turpentine	CE	CE	Wildlife Online	Low
Cryptostylis hunteriana	Leafless Tongue-orchid	-	V	PMST	Low
Sarcochilus weinthalii	Blotched Sarcochilus	E	V	PMST, Wildlife Online	Low
Arthraxon hispidus	Hairy-joint Grass	V	V	PMST	Low
Bothriochola bunyensis	Satin-top Grass	V	V	PMST	Low
Dichanthium queenslandicum	King Blue-grass	V	E	PMST	Low
Dichanthium setosum	bluegrass	-	V	PMST	Low
Paspalidium grandispiculatum	a grass	V	V	PMST, Wildlife Online	Low
Macadamia integrifolia	Macadamia Nut	V	V	PMST	Low
Clematis fawcettii	Stream Clematis	V	V	PMST	Low
Polianthion minutiflorum	-	V	V	PMST	Low
Pomaderris coomingalensis	-	E	-	Wildlife Online	Low
Phebalium distans	Mt Berryman Phebalium	E	CE	PMST	Low
Zieria verrucosa	-	V	V	Wildlife Online	Low
Thesium australe	Austral Toadflax	V	V	PMST, Wildlife Online	Low
Cossinia australiana	Cossinia	E	E	PMST	**Moderate**
Calellia pentastylis	Ooline	V	V	PMST	Low

Conservation status: Critically Endangered (CE), Endangered (E), Vulnerable (V), Near Threatened (NT).

Conservation significant fauna

The desktop assessment identified 47 conservation significant fauna species with the potential to occur within the Study area, including 28 birds, 12 mammals, 6 species of reptile and 1 amphibian. These species and their respective conservation status under the EPBC Act and NC Act are detailed in Table 4.13. Of these seven species were recorded from the Study area and a further eight species were assessed as having a moderate or higher likelihood of occurring within the Study area. Further details are provided in Section 4.7.1.4 and Section 4.8. Full details of the likelihood of occurrence assessment can be found in Attachment B of Appendix E.

Table 4.13 Desktop results for conservation significant fauna

Common Name	Scientific Name	EPBC Act	NC Act	Data source	Likelihood of occurrence
BIRDS					
Common Sandpiper	*Actitis hypoleucos*	M	SLC	PMST	Low
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	PMST	Low
Fork-tailed Swift	*Apus pacificus*	M	SLC	PMST	Low
Wedge-tailed Shearwater	*Ardenna pacifica*	M	V	Wildlife Online	Low
Australasian Bittern	*Botaurus poiciloptilus*	E	E	PMST	Low
Sharp-tailed Sandpiper	*Calidris acuminata*	M	SLC	PMST	Low
Curlew Sandpiper	*Calidris ferruginea*	CE (M)	CE	PMST	Low
Pectoral Sandpiper	*Calidris melanotos*	M	SLC	PMST	Low
Glossy Black Cockatoo (Eastern)	*Calyptorhynchus lathami lathami*	-	V	Wildlife Online	Low
Oriental Cuckoo	*Cuculus optatus*	M	SLC	PMST, Wildlife Online	**Moderate**
Grey Falcon	*Falco hypoleucos*	V	V	PMST, Wildlife Online	**Recorded**
Latham's Snipe	*Gallinago hardwickii*	M	SLC	PMST, Wildlife Online	Low
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V	V	PMST, Wildlife Online	Low
Painted Honeyeater	*Grantiella picta*	V	V	PMST, Wildlife Online	Low
White-throated Needletail	*Hirundapus caudacutus*	V (M)	V	PMST, Wildlife Online	Low
Swift Parrot	*Lathamus discolor*	CE	E	PMST, Wildlife Online	Low
Black-faced Monarch	*Monarcha melanopsis*	M	SLC	PMST, Wildlife Online	**Recorded**
Spectacled Monarch	*Symposiachrus trivirgatus*	M	SLC	PMST, Wildlife Online	**High**
Yellow Wagtail	*Motacilla flava*	M	SLC	PMST	Low
Satin Flycatcher	*Myiagra cyanoleuca*	M	SLC	PMST, Wildlife Online	**Moderate**

Common Name	Scientific Name	EPBC Act	NC Act	Data source	Likelihood of occurrence
Powerful Owl	*Ninox strenua*	-	V	Wildlife Online	**Recorded**
Eastern Curlew	*Numenius madagascariensis*	CE (M)	E	PMST	Low
Osprey	*Pandion haliaetus*	M	SLC	PMST	Low
Rufous Fantail	*Rhipidura rufifrons*	M	SLC	PMST, Wildlife Online	**Recorded**
Australian Painted Snipe	*Rostratula australis*	E	E	PMST	Low
Black-breasted Button-quail	*Turnix melanogaster*	V	V	PMST, Wildlife Online	**Recorded**
MAMMALS					
Northern Quoll	*Dasyurus hallucatus*	E	-	PMST	Low
Spotted-tail Quoll	*Dasyurus maculatus maculatus* (SE mainland population)	E	E	PMST Wildlife Online	**Moderate**
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	*Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT)	E	V	PMST, Wildlife Online	**High**
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	PMST	Low
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	-	PMST	**Moderate**
Greater Glider	*Petauroides volans*	V	E	PMST, Wildlife Online	**Recorded**
Ghost Bat	*Macroderma gigas*	V	E	PMST	Low
Yellow-bellied Glider (south-eastern)	*Petaurus australis australis*	V	E	PMST	**Moderate**
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	PMST	**Moderate**
Brush-tailed Rock-wallaby	*Petrogale penicillata*	V	V	PMST	Low
New Holland Mouse	*Pseudomys novaehollandiae*	V	V	PMST	Low
Short-beaked Echidna	*Tachyglossus aculeatus*	-	SLC	Wildlife Online	**Recorded**
REPTILES					
White-throated Snapping Turtle	*Elseya albagula*	CE	CE	PMST	Low
Adorned Delma, Collared Delma	*Delma torquata*	V	V	PMST, Wildlife Online	Low
Five-clawed Worm-skink	*Anomalopus mackayi*	V	E	PMST	Low
Yakka Skink	*Egernia rugosa*	V	V	PMST	Low

Common Name	Scientific Name	EPBC Act	NC Act	Data source	Likelihood of occurrence
Dunmall's Snake	*Furina dunmalli*	V	V	PMST, Wildlife Online	Low
Common Death Adder	*Acanthophis antarcticus*	-	V	Wildlife Online	Low
AMPHIBIANS					
Tusked frog	*Adelotus brevis*	-	V	Wildlife Online	Low

Value codes: Critically Endangered (CE), Endangered (E), Vulnerable (V), Near Threatened (NT), Migratory (M), Special Least Concern (SL)

Essential habitat

The Study area is mapped as containing essential habitat (refer to Figure 4.11) for:

- *Rhodamnia dumicola* (EH: 13406)
- *Haloragis exalata* subsp. *velutina* (EH:12163)
- *Picris conysoides* (EH: 7131)
- Black-breasted Button-quail (EH: 1092)
- Greater Glider (EH: 848).

Essential habitat areas are mapped over the following locations:

- between structure locations D1 to D6 and D9 to D10A
- along the majority of access tracks, which are adjacent to remnant vegetation.

The Study area is also mapped as containing protected wildlife habitat for the Black-breasted Button-quail and Short-beaked Echidna (refer Figure 4.11).

Protected plants

The preferred alignment intersects areas mapped as ‘high-risk areas’ for Protected Plants (refer to Figure 4.12). High-risk areas are mapped as occurring:

- between structure locations D1 to D6 and D9 to D10A
- along the majority of access tracks through remnant vegetation.

As the Project footprint contains areas mapped as high-risk for protected plants on the Protected Plants Survey Trigger Map, a protected plants flora survey was required within the Study area and a 100m buffer to the extent of the high-risk area and a Protected Plant Clearing Permit or Exempt Clearing Notice submitted to DES. The protected plant flora survey was undertaken on 15 to 18 August 2022 (refer further to Sections 4.7.1.3 and 5.2.8).

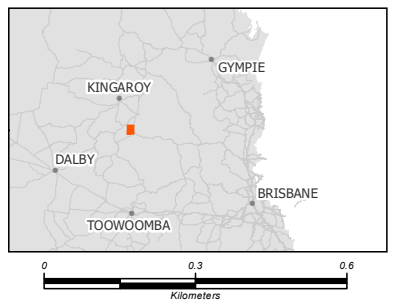
Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.11
MSES layers of relevance

TARONG POWER STATION ROAD
REEVE ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
D5
D6
D7
D8
D9
D10
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Access track full clearing
- Existing Transmission Feeder
- Local roads
- Forestry access tracks
- Ecology Study Area
- Regulated remnant vegetation intersecting a watercourse
- Essential habitat
- Protected wildlife habitat
- King 2 East Additional Surface
- Mining Lease (ML6674)
- Approved Surface Right Area
- Proposed Easement



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 14/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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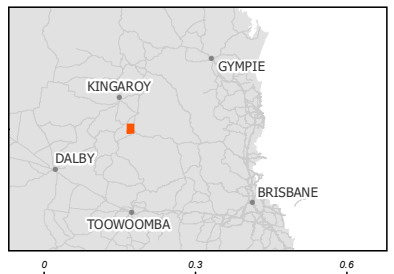
Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.12
High risk flora survey trigger mapping for protected plants

TARONG POWER STATION ROAD
REEVE ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
D5
D6
D7
D8
D9
D10
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Access track full clearing
- Existing Transmission Feeder
- Local roads
- Forestry access tracks
- Ecology Study Area
- High-risk flora survey trigger mapping
- Approved Surface Right Area
- Mining Lease (ML6674)
- King 2 East Additional Surface Area
- Proposed Easement



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 12/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.7.1.3 Field survey results

Regional ecosystems

Field verified regional ecosystems and vegetation communities within the Study area is presented in Table 4.14 and shown on Figure 4.13. Field verified vegetation communities and regional ecosystems and vegetation communities are mapped at a scale of 1:5,000.

The results of the field verification surveys of vegetation communities and regulated vegetation (regional ecosystems) within the approximately 56.6ha Study area includes approximately:

- 27.4ha of transmission line easement (60m wide)
- 29.2ha of proposed access tracks with a nominal 10m buffer either side of the access tracks.

Most of the transmission line easement comprises field verified non-remnant vegetation in the form of Hoop Pine (*Araucaria cunninghamii*) and juvenile hardwood plantations, and areas of remnant and high value regrowth (HVR) regulated vegetation, listed under the VM Act.

Table 4.14 Field verified vegetation communities and regional ecosystems in the Study area

Vegetation Community	Corresponding Regional Ecosystem	EPBC Act Status	VM Act Status	Extent (ha) in Study area		Totals (ha)
				Transmission line easement	Access tracks	
Low microphyll vine forest and semi-evergreen vine thicket with emergents on deeply weathered remnant Tertiary surfaces	12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii*	-	Endangered	3.6	4.8	8.4
Mixed *Acacia spp.* high value regrowth with vine thicket species on deeply weathered Tertiary surfaces	Regrowth 12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii*	-	Endangered (HVR)	4.2	1.5	5.7
Mixed *Acacia spp.* high value regrowth with vine thicket species on metasediments	Regrowth 12.11.11 - Araucarian microphyll vine forest on metamorphics +/- interbedded volcanics; usually southern half of bioregion	-	Least Concern (HVR)	3.1	-	3.1
Remnant *Eucalyptus moluccana* mixed open forest on metasediments	12.11.18 - Eucalyptus moluccana woodland on metamorphics +/- interbedded volcanics	-	Least Concern	-	9.5	9.5
Hoop pine plantation	Non-remnant	-	n/a	13.1	5.3	18.4
Juvenile Hardwood plantation	Non-remnant	-	n/a	2.2	0.5	2.7
Exotic / native shrubby grasslands and bare earth tracks	Non-remnant	-	n/a	1.2	7.6	8.8
Totals				**27.4**	**29.2**	**56.6**

Field verified regional ecosystems within the Study area were found to comprise mainly 12.5.13c, as opposed to regional ecosystem 12.5.13a as mapped by the Queensland Herbarium. The major differences between these two sub regional ecosystems relates to the overall structure and height, as well as the soil type and topographic position of the regional ecosystems. Regional ecosystem 12.5.13c has an ecological dominant layer which is low (<10 m) with scattered emergent trees and occurs on rocky shallow soils and ridgelines. On the other hand, regional ecosystem 12.5.13a is taller with multiple tree layers and occurs on deeper soils in situations with lower topographic relief (i.e. lower slopes and gullies).

Further inconsistencies were identified between State mapped regional ecosystems and the field verified regional ecosystems on the lower slopes of the Project. The vegetation containing proposed tower locations D1 to D5 are State mapped as high value regrowth (HVR) regional ecosystem 12.5.13a - Microphyll to notophyll vine forest +/- *Araucaria cunninghamii* and regional ecosystem 12.5.1 - Open forest complex with *Corymbia citriodora* subsp. *variegata* on subcoastal remnant Tertiary surfaces. The vegetation was dominated by *Acacia spp.* regrowth with vine thicket species in the understory.

The mapped HVR RE12.5.13/12.5.1 between structure locations D4 and D5 was field verified as HVR regional ecosystem 12.5.13c, due to the topographic position and soil type, in addition to the regional ecosystem attribution of 12.5.13c within the adjacent remnant vine thicket communities.

Field surveys confirmed the presence of Land Zone 11 associated with exposed areas of surface rock and shallow soils on slopes with underlying interbedded volcanics supporting HVR regional ecosystem 12.11.11 at tower locations D2 and D3 and regional ecosystem 12.11.18 on the lower slopes of the western access tracks (refer Figure 4.13). The patch of vegetation south-east of towers D11, D13 and D14 within the proposed access track buffer was also State mapped as regional ecosystem 12.5.13a, however it was field verified as 12.11.18. This patch is outside of the proposed transmission line easement. Based on the proposed transmission line design, this vegetation community is not impacted however, may be impacted if widening of the access track is required. Access track widening has currently not been identified for this area.

Vegetation along the existing access tracks is predominantly comprised of field verified non-remnant cleared tracks, surrounded by areas of remnant regulated vegetation listed under the VM Act including *Eucalyptus moluccana* mixed open forest and Microphyll to notophyll vine forest.

Full vegetation communities' descriptions are presented in Section 5.1 of Appendix E.

Flora species

A total of 103 flora species were recorded within the Study area during field surveys for the Project (refer to Attachment C of Appendix E).

During the August 2019 survey, one threatened flora species, *Haloragis exalata* subsp. *velutina*, listed as Vulnerable under the EPBC Act and NC Act, was recorded. The population of *H. e. velutina* was recorded within drainage lines and adjacent to existing tracks within habitat associated with the mixed *Eucalyptus moluccana* woodland on interbedded volcanics vegetation community within the Study area, which aligns with regional ecosystem 12.11.18 – *Eucalyptus moluccana* woodland on metamorphics +/- interbedded volcanics. The records of *Haloragis exalata* subsp. *velutina* from the field surveys are presented on Figure 4.13.

During the January 2022 survey, targeted surveys were undertaken for the previously recorded population of *H. e. velutina*, however the species was not recorded, which could be due to seasonal conditions. The areas where the *H. e. velutina* were previously recorded now consist of dense *Lantana camara* infestations in the understory, which may be preventing the recruitment and/or survival of the species. Effects of seasonality also may be having an impact on the population, in addition to periods of drought and impacts to plant pollinators. Despite the absence of this species during these field surveys, the vegetation community is still considered supporting habitat. Future surveys in areas where *H. e. velutina* were previously in 2019, may reveal the species as still present.

Rhodamnia dumicola listed as Endangered under the NC Act was recorded during the protected plant flora survey on 15 to 18 August 2022 (refer Figure 4.13).

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.13

Field Verified Vegetation Communities and threatened flora species records

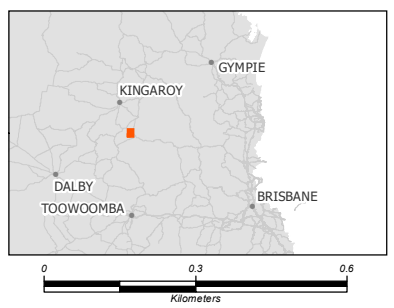
TARONG POWER STATION ROAD
REEVE ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
1030-STR-9009
1030-STR-9018
1030-STR-9019
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D10A
D11
D13
D14
D15
Non-remnant
12.11.11
12.5.13c
Plantation
12.11.18

Legend

- Rhodamnia dumicola records
- *Haloragis exalata* subsp. *exalata* (Vulnerable EPBC Act 1999 and NC Act 1992)
- Proposed transmission structure locations
- Transmission structure footprint
- Access track full clearing
- Local roads
- Forestry access tracks
- Existing Transmission Feeder
- Mining Lease (ML6674)
- Approved Surface Right Area
- Proposed Easement
- King 2 East Additional Surface Area

Field Verified Vegetation Community

- Mixed Acacia spp. high value regrowth with vine thicket species on LZ5
- Mixed Acacia spp. high value regrowth with vine thicket species on metasediments
- Non-remnant cleared mixed grassland, regrowth and tracks
- Non-remnant hardwood plantation
- Non-remnant hoop pine plantation
- Remnant Eucalyptus moluccana mixed open forest on metasediments
- Remnant low microphyll vine forest and semi-evergreen vine thicket



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 13/12/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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No other threatened flora species listed under the EPBC Act and/or NC Act were recorded within the Study area during the field surveys for the Project. An additional three threatened flora species were assessed as having a moderate likelihood of occurring in the Project area based on the presence of suitable habitat. These flora species are:

- *Cossinia australiana* – Endangered EPBC Act and NC Act
- *Picris conyzoides* – Vulnerable NC Act
- *Rhaponticum australe* – Vulnerable EPBC Act and NC Act (refer Table 4.12).

4.7.1.4 Habitat assessment

The Study area is comprised of several fauna habitat types, including softwood and hardwood plantations, remnant semi-evergreen vine thicket and dry rainforest, high value regrowth and non-remnant vegetation. A summary of field verified habitats, corresponding regional ecosystems and relevant threatened and or migratory species are presented in Table 4.15 and shown on Figure 4.14.

Full descriptions of each of the fauna habitat type listed in Table 4.15 are presented in Section 5.4.1 to 5.4.6 of the Ecological Assessment Report (refer Appendix E).

Table 4.15 Threatened species habitat and corresponding habitat type and regional ecosystems

Fauna habitat type	Corresponding regional ecosystem	Threatened fauna habitat	Extent (ha) in Study area		Totals
			Transmission line easement	Access tracks	
Low vine forest	Remnant 12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket with emergents on deeply weathered remnant Tertiary surfaces.	Black-breasted Button Quail Black-faced Monarch Spotted-tail Quoll Grey Falcon Oriental Cuckoo Powerful Owl Rufous Fantail Short-beaked Echidna Spectacled Monarch *Cossinia australiana* *Rhodamnia dumicola*	3.6	4.8	8.4
Regenerating Acacia and low vine forest	Regrowth 12.5.13c - Mixed *Acacia spp.* high value regrowth with vine thicket species on deeply weathered Tertiary surfaces.	Black-breasted Button Quail (foraging only as evidenced by platelets) Black-faced Monarch Oriental Cuckoo Powerful Owl (foraging) Spectacled Monarch Spotted-tail Quoll Rufous Fantail Short-beaked Echidna	4.2	1.5	8.8
	Regrowth 12.11.11 - Mixed *Acacia* spp. high value regrowth with vine thicket species on metasediments		3.1	-	
Eucalypt open forest	Remnant 12.11.18 - *Eucalyptus moluccana* mixed open forest on brown clays	Corben's Long-eared Bat Greater Glider	-	9.5	9.5

Fauna habitat type	Corresponding regional ecosystem	Threatened fauna habitat	Extent (ha) in Study area		Totals
			Transmission line easement	Access tracks	
		Grey Falcon Grey-headed Flying-fox Koala Oriental Cuckoo Powerful Owl Rufous Fantail Satin Flycatcher Short-beaked Echidna Yellow-bellied Glider *Haloragis exalata* subsp. *velutina* *Picris conyzoides* *Rhaponticum australe*			
Hoop pine plantation	Non-remnant	Within 50m of remnant habitat and with the right floristic understorey of dry rainforest and vine thicket species, Hoop Pine plantation provides supplementary foraging habitat for the Black-breasted Button-quail.	13.1 (1.2ha in 50m buffer to remnant habitat)	5.3	18.4
Juvenile hardwood plantation	Non-remnant	Short-beaked Echidna	2.2	0.5	2.7
Exotic / native shrubby grasslands and bare earth tracks	Non-remnant	n/a	1.2	7.6	8.8
Totals			**27.4**	**29.2**	**56.6**

Fauna species

A total of 135 fauna species were recorded within the wider Study area during the field surveys for the transmission line project and K2E Project combined, including six amphibians, 88 birds, 37 mammals (including 18 microbat species) and four reptiles. Domesticated or feral dogs, feral cats and Red Fox were also recorded within the Study area. A complete fauna species list is presented in Attachment C of the Ecological Assessment Report (Appendix E).

Five threatened fauna species were recorded during the field surveys for the Project:

- Grey Falcon (*Falco hypoleucos*), listed as Vulnerable under the EPBC Act and the NC Act
- Powerful Owl (*Ninox strenua*), listed as Vulnerable under the NC Act (not listed under the EPBC Act)
- Black-breasted Button Quail (*Turnix melanogaster*), listed as Vulnerable under the EPBC Act and the NC Act

- Greater Glider (*Petauroides volans (P. armillatus)*), listed as Vulnerable under the EPBC Act and Endangered under the NC Act
- Short-beaked Echidna (*Tachyglossus aculeatus*), listed as Special Least Concern under the NC Act (not listed under the EPBC Act).

The locations in which the above species were recorded are shown in Figure 4.14. In addition, two migratory species under the EPBC Act, the Black-faced Monarch (*Monarcha melanopsis*) and Rufous Fantail (*Rhipidura rufifrons*), were recorded. Both these species are listed as Special Least Concern under the NC Act.

A further eight fauna species of conservation significance were assessed as having a moderate or higher likelihood of occurring in the Project area based on recent/nearby records and/or the presence of suitable habitat. These were:

- Oriential Cuckoo: Migratory - EPBC Act, Special Least Concern - NC Act
- Satin Flycatcher: Migratory - EPBC Act, Special Least Concern - NC Act
- Spectacled Monarch: Migratory - EPBC Act, Special Least Concern - NC Act
- Spotted-tail Quoll: Endangered – EPBC Act; Vulnerable – NC Act
- Corben's Long-eared Bat: Vulnerable - EPBC Act and NC Act
- Yellow-bellied Glider: Vulnerable – EPBC Act; Endangered – NC Act
- Koala: Endangered – EPBC Act; Vulnerable – NC Act
- Grey-headed Flying-fox: Vulnerable – EPBC Act (refer Table 4.13).

The complete likelihood of occurrence assessment is presented in Attachment B of the Ecological Assessment Report (Appendix E).

4.7.2 Potential impacts and management measures

Overall disturbance for the proposed transmission line will be approximately 21.4ha based on the clearing of Hoop Pine plantation (11.2ha), juvenile mixed hardwood plantation (2.7ha), regrowth Acacia and low vine thicket (7.1ha) and already disturbed areas (0.9ha). Additional vegetation clearing of the Hoop Pine plantation may be required to widen access tracks. No ground disturbance of the remnant semi-evergreen vine thicket and dry rainforest and *E. moluccana* mixed open forest communities are proposed. There will also be vegetation trimming of remnant and regrowth native vegetation to reduce the height of the canopy vegetation within specific locations along the easement.

4.7.2.1 Construction phase impacts

The most significant impacts on ecological values will occur during the Project's construction phase, when vegetation and habitat removal will occur.

Vegetation clearance

Most of the Project area has been heavily impacted by commercial forestry activities, with much of the original vegetation communities having been cleared for development of plantation forestry. The Hoop Pine and mixed hardwood plantations within the Study area are essentially a monoculture, with low ecological and biodiversity value when compared to the previously cleared native vegetation communities. Both plantation communities are non-remnant and completely modified, and as such are no longer analogous to any native vegetation community or regional ecosystem.

Despite the level of site disturbance associated with forestry activities, the Project area retains biodiversity value in association with the field verified remnant and regrowth regional ecosystems listed in Table 4.16.

Table 4.16 presents the extent of Project-related impact (hectares) to vegetation communities and regulated vegetation (regional ecosystems) within the Study area.

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Figure 4.14

Habitats and threatened fauna species records within the study area

TARONG POWER STATION ROAD
REEVE ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
1030-STR-9009
1030-STR-9018
1030-STR-9019
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D10A
D11
D13
D14
D15

Legend

Threatened species recorded

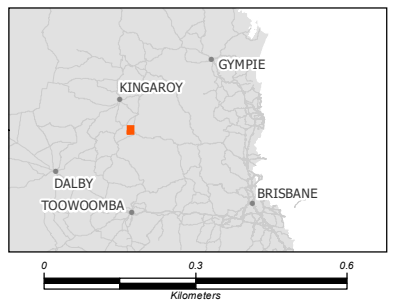
- Black-faced Monarch
- Rufous Fantail
- Black-breasted Button-quail Platelets
- Black-faced monarch
- Greater Glider
- Powerful Owl
- Rufous fantail
- Proposed transmission structure locations
- Transmission structure footprint
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- Ecology Study Area
- Approved Surface Right Area
- Proposed Easement
- King 2 East Additional Surface Area
- Mining Lease (ML6674)

Fauna Habitat

- Eucalypt open forest (remnant)
- Exotic/native shrubby grassland and bare earth tracks (non-remnant)
- Hoop pine plantation (non-remnant)
- Juvenile hardwood plantation (non-remnant)
- Low vine forest (remnant)
- Regenerating Acacia and low vine forest (regrowth)

Species Record

- Black-breasted Button-quail



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 13/12/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

C:\Users\AUAN504021\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS113963_Confidentail_K2EE\Mxd\28_TransmissionLine_EnvAR\PS127247_EnvAR_Fig4-14_Habitats_and_threatened_fauna_species_v2.mxd

Table 4.16 Extent of Project-related impacts to field verified vegetation communities and regulated vegetation

Vegetation Community	Regulated vegetation (regional ecosystems)	EPBC Act Status	VM Act Status	Impact area (ha)	Extent within Study area (ha)
Low microphyll vine forest and semi-evergreen vine thicket with emergents on deeply weathered remnant Tertiary surfaces	12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii*	-	Endangered	**0**	8.4
Mixed *Acacia spp.* high value regrowth with vine thicket species on deeply weathered Tertiary surfaces [1]	Regrowth 12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii*	-	Endangered (HVR)	**4.0**	5.7
Mixed *Acacia spp.* high value regrowth with vine thicket species on metasediments [1]	Regrowth 12.11.11 - Araucarian microphyll vine forest on metamorphics +/- interbedded volcanics; usually southern half of bioregion	-	Least Concern	**3.1**	3.1
Remnant *Eucalyptus moluccana* mixed open forest on metasediments	12.11.18 - *Eucalyptus moluccana* woodland on metamorphics +/- interbedded volcanics	-	Least Concern	**0**	9.5
Hoop pine plantation	Non-remnant (Buffer zone)	-	n/a	**11.2** (1.2)	18.4 (1.2)
Mixed Hardwood plantation	Non-remnant	-	n/a	**2.7**	2.2
Non-remnant cleared mixed grassland, regrowth and tracks	Non-remnant	-	n/a	**0.9**	8.8
Total				**21.4**	**56.6**

Note: 1. For the purposes of this impact assessment full clearing of the easement (60m wide) between structures D1 and D5 has been assumed. However, Powerlink is proposing to limit clearing (40m wide) to the draw-wire path in this location (except where brake and winch sites are proposed).

Powerlink and its contractors will be responsible for the clearing of vegetation within the proposed transmission line easement (apart from the Hoop Pine planation which will be cleared by HQPlantations as part of its forestry operations). Through detailed design, Powerlink has minimised the required extent of vegetation clearing of remnant and regrowth vegetation communities along the preferred alignment by:

- siting transmission structures to avoid areas of remnant vegetation
- increasing the height of transmission structures to enable remnant vegetation to be spanned
- helicopter stringing of the transmission line in areas where it crosses remnant vegetation
- minimising clearing in regrowth vegetation communities to draw-path clearing only as opposed to full easement clearing
- utilising existing access tracks where possible
- avoiding areas of remnant vegetation for new access tracks or required widening of existing access track.

In addition to Powerlink's standard environmental control measures outlined in the Project EMP (Appendix G) to minimise the level of impact from clearing vegetation the Project EWP and vegetation profile drawings will include vegetation management and mapping to provide clear guidance on areas to be cleared and retained, methods for clearing and other relevant environmental protection measures. Workers will be made aware of management requirements in induction training and through work instructions.

Loss of fauna habitat

The clearance of native vegetation can adversely affect native fauna species. Potential impacts resulting from clearing native vegetation can include the following:

- loss of habitat causing a reduction of biological diversity or loss of local populations and genotypes
- fragmentation of populations, which can reduce gene flow between small isolated populations, reduce the potential for species to adapt to environmental change and loss or severe modification of the interactions between species
- disturbance which can permit the establishment and spread of exotic species that may displace native species
- loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates
- loss of food resources such as foliage, flowers, nectar, fruit and seeds.

The low vine forest, regenerating Acacia and low vine forest and Eucalypt open forest habitats within the Project area supports most of the biodiversity recorded during field surveys. These communities provide a range of foraging, sheltering and breeding resources for native fauna and has varying levels of fallen woody debris and deep leaf litter.

Relatively large areas of native vegetation are associated with the Yarraman State Forest (location of the Project), and the nearby Tarong State Forest and Tarong National Park. A large north-south wildlife corridor exists to the east of the transmission line easement where access track provisions are located along and adjacent to Rocky Creek. This corridor provides fundamentally important movement and dispersal for native fauna, as it connects Yarraman State Forest with Tarong National Park to the west and Tarong State Forest to the north-west. Only minimal impacts are to occur within this large north-south wildlife corridor in association with access track provisions.

The impacts associated with the construction activities for the relocation of the transmission line are in the most relatively isolated and unlikely to result in detrimental impacts to wildlife corridors and connectivity.

Moreover, the clearing for the access tracks and transmission line relocation will not fragment an area of habitat into two or more separate habitats, nor will it result in fragmenting a population of native species into two or more isolated populations. Therefore, the risk of impact to wildlife movements resulting from the Project has been assessed as low.

Powerlink and its contractors will be responsible for the clearing of vegetation within the Project footprint extents (apart from the Hoop Pine planation which will be cleared by HQPlantations as part of its forestry operations). Flushing of large ground dwelling fauna will be undertaken prior to clearing to reduce incident of fauna species becoming trapped. A fauna spotter-catcher will be present during clearing activities within the regulated vegetation.

Actions to be considered to minimise any direct impact on adjacent ecologically sensitive areas include:

- surveying the extent of the Project footprint prior to clearing activities to ensure accuracy of the development footprint
- avoiding the development of access tracks in the low vine forest habitat (regional ecosystems 12.5.13c and 12.11.11)
- clearly marking no-go areas on maps and communicating these areas to vegetation construction staff
- demarcating no-go areas with flagging tape or another obvious means.

Fauna mortality or injury

Fauna injury or death has the greatest potential to occur during vegetation clearing. Some mobile species, such as birds, including the Black-breasted Button-quail, may be able to move away from the path of clearing and may not be greatly affected unless they are nesting. However, other species that are less mobile (ground dwelling reptiles and mammals), or

those that are nocturnal and nest or roost in tree hollows during the day (arboreal mammals and microbat species), may find it difficult to escape roosts and may find it difficult to move rapidly over relatively large distances when disturbed.

Clearing activities will be staged at a pace that allows fauna to progressively escape and relocate into adjacent habitats. Where feasible, clearing will be directional away from retained habitat in all of the isolated areas of impact, enabling fauna to be flushed towards adjoining retained habitat areas within the Yarraman State Forest.

In addition, the following measures will be implemented for clearing works undertaken by Powerlink or its contractors in the regenerating Acacia and low vine forest habitats:

- undertake a native fauna pre-clearance survey (or use of an existing survey) for proposed land clearance/disturbance areas
- marking of habitat trees (i.e. those with hollows and fissures) to enable appropriate tree dismantling prior to broader clearing operations
- avoid multiple separate areas of clearing occurring at any one time within a given Project footprint area (e.g. tower pads)
- clearing of the understorey first, avoiding temporarily retained habitat trees (point 2 above) to encourage fauna to move away from the clearing zone, before the retained habitat trees are removed.

These measures will be incorporated into the Environmental Work Plan prepared for the Project. In addition, measures will be implemented recover and arrange rehabilitation with an authorised carer for injured or orphaned native animals unavoidably impacted by clearing and/or construction activities. Any injured, sick or dead vertebrate fauna identified during the Project construction phase will be recorded by the fauna spotter catcher and notified to the Powerlink HSE Representative.

With these measures in place, the risk of direct mortality from the Project is assessed as low, based upon the implementation of the clearing and fauna management procedures to be applied by Powerlink, and the incremental staged clearing process allowing time for species to move on their own accord ahead of each stage of land clearing.

Changes to the aquatic environment

Direct construction impacts on the general aquatic environment will be negligible as Powerlink transmission structures will be located away from the banks of riparian areas (where possible) and will not be located within any watercourses. Potential impacts may arise as a result of:

- trimming/lopping of branches of larger trees over the creeks.
- erosion and sedimentation in the immediate vicinity of the watercourses as a result of access to the Project.

Additionally, spills of chemicals or significant erosion and sedimentation events during construction have the potential to affect the water quality of the surrounding watercourses. Such impacts upon water quality can also impact on aquatic ecosystem health, including aquatic plant damage and aquatic fauna health implications.

Powerlink's standard environmental controls will be implemented to minimise the level of impact on the aquatic environments including:

- installation and maintenance of appropriate erosion and sediment control measures
- keeping felled trees, vegetation cuttings and debris clear of waterways and low lying gullies
- ensuring that the integrity of the beds or banks is maintained and disturbance in these areas minimised
- the use of chemicals near any watercourse is to be strictly supervised and no overall spraying is to occur
- interference to, or disturbance of, the beds and banks of watercourses by heavy equipment will be minimised and/or avoided where practicable
- where located near waterways, stockpiles will be made on the downstream side of the centre line of the transmission line
- stockpiled material will be located at least 50m clear of all drains, waterways (or their flood banks) so as to prevent any obstruction to water flow; and at least 10m clear of standing timber, scrub or undergrowth (where practicable).

Activity and noise

During the construction phase, there will be an increase in noise and activity in the Project. Key noise sources will include activities involving machinery, such as clearing vegetation, site access, constructing foundations, structure erection, and line stringing activities. It is important to note that these potential impacts will not affect the entire Project simultaneously, nor will they persist in any one area for a considerable period of time (i.e. months).

However, when activity and noise is occurring in areas adjoining retained habitat, potential impacts may include:

- reduced foraging ability by auditory predators due to increased background noise
- increased risk of predation by visual predators due to increased background noise
- increased potential for collisions with vehicles
- human visitation causing disturbance to foraging or breeding behaviours.

Current research indicates that there are no government policies or other widely-accepted guidelines in respect to the noise levels which may be acceptable to wildlife. The levels or character of noise that may "startle" or otherwise affect the feeding or breeding pattern of birds or other wild animals are also not firmly established in the technical literature.

Sudden loud, impulsive or impact noises may cause birds and other fauna to become startled. If this noise occurs over the longer term, it may affect feeding and breeding behaviour in some species. It is expected that excavation, construction and earthmoving associated with the Project will potentially cause disturbance to all groups of fauna, especially birds. This will most likely result in avoidance of the area for the duration of these activities.

Increased dust

Deposition of dust, sand and soil resulting from construction may have potential impacts on vegetation if excessive levels are sustained over extended periods. When dust settles on plant foliage it can reduce the amount of light penetration on the leaf surface; block and damage stomata; and slow rates of gas exchange and water loss. Reduction in the ability to photosynthesise due to physical effects may result in reduced growth rates of vegetation, decreases in floral vigour, and overall community health.

To minimise the deposition of dust on adjacent vegetation, dust generation from Project activities will be minimised by engineering controls and dust suppression measures, such as water trucks and sprinklers. Vehicle speeds will also be restricted on cleared tracks to minimise the generation of dust.

Edge effects

Edge effects are zones of changed environmental conditions (e.g. altered light levels, wind speed, temperature) occurring along the edges of habitat fragments. Examples of edge effects include weed invasion and altered community assemblage. Clearing in remnant, high ecological value areas can promote the growth of different vegetation types (Moenting and Morris, 2006) and allow invasion by introduced species specialising in edge habitats. Since vegetation to the west side of the Project will be cleared for the K2E Project, significant increases in edge effects are not anticipated.

To minimise edge effects within the Project, the following measures will be implemented:

- Clear demarcation at the boundary of the clearing footprint of remnant vegetation that must not be disturbed. This is to avoid inadvertent clearing and disturbance.
- Implementation of biosecurity measures which will incorporate monitoring of the Project area for incursion of weed species and application of weed management, as required (refer Section 4.9).

Impacts will be temporary, and mitigation measures outlined above will apply.

4.8 Matters of Environmental Significance

This section discusses matters of environmental significance, their presence, and legislative framework in relation to the Project. Matters of environmental significant present within the Project area include both matters of national environmental significance (MNES) under the EPBC Act and matters of state environmental significance (MSES) under the EO Act. No matters of local environmental significance are identified in any of the relevant Local Planning Instruments and have not been considered further in this section.

The Project is unlikely to have a significant impact on MNES or MSES within the meaning of the relevant significant impact guidelines.

4.8.1 Matters of national environmental significance (MNES)

Under the EPBC Act, actions that have, or are likely to have a significant impact on a MNES require approval from the Australian Government Minister for the Environment. The Minister will decide whether assessment and approval is required under the EPBC Act. MNES protected under the EPBC Act, include:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed).
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.

MNES identified as potentially relevant to the Project include:

- nationally threatened ecological communities (TEC)
- threatened flora species
- threatened and/or migratory fauna species.

All other MNES identified above, are not present within the Study area or considered applicable to the Project.

4.8.1.1 Threatened ecological communities

The PMST returned five TECs listed under the EPBC Act as having potential to occur within 10km of the Project, as presented in Table 4.17.

The likelihood for each TEC to occur within the Study area was assessed by identifying the State Government regional ecosystems mapped within the Study area, along with the potential for these regional ecosystems to meet the definition of each respective TEC (refer Table 4.17). Based on this assessment, it was determined that all five TECs have a low potential of occurrence within the Study area.

Table 4.17 Summary of likelihood of occurrence for TECs listed under the EPBC Act

TEC	EPBC Act status	Likelihood of occurrence
Coastal Swamp Sclerophyll Forrest of New South Wales and South East Queensland	Endangered	**Low** The Study area is located above the coastal plains and does not contain any regional ecosystems representative of this TEC.
Lowland Rainforest of Subtropical Australia	Critically Endangered	**Low** Remnant patches of regional ecosystem 12.5.13c mapped by the Queensland Herbarium within the Study area can be considered part of the national Lowland Rainforest ecological community where the requirements of the Description, Key diagnostic characteristics and Condition thresholds listed in the Listing Advice are met (Threatened Species Scientific Committee (TSSC), 2011). Based on desktop findings, the remnant patches of regional ecosystem 12.5.13c fail to meet key diagnostic characteristics of the Lowland Subtropical Rainforest TEC including: — The community receives well below 1,300mm of rainfall annually at 789.8mm. — The community was recorded above 300m at 550m in altitude. Refer to Table 4.18 for further assessment.
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	**Low** The Study area does not contain any native grassland vegetation communities or regional ecosystems that could constitute the definition of this TEC.
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	**Low** None of the regional ecosystems mapped within the Study area contain Poplar Box (*Eucalyptus populnea*). Therefore, this TEC is not present.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	**Low** The only regional ecosystem recognised as potentially constituting this TEC in the South-East Queensland bioregion is RE 12.8.16, which occurs only at the far western edge of the bioregion (TSSC, 2011b). This regional ecosystem is not present in the Study area.

The Critically Endangered Lowland Rainforest of Subtropical Australia TEC was returned from database searches with potential to occur within the Project area. However, due to the elevation and average rainfall within the Project area, none of the field verified regional ecosystems can be considered the Lowland Rainforest of Subtropical Australia TEC. The field data obtained for the regional ecosystems 12.5.13c and 12.11.11 in the Study area was assessed against the key diagnostic characteristics and condition thresholds of the Lowland Rainforest of Subtropical Australia Listing Advice; these results are presented in Table 4.18.

Table 4.18 Key diagnostic characteristics within the Listing Advice for Lowland Rainforest of Subtropical Australia

Key diagnostics characteristics	Assessment against key diagnostic characteristics
The ecological community generally occurs at an altitude less than 300m above sea level.	All vegetation along the preferred alignment is within an altitude of between 490 - 560m AHD.
The ecological community typically occurs in areas with high annual rainfall (>1,300mm).	The average annual rainfall for the area is 788 mm.
The structure of the ecological community is typically a tall (20m – 30m) closed forest, often with multiple canopy layers.	Regional ecosystems 12.5.13c and 12.11.11 within the Study area lack the typical tall (20 – 30m) closed forest characteristics associated with the TEC.
Patches of the ecological community typically have high species richness (at least 30 woody species from Appendix A) (Threatened Species Scientific Committee (TSSC, 2011).	BioCondition site data that was collected for the K2E Project revealed that the regional ecosystems 12.5.13c and 12.11.11 within the Study area did not contain the necessary 30 woody species from Appendix A of the listing advice.

Further to the assessment in Table 4.18, the Lowland Rainforest of Subtropical Australia TEC is generally not described as dry rainforest but may include intergrades with dry rainforest and other rainforest types that meet the key diagnostic characteristics.

Based on the results of the flora surveys it is confirmed that the Lowland Rainforest of Subtropical Australia TEC is not present within the Project footprint. No other TECs listed under the EPBC Act have potential to occur in the Project footprint. Therefore, no EPBC Act-listed TECs are at risk from Project-related impacts and EPBC Act significant impact assessments are not required.

4.8.1.2 Threatened flora species

Threatened flora species under the EPBC Act identified as known, or with a high or moderate likelihood of being present within the Study area are identified in Table 4.19, along with an assessment of the risk of impact from the Project.

Table 4.19 EPBC Act listed threatened flora species with potential to be present within the Study area

Scientific Name	Common Name	EPBC Act Status	Likelihood of occurrence		Risk of impact
			Study area	Project footprint	
Rhaponticum australe	Austral Cornflower	Vulnerable	**Moderate** Not recorded during August 2019 or January 2022 surveys.	**Moderate** Potential habitat within the Project footprint but not recorded during targeted surveys.	Despite targeted surveys this species has not been recorded in the Study area. The Eucalyptus open forest habitat that provides potential habitat for this species will not be impacted by the Project. Therefore, this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.

Scientific Name	Common Name	EPBC Act Status	Likelihood of occurrence		Risk of impact
			Study area	Project footprint	
Haloragis exalata subsp. *velutina*	Tall Velvet Sea-berry	Vulnerable	**Recorded** Population recorded in open forest to woodland habitat along Rocky Creek during August 2019 surveys; not recorded during January 2022 surveys	**Low** Population recorded outside of area of project related impacts	The species has been confirmed within the Study area. The Eucalyptus open forest habitat that supports this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Cossinia australiana	Cossinia	Endangered	**Moderate** Not recorded during August 2019 or January 2022 surveys.	**Moderate** Potential habitat within the Project footprint but not recorded during targeted surveys.	Despite targeted surveys this species has not been recorded in the potentially suitable regenerating Acacia and low vine forest habitat and remnant low vine forest habitat. Therefore, this species is unlikely to be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Picris conyzoides	-	-	**Moderate** Not recorded during August 2019 or January 2022 surveys	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded in the Study area. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.

Of these species, *Haloragis exalata* subsp. *velutina* was recorded in open forest to woodland habitat along Rocky Creek during August 2019 surveys. It was not recorded during January 2022 surveys. As the Rocky Creek area will not be impacted by the Project, the species is at low risk of adverse impacts. Based on this assessment, none of the threatened flora species listed under the EPBC Act are at potential risk of project-related impacts. Therefore, EPBC Act significant impact assessments are not required.

4.8.1.3 Threatened fauna species

Threatened fauna species under the EPBC Act identified as known, or with a high or moderate likelihood of being present within the Study area are identified in Table 4.20, along with an assessment of the risk of impact from the Project.

Table 4.20 EPBC Act listed threatened fauna species with potential to be present within the Study area

Scientific Name	Common Name	EPBC Act Status	Likelihood of occurrence		Risk of Impact
			Study Area	Project Footprint	
BIRDS					
Falco hypoleucos	Grey Falcon	Vulnerable	**Recorded** Recorded during field survey	**Moderate** Species habitat within Project footprint.	The species has been confirmed within the Study area. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project.

Scientific Name	Common Name	EPBC Act Status	Likelihood of occurrence		Risk of Impact
			Study Area	**Project Footprint**	
					Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Turnix melanogaster	Black-breasted Button Quail	Vulnerable	**Recorded** Several individuals recorded during K2E field surveys (WSP, 2021)	**Recorded** Several individuals recorded during K2E field surveys (WSP, 2021)	The 7.1ha of regenerating Acacia and low vine forest habitat and 1.2ha or Hoop Pine plantation buffer zone that only provides supplementary foraging resources for this species will be impacted by the Project where transmission line infrastructure is proposed. Therefore, the species is at risk of potentially adverse impacts from the Project. **EPBC Act significant impact assessment required (refer Attachment D of Appendix E).**
MAMMALS					
Dasyurus maculatus maculatus	Spotted-tail Quoll	Endangered	**Moderate** Suitable habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Nyctophilus corbeni	Corben's Long-eared Bat	Vulnerable	**Moderate** Potential habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Petaurus australis australis	Yellow-bellied Glider	Vulnerable	**Moderate** Potential habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Petauroides volans	Greater Glider	Vulnerable	**Recorded** Recorded during K2E field surveys (WSP, 2021)	**Moderate** Species habitat within Project footprint.	Despite targeted surveys, this species has not been recorded. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.

Scientific Name	Common Name	EPBC Act Status	Likelihood of occurrence		Risk of Impact
			Study Area	Project Footprint	
Phascolarctos cinereus	Koala	Endangered	**High** Suitable habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded. While the woodland habitat along Rocky Creek provides viable habitat for the Koala, this habitat will be unaffected by the Project. The Koala does not make use of Hoop Pine plantation or semi-evergreen vine thicket and dry rainforest habitats. The juvenile mixed hardwood plantation that is isolated from viable woodland habitat along Rocky Creek by areas of Hoop Pine plantation and semi-evergreen vine thicket and dry rainforest habitats, is not used by the species as conclusively demonstrated by field surveys both for this Project and for the adjacent K2E Project. In addition, the juvenile mixed hardwood plantation has relatively low habitat value for the Koala, as it contains *Corymbia citriodora* subsp. *variegata*, which is not a primary or secondary feed tree species. As such, it is unlikely that the Koala will be encountered during construction of the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	**Moderate** Potential habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.

Of these species, the Black-breasted Button-quail, has been further assessed as potentially at risk from Project-related impacts. Therefore, significant impact assessments in accordance with the Significant Impact Guideline have been prepared for this species. The Project will remove approximately 7.1ha of regenerating Acacia and low vine forest habitat and 1.2ha of Hoop Pine plantation buffer zone habitat that only provides potential supplementary foraging resources for the Black-breasted Button-quail population that permanently reside in the adjacent remnant vine forest habitat, will be impacted by the Project. This will not adversely affect the resident population or place the species at risk of decline. Therefore, the loss of this potential supplementary foraging habitat is of no consequence to the species over the medium to long-term and the proposed action is unlikely to have a significant impact on the Black-breasted Button-quail within the meaning of the Significant Impact Guidelines. As outlined in Section 4.7.2.1, in undertaking this assessment, a worst-case impact scenario has been assessed (i.e. full clearing of the proposed 60m wide transmission line easement through within the regenerating Acacia and low vine forest habitat between structures D1 and D6). Powerlink are proposing to undertake draw-path clearing (including access tracks) in this location to avoid and reduce the extent of potential impacts on the Black-breasted Button-quail as a result of habitat clearing.

4.8.1.4 Migratory species

Migratory species identified as known, or with a high or moderate likelihood of being present within the Study area are identified in Table 4.21, along with an assessment of risk of impact from the Project.

Table 4.21 Migratory species with potential to be present within the Study area

Scientific Name	Common Name	Likelihood of occurrence		Risk of Impact
		Study Area	**Project Footprint**	
Cuculus optatus	Oriental Cuckoo	**Moderate** Potential habitat present within the Study area	**Moderate** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded in the potentially suitable low vine forest, Eucalypt open forest and regenerating Acacia and low vine forest and remnant low vine forest habitats. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Monarcha melanopsis	Black-faced Monarch	**Recorded** Several individuals recorded during field survey	**High** Potential habitat present within the Project footprint.	The 7.1ha of regenerating Acacia and low vine forest habitat that supports this species will be impacted by the Project where transmission line infrastructure is proposed. Therefore, the species is at risk of potentially adverse impacts from the Project. **EPBC Act significant impact assessment required (refer Attachment D of Appendix E).**
Symposiachrus trivirgatus	Spectacled Monarch	**High** Suitable habitat present within the Study area	**High** Potential habitat present within the Project footprint.	Despite targeted surveys, this species has not been recorded. The 7.1ha of regenerating Acacia and low vine forest habitat that provides potential habitat this species will be impacted by the Project where transmission line infrastructure is proposed. Therefore, the species is at risk of potentially adverse impacts from the Project. **EPBC Act significant impact assessment required (refer Attachment D of Appendix E).**
Myiagra cyanoleuca	Satin Flycatcher	**Moderate** Potential habitat present within the Study area	**Low** Potential habitat within the Project footprint, but not recorded during targeted surveys.	Despite targeted surveys, this species has not been recorded in the Study area. The Eucalypt open forest habitat that provides potential habitat for this species will not be impacted by the Project. Species is at low risk of adverse impacts and an EPBC Act significant impact assessment is not required.
Rhipidura rufifrons	Rufous Fantail	**Recorded** Several individuals recorded during field survey	**Recorded** Several individuals recorded during field survey	The 7.1ha of regenerating Acacia and low vine forest habitat that supports this species will be impacted by the Project where transmission line infrastructure is proposed. Therefore, the species is at risk of potentially adverse impacts from the Project. **EPBC Act significant impact assessment required (refer Attachment D of Appendix E).**

The significant impact assessments concluded that the migratory populations of Black-faced Monarch, Rufous Fantail and Spectacled Monarch that have been recorded, or are likely to occur, in the regenerating Acacia and low vine forest habitat within the Study area, are not ecologically significant proportions of each species population in the region or nationally. The Project is unlikely to substantially modify, by means of fragmentation beyond that already present, or destroy or isolate important habitat that supports (i.e. recorded Black-faced Monarch and Rufous Fantail) or may support (i.e. high likelihood of occurring Spectacled Monarch), local populations of these highly mobile migratory bird species.

In summary, the Project is unlikely to have a significant impact on the Black-faced Monarch, Rufous Fantail and/or Spectacled Monarch within the meaning of the Significant Impact Guidelines.

4.8.2 Matters of state environmental significance (MSES)

Matters of state environmental significance (MSES) are defined under the Environmental Offsets Regulation 2014. MSES include certain environmental values that are protected under Queensland legislation, including:

- *Nature Conservation Act 1992* (NC Act)
- *Marine Parks Act 2004*
- *Fisheries Act 1994*
- *Environmental Protection Act 1994* (EP Act)
- *Regional Interests Planning Act 2014*
- *Vegetation Management Act 1999* (VM Act)
- *Environmental Offsets Act 2014*.

MSES that are applicable to the Project include:

- regulated vegetation
- connectivity area
- protected wildlife habitat
- essential habitat.

The Section 14 of EO Act states an offset condition may be imposed if the prescribed activity will, or is likely to, have a significant residual impact on a prescribed environmental matter. Schedule 1 of the Environmental Offset Regulation 2014 identifies prescribed activities. The Infrastructure Designation process under the Planning Act is not considered a prescribed activity for the purposes of providing an offset under this EO Act.

Regardless of the above, Powerlink Queensland have employed the biodiversity mitigation hierarchy (avoid, minimise, and mitigate) for various stages of the Project, including:

- the corridor selection process (refer Section 2.2 Feasible Alternatives)
- employing mitigation measures through design and construction methods (being undertaken by Powerlink Queensland to reduce impacts where possible)
- mitigating environmental impacts through implementation of the EMP.

4.8.2.1 Regulated vegetation

Regulated vegetation within the Project area includes:

- Endangered RE 12.5.13c (Category B).
- High value regrowth (HVR) regulated vegetation comprising Endangered HVR regional ecosystem 12.5.13/12.5.1 (Category C).

- Great Barrier Reef riverine vegetation comprising Endangered HVR regional ecosystem 12.5.13/12.5.1 managed under the VM Act (Category R).
- Remnant vegetation intersecting within a 10m buffer distance of a stream order 1 to 4, managed under the VM Act.

Impacts to regulated vegetation are presented in Section 4.7.2. Through sensitive design of the transmission line, impacts to Endangered RE 12.5.13c have been avoided. Additionally, as Powerlink is exempt from impacts to regulated vegetation under the VM Act, the clearing of regulated vegetation has not been assessed further.

4.8.2.2 Connectivity area

The GIS test for connectivity areas was applied in accordance with the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* (SRI Guideline) (DEHP, 2014), which determined the Study area contains State mapped connectivity areas. In deciding if an offset is required for connectivity areas, the significance of the ecosystem tract in the context of the local and the regional landscape was assessed.

A Project-related impact on connectivity areas is determined to be a significant residual impact if either of the following tests are true:

1. the change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale; or
2. any core area that is greater than or equal to 1ha is lost or reduced to patch fragments (core to non-core).

The GIS test for connectivity areas has determined that any impact on connectivity areas is not significant, whereby a significant reduction in core remnant at the local scale is False or a change from core to non-core remnant at the site scale is False. Therefore, an offset for connectivity areas will not be required.

4.8.2.3 Protected wildlife habitat

The Queensland Government's Environmental Report for MSES identifies an area of protected wildlife habitat within the Study area. This area of protected wildlife habitat is based upon a species record for the Short-beaked Echidna, listed as Special Least Concern under the NC Act. This State mapped protected wildlife habitat will spanned by the proposed transmission line and not be impacted by the Project.

However, the Short-beaked Echidna was recorded on a motion sensor camera within the Study area during surveys for the K2E Project. The Study area provides viable habitat for the Short-beaked Echidna particularly within regenerating Acacia and low vine forest habitat which supports this species. It has been estimated that 7.1ha of regenerating Acacia and low vine forest habitat will be impacted by the Project where transmission line infrastructure is proposed. This places the species at risk of impact from the Project. Therefore, a significant residual impact assessment in accordance with the SRI Guideline was undertaken. This significant residual impact assessment concluded that the 7.1ha of habitat to be impacted by the Project is in a regenerative state and holds low habitat values for the Short-beaked Echidna. While the Project will incrementally result in the loss of 7.1ha of Short-beaked Echidna habitat at the local scale, the Project is generally mostly associated with periodically disturbed areas (forestry plantations). Therefore, the Project it is not likely to further fragment or isolate Short-beaked Echidna habitat; or be detrimental to the long-term persistence of a local population of the species. In summary, the Project is unlikely to have a significant impact on the Short-beaked Echidna within the meaning of the SRI Guidelines (refer to Section D2.5.2 of Appendix E).

The Powerful Owl was recorded from the open forest to woodland habitat within the Study area, both visually and via call recognition. The 7.1ha of regenerating Acacia and low vine forest habitat, which supports foraging habitat for this species, will be impacted by the Project where transmission line infrastructure is proposed. This places the species at risk of impact from the Project. As such a significant residual impact assessment in accordance with the SRI Guideline was undertaken. This significant residual impact assessment concluded that the 7.1ha of Powerful Owl habitat to be impacted by the Project may only be used by the species as a foraging and temporary roosting resource as part of a larger home range. It has been concluded that this habitat does not support nesting and breeding resources for the Powerful Owl. The Project will incrementally result in a 7.1ha loss of foraging habitat for Powerful Owl at the local, subregional and

regional scales. However, the proposed action is generally mostly associated with periodically disturbed areas (forestry plantations). Therefore, the Project is not likely to further fragment or isolate Powerful Owl habitat; or be detrimental to the long-term persistence of a local population of the species. In addition, the potentially affected habitat is unlikely to be important for the conservation of the local Powerful Owl population over the long-term. In summary, the Project is unlikely to have a significant residual impact on the Powerful Owl within the meaning of the SRI Guideline (refer Section D2.4.2 of Appendix E).

4.8.2.4 Essential habitat

Essential habitat is mapped by the State Government as occurring within the Study area, as shown on Figure 4.11. The essential habitat that is being impacted by the Project for each relevant species is presented in Table 4.22.

Table 4.22 Essential habitat being impacted by Project and risk of project related impacts

Species Essential Habitat	NC Act Status	Impacted Essential Habitat	Risk of Project related impacts
Black-breasted Button-quail (EH: 1092)	Vulnerable	4.0ha of regrowth RE 12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii* and 3.1ha of regrowth RE 12.11.11 - Araucarian microphyll vine forest on metamorphics +/- interbedded volcanics that is mapped as providing essential habitat for the Black-breasted Button-quail will be impacted. Total of 7.1ha of impact upon essential habitat.	Species already assessed as an MNES (refer Section 4.8.1.3). Significant residual impact assessment is not required.
Greater Glider (EH: 848)	Vulnerable	The Project will not directly impact the remnant RE 12.11.18 - *Eucalyptus moluccana* woodland on metamorphics +/- interbedded volcanics that provides essential habitat for the Greater Glider.	As the Project will not directly impact essential habitat, a significant residual impact assessment for the Greater Glider is not required.
Rhodamnia dumicola (EH: 13406)	Endangered	4.0ha of regrowth RE 12.5.13c - Low microphyll vine forest and semi-evergreen vine thicket +/- *Araucaria cunninghamii* and 3.1ha of regrowth RE 12.11.11 - Araucarian microphyll vine forest on metamorphics +/- interbedded volcanics, that is mapped as providing essential habitat for *Rhodamnia dumicola* will be impacted by the Project. Total of 7.1ha of impact upon essential habitat.	The species was recorded from adjacent to the Project footprint during field surveys. No individuals will be directly impacted by the Project. Approximately 7.1ha of mapped essential habitat for *Rhodamnia dumicola* will be impacted. Therefore, the species is potentially at risk of impact from the Project. **A significant residual impact assessment is required (refer Attachment D of Appendix E).**

4.9 Biosecurity

This section describes the potential biosecurity impacts associated with the Project. Restricted matters under the Biosecurity Act were identified from the Project area. Through exacerbation or introduction, these restricted matters have the potential create edge effects and habitat degradation. However, through the implementation of biosecurity mitigation measures, such impacts are not anticipated to occur from the Project. Additionally, Powerlink's general biosecurity obligation under the Biosecurity Act will be achieved.

4.9.1 Relevant legislation and policies

4.9.1.1 Australian Pest Animal Strategy 2017-2027 (Commonwealth Government)

Under the EPBC Act, a number of introduced animals are recognised as threats to native animals and plants. The impacts of some introduced animals have been listed as 'key threatening processes' for the survival of threatened species under the EPBC Act.

The Australian Pest Animal Strategy translates higher level policies and strategies into nationally agreed principles, goals and priorities to guide pest animal management. The strategy is achieved through the implementation of State and Territory legislation, nationally significant species action plans, and threat abatement plans.

Nationally significant species action plans provide detailed assessments of risks and impacts of pest animals. They specify priorities, targets, preferred strategies and indicators, and also identify key stakeholder partners.

Threat abatement plans describe the research, management, and any other actions necessary to reduce the impact of a listed key threatening process under the EPBC Act on native species and ecological communities.

4.9.1.2 Australia Weeds Strategy 2017-2027 (Commonwealth Government)

The Australian Weeds Strategy provides a national framework for addressing weed issues whilst maintaining the sustainability of Australia's primary industries and reducing the impact of weeds on the environment.

Thirty-two (32) Weeds of National Significance (WoNS) have been agreed by Australian governments based on an assessment process that prioritised these weeds based on their invasiveness, potential for spread and environmental, social and economic impacts. Consideration was also given to their ability to be successfully managed. A list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

WoNS have individual national strategic management plans. These plans define responsibilities and identify strategies and actions to control the weed species. They facilitate coordinated action from all stakeholders at a national level and improve linkages between research and ongoing control.

4.9.1.3 Queensland Biosecurity Act 2014

The Biosecurity Act is administered by DAF and provides management measures to protect agricultural and tourism industries and the environment from pests, diseases and contaminants.

Under the Biosecurity Act, invasive plants and animals may be classed as:

- Prohibited matter: a biosecurity matter not found in Queensland that has a significant impact on human health, social amenity, the economy or the environment.
- Restricted matter: a biosecurity matter found in Queensland that has a significant impact on human health, social amenity, the economy or the environment.

Suitable mitigation measures should be undertaken to prevent the proliferation of prohibited or restricted matters.

4.9.1.4 Local Government

The Biosecurity Act requires every local government in Queensland to develop a biosecurity plan for invasive biosecurity matter for their area. The local government plans relevant to the Project are:

- South Burnett Biosecurity Surveillance Program for Restricted and Prohibited Matter under the Biosecurity Act.
- Toowoomba Regional Biosecurity Plan – for Invasive Plants and Animals and annual review of Biosecurity surveillance programs.

These plans and programs prioritise pest management within the LGA based on existing priorities (national and state status), impacts and threats (conservation, water resources, agriculture and community), and capacity to manage the species.

4.9.2 Existing environment

4.9.2.1 Biosecurity zones

A biosecurity zone is a part of Queensland that has legal movement restrictions placed on it to limit the spread of pests and diseases within the state. The Queensland Biosecurity Manual (DAF, 2019) describes the risk minimisation requirements for movement of biosecurity carriers to be followed in compliance with the Biosecurity Regulation 2016.

The Project overlies several biosecurity zones including:

- Sugar cane pest biosecurity zone 6.
- Papaya ringspot biosecurity zone 1.
- Grape phylloxera risk zone.

The Project is also within the Cattle tick free area but just to the west of the Cattle tick line which runs between Yarraman and Nanango.

A biosecurity certificate may be required to move risk items originating in the zones above (including machinery and soil) into and around Queensland. The biosecurity zones associated with the Project area restrict the movement of certain plant materials and cattle. As none of these are relevant to the Project a biosecurity certificate is unlikely to be required.

4.9.2.2 Non-Indigenous flora and fauna species

The PMST search results (included in Appendix A of Appendix E identified WoNS; other plants that are considered to pose a significant threat to biodiversity; and feral animals which are considered likely to be present within the Project area. The Wildlife Online searches also identified additional introduced taxon known to be present in proximity to the Project area that have naturalised and that may be constitute a biosecurity matter.

Non-indigenous flora recorded during the field surveys within the Project are outlined Table 4.23.

Table 4.23 Non-indigenous flora species recorded within the Project

Scientific name	Common name	Weed of National Significance	Biosecurity Act status
Bryophyllum delagoense	Mother of Millions	No	Restricted invasive
Lantana camara	Lantana	Yes	Restricted invasive
Opuntia tomentosa	Velvety tree pear	No	Restricted invasive
Opuntia sp.	-	No	Restricted invasive

Three species of introduced pest animal were recorded from the area during field surveys including the feral dog, feral cat, and Red Fox.

4.9.3 Potential impacts

Potential impacts associated with biosecurity are likely to comprise the following:

- **Introduction of weeds:** During construction, weeds may be spread or introduced through movement of machinery and plant which is contaminated with weed material, or by importing and using contaminated soils. With favourable climatic conditions, this can result in weeds species proliferating in areas which were previously free of infestation.

- **Edge effects:** Clearing needed to complete the construction of the Project may exacerbate edge effects, changing population or community structures of the adjacent retained vegetation. These changing population or community structures can provide opportunities for weeds to establish, which may worsen the aforementioned impacts.
- **Habitat degradation:** The presence of species of biosecurity concern is often associated with ongoing degradation of habitat. This includes impacts associated with feral vertebrate activities, and loss of habitat values due to the introduction or exacerbation of weeds.

While the Project activities (particularly vegetation clearing) have the potential to disperse pest animal species out of the areas of disturbance and across the surrounding landscape, it is highly likely that pest animal species recorded in the Study area already occupy habitats in the locality. Therefore, the risk of the Project resulting in the establishment of these pest animal species in areas where they are currently absent is assessed as low.

Activities associated with the Project have the potential to disperse weeds into surrounding areas. While weed species are established throughout the Study area, especially Lantana (*Lantana camara*), the greatest density is contained within the previously cleared areas for plantation forestry and along access tracks. Activities associated with the Project have the potential to disperse weeds into surrounding areas. The most likely causes of weed dispersal associated with the Project include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery. This is an indirect impact that may reduce habitat quality. However, it should be recognised that much vegetation within the Study area, already has considerable weed infestation. Therefore, the overall current extent of habitat modification from weed invasion is not likely to increase extensively because of the Project.

4.9.4 Mitigation and management measures

Measures to minimise biosecurity risk associated with construction, operation and maintenance and decommissioning of the Project are outlined in Appendix A of the EMP (Appendix G). In line with these measures, detailed pre-construction and post-construction weed surveys will be undertaken for the Project area. The surveys will occur along the final alignment and associated access tracks and will, where present, identify WoNS, restricted and invasive matters and regionally declared weed species.

Biosecurity management measures will also be prepared for the Project and will contain a range of measures aimed at ensuring Powerlink achieve compliance with the general biosecurity obligation under the Biosecurity Act. The biosecurity measures will include:

- clean down protocols, including accepted methodology for any vehicles, plant, equipment or machinery entering site
- nominated permanent and temporary clean down locations established for construction work within or in the vicinity of the Project area
- known WoNS, Restricted, Invasive or Regionally Declared weeds identified in the Project area
- identification of the origin of high-risk construction materials, machinery and equipment and treatment where required to mitigate introduction of weed species
- management methods to control spread of weeds considered to be Restricted Matters in keeping with regional management practice or DAF pest control prescriptions
- promotion of awareness of weed management, by inclusion of weed issues, pictures and procedures into the Project's site induction program
- collaboration with landholders on any existing property specific integrated pest management or Biosecurity Management Plans
- routine weed monitoring during construction and operation to identify any new incidence of weeds.

4.10 Land use, existing services and Native Title

The impact on existing land uses and services from the Project is described in this section. While the Project will change the current land use from mining/State forest/plantation to infrastructure, it will be located adjacent to proposed mining activities within the K2E ASA. Therefore, the proposed land use is considered to be compatible with, and will not impact, the existing character and amenity of the current zones (i.e., Rural and Open Space). Powerlink has worked, and will continue to work, collaboratively with key stakeholders (i.e. Stanwell, DES and HQPlantations) during development of this Project to minimise impacts on surrounding land uses including the Meandu Mine and plantation forestry operations.

4.10.1 Existing environment

4.10.1.1 Tenure

The preferred alignment traverses three land parcels and one local road parcel. Detail of the lot on plan, tenure and relevant LGA traversed by the Project are provided in Table 2.2 of Section 2.5.2. The preferred alignment does not traverse any strata parcels or stock routes.

4.10.1.2 Zoning, character and amenity

Two Local Government Authorities are traversed by the preferred alignment, being:

- Toowoomba Regional Council
- South Burnett Regional Council.

Each Local Government Authority is subject to individual Local Planning Instruments which identify the strategic intent and desired outcomes for land use planning within the respective LGAs. The Project and how it relates to the two respective Local Planning Instruments is further discussed in Section 5.3.

The land traversed by the preferred alignment is zoned as 'Rural' for the portion within the South Burnett Regional Council and 'Open Space' for the portion within the Toowoomba Regional Council. Land use intent for the 'Rural' zoned areas traversed by the preferred alignment includes the maintenance of rural character and amenity. The existing rural character of the area is generally characterised by rural properties, with large lot sizes and supporting agricultural operational buildings, sheds or structures. Existing land uses within the 'Open space' zone include management resource protection, production forestry, plantation forestry (Figure 4.15).

Existing built infrastructure includes a number of sealed and unsealed roads and existing Powerlink transmission lines (refer Section 4.10.1.4). The 'Rural' and 'Open Space' character is also supported by dense vegetated areas, and natural features such as waterways and ridgelines.

The existing amenity of the area can be defined by considering elements such as noise, air quality and the visual environment. These elements have been assessed individually in this EAR. Overall, with the exceptions of existing construction projects, operation of existing road infrastructure and electricity infrastructure, these elements are considered to be representative of a rural environment.

4.10.1.3 Dominant land use

Plantation forestry

The primary land use within the Project area is State forest (Yarraman State Forest) used for forestry plantation. HQPlantations manages the forestry plantation in Yarraman State Forest under a 99-year Plantation Licence (PLP0289) which grants rights to manage, harvest and re-grow plantation timber on Government owned land (HQPlantations, 2014). Historical aerial photography illustrates that the area has been used for plantation forestry since at least 1982. Before this, to the area comprised of native vegetation.

Mining activities

The Project is located within the mining lease for the Meandu Mine (ML6674) operated by TEC Coal. Structures D1 through to D5 are proposed to be located within the existing surface rights area of the mine, while the remaining structures are located immediately adjacent to the proposed extension to the mine's surface rights area (K2E ASA).

Agricultural land

The preferred alignment traverses Class A and B agricultural land (crop land). The mapped Class A and B agricultural land is within the approved surface rights area of the Meandu Mine; therefore, the area is not used for agricultural purposes.

The preferred alignment also traverses land located within a designated Priority Agricultural Area (PAA) under the *Darling Downs Regional Plan 2013* and afforded protection under the *Regional Planning Interest Act 2014* (Queensland) (RPI Act). As the Project is not a resource activity, the requirements of the RPI Act do not apply. The mapped PAA area within the Project is currently used for plantation forestry purposes by HQPlantations and native vegetation of the Yarraman State Forest.

Tourism and recreation

Yarraman State Forest offers public value and amenity to the community as it is open to the public for recreational purposes including hiking, cycling, horse riding and trail bike riding. A picnic area (Rogers Park) is located within Yarraman State approximately 3km to the east of the preferred alignment (refer to Figure 4.15). Access to this park is available from D'Aguilar Highway.

Native Title

Native Title is defined under the Native Title Act. Native Title rights and interests are rights and interests in relation to land or waters held by Aboriginal peoples or Torres Strait Islanders under their traditional laws and customs and recognised by the common law of Australia.

Native Title rights may exist regardless of whether there is a Native Title claim or determination in relation to the relevant land or waters and may be exclusive or non-exclusive rights. Non-exclusive rights may co-exist with the rights of others, such as a pastoral leaseholder.

The preferred alignment does not traverse any current Native Title claims but the northern section of the alignment between structures D1 and D5 is adjacent to the Wakka Wakka People #3 Native Title claim as detailed in Table 4.24. Yarraman State Forest, being State Forest tenure, is also land subject to Native Title – indication only.

Table 4.24 Native Title determinations relevant to the Project

Name	NNTT Ref	Date determined	Outcome	Rights	Potential impacted lot
Wakka Wakka People #3 - Part A & B	QCD2022/003	12 April 2022	Native Title exists in the entire determination area	Non-exclusive	Lot 3 RP176969

4.10.1.4 Built infrastructure

Road and rail networks

Ridge Road connecting the Tarong Power Station Road to the Tarong-Yarraman Road is to the west of the preferred alignment in the vicinity of the existing Feeder 831 transmission line. A portion of this road will be closed as part of the K2E Project. No easements are traversed by the preferred alignment (refer Figure 2.2 in Section 2.5.2).

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report
Figure 4.15
Land Use

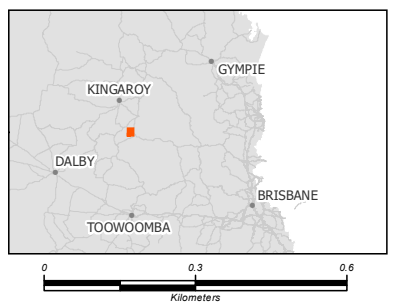
NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
D5
D6
D7
D8
D9
D10
D10A
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019
South Burnett Regional Council
Toowoomba Regional Council
Rocky Creek

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- Watercourse
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)
- Strategic Cropping Area
- Priority Agricultural Area
- Local Government Areas

Qld Land Use - Current

- Other minimal use
- Residual native cover
- Rehabilitation
- Grazing native vegetation
- Production native forests
- Plantation forests
- Softwood plantation forestry
- Cropping
- Fuel powered electircity generation
- Mining
- Mines
- Water storage - intensive use/farm dams



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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Other key roads in the vicinity of the Project are:

- D'Aguilar Highway (State-controlled managed by the Queensland Department of Transport and Main Roads (DTMR))
- New England Highway (State-controlled managed by DTMR)
- Tarong Power Station Road (privately owned)
- Tarong Yarraman Road (local government)
- Ridge Road (local government).

The location of these roads is shown on shown on Figure 4.16.

There is no operational rail infrastructure affected by the Project.

Further information on the road infrastructure along with the potential impact from the Project is provided in Section 4.13 Transport and Traffic.

Airports and air strips

The Project does not intersect with existing air transport infrastructure. The nearest aerodrome is situated Nanango Aerodrome located approximately 13km north north-east from the preferred alignment (refer Figure 4.16).

Electricity infrastructure

The Tarong and Tarong North power stations owned and operated by Stanwell are located approximately 1km to the north-west of the preferred alignment. The Tarong Substation is situated to the south-west of the Tarong power stations.

Existing high voltage electricity infrastructure within the area includes the existing Feeder 831 275kV transmission line between the Tarong and Middle Ridge substations, located immediately to the east of the Meandu Mine. Also to the north of the preferred alignment are other Powerlink transmission lines distributing power from the Tarong power stations via the Tarong substation including:

- Tarong - South Pine 275kV transmission line
- Tarong - Blackwall 275kV transmission line
- Tarong - Mt England 275kV transmission line.

No Ergon Energy infrastructure is present within the immediate surrounds of the Project.

Power distribution infrastructure is also located on the Meandu Mine to support its operations.

Electric and magnetic fields (EMF) emitted from the proposed transmission line are discussed in Section 4.14: Electric and Magnetic Fields.

Water and sewer infrastructure

The Project area has limited access to reticulated water and sewer. The local population mainly relies on the use of bores and private dams for water supply and septic systems for sewer.

A number of groundwater bores are located in the immediate area surrounding the preferred alignment. These are part of the Meandu Mine groundwater monitoring network. None of these bores are traversed by the preferred alignment.

Private infrastructure

As the preferred alignment traverses freehold tenure for the Meandu Mine and State land of the Yarraman Forest (Hoop Pine plantation and mixed hardwood plantation under the license holder HQPlantations), the potential for private infrastructure to be present is unlikely.

4.10.2 Potential impacts and management measures

4.10.2.1 Plantation forestry and mining activities

The Project will change the current land use from mining/State forest/plantation to infrastructure. Powerlink has worked collaboratively with Stanwell during Project planning to minimise impacts to the Meandu Mine, including the K2E Project (refer Section 2.2). Powerlink will continue to work collaboratively with Stanwell throughout the construction and operation of the Project.

Powerlink has worked with Stanwell through the design of the Project to ensure that that the proposed transmission line is appropriately offset from the proposed final highwall of the K2E pit to limit issues of geotechnical stability. Stanwell have also commissioned a subsidence and geotechnical assessment (including RPEQ certification) that the proposed excavations and associated pit shell for the extension of the K2E pit is geotechnically satisfactory (i.e. will not impact on the proposed transmission line).

Blasting works within the K2E pit have also been taken into consideration during design of the transmission line. A Blasting Vibration Management Plan for the K2E pit is being developed by Stanwell. Blasting procedures are carried out in accordance with *AS2187 – Explosives – Storage, Transport and Use.* Any blasting carried out within 500m of the Powerlink infrastructure will be undertaken in line with the controls outlined in the plan to ensure that safe operation of the transmission line is not impacted.

4.10.2.2 Agricultural land and operations

The preferred alignment does not traverse land used for agricultural purposes. Therefore, the Project will not impact agricultural land.

4.10.2.3 Rural and Open Space character and amenity

The preferred alignment will be in proximity (within 1km) from the existing portion of transmission line of Feeder 831 (to be decommissioned) and will be located adjacent to proposed mining activities within the K2E ASA. Therefore, the Project is considered to be compatible with, and will not impact, the existing character and amenity of the current zones (i.e., Rural and Open Space).

4.10.2.4 Tourism and recreation

Tourism and recreation opportunities exist in association with Yarraman State Forest and the nearby Tarong National Park (located approximately 5km west of the Project). Highways and State-Controlled Road within the proximity of the Project including the D'Aguilar Highway and Kingaroy Cooyar Road are accessed for tourism opportunities and localities within the region. As the proposed transmission line will be well screened from the surrounding road network by the Yarraman State Forest, it is unlikely that tourism and recreation within the region will be impacted. In addition, the State Forest within the preferred alignment is relatively low use and generally unoccupied for the most part; with the exception of HQPlantations' planting, thinning or harvesting activities.

4.10.2.5 Native Tile

Any acts or dealings in relation to land and waters that affect Native Title must comply with the Native Title Act in order to be validly done. To the extent that Native Title exists or may exist in the area of the Project, Powerlink will comply with the requirements of the Act for securing an easement for the transmission line. Powerlink typically complies with section 24KA of the Native Title Act, which applies to facilities for services to the public, for its transmission line easements. Under section 24KA, Native Title is not extinguished, but is 'suppressed' while the easement remains in place.

4.10.2.6 Built infrastructure

No impacts will occur to other infrastructure in the area from construction and operation of the Project. Additionally, no relocation of existing infrastructure is required to facilitate the Project. Traffic and transport impacts to the road network are discussed in Section 4.134.13.

4.10.2.7 Mitigation and management measures

Through the landholder and stakeholder engagement and infrastructure design processes, Powerlink has considered the existing land use associated with the Project to reduce and mitigate impacts where possible. Powerlink will continue to collaborate with landholders through the Project.

Construction and operation of the Project will be managed in accordance with Powerlink's standard environmental controls, particularly Appendix P of the Environmental Management Plan (Appendix G).

Mitigation measures for potential impacts to the road network are addressed in Section 4.13: Transport and Traffic and EMF issues in Section 4.14: Electric and Magnetic Fields.

4.11 Visual and public amenity

This section describes the potential impact of the Project on the existing visual and public amenity of the surrounding area. Visual and public amenity impacts from the Project are considered negligible due to the location of the sensitive receptors; topography; vegetation screening provided by the plantation forestry; and screening provided by native vegetation within the Yarraman State Forest.

4.11.1 Existing environment

The preferred alignment and surrounding area contain a variety of landscape features including plantation forestry, native forest areas, agricultural land, and industrial uses associated with the Meandu Mine and Tarong power stations. The preferred alignment traverses dense vegetation comprising plantation forestry (Hoop Pine) and native vegetation, offering some visual protection to surrounding land uses.

Yarraman State Forest offers a public amenity to the community as it is open to the public for recreational purposes including hiking, cycling, horse riding and trail bike riding. A picnic area, Rogers Park, is located within Yarraman State Forest, approximately 3km to the east of the preferred alignment. Rogers Park is separated from the transmission line by plantation forestry and native vegetation.

4.11.2 Potential impacts and management measures

Visual amenity impacts from the Project are considered negligible. Potential impacts to the visual amenity of sensitive receptors to the north, east and south of the Project will be mitigated through the screening provided by the remaining Hoop Pine plantation forestry and native vegetation within Yarraman State Forest. In addition, the State Forest in the area of the preferred alignment is relatively low use and generally unoccupied for the most part, with the exception of HQPlantations' planting, thinning or harvesting activities.

Due to the presence of the Meandu Mine and associated overburden emplacement and rehabilitated landscapes, visual amenity impacts from the transmission line to sensitive receptors to the west are unlikely.

While the Project will involve clearing of Hoop Pine and mixed hardwood plantation forestry along the preferred alignment, it is unlikely to restrict the general use of State forest land by the public. It is noted that harvesting activities currently place some restrictions on public use of the Yarraman State Forest (i.e. closure of roads and tracks during harvesting operations). Fencing of the easement is not proposed and as such will still be available for general recreational purposes (i.e. walking etc). Due to the extent of the understorey of lantana within the plantation forestry areas, public use of the area is largely restricted to Ridge Road and forestry access tracks. There are numerous forestry tracks within the

Yarraman State Forest outside of the Project which will still be available for sue and existing facilities such as Rogers Park will not be affected by the Project.

As such, the Project is considered unlikely to have a significant impact on public use of the Yarraman State Forest.

4.12 Cultural heritage

This section describes the potential impacts to Indigenous and non-Indigenous(historical) cultural heritage values from the Project. Potential impacts to Native Title have been previously discussed in Section 4.104.10. Due to the present and past uses of the area (i.e. native vegetation and plantation forestry), the likelihood of non-Indigenous heritage values being encountered during Project construction or operation/maintenance activities is assessed as low. The Project will not impact on any known or recorded Indigenous cultural heritage sites. However, there is potential for ground disturbance works associated with the Project to disturb unknown items of Indigenous cultural heritage, particularly artefact scatters.

4.12.1 Existing environment

4.12.1.1 Indigenous cultural heritage

A search of the DSDSDATSIP cultural heritage database and register identified recorded Indigenous cultural heritage in the vicinity of the preferred alignment. A number of cultural heritage sites are identified within proximity to the southern section of the preferred alignment, along a forestry access track running parallel to Rocky Creek. All of these known sites comprise artefact scatters. This forestry track has not been identified for use as access to the proposed transmission line structures.

4.12.1.2 Non-indigenous heritage values

A search of relevant Commonwealth, State and local heritage registers was conducted on 7 July 2022. These searches indicated that there are no registered historical heritage places within the Project area. The closest registered heritage place to the preferred alignment is the Tarong Homestead, located approximately 6.4km to the west of the Project. The Tarong Homestead (Lot 1 on B3811) (Queensland Heritage Register Place ID: 600759) is listed on both the Queensland Heritage Register and South Burnett Local heritage register.

4.12.2 Potential impacts and management measures

4.12.2.1 Indigenous cultural heritage

Due to the number of recorded Indigenous cultural heritage sites within the area, there is potential that ground disturbance works associated with the Project may disturb unknown items of cultural heritage such as artefact scatters. The *Aboriginal Cultural Heritage Act 2003* (Queensland) (ACH Act), administered by the DSDSDATSIP, requires that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal Cultural Heritage (the Cultural Heritage Duty of Care).

A person is taken to have complied with the Duty of Care if they are acting under a Native Title agreement or other agreement with an Aboriginal Party. Powerlink intends to address any Aboriginal cultural heritage risks and meet its Duty of Care through the development and implementation of Cultural Heritage Management Agreements (CHMAs) with each of the Aboriginal Parties, in accordance with the ACH Act.

Powerlink has established processes and has significant experience working closely with Traditional Owners for the management of cultural heritage risks in transmission line development. Powerlink is actively engaging with each of the Native Title groups to develop CHMAs for the Project. This will include agreed methodology for the identification and management of Aboriginal cultural heritage sites and values within the Project area and surrounding vicinity. This is expected to include detailed cultural heritage surveys of ground disturbance area with the Traditional Owners. The

locations and significance of the sites identified from database searches will be confirmed through surveys conducted under the CHMAs.

4.12.2.2 Non-Indigenous cultural heritage

There are no registered historical heritage places within or directly adjacent to the Project area. Accordingly, no impacts are proposed to known heritage values. Due to the present and past uses of the area (i.e. native vegetation and plantation forestry), the likelihood of non-Indigenous heritage values being encountered during construction of the Project is assessed as low.

4.12.2.3 Mitigation and management measures

The Project will not impact on any known registered historical heritage values or recorded Indigenous cultural heritage sites. However, there is potential for ground disturbance works to impact on currently unrecorded Indigenous cultural heritage values. As discussed in Section 4.12.2.1, cultural heritage surveys of ground disturbance areas will be undertaken with Traditional Owners to identify any potentially unrecorded heritage items, and to recommend management measures if required. Any residual risk will be mitigated by the following general measures:

- cultural heritage inductions for all Project personnel engaged in ground disturbance works
- implementation of the following procedures in the case of unexpected finds:
  - cease all works in the vicinity of the find
  - inform supervisor or cultural heritage coordinator
  - a qualified archaeologist will make an assessment and recommend management measures.

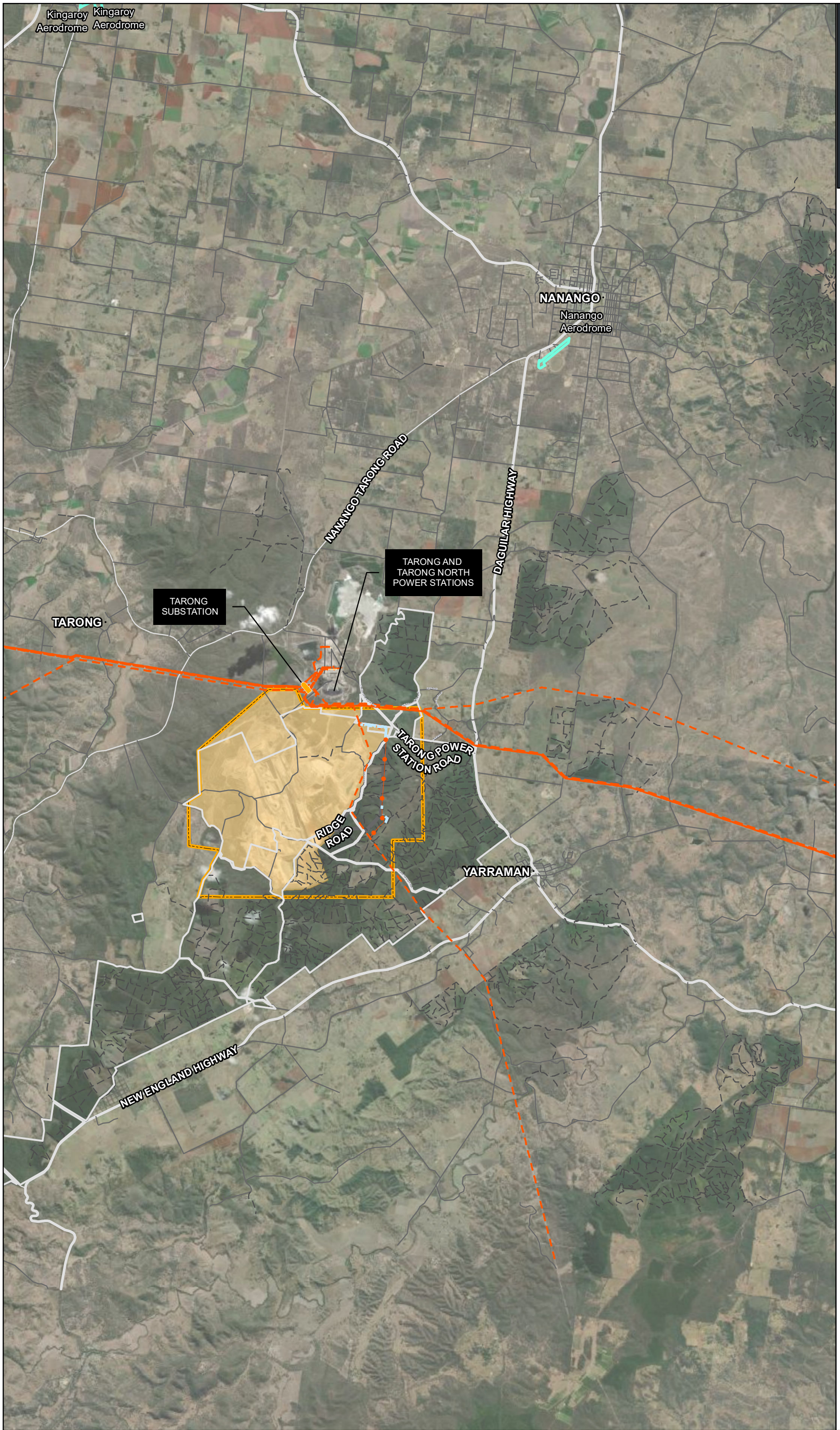
4.13 Transport and traffic

This section describes the potential impact of the Project on existing the existing road network. Based on the results of a Traffic Impact Assessment, prepared in accordance with Guide to Traffic Impact Assessment (TMR 2018) (refer Appendix F) the Project is not considered to have a significant impact on link capacity of the road network, pavements, or the operation of the D'Aguilar Highway/Tarong Power Station Road intersection. Traffic impacts will be managed in accordance with Powerlink's standard environmental controls as outlined in the EMP (Appendix G).

4.13.1 Methodology

A Traffic Impact Assessment (TIA) in accordance with the Guide to Traffic Impact Assessment (TMR, 2018) was undertaken to assess traffic-related impacts created by the Project. In line with the guide the methodology for the Traffic Impact Assessment included:

- a review of transport networks to establish existing conditions (i.e. without the Project)
- a site visit on 13 July 2022 to observe existing conditions and traffic operations on State-controlled roads
- identification of access routes to the Project site
- estimation of the traffic generation for the construction and operation phases of the Project and assignment of this traffic to the identified access routes
- assessment of impacts resulting from the Project-generated traffic on the State-controlled Road network in relation to:
  - road link capacity
  - intersection operation
  - pavement damage
  - other transport facilities
  - road safety
  - identification of mitigations measures.



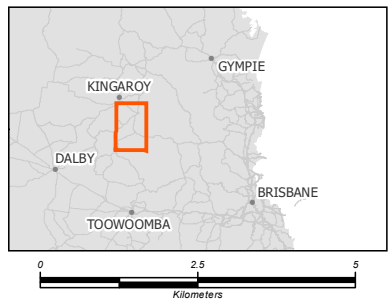
Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.16

Major Infrastructure and utilities

Legend

- Airports
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Highways
- Secondary Roads
- Local roads
- Forestry access tracks
- King 2 East Additional Surface
- Approved Surface Right
- Cadastre
- Mining Lease (ML6674)
- Tarong Substation



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:120,000 Date: 15/07/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.13.2 Existing environment

Access to the Project site during construction and operation will be via the D'Aguilar Highway and Tarong Power Station Road. The key roads to be used during construction and operation are described below.

Figure 4.16 shows the existing transport infrastructure in the vicinity of or traversed by the Project. Heavy vehicle routes in the vicinity of The Project site are shown in Figure 4.17; the D'Aguilar Highway is a B25 Heavy Vehicle route between Caboolture and Kingaroy.

Figure 4.17 Heavy vehicle routes (source: Queensland Globe)

4.13.2.1 Local road network

D'Aguilar Highway (40A-C)

The D'Aguilar Highway is a State-controlled highway extending from Caboolture in the south-east to Kingaroy in the north-west. It typically is a two-lane formation (with passing lanes provided in some locations) with sealed shoulders and edge line marking. The D'Aguilar Highway is primarily located in a rural environment with occasional urban areas (normally small towns). It predominantly has a posted speed limit of 100km/hr with speed reductions in some locations due to road geometry and urban centres. The D'Aguilar Highway in the vicinity of the Project is shown in Photo 4.3.

Photo 4.3 D’Aguilar Highway between Yarraman and Tarong Power Station Road facing north

Tarong Power Station Road

Tarong Power Station Road is privately owned and maintained with no general public access permitted. Tarong Power Station Road provides a secondary access to the Tarong Power Station and to the surrounding forestry plantations. Photo 4.4 and Photo 4.5 shows the entry to the Tarong Power Station Road from the D’Aguilar Highway.

As Tarong Power Station Road is not a State-Controlled Road, potential impacts resulting from the Project construction and operational activities have not been assessed within the TIA. The intersection with the D’Aguilar Highway has been included to identify any impacts to the D’Aguilar Highway.

Photo 4.4 Entry to Tarong Power Station Road from D’Aguilar Highway

Photo 4.5 Intersection of Tarong Power Station Road with D'Aguilar Highway (facing south)

Ridge Road

Ridge Road is a Council owned road jointly managed by Toowoomba Regional Council and South Burnett Regional Council, with the LGA boundary located at the centre of the Ridge Road reserve. Ridge Road provides a north-east to south-west connection between the Tarong Power Station Road and Tarong-Yarraman Road (via an unnamed section of road). Whilst providing a link between these two roads, Ridge Road has very low utilisation and is used primarily for access to the State Forest for HQPlantations and recreational users. A 3-day traffic survey of the Tarong Power Station Road and Ridge Road intersection, undertaken by ATC Engineers on Saturday 14, Tuesday 17 and Wednesday 18 September 2019 (between 7:30am and 4:30pm each day), observed a total of three vehicles using Ridge Road during this period, one of which was a Forestry vehicle.

It is understood that with the proposed future extension of the Meandu Mine surface rights area, a section of the existing Ridge Road corridor is proposed to be closed. Stanwell, who own and operate the Tarong Power Station and Meandu Mine have been in discussions with Toowoomba and South Burnett regional councils regarding the future status of Ridge Road.

As Ridge Road is not a State-Controlled Road, potential impacts resulting from the Project construction and operational activities have not been assessed within the TIA.

Key intersections

The key intersection expected to be used by traffic generated by the Project is D'Aguilar Highway / Tarong Power Station Road located approximately halfway between Yarraman and Nanango. The current configuration of the intersection is a priority-controlled T-intersection (refer Photo 4.5 and Photo 4.6). The D'Aguilar Highway (major road) has a single through lane in each direction, with a 120m Auxiliary Left Turn lane on the southern approach and an Auxiliary Right Turn arrangement on the northern approach. Tarong Power Station Road has a single approach and departure lane however has sufficient room to allow both a left and right turning vehicle to approach and queue at the stop line. This intersection is located approximately at chainage 4.50 on 40C - D'Aguilar Highway.

Photo 4.6 D'Aguilar Highway / Tarong Power Station Road intersection (source: Google Earth)

4.13.2.2 Traffic demands

D'Aguilar Highway Kingaroy to Kilcoy link

The average annual daily traffic observed traffic volumes and percentages of heavy vehicles from TMR 2020 Traffic Census data for the D'Aguilar Highway between Kingaroy and Kilcoy are provided in Table 4.25. Due to the changing nature of the D'Aguilar Highway as it enters into more urban and heavily traffic area east of Kilcoy, the transport environment considered has been limited to this area.

Table 4.25 D'Aguilar Highway AADT Traffic volumes (Kingaroy to Kilcoy) (2020)

Site	Road (section)	Chainage (km)	Volumes (AADT)			HV %		
			G	A	B	G	A	B
20536	40C - D'Aguilar Highway (Yarraman - Kingaroy)	21.67km - 42.97km	2,237	2,240	4,477	18%	8%	14%
30092	40C - D'Aguilar Highway (Yarraman - Kingaroy)	17.65km - 21.67km	2,546	2,610	5,156	18%	8%	14%
30032	40C - D'Aguilar Highway (Yarraman - Kingaroy)	4.72km - 17.65km	1,895	1,975	3,870	18%	8%	14%
160028	40C - D'Aguilar Highway (Yarraman - Kingaroy	0km - 4.72km	1,955	1,915	3,870	18%	8%	14%
160044	40B - D'Aguilar Highway (Kilcoy - Yarraman)	58.19km - 68.76km	1,968	1,957	3,925	18%	8%	14%
30091	40B - D'Aguilar Highway (Kilcoy - Yarraman)	54.58km - 58.19km	1,944	1,936	3,880	18%	8%	14%
160050	40B - D'Aguilar Highway (Kilcoy - Yarraman)	45.34km – 54.58km	1,781	1,586	3,367	18%	8%	14%
30090	40B - D'Aguilar Highway (Kilcoy - Yarraman)	32.65km - 45.3km	1,637	1,595	3,232	18%	8%	14%
30009	40B - D'Aguilar Highway (Kilcoy - Yarraman)	23.46km - 32.65km	1,823	1,840	3,663	18%	8%	14%
30043	40B - D'Aguilar Highway (Kilcoy - Yarraman)	10.55km - 23.46km	1,875	1,842	3,717	18%	8%	14%

Site	Road (section)	Chainage (km)	Volumes (AADT)			HV %		
			G	A	B	G	A	B
20534	40B - D'Aguilar Highway (Kilcoy - Yarraman)	6.48km - 10.55km	1,829	1,809	3,638	18%	8%	14%
20533	40B - D'Aguilar Highway (Kilcoy - Yarraman)	2.58km - 6.48km	1,922	1,918	3,840	18%	8%	14%
20053	40B - D'Aguilar Highway (Kilcoy - Yarraman)	0km - 2.58km	3,349	3,348	6,697	18%	8%	14%

Hourly flow proportions of average annual daily traffic flows for a representative section of the D'Aguilar Highway (Site 30032 – 40C - D'Aguilar Highway (Yarraman - Kingaroy) showing construction morning and afternoon peak period percentages are shown in blue and green in Figure 4.18.

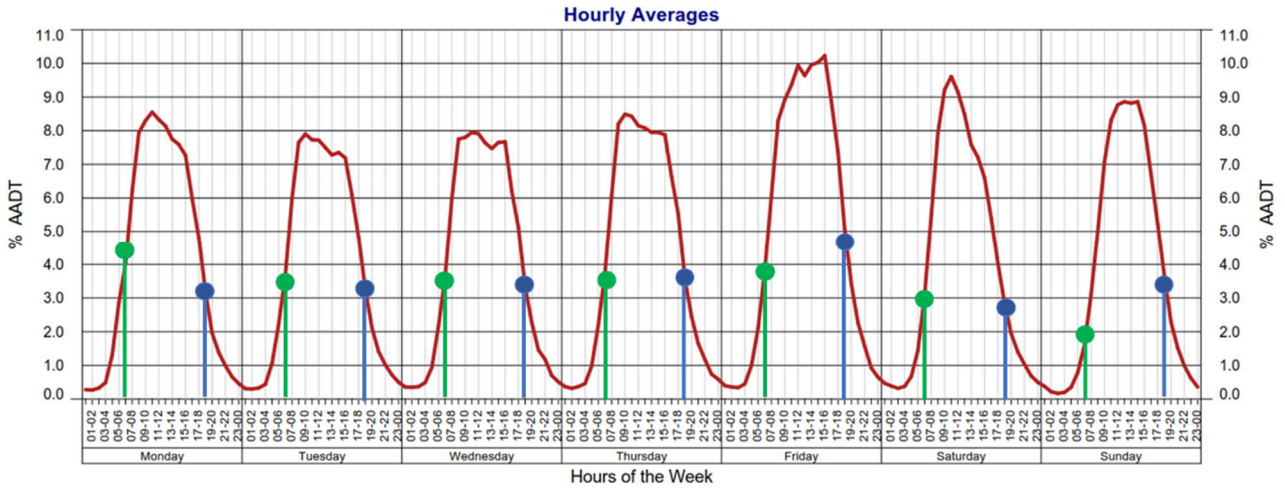


Figure 4.18 Indicative peak period (AM and PM) flow proportions (2020)

These flow proportions illustrate that during the expected morning and afternoon project traffic peak periods (6-7 am and 6-7 pm) weekday background traffic flows are typically 3-5% of daily flows. To provide a higher end estimate of hourly traffic flows, a 5% proportion has been adopted for this study. Calculated project peak hour link volumes on the D'Aguilar Highway are shown in Table 4.26. It is noted that the background peak period traffic volumes occur during the middle of the day typically between 10am and 4pm.

Table 4.26 Peak Hour traffic volumes (Kingaroy to Kilcoy) (2020)

Site	Road	Chainage (km)	Peak period (6-7AM and 6-7PM) traffic Volumes		
			G	A	B
20536	40C - D'Aguilar Highway (Yarraman - Kingaroy)	21.67km - 42.97km	112	112	224
30092	40C - D'Aguilar Highway (Yarraman - Kingaroy)	17.65km - 21.67km	127	131	258
30032	40C - D'Aguilar Highway (Yarraman - Kingaroy)	4.72km - 17.65km	95	99	194
160028	40C - D'Aguilar Highway (Yarraman - Kingaroy	0km - 4.72km	98	96	194
160044	40B - D'Aguilar Highway (Kilcoy - Yarraman)	58.19km - 68.76km	98	98	196
30091	40B - D'Aguilar Highway (Kilcoy - Yarraman)	54.58km - 58.19km	97	97	194

Site	Road	Chainage (km)	Peak period (6-7AM and 6-7PM) traffic Volumes		
			G	A	B
160050	40B - D'Aguilar Highway (Kilcoy - Yarraman)	45.34km – 54.58km	89	79	168
30090	40B - D'Aguilar Highway (Kilcoy - Yarraman)	32.65km - 45.3km	82	80	162
30009	40B - D'Aguilar Highway (Kilcoy - Yarraman)	23.46km - 32.65km	91	92	183
30043	40B - D'Aguilar Highway (Kilcoy - Yarraman)	10.55km - 23.46km	94	92	186
20534	40B - D'Aguilar Highway (Kilcoy - Yarraman)	6.48km - 10.55km	91	90	182
20533	40B - D'Aguilar Highway (Kilcoy - Yarraman)	2.58km - 6.48km	96	96	192
20053	40B - D'Aguilar Highway (Kilcoy - Yarraman)	0km - 2.58km	167	167	335

Intersection

2020 peak hour intersection turn volumes (6-7 am and 6-7 pm) for the intersection of D'Aguilar Highway / Tarong Power Station Road have been estimated based on:

- 5% of D'Aguilar Highway average annual daily traffic T volumes.
- Application of daily heavy vehicle proportions to the peak hour traffic volumes.
- Traffic count data (2019) for the intersection of Tarong Power Station Road / Ridge Road showing the following traffic volumes (between 7:30 am and 4:30 pm) on Tarong Power Station Road:
  - Six (6) vehicles eastbound and 5 vehicles westbound on Saturday 14 September
  - Forty (40) vehicles eastbound and 20 vehicles westbound on Tuesday 17 September
  - No vehicles on Wednesday 18 September
- Site observations of traffic flows on Tarong Power Station Road (a single vehicle turning into the road during a half hour period between 10 am and 10:30 am)
- Advice from Powerlink regarding traffic flows on Tarong Power Station Road.

The estimated 2020 morning and afternoon peak hour intersection turn volumes are shown in Figure 4.19.

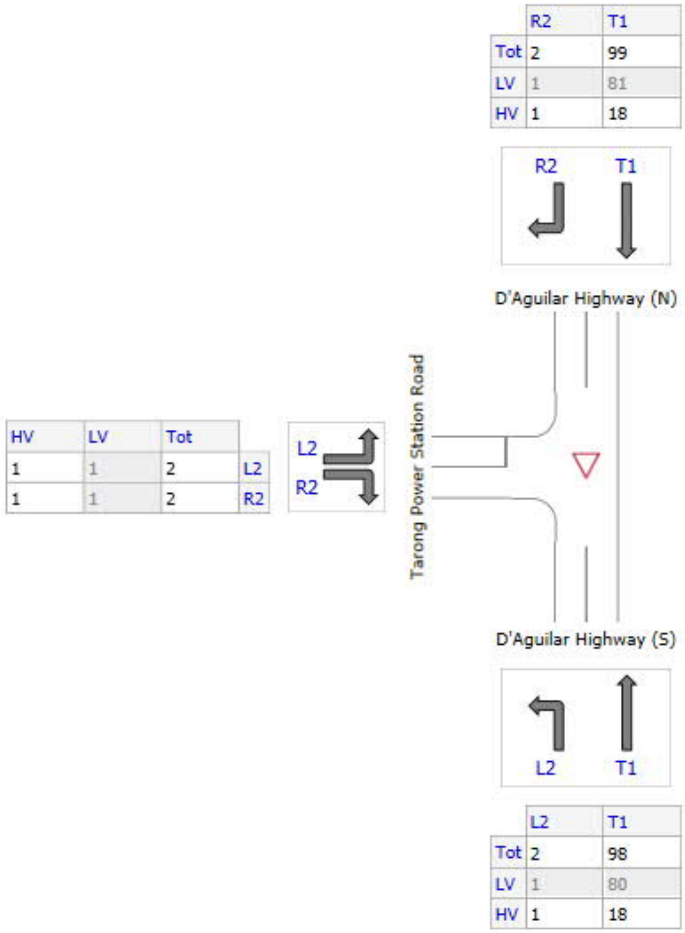


Figure 4.19 Estimated D'Aguilar Highway / Tarong Power Station Road morning and afternoon peak period intersection turn volumes (2020)

4.13.2.3 Growth rates

Historic average annual daily traffic growth rates on the D'Aguilar Highway for a segment on each road section (taken from the 2020 average annual daily traffic reports) are shown in Table 4.27.

Table 4.27 Historic growth rates (2020)

Site	Road	Growth rate		
		1 Year	5 Year	10 Year
30032	40C - D'Aguilar Highway (Yarraman - Kingaroy)	-6%	0%	1%
160050	40B - D'Aguilar Highway (Kilcoy - Yarraman)	0%	1%	1%

Based on the above, a growth rate of 1% per annum has been adopted to extrapolate the observed 2020 traffic volumes to the construction year of 2023. It is noted that traffic growth rates have been impacted in recent years by the advent of COVID, however due to the relatively low average annual daily traffic volumes and short time until year of construction (2023), the adopted growth rate is not expected to have a material effect on the outcomes of the analysis undertaken in this TIA.

4.13.2.4 Crash statistics

Crash data for the 5-year period from July 2016 to June 2021 has been extracted from Queensland Globe for the D'Aguilar Highway in the vicinity of the intersection with Tarong Power Station Road and is presented in Figure 4.20 and Table 4.28.

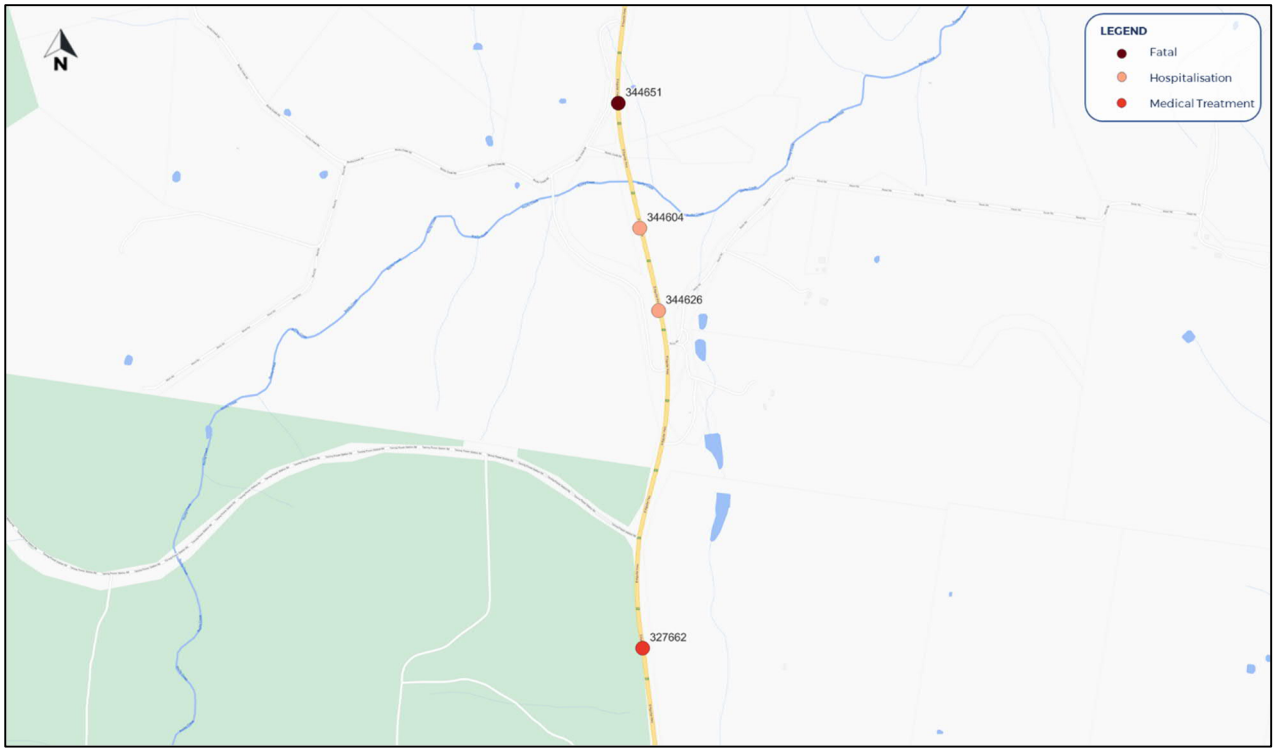


Figure 4.20 Crashes (2016 to 2021 in the vicinity of D'Aguilar Highway / Tarong Power Station Road intersection)

Table 4.28 Crashes (2016 to 2021 in the vicinity of D'Aguilar Highway / Tarong Power Station Road intersection)

Site	Crash Severity	Year of incident	DCA Code	Crash Nature	Number of Vehicles
344604	Medical treatment	2019	703	Off Path-Straight: Left Off Cway Hit Obj	Single Vehicle
327662	Hospitalisation	2019	502	Veh'S Overtaking: Out Of Control	Single Vehicle
344626	Medical treatment	2020	704	Off Path-Straight: Right Off Cway Hit Obj	Single Vehicle
344651	Fatal	2021	803	Off Path-Curve: Off Cway Rt Bend Hit Obj	Single Vehicle

4.13.2.5 Public transport

There are no public transport services operating in vicinity of the Project site. Private long distance coach services operated by Pursers Coaches travel along the D'Aguilar Highway between Caboolture and Kingaroy at a frequency of three services per week. School bus services operated by Pursers Coaches operate within the regional townships and surrounding regions and utilise the D'Aguilar Highway, including between Nanango and Yarraman. These school bus services operate twice daily at school start and end times.

4.13.2.6 Active transport

Due to the rural nature of the area, no dedicated active transport infrastructure is located in vicinity of the Project site. Pedestrian and cycle facilities exist within some of the urban areas along the D'Aguilar Highway and existing road lanes or shoulders may be used by cyclists. Roads designated as part of the Principal Cycle network exist outside of the D'Aguilar Highway corridor within the urban centres of Kingaroy, Nanango and Kilcoy.

4.13.3 Potential impacts and management measures

4.13.3.1 Construction

Link capacity assessment

An assessment of the increases to average annual daily traffic volumes on the D'Aguilar Highway as a result of construction generated traffic from the Project has been undertaken. This analysis represents a worst-case assessment for link capacity increases, investigating a day of peak construction workers and peak heavy vehicles combined. As per Section 4.13.2.3, a growth rate of 1% has been applied to the observed 2020 average annual daily traffic volumes to extrapolate to the 2023 construction year.

The results from this assessment show that the during the day of the Project's highest generated traffic volumes, development flows do not exceed 5% of the background AADT volumes in either direction on the D'Aguilar Highway (greatest increase of 1.5%). As such, the Project is not considered to have a significant impact on link capacity and no further analysis of link capacity impacts is required.

Pavement assessment

An assessment to determine potential pavement impacts resulting from the Project's construction generated heavy vehicle traffic has been undertaken. The initial assessment identifies any road links where the total development SARs are expected to exceed 5% of the background traffic SARs in either direction on the link's during the year of construction of each stage.

For the purpose of this assessment, a SAR4 value has been adopted for the D'Aguilar Highway with an average SAR4 value of 3.2 (as per the *Guide to Traffic Impact Assessment Practise Note: Pavement Impact Assessment* (TMR 2018) "All other roads" SAR4s value) applied to background HV traffic volumes. The results of this analysis are shown in Table 4.29.

This analysis shows that the total SAR4s generated by The Project do not exceed 5% of the construction year background SAR4s in either direction on the D'Aguilar Highway. As such, The Project is not considered to have a significant impact on pavements and no further analysis of pavement impacts is required.

Table 4.29 Pavement impact Assessment (2023 – Construction year)

Site	Road Link	Base Daily HV (G)	Base Yearly SAR4 (G)	Construction Total HV (G)	Construction Total SAR4 (G)	% increase (G)	Base Daily HV (A)	Base Yearly SAR4 (A)	Construction Total HV (A)	Construction Total SAR4 (A)	% increase (A)
20536	40C - D'Aguilar Highway (Yarraman - Kingaroy)	407	475,271	0	0	0.00%	179	209,044	512	1,482	0.00%
30092	40C - D'Aguilar Highway (Yarraman - Kingaroy)	463	540,921	0	0	0.00%	209	243,574	512	1,482	0.00%
30032	40C - D'Aguilar Highway (Yarraman - Kingaroy)	345	402,610	0	0	0.00%	158	184,313	512	1,482	0.00%
160028	40C - D'Aguilar Highway (Yarraman - Kingaroy	356	415,358	512	1,823	0.44%	153	178,714	512	1,482	0.44%
160044	40B - D'Aguilar Highway (Kilcoy - Yarraman)	358	418,120	512	1,823	0.44%	156	182,634	512	1,482	0.44%
30091	40B - D'Aguilar Highway (Kilcoy - Yarraman)	354	413,021	512	1,823	0.44%	155	180,674	512	1,482	0.44%
160050	40B - D'Aguilar Highway (Kilcoy - Yarraman)	324	378,390	512	1,823	0.48%	127	148,011	512	1,482	0.48%
30090	40B - D'Aguilar Highway (Kilcoy - Yarraman)	298	347,796	512	1,823	0.52%	127	148,851	512	1,482	0.52%
30009	40B - D'Aguilar Highway (Kilcoy - Yarraman)	332	387,313	512	1,823	0.47%	147	171,715	512	1,482	0.47%
30043	40B - D'Aguilar Highway (Kilcoy - Yarraman)	341	398,361	512	1,823	0.46%	147	171,901	512	1,482	0.46%
20534	40B - D'Aguilar Highway (Kilcoy - Yarraman)	333	388,588	512	1,823	0.47%	145	168,822	512	1,482	0.47%
20533	40B - D'Aguilar Highway (Kilcoy - Yarraman)	350	408,347	512	1,823	0.45%	153	178,994	512	1,482	0.45%
20053	40B - D'Aguilar Highway (Kilcoy - Yarraman)	609	711,526	512	1,823	0.26%	268	312,446	512	1,482	0.26%

Intersection assessment – project generated turn volumes

The turn volumes generated by the Project in the AM and PM construction peak periods at the intersection of D'Aguilar Highway / Tarong Power Station Road are shown in Figure 4.21 and Figure 4.22. These volumes represent the combined highest peak hour of traffic generation for both light and heavy vehicles during the construction period.

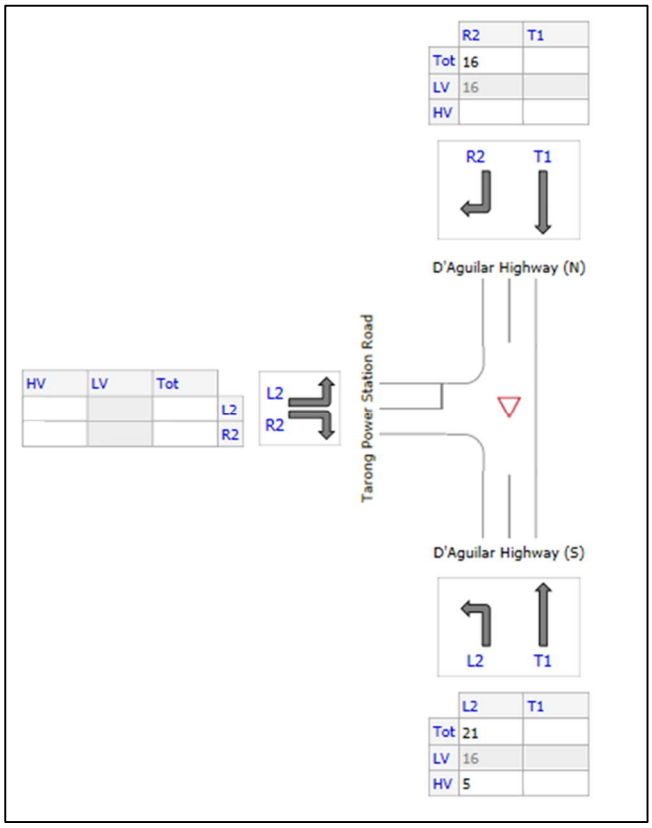


Figure 4.21 AM construction peak Project turn volumes - D'Aguilar Highway / Tarong Power Station Road

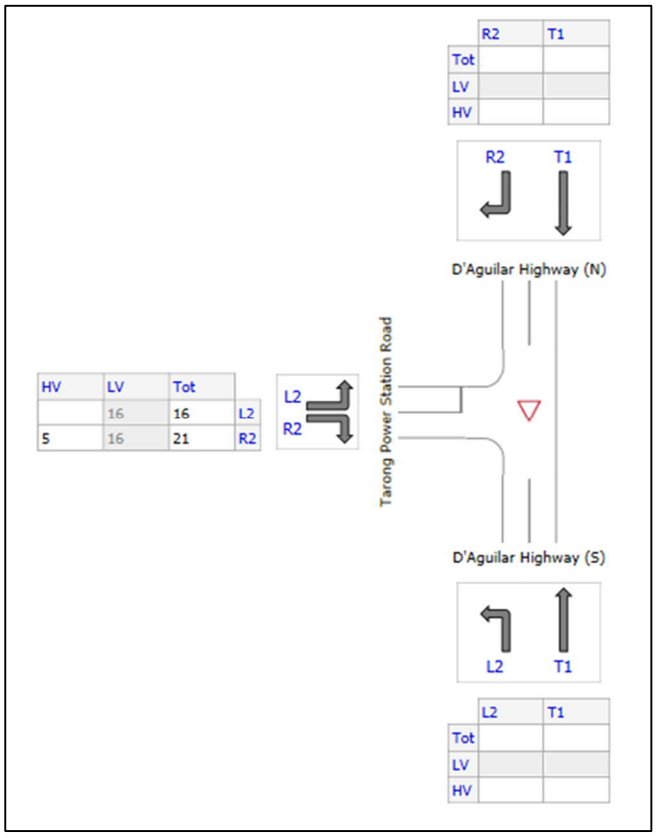


Figure 4.22 PM construction peak Project turn volumes - D'Aguilar Highway / Tarong Power Station Road

Intersection assessment – turn warrant assessment

A turn warrant assessment has been undertaken in line with *Austroads Guide to Traffic Management: Part 6* for the with and without the Project construction traffic. Although this assessment is typically undertaken for new intersections or accesses, it has been developed to assist in understanding suitability of the current intersection configuration to accommodate the additional traffic volumes generate by the Project construction activities. As per Section 4.13.2.3, a growth rate of 1% has been applied to the estimated 2020 peak hour turn volumes to extrapolate to the 2023 construction year. This assessment has been undertaken for the peak period of traffic generation for both light and heavy vehicles combined for the AM peak period (the construction stage and time period where turn volume into Tarong Power Station Road are the highest). The results of this assessment are shown in Figures Figure 4.23 and Figure 4.24.

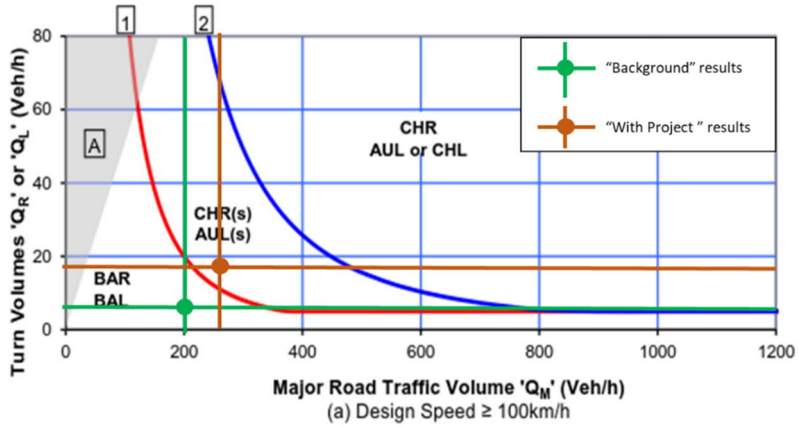


Figure 4.23 Left turn movement Turn Warrant assessment (AM peak)

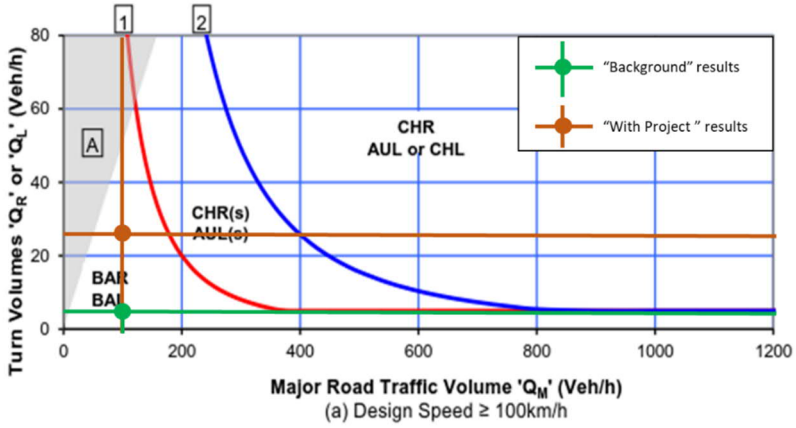


Figure 4.24 Right turn movement Turn Warrant assessment (AM peak)

These results show that with the addition of the Project's peak generated traffic, the current intersection left turn configuration is suitable with the inclusion of the Project's peak generated traffic.

The turn warrant assessment for the right turn identified a channelised right turn treatment as the recommended intersection configuration based on the intersection turn volumes. The following elements should be considered in relation to this outcome:

- this turn warrant assessment has been made for the highest periods of traffic generation (both works force and heavy vehicles), outside of this period, peak hour generated traffic is expected to be less than half of that that assessed
- it is only the AM peak period where the significant volumes of construction related traffic would be making the turn movements into Tarong Power Station Road
- the additional traffic volumes generated by the Project construction are temporary in nature
- the recommendation for a channelised right turn is in the lower end of the range.

Based on the above factors and the results of the intersection operation assessment and safety assessment, the current intersection configuration is considered appropriate for the increased traffic volumes during the Project construction activities.

Intersection assessment – intersection operation

Although the Project construction activities generate relatively low traffic volumes, it is expected to generate an increase of more than 5% of the base traffic for turn movements at the intersection of D'Aguilar Highway / Tarong Power Station Road in the AM and PM peak periods due to the very low (estimated at two vehicles per hour) background volumes.

To assess the resulting impacts, the intersection of D'Aguilar Highway / Tarong Power Station Road has been investigated in the 2023 AM and PM peak periods for without and with construction scenarios. As per Section 4.13.2.3, a growth rate of 1% has been applied to the estimated 2020 peak hour turn volumes to extrapolate to the 2023 construction year. This analysis was undertaken using SIDRA intersection software, reporting on the average delay, degree of saturation, delay based Level of Service (LOS) and 95th percentile queues by approach.

Level of Service (LOS) is defined in SIDRA as:

> *An index of the operational performance of traffic on a given roadway, traffic lane, approach, intersection, route or network, based on measures such as delay and degree of saturation etc. during a given flow period. This provides a quantitative stratification of a performance measure or measures that represent quality of service, measured on an A to F scale, with LOS A representing the best operation conditions from the traveller's perspective and LOS F the worst.*

Delay is defined in SIDRA as:

> *The additional (excess) travel time experienced by a vehicle or pedestrian relative to a base travel time, e.g. the free-flow travel time. Average delay considering all vehicles or pedestrians that are queued and not queued is a common performance measure used for intersection and network analysis.*

Degree of Saturation (DOS) is defined in SIDRA as:

> *The ratio of arrival (demand) flow rate to capacity during a given flow period. Also, known as the volume to capacity ratio (v/c ration), utilisation ratio, utilisation factor and traffic intensity.*

95th Percentile Queue Length is defined in SIDRA as:

> *The 95th percentile queue length is the value below which 95 percent of all observed cycle queue lengths fall, or 5 per cent of all queue lengths exceed.*

The assessed intersection layout of D'Aguilar Highway / Tarong Power Station Road is shown in Figure 4.25 and the results of this assessment for the without and with construction generated traffic scenarios is shown in Table 4.30 to Table 4.33. Further detailed SIDRA outputs are provided in Appendix F.

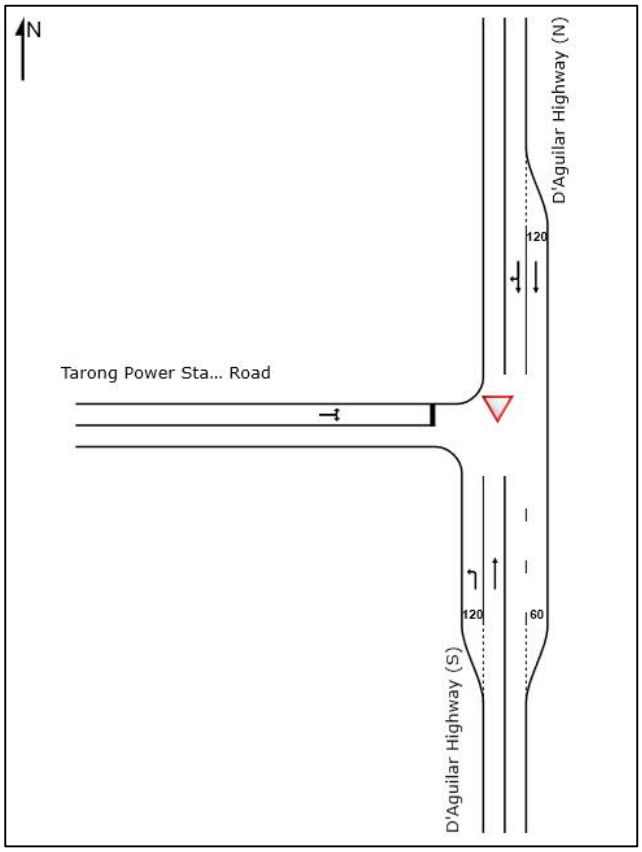


Figure 4.25 SIDRA intersection layout - D'Aguilar Highway / Tarong Power Station Road

Table 4.30 AM Peak – Base SIDRA results

Approach	Volume	LOS	DOS	Delay (s)	Queue (95th %) (m)
South: D'Aguilar Highway (S)	106	N/A	0.061	0.1	0.0
North: D'Aguilar Highway (N)	107	N/A	0.048	0.2	0.2
West: Tarong Power Station Road	4	A	0.006	11.8	0.2
All Vehicles	217	N/A	0.061	0.4	0.2

Table 4.31 AM Peak – Construction SIDRA results

Approach	Volume	LOS	DOS	Delay (s)	Queue (95th %) (m)
South: D'Aguilar Highway (S)	124	N/A	0.061	1.2	0.0
North: D'Aguilar Highway (N)	118	N/A	0.057	1.1	1.1
West: Tarong Power Station Road	4	A	0.007	12.0	0.2
All Vehicles	246	N/A	0.061	1.3	1.1

The assessment of the operation of D'Aguilar Highway / Tarong Power Station Road intersection in the PM peak period shows that with the addition of the heaviest expected peak period construction traffic the intersection continues to operate in an acceptable manner with:

- no change in intersection level of service
- minimal changes to approach degree of saturation (largest increase of 0.053)
- decrease changes to average approach delays, however an increase in average delay across the intersection (1.5s)
- minimal changes to queue lengths (largest increase of 1.7 m).

Table 4.32 PM Peak – Base SIDRA results

Approach	Volume	LOS	DOS	Delay (s)	Queue (95th %) (m)
South: D'Aguilar Highway (S)	103	N/A	0.061	0.1	0.0
North: D'Aguilar Highway (N)	104	N/A	0.048	0.2	0.2
West: Tarong Power Station Road	4	A	0.006	11.8	0.2
All Vehicles	211	N/A	0.061	0.4	0.2

Table 4.33 PM Peak – Construction SIDRA results

Approach	Volume	LOS	DOS	Delay (s)	Queue (95th %) (m)
South: D'Aguilar Highway (S)	103	N/A	0.061	0.1	0.0
North: D'Aguilar Highway (N)	104	N/A	0.048	0.2	0.2
West: Tarong Power Station Road	42	A	0.059	10.2	1.8
All Vehicles	249	N/A	0.061	1.9	1.8

Heavy vehicle routes

As a relatively low increase (<3%) in average annual daily traffic volumes are noted on the D'Aguilar Highway during the peak period of construction activities. It is not expected that construction heavy vehicle and workforce movements generated by the Project would impact the operation of existing heavy vehicles movements on the D'Aguilar Highway 25m B Double heavy vehicle route.

Public transport

No public transport in the vicinity of the site apart from occasional coach services (three per week). School bus services will be in operation in the regional centres and surrounding areas and along the D'Aguilar Highway. Due to the low traffic volumes generated by Project construction activities (primarily worker force movements from Nanango, Yarraman, Kingaroy), it is expected to have a minimal impact on these services. In addition, it is noted that the heaviest time for construction movements is expected at the start and end of construction hours (6:30 am to 6:30 pm) which is outside school bus service periods (e.g. immediately prior/post school times).

Active transport

Given the surrounding land uses in the vicinity of the Project, the demand for cycling and pedestrian travel in the area is likely to be low. Although there would be increased traffic from construction vehicles in urban areas along the access routes, the increase is minor (<3% of average annual daily traffic). Therefore, no impact to existing active transport movements expected. It is noted that the largest hourly construction movements (workforce) would occur outside peak traffic periods (typically between 10 am and 4 pm) and would have minimal impact to pedestrians and cyclists.

Road safety assessment

A risk assessment of impacts resulting from the Project construction activities has been undertaken. This assessment has identified the following key risks associated with the construction of the Project

- increases in traffic volumes
- increases to left and right turn movements into and out of Tarong Power Station Road
- increases to heavy vehicles volumes along the D'Aguilar Highway.

These risks have been assessed using the risk assessment framework as detailed in the *Guide to Traffic Impact Assessment* with the results presented in Table 4.34.

Table 4.34 Road safety risk assessment

Risk Item	Without Development			With Development			Mitigation measure	With Development and mitigation		
	Likelihood	Consequence	Risk Score	Likelihood	Consequence	Risk Score		Likelihood	Consequence	Risk Score
Increased left turn movement into Tarong Power Station Road, rear end collision through movement with left turn entry	1	4	M	2	4	M	Construction access warning signage	1	4	M
Increased right turn movement into Tarong Power Station Road, rear end collision through movement with right turn entry	1	5	M	2	5	M	Construction access warning signage	1	5	M
Increased right turn movement into Tarong Power Station Road, side collision of though movement with right turn entry	1	5	M	2	5	M	Construction access warning signage	1	5	M
Increased right turn movement into D'Aguilar Highway, side collision of through movement with right turn exit	1	5	M	2	5	M	Construction access warning signage	1	5	M

As the Project is a Planning Act development, and the D'Aguilar Highway has an average annual daily traffic of less than 8,000 per day (but a posted speed limit greater than 80 km/hr), a road safety assessment of the increased turning volumes on the D'Aguilar Highway / Tarong Power Station Road intersection has been undertaken. This found:

- Following review of the current crash data it appears that the current intersection arrangement does not pose a significant safety risk under current traffic conditions. Furthermore, with no proposed change to the vertical or horizontal geometry of the intersection, no change in the existing sight lines is expected at the intersection.
- During the construction stage of this project, there will be an increase in the heavy vehicles utilising this intersection which will increase the risk profile at this location and as such increases the risk likelihood as reflected in Table 4.34 above.

4.13.3.2 Operation

Due to the nature of the Project, minimal traffic is expected to be generated as a result of the operation of the transmission line. The expected traffic generated by the operation of the Project results from periodic inspection and maintenance activities and is estimated in the region of three vehicle trips on average per year.

As the construction activities were not found to have any significant impact on the transport network, and operational traffic is significantly less than that generated by construction activities, the operation of the Project is expected to have negligible impact on:

- link capacity and pavement
- intersection operation
- heavy vehicle routes
- active or public transport networks
- general road safety.

4.13.3.3 Mitigation and management measures

The following mitigation measure is recommended to be implemented to reduce and manage the potential impact to the D'Aguilar Highway resulting from the Project construction activities:

- Temporary warning signs to be introduced on the D'Aguilar Highway in the vicinity of the intersection with Tarong Power Station Road to provide road users advanced warning of additional turning vehicles.

Due to the low generated traffic volumes associated with the Project operational activities (an average of 3 vehicle trips per year), no mitigation measures are required during the operational phase.

4.14 Electric and magnetic fields

This section describes the potential electric and magnetic field (EMF) impacts associated with the proposed transmission line. As both the calculated electric field and magnetic field strength from the proposed transmission line are well below the International Commission on Non-Ionizing Radiation Protection reference levels for general public exposure, no areas have been identified within and around the transmission line easement.

4.14.1 Background information regarding electrical and magnetic fields

EMFs occur almost everywhere; can exist independently of each other; and can result from both natural sources and human activity. Naturally occurring electric fields result from charged particles in the atmosphere and storm activity, and the electric field strength can vary quite quickly as a result of lightning discharges. The earth's natural magnetic field varies with latitude, and some rocks and minerals are also naturally magnetic.

Unlike most natural EMFs, those relevant to transmission lines alternate at the frequency of the alternating current power transmission system. These fields alternate in magnitude and direction 50 times per second (50 Hz). Although they may occur simultaneously at the same place, the EMFs exist independently of one another. These power–frequency fields are commonly referred to as extra low frequency electric and magnetic fields (ELF EMFs).

Household electrical wiring and common appliances (electric blankets, televisions, hair-dryers, computers, etc.) all produce ELF EMF. Background magnetic fields in the home are usually around 0.1 μT and background electric fields in the home can be up to 20 V/m (ARPANSA, 2018). The electric field produced by any source outside the home will be attenuated considerably by the structure of the home, as all common building materials are sufficiently conducting to screen fields (World Health Organization, 2007).

EMFs should not be confused with electromagnetic radiation. EMFs are fundamentally different in their physical nature and in the way they interact with the body (NZ Ministry of Health, 2013). Electromagnetic radiation is a term used to describe the movement of electromagnetic energy through the propagation of a wave (e.g. radio waves, microwaves). This wave is composed of electric and magnetic waves which oscillate (vibrate) in phase with, and perpendicular to, each other (Energy Networks Association, 2016). This contrasts with EMF, where the electric and magnetic components are essentially independent of one another. EMFs around power lines and electrical appliances are not a form of radiation (NZ Ministry of Health, 2013).

4.14.2 Sources of power frequency electric and magnetic fields

4.14.2.1 Electric fields

EMFs are produced by all transmission lines, distribution systems, wiring and equipment that use alternating current electricity. An electric field will exist around any conductor that is energised from the power supply, whether or not there is any load connected to it. The strength of power frequency electric fields depends primarily on the voltage of the system; the distances of the point of measurement from the energised conductor; and from nearby earthed objects.

High voltage transmission lines may generate fields of several thousand volts per metre (V/m), whereas fields from lower voltage distribution lines will be in the order of hundreds of V/m, and home appliances several tens of V/m or less.

It is important to note that the electric field strength falls quickly with increasing distance from the voltage source. It is also relatively easy to shield electric fields. Trees, shrubs, buildings, human skin and even clothes will shield electric fields.

4.14.2.2 Magnetic fields

Magnetic fields are produced by, and proportional to, the flow of alternating electric current through conductors. The strength and direction of the field will change with the alternating current at 50 Hz. Transmission line magnetic fields are affected by variables such as line loading, line design, and wire height above ground (Energy Networks Association, 2006). The strength of the magnetic field also decreases rapidly with distance from the source, but it is not practical to provide shielding for magnetic fields (unlike the simple shielding that is possible for electric fields).

Depending on their configuration relative to each other, the magnetic fields generated by individual conductors in an alternating current power system can partly cancel each other. This cancelling effect is greater when the conductors are closer together. For example, this is why the magnetic field directly above an underground cable buried 1 to 1.5m deep can be as high as (or higher than) the field directly below an equivalently loaded line some 10m overhead. However, the field strength from the underground cable will usually fall off faster with increasing distance because of the closer proximity of the conductors to one another.

Magnetic fields are measured using a gaussmeter, in a unit of microtesla (μT) or milligauss (mG). 1 Microtesa (μT) equals 10 milligauss (mG).

Typical magnetic fields measured at normal user distance from common household appliances, some overhead lines, and associated infrastructure are outlined in Table 4.35. The data in Table 4.35, from the Energy Networks Association, shows that power frequency magnetic fields are not just associated with high voltage transmission lines but are found everywhere in modern society with its almost universal reliance on electricity.

Table 4.35 Typical magnetic field ranges (Energy Networks Association, 2016)

Item	Range of measurements in μT
Electric stove	0.2 – 3
Refrigerator	0.2 – 0.5
Electric kettle	0.2 – 1
Toaster	0.2 – 1
Television	0.02 – 0.2
Personal computer	0.2 – 2
Electric blanket	0.5 – 3
Hair dryer	1 – 7
Pedestal fan	0.02 – 0.2
Substation (at fence)	0.1 – 0.8
Distribution line	-
Under line	0.2 – 3
10m away	0.05 – 1
Transmission line	-
Under line	1- 20
Edge of easement	0.2 - 5

4.14.3 Potential impacts and management measures

Expected EMFs were calculated for the Project at its lowest expected clearance to the ground. The calculated field strength was then compared to the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2010 guideline field strength reference levels for general public to time varying electric and magnetic fields (Table 4.36).

Table 4.36 ICNIRP 2010 reference level for general public exposure to time varying electric and magnetic fields

Frequency range	e-field strength E (kV m^{-1})	Magnetic field strength H (A m^{-1})	Magnetic flux density B (T)
1 Hz – 8 Hz	5	$3.2 \times 10^4/f^2$	$4 \times 10^{-2}/f^2$
8 Hz – 25 Hz	5	$4 \times 10^3/f$	$5 \times 10^{-2}/f$
25 Hz – 50 Hz	5	1.6×10^2	2×10^{-4}
50 Hz – 400 Hz	$2.5 \times 10^2/f$	1.6×10^2	2×10^{-4}
400 Hz – 3 kHz	$2.5 \times 10^2/f$	$6.4 \times 10^4/f$	$8 \times 10^{-2}/f$
3 kHz – 10 MHz	8.3×10^{-2}	21	2.7×10^{-5}

Notes: f in Hz

- In the frequency range above 100 kHz, RF specific reference levels need to be considered additionally.

The relevant values from this guideline for the proposed 275kV transmission line are:

- magnetic field - 2000 mG
- electrical field - 5kV/m.

The results of this assessment are presented below and indicate that both electric and magnetic fields from the Project will remain well below the ICNIRP guideline reference levels at 1m above ground level.

Magnetic fields

The calculated magnetic fields for the 275kV transmission line under various operating scenarios are shown in Table 4.37 and illustrated in Figure 4.26. These values indicated the calculated magnetic fields for the transmission line is significantly below the ICNIRP 2010 guideline reference level for General Public of 2000 mG under all operating scenarios.

Table 4.37 Calculated magnetic field results

Load	**Magnetic Field At Maximum Level (mG)**	**Magnetic Field at Edge of Easement (mG)**	**ICNIRP Guideline Reference Limit (mG)**
Infrequent High Load	90.0	26.4	2000
Typical Daily Maximum	82.1	24.1	2000
Short Time Emergency Load	123.6	36.3	2000
Time Weighted Average TWA (Peak * LF * avg days)	26.9	8.1	2000

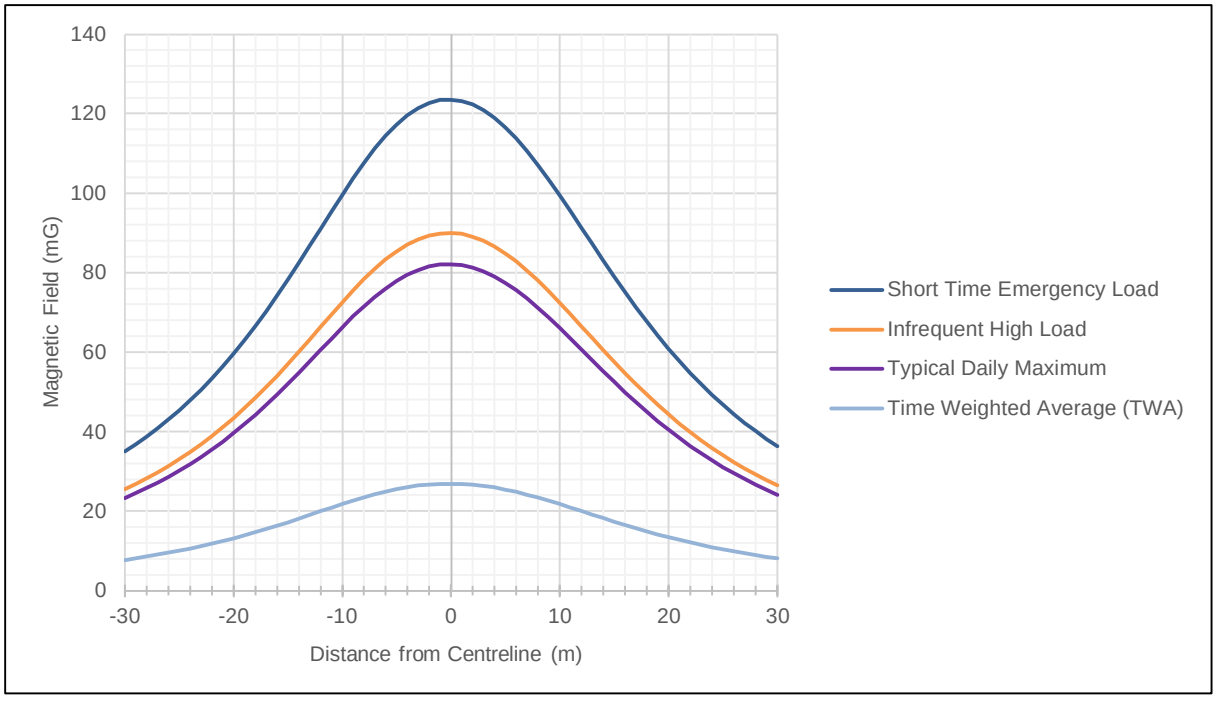


Figure 4.26 275kV magnetic field

Electric fields

The calculated minimum and maximum electric fields for the new single circuit 275kV part of the line are outlined in Table 4.38 and shown on Figure 4.27. As shown, the minimum and maximum calculated electric field levels are below the guideline reference level of 5 kV/m at 1m above the ground under the line and at the edge of the easement.

Table 4.38 Calculated minimum and maximum electric field (275kV single circuit transmission line)

Load	Electric Field At Maximum Level (kV/m)	Electric Field At Edge of Easement (kV/m)	ICNIRP Guideline Reference Limit (kV/m)
Max	1.501	0.376	5
Min	1.463	0.374	5

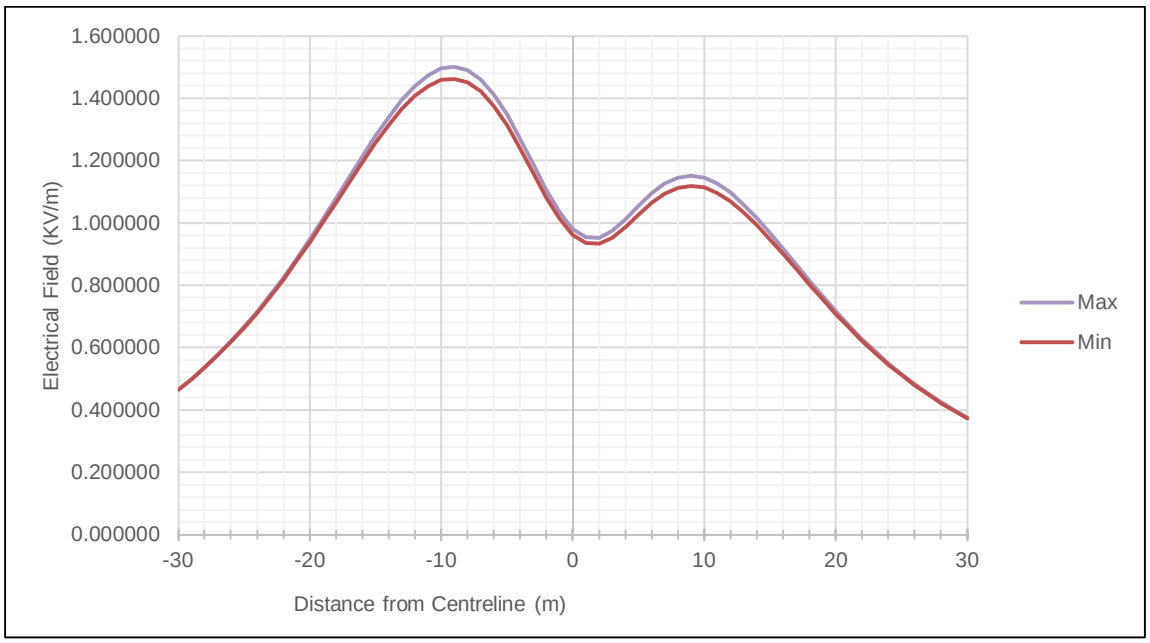


Figure 4.27 275kV electric field

When taking into consideration the edge of the easement, it was found that both the electric field and magnetic field strength for the proposed 275kV transmission line are well below the ICNIRP 2010 reference levels for general public exposure to time varying electric and magnetic fields. Therefore, there are no areas of concern within and around the transmission line easement.

As outlined in Section 4.3.1.2, the closest sensitive receptor is located approximately 1.5km from the preferred alignment. EMF concerns from the preferred alignment at this sensitive receptor are therefore unlikely. It is not expected that any persons other than Powerlink Queensland employees or contractors would spend any significant periods of time close to the transmission infrastructure.

Powerlink has adopted the policy of prudent avoidance with regards to EMF, such as assisting the community experiencing television or radio reception problems caused by transmission line by providing advice and, if required, signal amplification equipment. Due to the distance of the preferred alignment to the closest sensitive receptors (over 1.5km) and the proximity of other transmission line infrastructure to this sensitive receptor, interference with telephone or radio reception is not expected to be an issue for the Project. There is no other infrastructure (e.g. electrical fences) near the proposed easement which could cause induced charge issues. If any items or objects are location through further work, Powerlink will assess the potential for induced charge in proximal conductive objects and propose mitigation measures for any objects in or near the easement that may be affected.

4.15 Bushfire risk

Potential bushfire risks associated with the Project are described in this section. A portion of the preferred alignment traverses an area mapped as a moderate bushfire prone area. No mapped high, very high or extreme bushfire prone areas are traversed by the proposed alignment. Vegetation clearing associated with both the transmission line project and the adjacent K2E Project will reduce the bushfire hazard in the area and the overall bushfire risk. Based on the assessment undertaken, Powerlink's standard measures as outlined in the Bushfire Mitigation – Plan (ASM-PLN-A3285085) are deemed appropriate for the Project.

4.15.1 Existing environment

4.15.1.1 Bushfire hazard mapping

State Planning Policy (SPP)

The SPP expresses the State interests in land-use planning and development, including natural hazards, risk and resilience. The SPP includes state-wide mapping for bushfire prone areas (mapped as potential fire intensity), which considers potential fuel load, maximum landscape slope, and fire weather severity.

A bushfire prone area is defined by the SPP as land that is potentially affected by significant bushfires, including vegetation likely to support a significant bushfire; adjacent land they could be subject to impacts from a significant bushfire; and land that is identified by the SPP and / or a Local Planning Instrument as a bushfire prone area.

A small area of the southern part of the preferred alignment between structures D10 and D14 is mapped as a 'Medium Potential Bushfire Intensity' Bushfire Prone Area and 'Potential Impact Buffer' area under the SPP mapping (Queensland Government, 2017b) (refer Figure 4.28).

The preferred alignment between structures D11 to D14 also intersects the 'Potential Impact Buffer' area of a mapped 'High Potential Bushfire Intensity' Bushfire Prone Area associated with vegetation along Rocky Creek (refer Figure 4.28).

Local Planning Instruments

The local planning instruments applicable to the Project include:

- *South Burnett Regional Planning Scheme 2017* (South Burnett Regional Council).
- *Toowoomba Regional Planning Scheme 2021* (Toowoomba Regional Council).

The Minister has identified that the natural hazards, risk and resilience State interest is not reflected within the above Local Planning Instruments. However, all schemes include bushfire overlay mapping and assessment benchmarks.

The bushfire overlay mapping in the *Toowoomba Regional Planning Scheme 2021* identifies a section of southern part of the preferred alignment within the LGA as 'Medium Fire Risk' area (similar to the area identified by the SPP mapping). High Fire Risk areas are also mapped along Rocky Creek. No bushfire risk has been identified for the part of the preferred alignment within the South Burnett Regional Council LGA.

As noted above, bushfire hazard mapping takes into consideration fuel loads (vegetation types), landscape slope, and weather conditions. A summary of these considerations for the Project area is provide in the sections that follow.

Meandu Mine Transmission Line Relocation Project Environmental Assessment Report

Figure 4.28
Bushfire risk

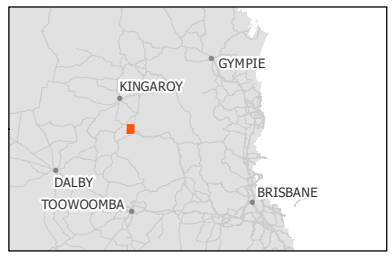
NG POWER STATION ROAD
NANANGO NEUMGNA ROAD
ROCKY CREEK ROAD
MUNT ROAD
RIDGE ROAD
1030-STR-9008
D1
D2
D3
D4
1030-STR-9009
Lot 3 RP176969
D5
D6
Lot 10 SP305494
Ridge Road reserve
D7
D8
D9
D10
D10A
Lot 289 FTY1859
D11
D13
1030-STR-9018
D14
D15
1030-STR-9019

Legend

- Proposed transmission structure locations
- Transmission structure footprint
- Proposed Feeder
- Existing Transmission Feeder
- Access track full clearing
- Local roads
- Forestry access tracks
- King 2 East Additional Surface
- Proposed Easement
- Approved Surface Right Area
- Cadastre
- Mining Lease (ML6674)

Bushfire Prone Area

- Very High Potential Bushfire Intensity
- High Potential Bushfire Intensity
- Medium Potential Bushfire Intensity
- Potential Impact Buffer



Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:15,000 Date: 14/12/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia

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4.15.1.2 Bushfire risk analysis

Site conditions

Topography and slope

As described in Section 4.1.2.1, the topography along the preferred alignment is heavily undulating and well drained. The preferred alignment is located along the mid slopes of a north-south ridgeline, parallel to Ridge Road. This ridgeline has been formed along the crest of a deeply weathered basalt ridge. The ridge is reasonably level, with upper slopes typically between 5 and 10 percent, mid slopes between 15 and 20 percent and more gentle gradients at the toe of the slope towards the ephemeral drainage line known as Rocky Creek. The slopes are dissected by gullies draining to the east. Elevation throughout the Project area generally ranges from 490 – 560m AHD (Department of Resources, 2016).

Vegetation

Field surveys were undertaken in August 2019 and January 2022. The REs and vegetation communities identified in the field are provided in Table 4.39.

The methodology for state-wide mapping of bushfire prone areas in Queensland assigns REs to twenty vegetation hazard classes, which are then grouped as either bushfire prone, grassfire prone or low fuel load classes (Leonard, Newnham, Opie, & Blanchi, 2014). The *Eucalyptus moluccana* mixed open forest (RE12.11.18) along Rocky Creek; the non-remnant juvenile mixed hardwood plantation; and Acacia spp. high value regrowth communities were identified as Bushfire Prone vegetation classes (Class 3, Class 5, and Class 8 respectively). These classes have the potential to support a significant bushfire or the potential to be subject to significant bushfire attack. The bushfire risk from the non-remnant Hoop Pine plantation (Class 15) and remnant semi-evergreen vine thicket and dry rainforest communities (Class 14) was identified as low.

Table 4.39 Regional Ecosystems (REs) within the Project area using field verified mapping

RE ID	Short description	Vegetation hazard class (VHC)	Potential fuel load (tonnes/ha)
RE12.11.18	*Eucalyptus moluccana* mixed open forest on brown clays	VHC 3 – Tall open forests	28
RE12.5.13c	Low microphyll vine forest and semi-evergreen vine thicket with emergent on deeply weathered remnant Tertiary surfaces	VHC 14 – Dry vine forests and vine thickets	5
RE112.5.13c (HVR)	Mixed Acacia spp. high value regrowth with vine thicket species on deeply weathered Tertiary surfaces	VHC 8 – Acacia communities	10
RE12.11.11 (HVR)	Mixed Acacia spp. High value regrowth with vine thicket species on metasediments	VHC 8 – Acacia communities	10
Non-remnant	Hoop Pine plantation	VHC 15 – Hoop Plantations	5
Non-remnant	Juvenile hardwood plantation	VHC 5 – Exotic and hardwood plantations	26

Climate

As described in Section 4.2 the Project area is considered to experience a sub-tropical climate with warm wet summers and mild winters.

Bushfire 'season', as described by Queensland Fire and Emergency Services, normally commences in this region around July. The Project is identified as experiencing a peak in risk during Spring / Spring and Summer (Figure 4.29) (BoM, 2009). The threat of bushfires increases with periods of reduced rainfall and increased temperatures, which can increase the amount of dry grass available to burn.

Climate modelling from the Commonwealth Scientific and Industrial Research Organisation (Commonwealth) (CSIRO) and BoM predicts a temperature rise of 0.6 °C to 1.3°C by 2030 with reduced rainfall and increased intensity of heavy rainfall events projected in the Wide Bay – Burnett region (full range of emission scenario). The extreme heat and dry conditions experienced in the Project area both now and the foreseeable future can be conducive for a bushfire event.

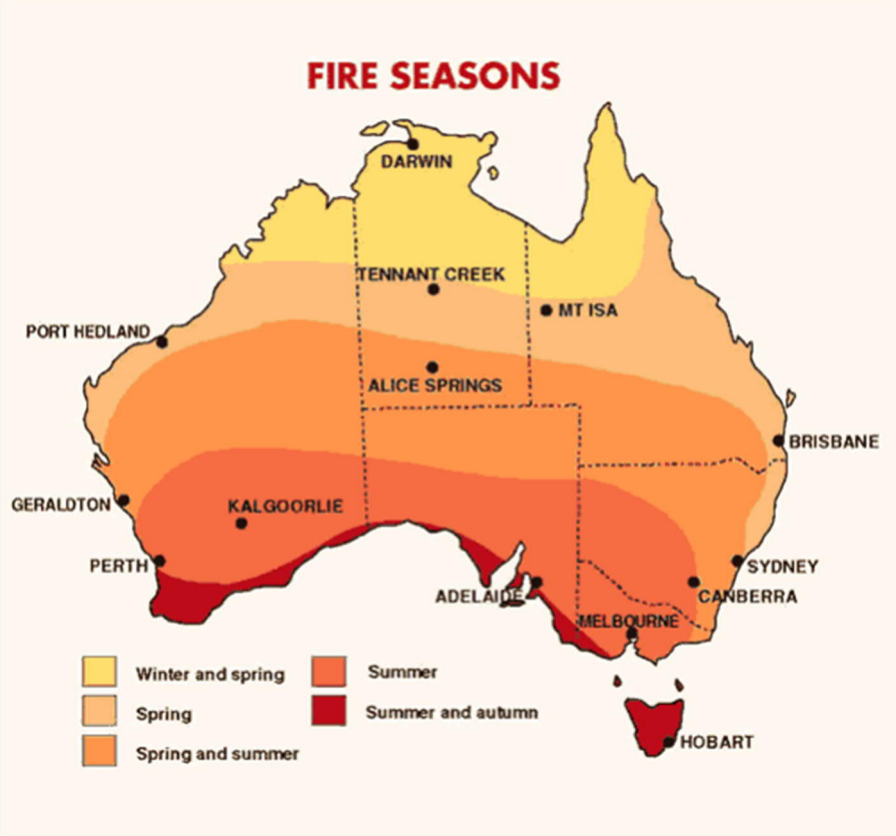

Figure 4.29 Fire seasons

4.15.2 Potential impacts

Bushfires are potentially harmful to people and property. Potential impacts are addressed below as either a fire hazard from the Project or fire hazard to the Project.

4.15.2.1 Fire hazard from the Project

Construction

Construction equipment and vehicles have the potential to create a fire risk through the generation of sparks, heat, and machinery faults which may ignite dry combustible materials. Other potential sources of ignition may arise from accidental fires from human related activities.

Construction activities will generate combustible material in the form of cardboard, and paper packing material and mulched/chipped vegetation. Potential spills of fuel, oil and flammable liquid may also increase the risk of bushfire, particularly in proximity to dry combustible materials.

Operation and maintenance

Operational fire risk is generally related to external influences, such as climate, surrounding land use, and the proximity and density of surrounding vegetation. Operational faults are rare and do not necessarily result in electrical arc flashover to vegetation. During periods of reduced rainfall and increased temperatures, dry vegetation has the to come into contact with the transmission line conductor. This may result in a fire event through power arcing but has been assessed as unlikely for the Project. Due to the height of the transmission line structures, these events are very rare.

Operational waste, particularly dry combustible waste, is anticipated to be limited (Section 4.17: Waste Generation and Management). Therefore, operational waste will have a negligible contribution to bushfire risk from the Project.

During maintenance of the infrastructure, it is anticipated that vegetation waste will be generated which may present a potential fire risk. Sprayed vegetation is usually left to die back and decompose naturally. Cleared regrowth may be mulched or chipped. Burning of vegetative waste will not be undertaken.

Maintenance is also likely to present similar fire risks to construction, on a smaller and more localised scale. These risks include the generation of sparks or heat, machinery faults which may ignite dry combustible materials. Other potential sources of ignition may arise from accidental fire from human related activities.

4.15.2.2 Fire hazard to the Project

Fires burning adjacent to or under high voltage transmission lines have the potential to:

- create electrical arcs (known as ‘flashovers’) that can endanger people, animals and objects
- damage or destroy the wires, insulators and supports of the transmission line
- interrupt electricity supply to households and industry.

Further information on safety risks associated with fires burning near transmission lines are provided on Powerlink’s website (Powerlink Queensland, 2015).

Fire events within the vicinity of transmission lines would most likely be the result of environmental conditions, such as climatic conditions, or land use activities. Powerlink actively reduces vegetation with the easement during maintenance programs. Therefore, the easement and Project access tracks often act as a firebreak if a fire occurs. Transmission line access tracks may also be used by fire crews in the event of fire. The Project design is unlikely to impose restrictions upon existing bushfire management techniques.

Transmission lines are designed to be compatible with the impacts of potential natural hazards that may occur within the proposed easement and potential fire impacts to the transmission lines are limited.

4.15.2.3 Assessment against the SPP assessment benchmarks for natural hazards, risk and resilience

The overall intent of the natural hazards, risk and resilience State interest in the SPP is that the risks associated with natural hazards, including the projected impacts of climate change, are avoided or mitigated to protect people and property and enhance the community’s resilience to natural hazards.

The State interest includes the following assessment benchmarks in relation to bushfire prone areas:

- development avoids bushfire prone areas, and where avoidance is not possible, development mitigates the risk to people and property to an acceptable or tolerable level
- development supports and does not hinder disaster management response or recovery capacity and capabilities.
- development avoids increasing the severity of bushfires and the potential resulting impacts
- risks to public safety from the storage and use of hazardous materials are avoided.

The preferred alignment is not located within a bushfire prone area which is mapped as 'high', 'very high' or 'extreme'. While the preferred alignment crosses a mapped 'medium" risk bushfire prone area associated with Hoop Pine plantation between structures D10A and D11, this vegetation, along with other Hoop Pine plantation areas to the west of the preferred alignment will be cleared as part of harvesting activities by HQPlantations. Remaining vegetated areas to the west of the preferred alignment, including the mixed hardwood plantation, will be cleared by Stanwell or its contractors for the K2E Project. All vegetation apart from the semi-evergreen vine thicket communities will be cleared from the proposed easement.

The clearing of vegetation to facilitate construction and operation of the transmission line will improve access to the site and can be utilised by disaster management response teams if required. Where vegetation remains, the cleared easement will also act as a firebreak which will both protect the transmission line from nearby fire and adjoining properties in the event an outbreak occurs near the alignment.

As part of their planning assessments, Powerlink considers the potential for fire start impacts along with the vulnerability of network assets to fire events. Transmission networks are considerably less prone to either being damaged or starting a fire than distribution networks as:

- transmission assets are less likely to be located in urban areas
- transmission lines are supported on tall towers and poles whereas distribution lines are usually on low wooden poles much closer to vegetation
- transmission conductors are usually located well away from trees and branches that could otherwise come into contact with the energised conductors causing an electrical arc which may ignite a bushfire
- transmission lines are built to a very high engineering standard and suffer from very few failures which would cause fire ignition
- transmission component failures generally occur in extreme weather events, usually accompanied by rain (e.g. cyclones and thunderstorms)
- transmission line conductors are separated by much greater distances than distribution conductors and are designed not to clash in mid-air
- transmission lines have a dedicated easement with an average width of 50m with greater control of vegetation growing immediately below a transmission line.

4.15.2.4 Mitigation and management measures

Based on the above assessment, Powerlink's standard measures as outlined in the *Bushfire Mitigation – Plan* (ASM-PLN-A3285085) and attached as Appendix I are deemed appropriate for the Project. In addition, the measures outlined in Appendix N of the EMP will also be applied during construction and operational activities (refer Appendix G).

Design

- Powerlink has a specific *Guideline for the Design of Transmission Lines for Bushfires* (A544415). This will be included into future revisions of design specifications along with the Cigre Technical Brochure 767: Vegetation fire characteristics and the potential impacts on overhead line performance (A3173485). A review of AS3959 has been performed and Powerlink's design of transmission assets is considered to meet or exceed these requirements. Protection settings have been reviewed and confirmed to exceed industry standards.
- The transmission line design will include all current design principles and safeguards to avoid arcing and line breakage.

Construction

- Fire hazard warnings associated with weather patterns and fire risk are issued by the BoM and the Queensland Rural Fire Service. Daily checking of fire hazard warnings will be undertaken and construction crews made aware of the fire warnings (e.g. through pre-starts).

- Flammable and combustible liquids (i.e. fuel) will be stored within facilities designed to *AS1940–2004 The Storage and Handling of Flammable and Combustible Liquids.*
- Procedures guiding the response to emergency and fire situations, and requests from emergency management authorities, will be documented and communicated where applicable to project location.
- Firefighting equipment must be kept on site when hot works are being undertaken. Personnel must be trained in the use of the equipment.
- All machinery must have a tested and tagged fire extinguisher available.
- Burning of vegetation is prohibited, unless a permit is obtained by a local fire authority and Powerlink, prior to burning.
- Designated smoking areas are to be identified with cigarette butt bins for safe disposal.

Operation and maintenance

- Flammable and combustible liquids (i.e. fuel) will be stored within facilities designed to *AS1940–2004 The Storage and Handling of Flammable and Combustible Liquids*.
- Powerlink maintains its easement through routine vegetation maintenance to ensure vegetation remains outside of untrained exclusion zones and incompatible species do not interfere with the safe operation of the transmission line.
- Cleared vegetation will not be placed in a location which may increase any fire hazard and impact on the Project in the event of a fire.
- Burning of vegetation is prohibited, unless a permit is obtained by a local fire authority and Powerlink.
- Powerlink adopts an asset risk management approach that considers potential fire starts from network components (e.g. insulator and instrument failures). High consequence areas and the likelihood of failures are assessed to determine the optimal investment in the network.

4.16 Hazards, health and safety risks

This section describes the potential hazards and health and safety risks associated with the construction, operation, maintenance, and decommissioning phases of the Project. Mitigation measures to minimise the identified risks are also discussed in this section. Based on the assessment undertaken, Powerlink's standard environmental controls as outlined in the EMP are deemed suitable for managing the identified risks.

4.16.1 Risk identification

4.16.1.1 Methodology

Hazards and risks are defined as:

- Hazards: A source of potential harm or an existing situation with a potential to cause loss, harm to people or damage to property and environment.
- Risks: The chance of something happening that will have an impact on objectives. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it. Risk is measured in terms of a combination of the consequence of an event and its likelihood.

The approach identifies identification of potential hazard associated with the construction, operation and decommissioning of the transmission line along with the potential consequences of exposure to the hazard for sensitive receptors identified in the Project area. Receptors are not restricted to individuals or communities, and include sensitive environments such as land, water, flora and fauna. Mitigation measures and safeguards will be established to minimise

the risk to the community, property, and environment. All risks will be managed through Powerlink management plans and risk management framework and procedures.

The assessment has been carried out using the information available at the time of preparation of the EAR. Further investigation and development of design may lead to the identification of additional hazards and associated risks, or changes to the identified risks. Identified risks will be continuously monitored and risk assessments conducted to identify and assess emergent risks throughout the Project lifecycle. Additional mitigation measures will be developed and documented as required.

4.16.1.2 Data sources

Relevant datasets and sources for this assessment are provided in Table 4.40. This includes several relevant risk assessments and disaster management plans that have been undertaken by South Burnett and Toowoomba Regional Councils which are traversed by the preferred alignment.

Table 4.40 Data set and sources

Relevant Data	Sources
District Disaster Management Plan	Gympie District Disaster Management Plan (2021)
Local Disaster Management Plan	South Burnett Regional Council - Local Disaster Management Plan (v7 June 2021) Toowoomba Regional Council – Local Disaster Management Plan (2015)
Planning Scheme	Toowoomba Regional Council Planning Scheme (2021) South Burnett Regional Council Planning Scheme (2017)
EAR sections (this report)	Land, Climate, Flora, Fauna, Transport and Traffic, Hydrology, Bushfire Risk, Waste Management
Powerlink Policies	Environmental Management Plans, Emergency Response Plan, Asset Management Strategy, Powerlink Homepage
Climate Data	Bureau of Meteorology

4.16.1.3 Preliminary risk identification

The risk identification presented in this section is a desktop study evaluating the key Project risks. Technical studies undertaken as part of this EAR have been incorporated into this assessment where applicable. The key hazards and risks identified for the Project are presented in Table 4.41.This preliminary risk assessment forms part of the larger risk management process which will continue throughout the lifecycle of the Project and has sought to identify hazards which may presently exist prior to construction. The Project will continuously monitor identified risks and conduct future risk assessments to identify and assess emergent risks throughout the Project lifecycle.

Table 4.41 Preliminary hazard and risk identification

Hazards	Potential health, safety and environmental impacts	Mitigation measures	Risk
Natural hazard and environmental risks:			
Bushfire	Transmission line structural failure and loss of service delivery Potential for flammable goods to escalate risk of encroaching bushfire Injuries or fatality Damage to neighbouring infrastructure and properties.	Design of the Project has considered the potential bushfire hazards and risks and will manage these to minimise impact to the health, safety and environment to so far as is reasonably practicable. Powerlink's standard environmental controls for Bushfire (refer Appendix N of EMP (Appendix G) and Powerlink's Bushfire Mitigation – Plan (refer Appendix I).	Refer further to Section 4.154.15 of this EAR.
Landslide	Instability of transmission tower Significant failure of infrastructure and service delivery Change of construction plan Injuries or fatality, e.g. struck by moving rocks	Design of the Project has considered the potential hazards and risks from landslides and will manage these to minimise impact to the health, safety and environment to so far as is reasonably practicable. Powerlink's standard environmental controls for Erosion and Sediment Control (refer Appendix C of EMP (Appendix G).	Low: No earthworks or clearing of vegetation is proposed in the High Landslide Hazard area mapped by the Toowoomba Regional Planning Scheme. Refer to Section 4.1 of this EAR.
Flooding	Transmission line damage and loss of service delivery Damage to electrical assets Loss of access to infrastructure Inundation of construction laydown areas	Design of the Project has considered the potential flood risks and will manage these to minimise impact to the health, safety and environment to so far as is reasonably practicable.	The Project is outside of the flood envelope for the 'high-risk' categories of flood hazard area under both planning schemes and there will be no impact on flood levels as a result of construction of the Project (refer to Section 4.5.1.1).
Acid sulfate soils	Damage to infrastructure. Impacts to aquatic ecology.	Powerlink's standard environmental controls for Acid Sulfate Soils (refer Appendix G of EMP (Appendix G).	Risk of the Project encountering acid sulfate soils has been assessed as low (refer to Section 4.1 of this EAR)

Hazards	Potential health, safety and environmental impacts	Mitigation measures	Risk
Contaminated land	Excavation of contaminated land from sites listed on EMR/ CLR and further potential contamination, including landfill, petroleum oil storage Contact with acid sulfate soils Contamination to watercourses Disposal of contaminated material and/ or on site remediation of contaminated soil	Powerlink's standard environmental controls for Contaminated Land (refer Appendix H of EMP (Appendix G).	Based on current and past land uses (plantation forestry and native vegetation) the risk of the Project encountering contaminated land has been assessed as low (refer to Section 4.1 of this EAR).
Meandu Mine operations (geotechnical instability and blasting)	Transmission line damage and loss of service delivery Damage to electrical assets Injuries or fatality	Design of the Project has taken into consideration proposed future expansion of the Meandu Mine including the potential for geotechnical instability and the impact from blasting activities. Powerlink will continue to work collaboratively with Stanwell to ensure that mining activities do not compromise the proposed transmission line.	
Spread of animal or plant disease (e.g. via vehicles and mobile plant and equipment)	Loss of biodiversity (refer to Sections 4.7.2 and 4.9.3) Broader impacts could include potential health hazards to stock, quarantine impacts or changes to irrigation requirements if transported in the wider area.	Powerlink's standard environmental controls for Biosecurity (refer Appendix A of EMP (Appendix G) including development and implementation of a Biosecurity Management Plan.	The risk of the Project resulting in the establishment of new pest animal and plant species in in areas where they are currently absent is assessed as low. Refer further to Section 4.9 of this EAR.
Waste (e.g. waste concrete, timber, plastic packaging)	Offensive odour Impact on visual amenity, e.g. temporary stockpiles Contamination of soils or waterways	Powerlink's standard environmental controls for Waste Management (refer Appendix I of EMP (Appendix G	Low Refer further to Section 4.174.17 of this EAR.

Hazards	Potential health, safety and environmental impacts	Mitigation measures	Risk
Dangerous Goods and Hazardous Substance Storage and Handling	Loss of containment Pollution to stormwater and soil Potential fire from flammable goods and escalation of bushfire risk. Health impacts.	Powerlink's standard environmental controls for Hazardous Materials (refer Appendix J of EMP (Appendix G) Refer further to Section 4.16.1.4 of this EAR.	Low: Due to the length of the preferred alignment (approximately 5km) it is unlikely that significant quantities of the hazardous substances listed will be required for the Project.
Dangerous Goods and Hazardous Substance Transportation	Loss of containment Pollution to stormwater and soil Potential fire from flammable goods and escalation of bushfire risk.	The transportation of dangerous goods will only be undertaken by license transporters in accordance with *Australian Code for the Transport of Dangerous Goods by Road & Rail* (ADG Code), including the requirements to display Hazchem signage, placard and carry spill containment equipment to be used by emergency services personnel in the event of an emergency.	Low: Due to the length of the proposed transmission line (approximately 5km) it is unlikely that significant quantities of the hazardous substances listed will be required for the Project.
Dust e.g. from roadworks, clearing of land, installation	Poor visibility Residential complaints Respiratory irritation	Powerlink's standard environmental controls for Air Quality (refer Appendix K of EMP (Appendix G).	The likelihood of the Project causing air quality impacts at residents or to other sensitive land sues has been assessed as low. Refer further to Section 4.3 of this EAR.
Noise and vibration	Nuisance and disturbance to residential or other sensitive land uses.	Powerlink's standard environmental controls for Noise and Vibration (refer Appendix L of EMP (Appendix G).	The likelihood of the Project creating noise disturbance to residents or other sensitive land uses has been assessed as low. Refer further to Section 4.4 of this EAR.

Hazards	Potential health, safety and environmental impacts	Mitigation measures	Risk
Increased volume of traffic (including heavy vehicle) on local road network.	Public road traffic accidents causing severe or fatal injuries. Increase in road wear.	Powerlink's standard environmental controls for Transport and Traffic (refer Appendix O of EMP (Appendix G) including development and implementation of a Traffic Management Plan.	Low Refer to Section 4.134.13 of this EAR.
EMF	Health impacts from prolonged exposure to EMFs. Interference with television or radio reception.	Although there is no scientifically proven causal link between EMFs from transmission lines and human health, the Project nevertheless will follow 'prudent avoidance' approach in the design and siting of transmission lines and towers. Advice and, if required, signal amplification equipment to assist with television or radio reception problems.	Technical assessment confirmed that EMFs from the transmission line are below the guideline limit published by the International Commission on Non-Ionizing Radiation Protection (refer Section 4.14).
Health and safety risks:			
Contact with high voltage electricity	Injuries, e.g. cardiac arrest, electrical shock Fatality	High voltage electrical work will be managed to satisfy the requirements of the *Electrical Safety Act 2002* and subordinate legislation, including adherence to Powerlink's Electrical Safety Rules and Safe Access to High Voltage Electrical Apparatus.	Low: Managed in accordance with Powerlink's standard procedures and practices.

Hazards	Potential health, safety and environmental impacts	Mitigation measures	Risk
Overhead equipment and transmission line collision, e.g. Heli-stringing, overhead cranes, low flying helicopters patrols	Dropped loads Contact with live electricity Severe or fatal injury	Risk assessments, SWMSs/JSAs, Take 5, training of personnel and operation of machinery by competent authorised persons.	Low: Managed in accordance with Powerlink's standard procedures and practices.
Hot work and machinery use	Risk of fire or explosion from ignition of flammable contaminants and escalation of bushfire risk.	Project will ensure that a risk assessment process is in place in accordance with Powerlink's fire management principles to prevent outbreak of fire,	Low: Managed in accordance with Powerlink's standard procedures and practices.
Fatigue	Severe or fatal injury Damage to equipment, infrastructure or property.	Powerlink Fatigue Management Guidelines are used to ensure conditions of work of personnel align with *Work Health and Safety Act 2011*.	Low: Managed in accordance with Powerlink's standard procedures and practices.
Underground services	Damage to infrastructure Severe or fatal injury to construction personnel	Dial Before You Dig Excavation works comply with Safe Work Australia Model Code of Practice.	Due to the current and past land uses of the site (plantation forestry and native vegetation) it is unlikely that underground services will be encountered during excavation works.
Vandalisms, e.g. security breach	Compromising infrastructure security Contact with live electricity Severe or fatal injury	Public awareness	Low: Managed in accordance with Powerlink's standard procedures and practices.

Proposed controls will be considered through the construction risk assessment process. The controls will be based on existing Powerlink safety management systems. The management strategies practiced by Powerlink will be in place for the duration of the Project and are not limited to the control measures discussed in the EAR.

4.16.1.4 Dangerous goods and hazardous substance management

The chemicals used during the construction, operation and decommissioning phases will include fuel (predominantly diesel), lubricants, oils, minor quantities of solvents and acids, degreasers and domestic cleaning agents.

The anticipated list of chemicals used throughout the lifecycle of the Project along with their purpose and dangerous goods details are presented in Table 4.42. Due to the length of the preferred alignment (approximately 5km) it is unlikely that significant quantities of the hazardous substances listed will be required for the Project.

Table 4.42 Indicative list of dangerous goods and hazardous substance

Chemical name	Design life cycle stage	Purpose / use	DG Class	UN no.	pg
Concrete Curing Compound	Construction	Concreting for slab construction	N/A	N/A	N/A
Concrete retardant	Construction	Concreting for slab construction	N/A	N/A	N/A
Concrete residue	Construction	Concreting for slab construction	N/A	N/A	N/A
Kerosene	Construction	Fuel for mobile equipment	3	1223	III
Primer (solvent/glue)	Construction	Cleaning and degreaser	3	1206	II
Expanda Foam (fomofill)	Construction	Sealing of joints and gaps	2.1	1950	N/A
Silicon	Construction	Sealing of joints and gaps	4.1	1346	III
Aerosols paints	Construction	Line marking	2.1	1950	N/A
Alminox	Construction	Improve Joint conductivity and prevent corrosion	N/A	N/A	N/A
Electrical contact cleaner	Construction Operation	Cleaning of grease from electric components	2.1	1950	N/A
Diesel Fuel	Construction Operation Decommissioning	Fuel for mobile equipment	3 (Class C1)	1202	III
Lubrication oil (including grease and transformer oil)	Construction Operation Decommissioning	Lubricate equipment	Class C2	N/A	N/A
Sulphur Hexafluoride (SF 6) gas	Construction Operation	Transformer insulation	2.2, 6	1080	N/A
Herbicides	Construction Operation Decommissioning	Weed removal	N/A	N/A	N/A

Transportation of dangerous goods

The transportation of dangerous goods will only be undertaken by license transporters in accordance with *Australian Code for the Transport of Dangerous Goods by Road & Rail* (ADG Code), including the requirements to display Hazchem signage, placard and carry spill containment equipment to be used by emergency services personnel in the event of an emergency.

Dangerous goods and hazardous substance storage (permanent and temporary)

Appendix J of the Environmental Management Plan (Appendix G) requires that there is no contamination of land or water as a result of a spill or release of hazardous material. In line with the general requirements for hazardous materials management, all chemicals will be stored, handled and used according to provisions in their Safety Data Sheet (SDS). SDS shall be made available for each chemical used and stored in an easily accessible location.

Standard procedures for the storage, containment, disposal and spill response for potentially hazardous materials will be managed in accordance with *AS 1940:2017 Storage and Handling of Flammable and Combustible Liquids* and *AS 3780:2008 Storage and Handling of Corrosive Substance*. The storage and handling, including first aid and clean up response of these chemicals will be incorporated into the Emergency Response Plan for the Project. Spill management requirements include:

- assess spill (extent and potential to migrate offsite, fire hazard potential, type and volume)
- isolate the spill (prevent further spillage, blocked drains and prevent access to the area)
- notification of the spill
- clean up and remediation
- restock spill kit(s).

4.16.1.5 Health and safety management

The Project will comply with the Electrical Safety Act, WHS Act and WHS Regulation.

High voltage safety

High voltage electrical work will be managed to satisfy the requirements of the Electrical Safety Act and subordinate legislation, including adherence to Powerlink's Electrical Safety Rules and Safe Access to High Voltage Electrical Apparatus.

Where community members wish to undertake work on or near a Powerlink transmission line easement, Powerlink provides guidance in their publication titled *Powerlink Management of Easement Co-use Requests Guideline*. This publication provides guidelines on activities which are generally permitted, require written approval, or are not permitted on or near a Powerlink transmission line easement. It is freely available on Powerlink's Website.

Trespassing on or vandalisms of transmission towers or substations can result in severe or fatal injury. Powerlink is committed to continued delivery of powerline safety messages to the community through the 'Look up and Live' campaign, electrical safety awareness activities, and community engagement activities to increase public awareness of the powerline safety.

Collision with machinery or equipment

Heavy machinery used during construction includes excavators, graders, rollers, cranes, generators, and drill rigs. The movement of heavy equipment has the potential to cause serious injuries due to factors such as ground instability, equipment integrity failure, or human error. As such, the operation and maintenance of machinery will be in accordance with the manufacturer's specification, machinery maintenance procedures, and testing of braking systems. Administrative controls include risk assessments, SWMSs/JSAs, Take 5, training of personnel, and operation of machinery by competent authorised persons. Engineering controls will also be implemented, including exclusion zones where there is the potential

to encroach high voltage exclusion zones, or for tasks such as working at heights. Helicopter activities will be carried out for construction and maintenance of the Project. This includes heli-stringing, insulator washing work, aerial inspection, and patrols. The use of helicopters during construction reduces the reliance on heavy equipment and road access. Such helicopter activities may include cable stringing, lifting, placement, or removal of the transmission line. Risks associated with low flying helicopters will be managed, including through pilot responsibilities to maintain safe distance to residential premises, livestock, and towers.

Hot work

Activities which involve hot work have the potential to generate fires. The Project will ensure that a risk assessment process is in place in accordance with Powerlink's fire management principles to prevent outbreak of fire, including:

- limit hot work during extreme weather conditions
- availability of first response fire-fighting equipment and trained personnel
- adopt low fire risk infrastructure design
- develop strategies in the planning, investigation and acquisition phases
- timely delivery of operational and maintenance strategies including regular inspections and vegetation maintenance.

Fatigue management

Powerlink Fatigue Management Guidelines are used to ensure conditions of work of personnel align with WHS Act. Random breath testing and drug and alcohol test will be carried out to identify fitness for work to reduce the likelihood of related incidents.

Underground services

Facility records and visual inspections will be conducted to gather site information to identify hazards, soil conditions, trenches, pits, bores, standing water, and potentially dangerous obstruction which may impact on safe execution of work. The Project will lodge a *Dial Before You Dig* enquiry prior to excavation or drilling work, which provides information about underground services on the worksite. Excavation work will be carried out according to Project work plans and any excavations, including exposed underground assets, will be backfilled. Procedural control for the Project will also ensure that excavation work will comply with *Safe Work Australia Model Code of Practice*.

4.17 Waste generation and management

This section outlines the waste products generated from the construction and maintenance of the transmission line. Waste streams identified from dismantling of the existing transmission line are also identified. Management of waste streams from the Project will be undertaken in accordance with the measures outlined in Appendix I of the EMP (refer Appendix G*).*

4.17.1 Construction

The construction of the proposed transmission line will generate various waste types. Potential waste streams are outlined in Table 4.43, along with the disposal and recycling options available. Quantities of waste have yet to be determined. Estimates will be generated during the detailed design phase and a Waste Management Plan will be prepared for the Project. General management measures to inform this Waste Management Plan are described in Appendix I of the EMP (refer Appendix G). The Waste Management Plan will provide details of the estimated quantities of waste from each waste stream and will include all actions needed to effectively implement the waste management hierarchy. It will also establish a waste monitoring program for the construction stage.

Table 4.43 General waste generation and management during construction

Waste type	Recycling options	Management / disposal method
Cleared vegetation	Vegetation mulch to be retained on site for use in mitigation and site management works (e.g. erosion control).	Due to the relatively small amount of vegetative waste likely to be generate from this Project, disposal will be either via chipping or mulching. Burning of vegetative waste will not be undertaken.
Excess spoil	Reuse as fill around site or to construct ancillary infrastructure (e.g. access tracks, where applicable) or reinstatement of eroded areas.	Uncontaminated spoil is usually stockpiled and spread around the transmission line structure after construction is complete. Contaminated material will be disposed of by an appropriately licensed waste contractor to a licensed waste facility.
Waste concrete	Return to concrete plant for reuse of sand and gravel.	Collected and disposed of by construction contractor or concrete supplier.
Excess nuts, bolts, etc.	Recycled via scrap metal recyclers.	Collected during and after construction.
Wooden boxes and pallets	Generally not accepted back by suppliers.	Disposed of at landfill if not accepted back by suppliers.
Plastic bags and packaging	Nil	Collected and disposed of at landfill.
Cardboard packing and boxes	Collected and recycled	Not required
Conductor drums	Returned to supplier for reuse	Not required
Scrap conductors	Recycled via scrap metal merchants	Not required
Excess steel	Recycled via scrap metal merchants	Not required
Sewage	Nil	Wastes to be transported by a licensed regulated waste transport contractor and must only be disposed of at licensed disposal facilities.

Transmission line support structures are designed, fabricated, and supplied to sites ready for installation. This practice ensures that minimal excess material is transported to site; on–site waste generation is minimised; and waste generation is limited to faulty fittings (e.g. nuts and bolts) or incorrect/damaged steel members.

Waste excavated material will be reused where possible. Where excavated waste material cannot be reused (e.g. due to contamination), is to be disposed of by a licensed waste contractor (if required) to a facility that is authorised to accept that type of waste. Stockpiles and waste that must be stored temporarily on site will be located on existing cleared areas on the site away from drainage channels and slopes. All stockpiles of waste excavated material will be covered or watered down when weather conditions dictate.

Waste produced during construction activities will be disposed of as required by relevant legislation (e.g. EP Act, WRR Act). Waste kept on site will be stored in a manner that does not pose health and safety risks. Segregation of waste will allow for efficient reuse, recycling, or disposal. Putrescible waste will be sorted in closed waste containers to prevent the attraction and breeding of pest and disease vectors (such as flies and rodents) and will be removed from site at the end of each day. Waste that cannot be reused onsite will be transported to a facility that is authorised to accept that type of waste.

4.17.2 Dismantling existing transmission line

Following commissioning of the new transmission line, the existing portion of the Feeder 831 transmission line will be decommissioned and dismantled. This will require the removal of tower structures, overhead conductors, earth wires, insulators, line hardware, concrete, and steel foundation components. Prior to dismantling the transmission line, a Decommissioning Management Plan will be prepared which will provide detail regarding the employing the waste management hierarchy (e.g. re-use, recycling, disposal) of the transmission line components.

4.17.3 Operation and maintenance

The types of waste generated by transmission line maintenance are similar to those generated during construction but in much smaller quantities.

Operation of the transmission line does not generate waste, except during infrequent refurbishment programs. Some waste is generated from line maintenance activities (i.e. conductor offcuts, damaged insulators). Generated waste materials would be removed from the site and either recycled or disposed of at facilities that are authorised to accept the waste.

Easement maintenance schedules depend on the type and growth rates of the easement vegetation; the maintenance requirements of landholders; and transmission line equipment failures. Maintenance inspections are expected to occur approximately once every 12 months. Maintenance of vegetation regrowth will be maintained less frequently, and on an as-needs basis. Typical vegetation regrowth maintenance works include mechanical trimming; mechanical removal; and selective use of herbicides, predominantly used for stump spraying. Powerlink uses contractors for routine maintenance of easements. Cleared regrowth will be mulched or chipped, with the waste being sold or distributed by the contractor. Additional maintenance could be required in the event of a transmission line failure or natural disaster that may compromise the operational safety of the line or state of the easement.

5 LEGISLATIVE AND PLANNING FRAMEWORK

Section 5 provides an overview of the regulatory framework (Commonwealth, State and local) applicable to the Project. This section also provides an assessment of the Project against local, regional and State planning requirements, policy and criteria, as applicable to the Ministerial Infrastructure Designation process.

5.1 Commonwealth legislation

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

The EPBC Act is the Commonwealth's key legislative framework for protecting and managing important environmental values including flora, fauna, ecological communities and heritage places. These values are defined as MNES under the EPBC Act. The EPBC Act is administered by DCCEEW and establishes a process for environmental assessment and approval of proposed actions that have, will have, or are likely to have, a significant impact on MNES. If the proposed works may cause a significant impact on an MNES, the selected corridor must be referred to the Commonwealth Minister for Environment for assessment of the potential impacts. The Minister will decide whether the proposed works is:

- not a controlled action (the selected corridor does not need to be assessed any further); or
- not a controlled action 'particular manner' (the selected corridor does not need to be assessed any further, providing that the action is undertaken in accordance with conditions that are supplied with the decision); or
- controlled action (the selected corridor will need to be assessed against the EPBC Act, through one of several mechanisms available depending on the type of the proposed works).

Based on the assessments undertaken and presented in this EAR, the Project will not result in significant impacts to assessed MNES within the meaning of the *Matters of National Environmental Significance Significant Impact Guidelines 1.1 EPBC Act.* Therefore, an EPBC Act Referral for the Project is not required.

5.1.2 Native Title Act 1993

The Native Title Act provides for the recognition and protection of traditional rights and interests in land and waters held by the Aboriginal and Torres Strait Islander peoples under their traditional laws (or lore) and customs. Native Title rights are determined under the common law of Australia. Any acts or dealings in relation to land and waters subject to native title are only valid if they comply with the provisions of the Native Title Act.

The preferred alignment does not traverse any current Native Title claims. However. the northern section of the alignment between structures D1 and D5 is adjacent to the Wakka Wakka People #3 Native Title claim (QCD2022/003). Yarraman State Forest, being State Forest tenure is also land subject to Native Title (indication only).

Within land over which Native Title rights do exist, Powerlink must comply with the requirements of the Native Title Act to secure an easement for the transmission line. Construction of Powerlink's electricity transmission lines is covered by the process under section 24KA of the Native Title Act. Under section 24KA, Native Title is not extinguished, but is 'suppressed' while the easement remains in place.

5.2 State legislation

5.2.1 Electricity Act 1994

The Electricity Act is the principal legislation governing Queensland's electricity industry. It provides a framework for all electricity industry participants to follow to ensure the efficient, economically and environmentally sound supply and use of electricity. Powerlink must comply with the conditions set for transmission authorities under section 31 of the Electricity Act. Specifically, the transmission entity must properly account for the environmental effects of its activities under the transmission authority.

Requirements for construction and operation of the electricity network are set out under the Electricity Act and subordinate legislation, including the Electricity Regulation 2006. Various activities related to the construction and operation of electricity infrastructure are exempt from approval. In particular, the clearing of native vegetation on freehold land is exempt development under the Planning Act if the clearing:

- is for operating works for a transmission entity
- is on land subject to a designation under the Planning Act for electricity operating works.

5.2.2 Electricity Safety Act 2002

The Electricity Safety Act seeks to prevent the potential death, injury or destruction caused by electricity. The Electricity Safety Act regulates electricity works to prevent persons from being killed or injured by electricity, and to prevent property from being destroyed by electricity. The transmission line must be designed in compliance with the requirements outlined under the Electricity Safety Act.

5.2.3 Planning Act 2016

The Planning Act enables the Planning Minister (Queensland) to designate premises for the development of infrastructure prescribed within the Planning Regulation. 'Electricity operating works' are considered 'infrastructure' which is prescribed development under the Planning Regulation. The Planning Minister is the only State minister with authority to designate land for infrastructure. The MGR outlines the process for making ministerial designations. The assessment process involves submission of an environmental assessment report, a minimum 20 business day consultation period, and a State interest review.

A designation includes requirements about works for the infrastructure (such as the height, shape, bulk, landscaping, or location of works), the use of premises including access and ancillary uses, or lessening the impact of the works or use (such as environmental management procedures). Under section 44 of the Planning Act, infrastructure that is designated is considered accepted development and will not require further approvals under the Planning Act (with the exception of building work under the *Building Act 1975*). However, this does not exempt any approvals required under other legislation.

Ministerial Infrastructure Designation under the Planning Act is being sought for the Project.

5.2.4 Land Act 1994

The *Land Act 1994* (Queensland) (Land Act) governs the allocation and management of land for development including non-freehold, freehold, leasehold and other tenures. The Project traverses a mix of freehold tenure, State land and local road reserves. The Electricity Act provides some exemptions to the Land Act for works by transmission entities such as Powerlink. Transmission entities are entitled to take necessary action in publicly controlled places (such as unallocated State land) to provide or supply electricity under section 101 of the Electricity Act, as well as undertake works on road reserves through written agreement from the road authority under section 102.

5.2.6 Acquisition of Land Act 1967

The Acquisition of Land Act sets out the processes for compulsory and voluntary acquisition of land for a public purpose by a constructing authority. Powerlink may acquire freehold land or register an easement over land for the transmission line. Land may be acquired either by voluntary agreement for easements or other tenures required or, where agreement cannot be reached, by compulsory resumption of land.

5.2.7 Environmental Protection Act 1994

The EP Act is administered by the DES and operates as the key legislative framework for environment protection and management in Queensland through mechanisms to monitor and enforce environmental compliance. Section 319 establishes a general environmental duty of care which Powerlink are obliged to meet when undertaking works and operations of their electrical infrastructure. The duty states that an organisation undertaking an activity must not cause, or be likely to cause, environmental harm unless all reasonable and practicable measures to prevent or minimise the harm are taken.

Powerlink will comply with the general environmental duty as a result of the design and mitigation measures informed by preliminary studies; this EAR; standard Powerlink management procedures; and a Project-specific EMP. Management procedures and the EMP will be implemented throughout the construction and operational stages of the Project.

The *Environmental Protection Regulation 2019* is subordinate legislation to the EP Act and prescribes Environmentally Relevant Activities (ERAs) which have the potential to release contaminates into the environment or cause environmental harm. It is not expected that the development of the transmission line would trigger any ERAs. Therefore, an Environmental Authority under the EP Act is not required.

The Environmental Protection Regulation prescribes requirements for the management of regulated waste. Any regulated waste generated by the project will be tracked, transported and disposed of in accordance with legislative requirements.

5.2.8 Nature Conservation Act 1992

The NC Act is the primary legislation governing the protection and management of native wildlife, habitat and protected areas, including national parks and nature refuges. The NC Act is administered by the DES. Where clearing is required in an area containing threatened flora species and supporting habitats, a clearing permit must be obtained from the DES. The protected plants flora survey trigger map identifies ‘high-risk’ areas for protected plants to occur and must be used to determine whether a targeted flora survey is required for a particular area. ‘High-risk’ areas are those in which threatened flora is known or likely to exist.

As the Project footprint contain areas mapped as high-risk for protected plants on the Protected Plants Flora Survey Trigger Map, a protected plant flora survey will need to be undertaken and a Protected Plant Clearing Permit or Exempt Clearing Notice submitted to the DES. The protected plant flora survey was undertaken on 15 to 18 August 2022. As this flora survey confirmed the presence of *Rhodamnia dumicola* (Rib-fruited Malletwood) (listed as Endangered under the NC Act) within the clearing buffer zone, a Project Plants Clearing Permit is required for the Project and an application has been submitted to DES.

As with any removal of native vegetation and habitats, there also is inherent risk of impacting animal breeding places of least concern (non-colonial) fauna species. To mitigate this risk, it is a requirement under the NC Act to implement a Species Management Program (SMP) “low risk of impacts”. If an animal breeding place for an endangered, vulnerable, near threatened, special least concern or least concern (colonial breeder) fauna species is recorded in areas of potential impact, Powerlink will require a SMP “high-risk of impacts” prior to undertaking any construction activities.

Several fauna breeding habitat features were recorded within the Project area, including bird nests, hollow bearing trees and arboreal termitaria with nest excavations. Therefore, a Low-risk SMP approved by DES will be required for the Project prior to construction.

As the Project requires clearing habitat for Endangered, Vulnerable, Near Threatened, Special Least Concern or Least Concern (colonial breeder) fauna species listed under the NC Act, a High-risk SMP will need to be prepared for the Project and approved by DES prior to construction commencing. Species of relevance to the High-risk SMP include:

- colonial breeding microbat species
- Black-breasted Button-quail (the Project involves clearing of supplementary foraging habitat for the species)
- Short-beaked Echidna.

5.2.9 Vegetation Management Act 1999

The Queensland Department of Resources (DoR) administers the VM Act which seeks to manage native vegetation in Queensland, with the exception of non-woody vegetation regulated under the NC Act. Regulated Vegetation Mapping identifies categorised areas of remnant vegetation in Queensland and is used to establish whether clearing of native vegetation is considered assessable development requiring a permit.

The Project traverses areas of native vegetation that may need to be cleared. Under schedule 10 of the Planning Regulation, operational work that is the clearing of native vegetation is assessable development unless the clearing is exempt clearing work or accepted development. However, under section 44 of the Planning Act, where an Infrastructure Designation is granted, the work would automatically be considered accepted development. As highlighted in section 6.2.1, a similar exemption is also provided under section 112A of the Electricity Act.

5.2.10 Water Act 2000

The Water Act provides the legislative framework for the sustainable use, allocation and management of water resources in Queensland. It is administered by DoR and regulates activities occurring within designated watercourses under the Water Act. The Watercourse Identification Map categorises water features as either a designated watercourse, drainage feature, downstream limit of a watercourse or lake, and is used to determine the assessment requirements for undertaking activities within a watercourse. Activities including excavating, filling or destroying native vegetation within a watercourse may require approval under the Water Act in the form of a riverine protection permit. Powerlink is an approved entity exempt from requiring a permit if the self-assessment guidelines under DoR's 'Riverine protection permit exemption requirements' are followed.

The Project traverses several drainage features. While construction of the transmission line will not require works disturbing a waterway, construction of new maintenance tracks over designated watercourses will need to comply with the exemption requirements. Compliance with the exemption requirements may be achieved through the implementation of a Construction Environmental Management Plan. Where compliance cannot be met, a riverine protection permit would be required from DoR for any works within affected watercourses.

5.2.11 Fisheries Act 1994

The *Fisheries Act 1994* (Fisheries Act) governs the management of fisheries, declared fish habitat areas and marine plants and is administered by DAF. Works which may cause disturbance to 'waterways' as defined under the Fisheries Act can be subject to assessable operational work for waterway barrier works, unless construction complies with the conditions under the 'Accepted development requirements for operational work that is constructing or raising waterway barrier works'.

DAMS is used to determine the presence of waterways in an area and their risk level. The Project crosses waterways of low (green) and moderate (amber) risk levels. Waterway crossings will be located high in the catchments, where fish habitat and passage are limited due to the ephemeral nature of the waterways. Furthermore, they do not connect to any important breeding, feeding or refuge area. As such, potential impacts to fish passage are considered minor.

Construction of the transmission line will not require works disturbing a waterway. However, construction of maintenance tracks across waterways will need to comply with the accepted development requirements. It is not likely that Powerlink would require approval for the works as long as new waterway crossings are built in accordance with the requirements. Should any works within a waterway not comply with the Accepted development requirements, a development permit is ordinarily required under the Planning Act. However, assuming an Infrastructure Designation is granted over the project, operational work for waterway barrier works will automatically be considered accepted development not requiring a development permit.

5.2.12 Aboriginal Cultural Heritage Act 2003

The ACH Act seeks to provide effective recognition, protection and conservation of Aboriginal cultural heritage. It establishes the processes for managing activities that may cause potential harm to Aboriginal cultural heritage, which is identified through the Aboriginal Cultural Heritage Database and Register and administered by DSDSATSIP.

A search of the DSDSATSIP cultural heritage database and register has identified a number of records of Aboriginal cultural heritage values within the investigation area. Powerlink will be responsible for carrying out works in accordance with the Duty of Care Guidelines under the ACH Act by taking all reasonable and practicable measures to ensure the activities do not harm Aboriginal cultural heritage values. The Guidelines categorise activities depending on the nature of the works and likelihood of causing harm. These categories determine the certain obligations that are required to meet the cultural heritage duty of care.

Should the project be considered to pose a high-risk to Aboriginal cultural heritage, engagement with the relevant cultural heritage parties for the area is likely to be required. It also may necessitate preparation of a cultural heritage management plan or cultural heritage management agreement. Activities which pose a high-risk to Aboriginal cultural heritage which may apply to the project include:

- works in proximity to registered Aboriginal cultural heritage sites or places, or within places with known cultural heritage values
- works within areas with little or no previous ground disturbance (i.e. clearing of remnant vegetation, escarpments)
- works in proximity to water features, such as riparian areas.

5.2.13 Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* (Queensland) (TI Act) regulates the management of the State-controlled road network and is administered by DTMR. The Project does not traverse any State-controlled roads. Under section 50 of the Transport Infrastructure Act, construction, maintenance and operation of ancillary works and encroachments within State-controlled roads (i.e. placement of a transmission line over the road) can only be undertaken where a written approval has been granted from DTMR.

5.2.14 State Planning Policy

The SPP sets out the framework of 17 State interests that are relevant to the assessment of development in Queensland. The SPP applies, to the extent relevant, to development applications and designated infrastructure under the Planning Act and prevails over all other regional and local planning instruments. The relevant state interests are outlined in Table 5.1 along with a description of how each interest relates to the project.

Table 5.1 Summary of applicable SPP State Interests

Relevant State Interest	Application	Relevant State Interest
Economic Growth	Agriculture	The investigation area traverses a small portion of Class A and B agricultural land (crop land). The mapped Class A and B agricultural land is within the approved surface rights area of the Meandu Mine; therefore, the area is not used for agricultural purposes.
	Mining and Extractive Resources	Apart from the existing Meandu Mine to the west the Project is not located near any Key Resource Area. Design of the Project has considered existing and future operations at the Meandu Mine and been undertaken in consultation with Stanwell as owners of the Meandu Mine. The Project is therefore not expected to impact on mining and extractive resources.
Environment and Heritage	Biodiversity	The Project area as containing the following biodiversity related MSES: — Remnant RE 12.5.13c (Category B) — High value regrowth RE 12.5.13c (Category C) — Regulated vegetation intersecting a watercourse — Threatened fauna species habitat including the Black-breasted Button-quail (vulnerable); Powerful Owl (vulnerable); Oriental Cuckoo (special least concern); Black-faced Monarch (special least concern); Spectacled Monarch (special least concern); Rufous Fantail (special least concern) — Threatened flora species habitat including: *Callitris baileyi, Cossinia australiana, Dichanthium setosum, Haloragis exalata subsp. velutina, Paspalidium grandispiculatum, Picris conyzoides, Rhaponticum australe, Rhodamnia dumicola, Sarcochilus weinthalii, Thesium australe*
	Cultural Heritage	Multiple records of Aboriginal cultural heritage values have been identified within the Project area. The ACH Act requires all people carrying out activities to take all reasonable and practicable measures to protect Aboriginal cultural heritage (Section 23). Powerlink intends to meet its duty of care under the ACH Act through formal a Cultural Heritage Management Agreement to be negotiated with the relevant Aboriginal Party. This agreement will include processes for detailed Cultural Heritage assessments and surveys with Traditional Owners.
	Water Quality	The Project area transects a number of unmapped watercourses and one drainage feature and as such will be designed to avoid and minimise impacts to these watercourses where possible. An EMP will be prepared and ensure any impacts to water quality during construction are minimised.

Relevant State Interest	Application	Relevant State Interest
Safety and Resilience to Hazards	Emissions and Hazardous Activities	This EAR assesses potential hazardous activities and risks to people and property that may be associated with the Project. Where potential emissions and hazardous activities are identified during construction, appropriate mitigation measures will be implemented to avoid, mitigate and minimise any adverse impacts.
	Natural Hazards, Risk and Resilience	This EAR assesses risks to the Project and surrounding area from potential natural hazards (i.e. bushfire, flooding, landslip). The potential for natural hazards to occur has been considered throughout the design of the Project and where necessary mitigation measures have been identified to avoid, mitigate and minimise any adverse impacts. The Project area is mapped as being in proximity to a bushfire prone area. Based on the assessment undertaken, Powerlink's standard measures as outlined in the Bushfire Mitigation – Plan (ASM-PLN-A3285085) are deemed appropriate for the Project.
Infrastructure	Energy and Water Supply	The relocation of transmission line will allow for continuation of the reliable provision and operation of electricity infrastructure between the H018 Tarong and H014 Middle Ridge Substations.
	Transport Infrastructure	Through the Traffic Impact Assessment undertaken, the Project is not considered to have a significant impact on link capacity of the road network, pavements, or the operation of the D'Aguilar Highway/Tarong Power Station Road intersection.

5.2.15 Regional Plan

The Project is subject to two regional plan areas: the *Wide Bay Burnett Regional Plan* and the *Darling Downs Regional Plan.*

5.2.15.1 Wide Bay Burnett Regional Plan (WBBRP).

The *Wide Bay Burnett Regional Plan* was implemented in 2011 as a statutory instrument providing strategies aiming to address economic, social and environmental issues in the region, including identifying strategic infrastructure and service needs and support economic prosperity.

The transmission line relocation would be consistent with the aim of the *Wide Bay Burnett Regional Plan* to provide reliable energy which supports growth in an economically and ecologically sustainable manner. The *Wide Bay Burnett Regional Plan* states that development in regional landscapes needs to be responsibly planned to complement, protect, and enhance landscape values, including areas of significant biodiversity value, rural production, scenic amenity, and landscape heritage. Design of the preliminary alignment has aimed to minimise impacts upon land uses and environmental values in the surrounding area.

5.2.15.2 Darling Downs Regional Plan

The *Darling Downs Regional Plan* was implemented in 2013 as a statutory plan that sets intentions to enable opportunities for economic growth and diversity in the region, to protect areas of regionally significant agricultural production, and to identify infrastructure outcomes that will support economic growth.

Development of the Project would be consistent with the aim of maximising economic growth through the provision of electricity infrastructure needed to facilitate resource developments, which accounts for a large percent of the region's economy. A priority outcome sought for electricity infrastructure in the region is to reinforce electricity generation, transmission and distribution systems in response to forecast industry growth, with consideration of energy efficient efforts. The relocated transmission line would ensure the continued provision of energy to the region and therefore supports the strategic directions of the Darling Downs Regional Plan.

5.3 Local legislation

5.3.1 Planning Schemes

The local planning schemes for the South Burnett Regional Council and Toowoomba Regional Council are the *South Burnett Regional Council Planning Scheme* (2017) and *Toowoomba Regional Council Planning Scheme* respectively.

Once the land has been designated, development relevant to the designation becomes accepted development under the local planning schemes and as such further planning approval is not required. It is worth noting however, that the Minister may have regard to the local government assessment framework and decisions may be influenced by zoning, land-use intent, and local ordinances and by-laws.

As the local government assessment framework may be relevant in the designation of the land, it is worth noting that the Project is zoned as "Open Space" and adjoins Mining (the Meandu Mine) (Extractive industry zone) under both applicable planning schemes. The proposed portion of the transmission line to be relocated, will however be in close proximity to the existing transmission line (to be decommissioned) and will be located adjacent to proposed mining activities within the K2E ASA. Therefore, the proposed infrastructure is not considered to be incompatible with the existing land uses.

5.3.1.1 South Burnett Regional Council

The *South Burnett Regional Plan* was implemented in 2017 as a statutory instrument providing strategies aiming to address economic, social and environmental issues in the region, including identifying strategic infrastructure and service needs and support economic prosperity.

The transmission line relocation would be consistent with the aim of the *South Burnett Regional Plan* to provide reliable energy which supports growth in an economically and ecologically sustainable manner. The *South Burnett Regional Plan* states that development in regional landscapes needs to be responsibly planned to complement, protect, and enhance landscape values, including areas of significant biodiversity value, rural production, scenic amenity, and landscape heritage. Development of the preliminary alignment has aimed to minimise impacts upon land uses and environmental values in the surrounding area.

5.3.1.2 Toowoomba Regional Council

The *Toowoomba Regional Plan* was implemented in 2017 as a statutory plan that sets intentions to enable opportunities for economic growth and diversity in the region, to protect areas of regionally significant agricultural production, and to identify infrastructure outcomes that will support economic growth.

The transmission line relocation would be consistent with the aim of maximising economic growth through the provision of electricity infrastructure needed to facilitate new energy and resource developments, which accounts for a large percent of the region's economy. A priority outcome sought for electricity infrastructure in the region is to reinforce electricity generation, transmission and distribution systems in response to forecast industry growth, with consideration of energy efficient efforts. The relocated transmission line would maintain the level of service to the growing energy industry in the region and therefore supports the strategic directions of the Toowoomba Regional Plan.

5.3.2 Local Laws

Local laws are administered by the *Local Government Act 2009* (Queensland) (LG Act) and are used to regulate matters specific to LGAs. While the approvals framework for this project gives rise to a number of legislative and regulatory exemptions, the local laws imposed by the relevant local governments will still apply and may trigger permits required to be obtained for development. The local laws that may apply to the project are provided as follows.

- South Burnett Regional Council Local Law No. 3 – Community and Environmental Management 2011.
- South Burnett Regional Council Local Law No. 4 – Local Government Controlled Areas, Facilities and Roads 2011.
- Toowoomba Regional Council Local Law No. 3 – Community and Environmental Management 2011.
- Toowoomba Regional Council Local Law No. 4 – Local Government Controlled Areas, Facilities and Roads 2011.

The Community and Environment Management local laws deal with key matters including protection against animals and plant pests, vegetation overgrowth, visual pollution, fire hazards, community safety hazards and noise impacts. The local laws governing Local Government Controlled Areas, Facilities and Roads regulate access to local government-controlled areas and prohibit or restrict particular activities on local government-controlled areas or roads. The relevant local councils should be consulted in relation to potential impacts to local government-controlled roads prior to commencement of construction.

5.4 Summary of legislative triggers

The following Table 5.2 provides an overview of the relevant planning and approval requirements potentially triggered by legislation based on the current level of investigation. Note that not all approvals may be required and will depend upon subsequent detailed assessments of site-specific impacts and design solutions. Standard Powerlink requirements detailed under the Electricity Act have not been listed below.

Table 5.2 Summary of legislative requirements

Legislation	Responsible authority	Activity	Licence / permit approval
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	Department of Climate Change, Energy the Environment and Water	Potential for significant impact on MNES	EPBC Referral. Assessments undertaken to support development of EAR indicate that the Project will not result in significant impact to MNES and an EPBC Act Referral is not required.
State			
Planning Act 2016	Department of State Development, Infrastructure, Local Government and Planning	Electricity operating works	Ministerial Infrastructure Designation
Acquisition of Land Act 1967	Department of Resources	Easement acquisition across freehold and non-freehold land	Voluntary agreement preferred Compulsory acquisition can be undertaken

Legislation	Responsible authority	Activity	Licence / permit approval
Nature Conservation Act 1992	Department of Environment and Science	Potential for clearing protected plants	Protected Plant Clearing Permit (if protected plants are identified in subsequent field surveys)
		Potential for clearing within a 'high-risk' flora trigger area	Exempt Clearing Notification (if no protected plants are identified)
		Clearing habitat of least concern (non-colonial) fauna species	Low-Risk Species Management Program
		Clearing habitat of endangered, vulnerable, near threatened, special least concern or least concern (colonial breeder) fauna species	High-Risk Species Management Program
Vegetation Management Act 1999	Department of Resources	Clearing native vegetation	Land subject to Infrastructure Designation is accepted development (not requiring a development permit for operational works)
Water Act 2000	Department of Resources	Undertaking works within a watercourse which involves excavation, fill or removal of vegetation (Construction of maintenance tracks)	Riverine protection permit (if exemption requirements cannot be met)
Fisheries Act 1994	Department of Agriculture and Fisheries	Waterway barrier works within a waterway (Construction of maintenance tracks)	Land subject to Infrastructure Designation is accepted development (not requiring a development permit for operational works)
Transport Infrastructure Act 1995	Department of Transport and Main Roads	Crossing of State-controlled roads	Agreement required

6 ENVIRONMENTAL MANAGEMENT

6.1 Powerlink's commitment to environmental management

Powerlink is committed to the protection of the environment and management of adverse environmental impacts as a result of Powerlink activities. Every Powerlink individual is responsible and accountable for environmental management, and Powerlink's leaders are active role models of this commitment.

Powerlink's Health, Safety and Environment Policy outlines the commitment to delivering environmental outcomes for everyone, everywhere and everyday by the following:

- setting targets and objectives to monitor performance aimed at the elimination or minimisation of environmental harm
- consulting and communicating with employees and other stakeholders on relevant environmental matters
- applying a continuous improvement framework to the development, implementation and review of standards, procedures and supporting documentation which complies with environmental statutory obligations; is fit for purpose; and drives protection of the environment and prevention of pollution
- systematically identifying, assessing, and managing as far as reasonably practicable the environmental impacts which may arise from Powerlink's activities
- ensuring environmental responsibilities are clearly defined and individuals are accountable for performance within their scope of responsibility
- providing the necessary resources to meet these commitments.

6.2 Environmental management plan

The mitigation and management measures for this Project have been proposed in line with Powerlink's standard environmental controls. Additional measures have been proposed where required to provide further mitigation and management measures specifically for the Project.

All constructions measures proposed for the Project are documented in Appendix G: Environmental Management Plan. In addition, an environmental work plan (EWP) has been prepared for the Project. The EMP contain:

- roles and responsibilities
- performance criteria
- monitoring and compliance, including audits training and competency.

The EMP and EWP are capable of being read as a stand-alone document without reference to other parts of the EAR.

7 CONCLUSIONS

Powerlink Queensland (Powerlink) is proposing to relocate a portion (approximately 5km) of its Feeder 831 275kV transmission line between the Tarong and Middle Ridge substations, located immediately to the east of the Meandu Mine. Environmental and planning (land use) approval for the Project is being sought via the Ministerial Infrastructure Designation (MID) process under the Planning Act. To obtain a MID, an Infrastructure Entity is required to prepare an Environmental Assessment Report (EAR) that considers and addresses the potential environmental, social and economic impacts associated with the construction, operation and maintenance of the Project. This EAR has been prepared to support the MID of the Project. This EAR includes an Environmental Management Plan (EMP) for the relevant built components of the Project.

Relocation of a portion of the Feeder 831 transmission line is required to overcome potential geotechnical instability issues in a section of the current Feeder 831 corridor and to safely accommodate future mining activities within the approved surface rights area of the Meandu Mine which requires that a section of land underneath the current Feeder 831 is mined. In addition, TEC Coal is currently seeking approval to increase the approved surface rights area at the Meandu Mine K2E Project. Planning for the relocation of the portion of Feeder 831 transmission line has been undertaken with consideration of the K2E Project.

The preferred alignment for the relocated transmission crosses sections of HQPlantations forestry operations in Yarraman State Forest. The preferred alignment is also located within the mining lease for Meandu Mine (ML6674). The northern portion of the preferred alignment (between structures D1 and D5) traverses the approved surface rights area of the Meandu Mine, while the remainder of the preferred alignment is located immediate to the east of the boundary of the proposed K2E ASA. Agreements have been reached with Stanwell Corporation Limited (as owner of the Meandu Mine) and HQPlantations to allow the relocation project to proceed.

In addition to the nearby Meandu Mine, the regional area surrounding the Project contain a variety of landscape features including native forest areas, plantation forestry, arable plains and undulating terrain with large pastoral holdings which contribute to the visual amenity and rural setting. The nearest sensitive receptors to the Project are residential dwelling that occur to the north and north-east, with the closest being approximately 1.5km from the preferred alignment (off Munt Road). The nearest town to the Project is Yarraman, located 4km south-east. The Yarraman State Forest separates all sensitive receptors from the preferred alignment.

The Project area contains sensitive ecological values in the form of remnant semi-evergreen thicket and dry rainforest communities (RE12.5.13c), which provides known habitat for a number of conservation significant flora and fauna including the Black-breasted Button-quail (listed as Vulnerable under the EPBC Act and NC Act) and *Rhodamnia duumicola* (listed as Endangered under the NC Act). Clearing of this remnant vegetation has been avoided through:

- siting transmission line structures outside of area of remnant vegetation
- increasing the height of structures to span remnant vegetation
- helicopter string of the transmission line over areas of remnant vegetation
- avoiding areas of remnant vegetation for access track widening or new access tracks.

In addition, the height of transmission line structures was raised in the area of high value regrowth vegetation (RE12.5.13c and RE12.11.11) between structures D1 and D5 to minimise vegetation impacts. Clearing of vegetation in this area will also be restricted to that required for the draw path (approximately 40m wide easement clearing) apart from at proposed break and winch sites where full easement clearing will occur.

With the implementation of these measures, as well as Powerlink's standard environmental controls for vegetation management and minimisation of interactions with wildlife (Appendix G), the Project has been assessed as unlikely to have a significant impact on biodiversity values. The risk of the Project impacting other values considered in this EAR were assessed as low, with impacts able to be managed in accordance with Powerlink's standard environmental controls as outlined in the Project EMP.

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