



APPENDIX C

CORRIDOR SELECTION REPORT

**Powerlink Queensland
Corridor Selection and
Preliminary Alignment Report**

**Transmission Line Route:-
Western Downs Substation to the existing
Queensland N.S.W Interconnector**

Date: October 2009
Job Reference: PR24395



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1.0 INTRODUCTION

1.1 BACKGROUND

Conics was commissioned by Powerlink Queensland to prepare a Preliminary Alignment Report (PAR) for a proposed 275,000 volt (275kV) transmission line between the proposed Western Downs Substation to the South West Queensland Area (Halys in the vicinity of Tarong) (Figure 1-1). This line is proposed to be built on partially vacant easements from the Warra to Halys area. Powerlink Queensland have previously undertaken a preliminary corridor selection process to identify the potential corridor alignment options available within the study area. The alignment options identified by this investigation have been considered in further detail within this report. The potential for necessary deviations of the corridor options proposed in the Powerlink Queensland investigation are also considered within this report.

Of the alignment options considered, one route has been proposed as the preferred alignment option. The aim of this report is to investigate all three options and make a final recommendation as to a preferred alignment option. Construction is proposed to commence in 2010.

1.2 JUSTIFICATION FOR PROJECT

As a Transmission Network Service Provider in the National Electricity Market, and a holder of a transmission licence in Queensland, Powerlink Queensland is required to develop its network to meet the security and reliability standards of the National Electricity Rules, the Queensland Electricity Act 1994 and the terms of its transmission licence.

Electricity use in Southern Queensland has exhibited very strong growth during the past ten years and growth is expected to continue over the next ten years, due to inter alia population growth and the on going uptake of domestic air-conditioning. The existing transfer capability of Powerlink's network between Central Queensland and Southern Queensland, as well as between Bulli, South West, and South East Queensland, is described by limit equations which dynamically maximise the transmission capability available to electricity market participants at any time. It has been identified that the focus of generation adjacent to the Braemar Substation, in the south-west, may soon impose limits on the capability of that facility to meet system and security limits.

The network needs to be developed in an efficient manner so that future generation capacity that needs to be transferred can also be connected without exceeding fault ratings in the 275kV network.

1.3 SCOPE OF THE PRELIMINARY ASSESSMENT REPORT

The scope of the PAR is to assess and compare corridor options for the proposed 275kV transmission line, in terms of relevant environmental, planning (including social) and construction cost criteria and recommend a preferred corridor for further detailed assessment (i.e. an Environmental Impact Statement).

Initial studies undertaken by Powerlink Queensland and Conics for this PAR have been carried out in accordance with Powerlink Queensland's Internal Guidelines for Route Alignment (Powerlink Queensland 2004), which states that Powerlink Queensland will, "...wherever practical and economically feasible:



- *Position the transmission line as far as is reasonable from residences, or places of assembly in which children remain for extended periods of times such as schools, childcare centres, etc;*
- *Limit the number of property titles affected by the proposed easement;*
- *Align the easement as close to property boundaries as possible; and*
- *Position the transmission towers and wires so as to cause minimal interference with farming operations."*

1.4 ASSESSMENT METHODOLOGY

Identification and assessment of the three potential corridors for the proposed transmission line included the following:

- Desktop assessment of existing information, mapping and reports;
- Field assessment by 2 ecologists and a soil scientist\hydrologist; and
- Consultation with Powerlink Queensland.

Desktop investigations of the Study Area were conducted using a number of information sources: maps, aerial photography, flora and fauna databases (Department of Environment and Resource Management (DERM) and Queensland Museum), Department of Mines and Energy (DME) mining mapping, remnant vegetation (RE) mapping, the Chinchilla and Dalby Shire Planning Schemes, state and federal cultural heritage databases and other existing literature on the area.

The short-list of possible alignment options was developed by Powerlink Queensland by identifying routes that considered the proximity to or potential impacts on environmental and social (including planning) values of the Study Area and general locality. As a result of these initial investigations, Powerlink proposed three potential corridor alignments for further consideration in the PAR. An overview of these corridor options is provided in Section 4.1.

Preliminary field assessments of the three potential corridor alignments and surrounding environments were undertaken during the week of 7th of September 2009. During the field assessments, a number of environmental and land use considerations were investigated, namely ecology, hydrology, soil, geology and land use. These preliminary investigations were limited due to private property restrictions and hence, the scope of these investigations was limited to observations made possible mostly from roadside corridors.

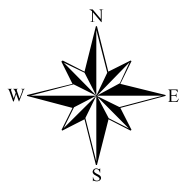
The comparison and analysis of corridor options is explained in Sections 4.2 and 4.3. From this analysis, one option provided the least constraint in relation to the environmental, planning/social and constructions considerations (see Sections 4.2 and 4.3). This option is recommended to form the preferred corridor for further detailed analysis (i.e. an Environmental Impact Statement).

Powerlink Western Downs PAR Alignment Options

Figure 1.1

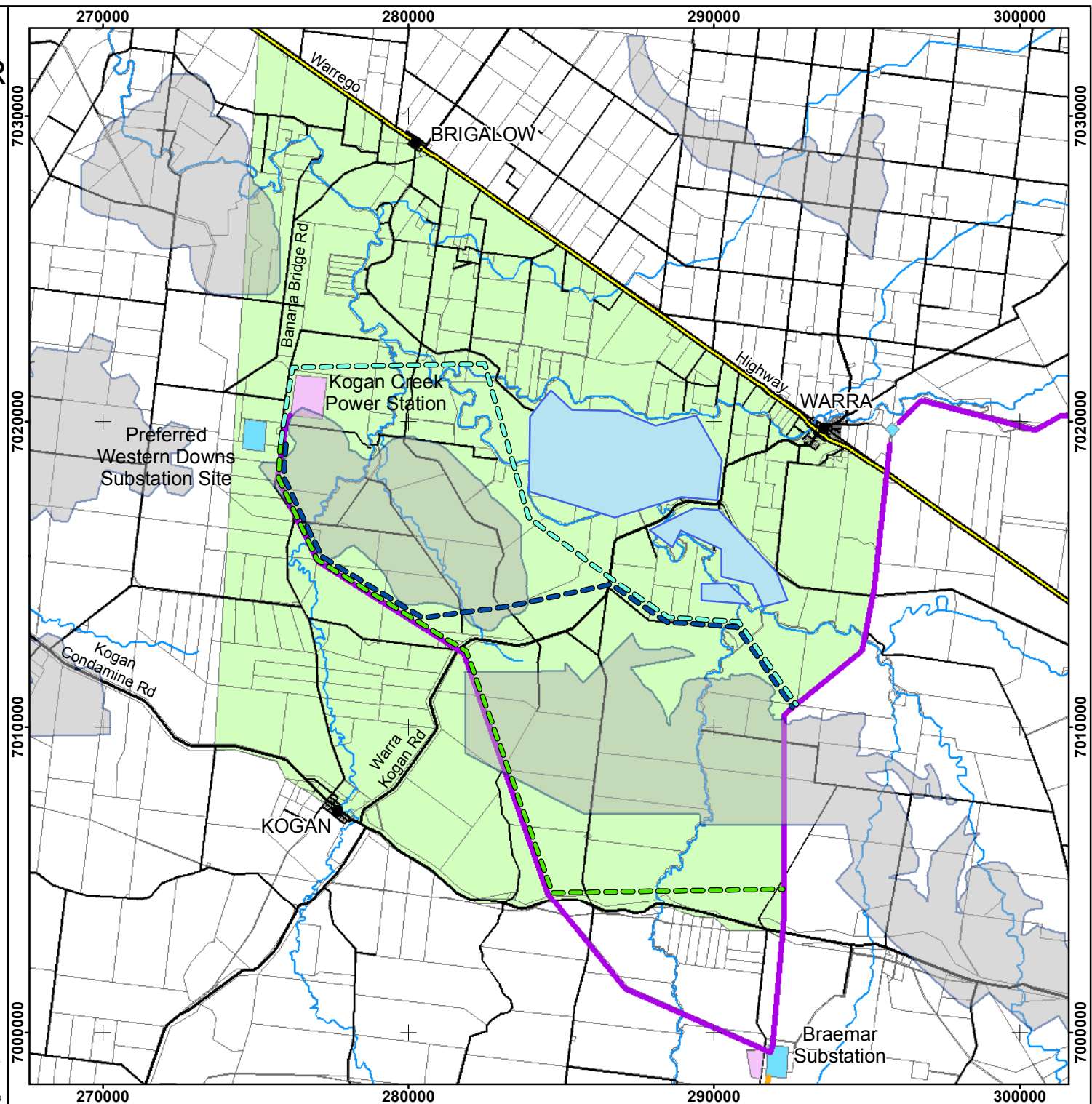
Alignment Options

- Northern Route
- Central Route
- Southern Route
- 275 kV
- 330 kV
- Highway
- Main Road
- Local Road
- Watercourse
- Power Station
- Sub-station
- Irrigation
- Coal Resource Area
- Cadastre
- Study Area



0 1,000 2,000 4,000 6,000 8,000 Metres

Scale 1 : 180 000
Datum / Projection: GDA94 MGA Zone 56





2.0 DESCRIPTION OF STUDY AREA

2.1 INTRODUCTION

The Study Area is defined as the area between the proposed Western Downs substation site in the west, the existing Queensland NSW Interconnector line (QNI) to the east, the vicinity of the Warrego Highway between Warra and Brigalow to the north and the Kogan Condamine Road in the south (Figure 1-1). Three corridor options were evaluated within this study area.

2.2 LOCAL GOVERNMENT AREAS

The study area is contained within the Western Downs Regional Council area (previously the Wambo and Chinchilla Shire Councils).

2.3 POPULATION CENTRES

The nearest population centres are Dalby (50km) and Chinchilla (30km). The smaller centres of Warra, Brigalow and Kogan are within the Study Area. The locations of these townships within the Study Area are shown on Figure 1-1.

2.4 ROADS

The principle road within the Study Area is the Warrego Highway which traverses the northern portion of the study area in an east-west direction and is the main road transport corridor between Toowoomba and Western Queensland. It links key rural service centres in the region including Dalby (to the east of the Study Area) and Chinchilla (to the west of the Study Area), as well as numerous other small towns. Other local roads within the study area include:

- Warra – Kogan Road;
- Kogan – Condamine Road; and
- Banana Bridge Road.

A network of minor roads and access tracks are located throughout the Study Area.

2.5 LAND USES

The economic base of the Western Downs Regional Council area traversed by the Study Area is generally primary production that includes:

- Beef;
- Grain (wheat, sorghum);
- Feedlots; and
- Forestry.



Irrigated cultivated lands are evident along the alluvial plains of the Condamine River and tributaries. Dry land cultivation occurs on the better soils elsewhere.

The Kogan Creek Power Station and associated coal mine are also located in the study area and provide a number of jobs for the local area and beyond.

The Tong Park Piggery and several smaller piggeries occur within and adjacent to the Study Area.

2.6 NATURAL ENVIRONMENT

The natural environment of the Study Area is dominated by flat to undulating plains with emergent residual low hills. The Study Area falls within the Condamine - Balonne River Catchment and the Condamine River flows through the Study Area. Also within the area are numerous creeks (including Braemar Creek, Branch Creek, Kogan Creek and Cooranga Creek) and drainage lines. There are numerous Lacustrine, Palustrine and Riverine wetlands mapped across the Study Area (EPA 2005).

There are no National Parks within the Study Area. The Dalby State Forest is located in the south-east of the Study Area and the Braemar State Forest is located south of the Study Area.

The majority of the landscape of the study area is currently used for agricultural and grazing purposes. Clearing and general disturbance of the existing natural environment has occurred as a result of this land use and others found within the study area such as industry and residential. The Study Area does however contain patches of mapped remnant vegetation including a large area of mapped not of concern RE which stretches some way across the centre of the Study Area.



3.0 DETERMINATION OF PRELIMINARY ALIGNMENT OPTIONS

3.1 PRELIMINARY ALIGNMENT CONSTRAINT CATEGORIES

Corridor options were developed by Powerlink Queensland by identifying routes that considered the proximity to, or potential impacts on environmental and social (including planning) values of the Study Area and general locality. These included:

- Population centres and other residential areas;
- Watercourses;
- Sensitive land uses, such as houses, schools, hospitals, churches and cemeteries;
- Airstrips;
- Topography;
- Mineral resources, including registered active, and non-active leases;
- Significant vegetation communities and fauna habitats, particularly for species of conservation significance;
- Areas of State Forests;
- Areas of potential cultural heritage significance, both indigenous and non-indigenous;
- Tourism and recreation areas; and
- Areas of visual or scenic amenity.

Construction costs and engineering issues were also considered during the evaluation process.

3.2 INFORMATION SOURCES

Information sources used to research the constraints for each of the proposed corridor options included:

- Department of Infrastructure and Planning (DIP) – planning schemes of Wambo and Chinchilla Shire Councils;
- Department of Mines and Energy (DME) – Interactive Resource and Tenure Maps (mining leases, geological landform) (2009).
- Department of Environment and Resource Management (DERM) – cultural heritage records on the Queensland Heritage Register (2009), Wildlife Online database (2009);
- CSIRO – soil landscape maps (1985);
- Queensland Herbarium – regional ecosystem mapping version 5.0 (2005a), HERBRECS database of individual threatened flora species (2009);
- Queensland Museum – fauna species database (2009);
- Department of Environment, Water, Heritage and Arts (DEWHA) – Online Database for Matters of Environmental Significance (2009), cultural heritage records on the Register of National Estate (2009);
- Aerial photography (Powerlink Queensland 2009); and
- Local landholders and Western Downs Regional Council staff.



3.3 MAJOR ALIGNMENT DEVELOPMENT CONSTRAINTS

Major constraints within the Study Area were also considered when formulating corridor alignment options. These constraints (which will be given further attention in Section 4), include:

- Coal reserves (Kogan Creek, Glen Wilga, Wilkie Creek) within the area;
- Kogan Creek Power Station and associated infrastructure, conveyors, ash dam etc;
- Tong Park Piggery, the largest piggery in Australia (73,000 pigs);
- Irrigated farmlands and associated infrastructure adjacent to the Condamine River and on the floodplains of the major creeks in the area;
- Broadacre farming on the Brigalow – Jimbour Floodplains;
- Rural residential subdivisions to the north of the town of Kogan on Banana Bridge Road and the Kogan-Warra Road;
- Remnant vegetation including some areas classified as “endangered”;
- The Dalby State Forest;
- Isolated farmhouses;
- Scarp country comprising elevated rocky terrain above the surrounding plains; and
- A disused airstrip on the Tong Park property.

After consideration of the aforementioned values and Study Area constraints, four corridor alignment options were developed by Powerlink Queensland. Further investigation revealed that the fourth option, which was going to depart the existing easement in the Warra area to the north of the Condamine River would encounter intensive cultivation and land use including irrigated cultivation in the Warra Creek, Cooranga Creek and Condamine River areas. This option would also pass immediately to the west and north of Warra and consequently this option was rejected on the basis of land use and social impacts. Consequently, consideration is now only given to the remaining three routes which depart from the existing QNI easement, south of the Condamine River (see Figure 1.1).

The existing Tarong to Braemar transmission line easement has sufficient width to accommodate one additional line on the western/northern side of the existing line. This easement width was acquired at the time of the original easement acquisition in anticipation of future transmission line development from the Braemar/SWQ area into the Tarong Area. It is proposed to utilise this space from Tarong through to the Warra/Condamine River area and then acquire a new easement through to the proposed Western Downs substation. The three alignment options which are considered in this report have previously been assessed by Powerlink Queensland with regard to the location of residences, terrain, vegetation, coal resources, irrigation and other rural land use restrictions. Details of the proposed alignment routes of these corridors are detailed in Section 4.1.



4.0 STUDY AREA & CORRIDOR CONSIDERATIONS

4.1 BRIEF OVERVIEW OF CORRIDOR OPTIONS

Three corridor options have been considered for the proposed transmission line (see Figure 1.1). Specific descriptions and location details relating to each of these options are discussed below.

4.1.1 Northern Route

This route is approximately 24.5km long and departs the QNI approximately 3.5 km south of the Condamine River, angles north west (3.6km) to pass between irrigated farming country adjacent to the river and Tong Park piggery. The northern boundary of the piggery (Wolskis Road) is followed through to the Kogan Warra Road (8.2km) and then the line continues north west (11.9 km) to the Kogan Creek Coal Resource. The line then angles north to cross the Condamine River (13.6 km), enters irrigated farming country before heading west (16.1 km) to again cross the Condamine River (18.9 km). The line continues west to pass to the north of the Kogan creek Power station. Two crossings of the Condamine River, one of Braemar Creek, Cooranga Creek (possibly), and one of Kogan Creek are required. Cultural heritage may be an issue at these crossings and the scarp country adjacent to the river.

4.1.2 Central Route

This route is approximately 24.6km long and follows the same course as the Northern Route through to the Kogan Warra Road (8.2 km). At the road crossing, the alignment angles to the south west, and then west, generally parallel with the road and skirting the southern edge of the Kogan Creek Coal resource. At approximately 15.4km, the route joins the existing Kogan Creek to Braemar 275kV transmission line which is then followed through to the Power Station (24.6km). Crossings of Braemar Creek, Branch Creek and Kogan Creek are required. There are no crossings of the Condamine River. Cultural heritage issues are considered of medium risk. There is one house in close proximity (<200m), and one more distant (500m) of a possible alignment. Purchase of the property containing the house may be a consideration.

4.1.3 Southern Route

This route is approximately 35.5km long and skirts the Tong Park piggery to the east, south and west by continuing south along the QNI towards Braemar before heading west (7.1km) along the existing Ergon 110 kV line. The route intersects the Kogan Braemar 275kV line (15.7km) where it then parallels the existing line to the north north-west (24.4km), and then west north west (33.5km) before entering the Kogan Creek Power Station (35.5km). Crossings of Braemar Creek, Branch Creek and Kogan Creek are required. There are no crossings of the Condamine River. Cultural heritage issues are considered of medium risk. There are two houses approximately <500m to the south of the existing Kogan Braemar easement where the lines would be parallel. Incremental impact on these houses would be low.

4.2 ENVIRONMENTAL ASSESSMENT CONSIDERATIONS

The following environmental assessment criteria have been examined in light of the Study Area. Major constraints/factors for consideration are raised in the following sections.



4.2.1 Topography

The Northern alignment is predominantly flat and traverses the Condamine River floodplain and river terraces. The Central and Southern routes rise from the floodplain towards the Kogan Creek Power Station with elevated plains, jump-ups and dissected scarp country 20m – 30m above the surrounding landscape. Figure 4.1 illustrates the topography of the study area.

4.2.2 Geology and Soils

The primary geological units of the area the alignments traverse are the Kumbariila beds. Secondary units are alluvial in the major drainage lines. The Northern and Central alignments terminate on Walloon Coal Measures.

Soils are dominated by duplex soils (Light forest, Ironbark/Bull oak forest and Cypress Pine Sand Land Resource Areas), with areas of clay alluvial plains in the North. There is considerable soil variability, however as a general description soils are thin sandy loam surfaced over sodic subsoils on the lowlands, with skeletal soils overlaying shallow rock on the elevated scarps. The alluvial plains to the north have been strongly influenced by the sandstone geology and exhibit sodicity in the surface soils. Figure 4.2 illustrates the soils of the study area.

4.2.3 Hydrology

The Condamine River and Cooranga Creek border the northern edge of the investigation area. The northern alignment crosses both the River and Creek twice near their confluence. Braemar Creek borders the eastern edge and Kogan Creek is towards the west of the investigation area. Several other small creeks and water courses will be crossed. All streams are ephemeral and only flow following local rain or rain in the catchment. There is a lacustrine wetland on Braemar Creek upstream of the Central route crossing of Braemar Creek.

The northern alignment has 6 waterway crossings. It traverses both the Condamine River and Cooranga Creek twice and both Kogan and Braemar Creek once. The central alignment has 3 waterway crossings. It traverses Kogan, Eastern Branch and Braemar Creeks. The southern alignment has 2 waterway crossings and traverses both Kogan and Braemar Creeks. Figure 4.3 illustrates the watercourses in the study area.

Groundwaters are moderately deep (5-15m) and are estimated to be static in the eastern part of the investigation area and trending upwards in the west. There is potential for watertables reaching the surface (in lower parts of the landscape) within 100 years (Searle et al 2008). Modelling predictions of landuse indicate increased rates of recharge. Current monitoring show a rising groundwater trend (Searle et al 2008).

4.2.4 Flora and Fauna

Potential impacts on flora and fauna will vary across the Study Area and may influence corridor selection. Issues that should be considered include the extent of tree clearing, impacts on regional ecosystems (REs) and effects on significant flora and fauna species.



4.2.4.1 Vegetation Cover and Clearing

Regional Ecosystem data and aerial photography for the area was interpreted and used as the basis for broader assessment and opportunistic site evaluations undertaken from roads where access permitted. Whilst numerous quaternary vegetation site investigations were undertaken along each corridor option, for the purposes of this study, the extent of vegetation likely to be affected by each of the transmission line corridor options has been determined through the analysis of the presence and area of REs affected (e.g. the average length of the disturbance corridor) and analysis of aerial photography.

Vegetation clearing is an environmental consequence of the construction of transmission line projects. Depending on the condition (i.e. vegetated or disturbed) of the land adjacent to the corridor, additional vegetation clearing can have significant impact on both environmental and visual amenity levels. Removal of vegetation or the potential retention of vegetation within a corridor option may increase costs and could have a number of operational and maintenance implications.

The *Vegetation Management Act 1999* regulates clearing of remnant vegetation on both freehold and leasehold land. Remnant vegetation is categorised into REs, which describe the unique combination of vegetation species, geology and landform, across Queensland's bioregions (Sattler and Williams, 1999). Conservation status categories are assigned to all REs. The three conservation categories are 'endangered', 'of concern' and 'not of concern'. The construction of the proposed transmission line may require some clearing of remnant vegetation listed under the *Vegetation Management Act 1999*.

Powerlink Queensland have some exemptions in relation to the clearing of native vegetation on freehold lands under s112A of the Electricity Act 1994, where the works are for a "...transmission entity on land designated for the operating works by a Minister under the Integrated Planning Act 1997".

To enable a thorough assessment of the preferred corridor options in relation to REs and native vegetation:

- A preliminary assessment of vegetation along the three alignment options was undertaken with quaternary vegetation site assessments undertaken along each alignment where possible (restricted to public access areas). Further detailed vegetation assessments were not undertaken at this stage; and
- All categories of REs (i.e. 'endangered', 'of concern' and 'not of concern') were considered in the assessment of corridor options.

A number of mapped REs (DERM 2005) occur within the Study Area. These are illustrated in Figure 4.4 and descriptions of each of the REs to be traversed are outlined in Table 4.1. This table also expresses the likelihood of the REs to be present within the Study Area based on preliminary field observations.

TABLE 4.1 REGIONAL ECOSYSTEMS IN THE STUDY AREA WHICH ALIGNMENTS TRAVERSE

RE CODE	RE DESCRIPTION	VMA STATUS	ALIGNMENTS TO TRAVERSE	LIKELIHOOD OF OCCURANCE
11.5.1	<i>Eucalyptus crebra</i> , <i>Callitris glaucophylla</i> , <i>Angophora leiocarpa</i> , <i>Allocasuarina luehmannii</i> woodland on Cainozoic sand plains/remnant surfaces	Not of Concern	Central Option Southern Option	Likely
11.5.20	<i>Eucalyptus moluccana</i> and/or <i>E. microcarpa</i> , <i>E. pilligaensis</i> with <i>E. crebra</i> woodland on Cainozoic sand plains.	Not of Concern	Central Option Southern Option	Likely
11.4.3/11.5.20 50/50	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains. AND <i>Eucalyptus moluccana</i> and/or <i>E. microcarpa</i> / <i>E. pilligaensis</i> ± <i>E. crebra</i> woodland on Cainozoic sand plains	Endangered	Northern Option Central Option	Mixed polygon. Mapped 11.4.3 unlikely to present based on field observations. 11.5.20 most likely present.
11.4.12	<i>Eucalyptus populnea</i> woodland on Cainozoic clay plains.	Endangered	Northern Option Central Option	Likely
11.7.4/11.7.5	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust. AND Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks.	Not of Concern	Northern Option Central Option Southern Option	Likely
11.3.2/11.3.17 80/20	<i>Eucalyptus populnea</i> woodland on alluvial plains. AND <i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	Of Concern	Central Option Southern Option	Likely
11.3.2/11.3.18/11.3.4 40/35/35	<i>Eucalyptus populnea</i> woodland on alluvial plains. AND <i>Eucalyptus populnea</i> , <i>Callitris glaucophylla</i> , <i>Allocasuarina luehmannii</i> shrubby woodland on alluvium. AND <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains.	Of Concern	Northern Option Central Option Southern Option	Likely

RE CODE	RE DESCRIPTION	VMA STATUS	ALIGNMENTS TO TRAVERSE	LIKELIHOOD OF OCCURANCE
11.7.7	<i>Eucalyptus fibrosa</i> subsp. <i>nubila</i> ± <i>Corymbia</i> spp. ± <i>Eucalyptus</i> spp. on lateritic duricrust	Not of Concern	Central Option Southern Option	Likely
11.7.4/11.7.7/11.7.5 50/40/10	<i>Eucalyptus decorticans</i> and/or <i>Eucalyptus</i> spp., <i>Corymbia</i> spp., <i>Acacia</i> spp., <i>Lysicarpus angustifolius</i> on lateritic duricrust. AND <i>Eucalyptus fibrosa</i> subsp. <i>nubila</i> ± <i>Corymbia</i> spp. ± <i>Eucalyptus</i> spp. on lateritic duricrust AND Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks.	Not of Concern	Central Option Southern Option	Likely
11.3.25/11.3.4/11.3.3 80/10/10	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines AND <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains AND <i>Eucalyptus coolabah</i> woodland on alluvial plains	Of Concern Sub-Dominant	Northern Option	Likely



Table 4.2 describes the total length of 'endangered', 'of concern' and 'not of concern' mapped remnant vegetation to be traversed by each corridor option.

TABLE 4.2 REMNANT VEGETATION TO BE TRAVERSED FOR EACH CORRIDOR OPTION

CORRIDOR OPTION	KM OF 'ENDANGERED'* RE TO TRAVERSE	KM OF 'OF CONCERN' *RE TO TRAVERSE	KM OF 'NOT OF CONCERN'* RE TO TRAVERSE	TOTAL KM OF RE TO TRAVERSE
Northern	0.8	1.3	2.2	4.3
Central	0.3	0.9	7.1	8.3
Southern	0.0	0.3	13.3	13.6

* 'Endangered', 'Of Concern' and 'Not of Concern' as listed under the *Vegetation Management Act 1999*.

4.2.4.2 Commonwealth Threatened Ecological Communities

Vegetation communities may also be protected as 'threatened ecological communities' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Projects which have the potential to significantly impact a 'threatened ecological community' may require 'referral' to the Federal Department of Environment, Water Heritage and Arts (DEWHA) for assessment under the EPBC Act.

The DEWHA database search identified four threatened ecological communities known or potentially occurring in the vicinity of the Study Area. The field assessment did not reveal the presence of any threatened ecological communities however RE mapping indicates that Brigalow (*Acacia harpophylla*) dominant and sub-dominate communities (listed as Endangered) may be present within the Study Area. In addition to this, the landscape evident along the northern portion of the Study Area may also provide suitable habitat for 'Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland' (listed as Critically Endangered). Whilst it is considered unlikely that the 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland' would occur within the Study Area (due to a lack of corresponding REs), it is possible that Weeping Myall Woodlands may occur within the Study Area.

Detailed field investigations are required to confirm the presence or absence of these communities. In the event that field investigations confirmed the presence of any threatened ecological community, referral of the project would need to be considered as part of the EIS phase of the project, once a final alignment has been determined and the extent of impact to this community established. The decision to refer the project would depend upon the significance of the predicted impacts on the relevant matter of national significance.

4.2.4.3 Flora and Fauna of Conservation Significance

Conservation significant flora and fauna species listed under provisions of Commonwealth and State legislation have the potential to influence the planning, design and construction of the transmission line and maintenance of any associated easements. If any flora or fauna of conservation significance exist within or adjacent to the final corridor option, management strategies to avoid or minimise impact to the species population and associated habitat may be required. This may include obtaining approvals from DERM to remove/relocate these threatened species from within the proposed corridor area. This may impact project delivery and cost.,



In order to determine the potential occurrence of flora and fauna of conservation significance in or adjacent to each of the corridor options, a number of database searches were undertaken (see Section 3.2). Species of conservation significance are described under the Queensland *Nature Conservation (Wildlife) Regulation 2006* (NCWR) and under the Commonwealth *EPBC Act*. Detailed search results are presented in Appendix A. The database searches produced the following results:

- A total of 10 threatened flora species including two listed under the NCWR, one from the EPBC Act and 7 listed under both the NCWR and EPBC Act; and
- A total of 19 threatened fauna species including six listed under the NCWR, three from the EPBC Act and ten listed under both the NCWR and the EPBC Act.

Specific potential impacts on these threatened flora and fauna species of each of the alignment options being considered have not been quantified at this stage. Detailed field investigations at the Environmental Impact Statement stage (i.e. site-specific investigations) will however determine whether the final alignment impacts upon areas potentially supporting threatened species. It should be noted that during the preliminary field investigations, *Philothea sporadica* (listed under the EPBC Act and NCWR) individuals were recorded at two locations within the vicinity of the central and southern alignments. Habitat suitable for the species is found throughout the Study Area and detailed field investigations to follow will record any additional individuals or populations. Extensive populations of *Philothea sporadica* were managed during the construction of the Kogan Creek – Braemar Transmission Line.

During preliminary field investigations across the Study Area, environmental and noxious weeds were recorded. Three declared weed species, listed under the *Land Protection (Pest and Stock Route Management) Act 2002* (LPA), were identified during the field assessment. These were:

- *Senecio madagascariensis* (Fireweed) - Class 2 Declared Plant;
- *Opuntia tomentosa* (Velvety Tree Pear) – Class 2 Declared Plant; and
- *Opuntia stricta* (Prickly Pear) – Class 2 Declared Plant.

The occurrence of these weeds is however common across all three corridor options and therefore has not been used as an assessment option.

4.2.5 Forest and Conservation Areas

To determine the potential impacts on the Study Area's ecological and recreational assets and values, the presence of regionally recognised state forests and conservation areas has been investigated.

There are no National Parks within the Study Area. The south-east corner of the Study Area traverses the northern section of the Dalby State Forest, and the Braemar State Forest is located south of the Study Area but still within the immediate vicinity.



4.2.6 Cultural Heritage

Review of the Queensland Heritage Register (European) indicates an absence of non-indigenous cultural heritage sites within the immediate vicinity of the Study Area (DERM, 2009). Australian Heritage Database searches for the localities of Warra, Kogan, Dalby and Chinchilla, have identified the Boonarga Cactoblastis Memorial Hall (for its association with the defeat of the prickly pear plague; a major event in Australia's agricultural history), and the Chinchilla Sands Local Fossil Fauna Site (a highly significant Pliocene fossil site), neither of which are located within the Study Area (DEWHA, 2009). The Cactoblastis Memorial Hall is situated approximately 10km north of the Study Area, on Horswoods Road (along the Warrego Highway), Boonarga. The Chinchilla Sands Local Fossil Fauna Site is situated approximately 15km north-west of the Study Area, along the northern bank of the Condamine River.

All significant Aboriginal cultural heritage in Queensland is protected under the *Aboriginal Cultural Heritage Act 2003*, and penalty provisions apply for any unauthorized harm. Under the legislation a person carrying out an activity must take all reasonable and practical measures to ensure the activity does not harm Aboriginal Cultural Heritage.

The construction activities that are proposed for this transmission line is subject to both Category 4 and Category 5 activities of the Duty of Care Guidelines. For example:

Where an activity is proposed under category 5 there is generally a high risk that it could harm Aboriginal cultural heritage. In these circumstances, the activity should not proceed without cultural heritage assessment.

Where an activity is proposed under category 5, it is necessary to notify the Aboriginal Party and seek:
(a) *Advice as to whether the feature constitutes Aboriginal cultural heritage; and*
(b) *If it does, agreement as to how best the activity may be managed to avoid or minimise harm to any Aboriginal cultural heritage.*

A search of the Cultural Heritage Database and Register completed on the 5th of November 2008 shows significant Aboriginal cultural heritage areas and objects in the central study area option (only area searched). This includes scarred trees, artefact scatters, artefacts, shell material and a stone well. It is worth noting that significant cultural heritage is likely to be found in those areas that have not been previously subjected to a cultural heritage survey.

There are two previously known Aboriginal parties for the study area. However, recent native title activity now poses some initial constraints to the project but nevertheless this does not have any impact on selection of the northern, central, or southern route options. Note, further investigations are required by Powerlink to identify who is the Aboriginal party(s) for this project.

Aboriginal cultural heritage, which may occur on the study area, is protected under the terms of the *Aboriginal Cultural Heritage Act 2003* even if there are no records are recorded in an official register and whether or not they are located in, on or under private land.



Powerlink Queensland will be required to obtain a registered cultural heritage management plan (CHMP) with the identified Aboriginal Party(s) for this project. The approved CHMP will include a cultural heritage survey of the areas identified as being subject to Category 5 activities and a final report proposing how Powerlink Queensland should avoid harm to cultural heritage during construction.

The Project is not expected to impact upon areas or objects of social importance or cultural significance, however, the likely presence of remnants of cultural heritage has not been dismissed.

4.2.7 Contaminated Land

Contaminated land could impact on the alignment of the transmission line. No visual evidence of contaminated land or contaminating activities was identified during the field investigation however further investigations are warranted.

4.2.8 Noise

Noise is unlikely to vary between the potential corridor options. Noise issues will generally be insignificant but where considered will relate to proximity to dwellings which will be assessed elsewhere. Consequently, noise has not been considered a key criterion for the purposes of determining the preferred corridor.

4.2.9 Air Quality

Air quality is unlikely to vary between corridor options. Air quality issues will generally be insignificant during construction, but where considered an issue will relate mainly to proximity to dwellings. This issue will be addressed in the Environmental Impact Statement. Consequently, air quality has not been considered a key criterion for the purposes of determining the preferred corridor.

4.2.10 Electro Magnetic Fields (EMF)

Any potential effects would be greatest in houses near the corridor. There are 2 houses within 500m of each of the alignment options and Consequently, EMF has not been adopted as a criterion for the purposes of determining the preferred corridor, however it will be evaluated in determining the study alignment. Any potential impacts will be examined in detailed within the Environmental Impacts Statement.

4.2.11 Flood, Bushfire and Landslide

Areas of bushfire risk, as determined by the Queensland Rural Fire Service, have been identified on Western Downs Regional Council's Chinchilla Town Planning Scheme Overlay Map 4 *Bushfire Hazard Areas*. The mapping identifies the Study Area as occurring within a Low to Medium Bushfire Hazard classified area.

Preliminary desktop studies have indicated that the threat of fire within the Study Area is not expected to cause significant impacts to the proposed transmission line options, but will however be considered in more detail at the Environmental Impact Statement stage in accordance with *State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*.



4.2.12 Traffic and Infrastructure

All three alignment options intersect road infrastructure within the study area. The northern alignment intersects Banana Bridge Road, Healeys Crossing Road, and Warra Kogan Road. The central alignment option intersects a total of 5 roads, comprising 5 local roads (Banana Bridge Road, Muhlings Road, Taylors Road, Wolskis Road and Healeys Crossing Road) and 1 main road (Warra Kogan Road). The southern alignment route intersects a total of 5 roads, namely Banana Bridge Road, Muhlings Road, Beelbee Road, Braemar Warra Road, and Warra Kogan Road.

None of the alignment options will intercept train lines within the study area.

4.3 PLANNING ASSESSMENT CONSIDERATIONS

The following planning assessment criteria have been examined in light of the Study Area. Major constraints/factors for consideration are raised in the following sections.

4.3.1 Visual Amenity

The key landscape characteristics that will influence the visual impact of transmission lines in this location will be topography, existing vegetation and visibility of the proposed route from local houses and roads. The feature within the study area with the highest visual amenity is the Condamine River valley, any route crossing this feature will have an impact on the visual amenity of the river. The topography of the region is generally flat, ranging from 310m to 380m above sea level, allowing long views across agricultural fields where there is no mature vegetation to provide a visual break. All three options are through sparsely populated rural areas with a mixture of large blocks of existing vegetation and open agricultural fields with scattered mature trees. The most significant viewing location will be from the Warrego Highway with the Warra-Kogan Road, Kogan-Condamine Road and the Banana Bridge Road as secondary roads from which parts of the three options are visible. The vegetation along the Condamine River will limit the views south west from the Warrego Highway.

Each of the three routes will cross the Warra Kogan Road and will be visible from Banana Bridge Road. The visual impact of any of these routes within the landscape will be reduced where they can follow existing transmission line routes, the southern route benefits from this factor more than either of the others.

4.3.2 Planning Scheme Requirements

4.3.2.1 Current Zoning

The proposed corridors traverse land that is included in the Rural Zone and is primarily used for rural purposes. The purpose of the Rural Zone is to retain the viability of the land within this zone for primary production.

The zoning of the land reflects the current land uses and Council's expectations for future land uses that can occur in this zoning. Consequently, the zoning of the land affords land owners certain use rights over their land. The land to be traversed by the three proposed transmission line routes are zoned 'Rural' in the Planning Scheme for both the former Chinchilla Shire and Wambo Shire areas.



As outlined in the Easement and Land Acquisition Route Study Report prepared by Powerlink Queensland, there are a number of land uses that may affect the ultimate alignment of the proposed route. These land uses include dwellings, Tong Park Piggery and irrigated farming. It is also noted that Coal resources are also identified between the Kogan Power Station and the Queensland – New South Wales Interconnector corridor.

It is acknowledged that there are a number of land uses and resources that need to be taken into consideration when determining the preferred route. However, as the proposed routes traverse land within the same zone, the current zoning affects the proposed routes equally and therefore has not been used as an assessment option.

4.3.2.2 Good Quality Agricultural Land

The major land use within the study area is agriculture and therefore the potential impacts on Good Quality Agricultural Land (GQAL) need to be considered. The proposed transmission line routes traverse land mapped as *Good Quality Agricultural Land (Class A and Class B)* as identified on Sheet 3 of 7 in the former Chinchilla Shire Council Planning Scheme and Sheet 5 of 9 of the former Wambo Shire Planning Scheme (Figure 4.5). Consideration is given to the length of the proposed corridor routes that traverse GQAL.

As outlined in the Guidelines for State Planning Scheme Policy 1/92, GQAL is land which is capable of sustainable use for agriculture, with a reasonable level of inputs, and without causing degradation of land or other natural resources. In this context, *agricultural land* is defined as land used for crop or animal production, but excluding intensive animal uses such as feedlots, piggeries, poultry farms and plant nurseries based on either hydroponics or imported growth media. Four classes of GQAL have been defined for Queensland and are described in Table 4.3.

TABLE 4.3 GQAL IN THE STUDY AREA WHICH ALIGNMENTS TRAVERSE

CLASS	DESCRIPTION
Class A	Crop land - Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
Class B	Limited crop land - Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
Class C	Pasture land - Land that is suitable only for improved or native pastures due to limitations which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment.
Class D	Non-agricultural land - Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

Agricultural land classes are based on an assessment of the agricultural suitability of the land for specified agricultural uses. Agricultural land suitability is a rating of the ability of land to maintain a sustainable level of productivity. The factors used to assess agricultural land suitability are the soil, topographic and climatic limitations which determine sustainable productivity. Explicit evaluation of economic factors, such as the size of production units, is not included as they are not considered relevant to the quality of the resource.



In this Instance, both Planning Schemes map their GQAL land as either Class A or Class B. Class A is suitable for crop production and Class B land is suitable for crop production however has limitations (e.g. nutrient deficient, erosion, stoniness).

All three corridor options traverse either or both Class A and Class B GQAL, as summarised in Table 4.4.

TABLE 4.4 LENGTH OF GQAL TRAVERSED

ALIGNMENT OPTION	CLASS A LAND	CLASS B LAND	TOTAL CLASS A AND B LAND
Northern	4.2km	5.6km	9.8km
Central	1.5km	3.7km	5.2km
Southern	0	2.7km	2.7km

For the purpose of considering this matter, we have focused on the extent to which the three corridor routes traverse land that is Class A GQAL. This approach has been adopted given that Class B GQAL, as described above, is considered by the Department of Environment and Resource Management as having severe limitations to current and potential crops.

4.3.3 Bushfire Hazard

Both of the Planning Schemes relevant to the project have incorporated mapping and planning provisions that are in accordance with the *State Planning Scheme Policy 1/03 – Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*.

In both Planning Schemes, the Bushfire Hazards has been mapped as being either:

- Low Hazard;
- Medium Hazard; or
- High Hazard.

(refer to Chinchilla Shire Planning Scheme Sheet 4 of 7 & Wambo Shire Planning Scheme Sheet 6 of 9).

For the purpose of this report, we note that both Planning Schemes contain a *Rural Zone Code* that include the Performance Criteria and Acceptable Solution associated with the development of land and bushfire hazard.

These provisions indicate that development is preferred on land mapped as having a 'Low Hazard' bushfire risk. Where development is proposed in areas with a 'Medium Hazard' or 'High Hazard', bushfire management measures are required.

In this instance, it is proposed to assess each route based upon the length of proposed corridors that traverse land that is mapped as being of a 'Low Hazard'.



An assessment of the Council mapping and the proposed routes indicates that the entire Northern Route is mapped as being affected by 'Low Hazard' bushfire risk. The Central Route traverses land mapped as both 'Low Hazard' and 'Medium Hazard', with the majority of the Southern Route traversing land mapped as being of a 'High Hazard'. The central route is predominately located over land mapped as 'Low Hazard', with only approximately 500m of the corridor of the entire route traversing land identified as being of 'Medium Hazard'. The majority of the southern route traverses land mapped as having a 'Medium Hazard' bushfire risk.

TABLE 4.5 BUSHFIRE HAZARD RISK

OPTION	LOW HAZARD	MEDIUM HAZARD	HIGH HAZARD
Northern	X		
Central	X	X	
Southern			X

4.3.4 Mineral Development Licence Area

Both Planning Schemes have mapped areas contained with a Mineral Development License area (refer to Chinchilla Shire Planning Scheme Sheet 5 of 7 & Wambo Shire Planning Scheme Sheet 8 of 9) (Figure 4.6). The status of the licenses areas mapped is unknown at this stage. It is however noted that each of the Planning Schemes identifies the real property description for those lots included in the license area.

The mapping in the Planning Scheme also makes it difficult to confirm the true extent of the Mineral Development License area that might be affected by each of the proposed routes. A visual assessment of Council's mapping indicates that the length of the northern and central routes that traverse these mapped areas is similar and the southern route does not traverse any land mapped as a Mineral Development Licence area.

4.3.5 Biodiversity Planning

The Chinchilla Planning Scheme is the only Local Government area for this project that has a Biodiversity Planning Assessment Area mapped (Map 6 of 7).

The purpose of the Biodiversity Planning Assessment area is to ensure that sufficient detail is provided as part of Development Application to enable Council to accurately assess the impact of the proposal on habitats for essential habitat for endangered, rare or threatened species.

For the purpose of considering this matter, we have focused on the extent to which the three routes traverse land that is mapped as requiring a 'Biodiversity Planning Assessment'. Preliminary interrogations of the plan indicate the approximate length of each route affected by this trigger is considered to be similar

4.3.6 Groundwater Vulnerability

Both Planning Schemes have mapped areas considered to be subject to 'Ground Water Vulnerability' (refer to Chinchilla Shire Planning Scheme Sheet 7 of 7 & Wambo Shire Planning Scheme Sheet 7 of 9). The purpose of the mapping is to trigger an assessment the groundwater on mapped sites. In doing so, Council is provided with



sufficient information as part of a Development Application to determine the likely impacts of the development on the quality of groundwater.

Groundwater vulnerability is common across all three corridor options and therefore has not been used as an assessment option.

4.3.7 Transmission Line Separation

The Planning Schemes for both the former Chinchilla Shire Planning Scheme and former Wambo Shire contemplate the provision of separation distances between Powerline/Electricity Easements and development. The relevant Performance Criteria and Acceptable Solutions for development in the Rural Zone located in proximity to electricity easements is contained within Section 4.1 of each Planning Scheme. Similarly, Schedule 2, Division 3 of each Planning Scheme also articulates and illustrates the relevant separation or buffer distances.

For a 275kV transmission line easement, both Planning Schemes require 'habitable buildings' and 'child orientated uses' to maintain a minimum separation distance of 40 metres from the most proximate boundary of a transmission line easement.

These provisions relate to the separation distance to be provided when development, such as a house, is being erected near an electricity transmission line easement. The converse can apply. That is, to ensure the proposed routes do not result in an existing dwelling becoming non-compliant with the Planning Scheme requirements, each of the proposed routes should maintain a minimum separation distance of 40 metres from any 'habitable building' and 'child orientated use'. A 'Habitable Building' is defined by both Planning Schemes as "...any building, part of building or structure able to be lawfully used for "residential activities". The term 'Residential Activities' is further defined to include an Accommodation Building, Bed and Breakfast Premises, Caretaker's Residence, Detached House, Homes Business, Multiple Dwelling and Visitor Accommodation.

For the purpose of this assessment, it is noted that Powerlink Queensland has identified that houses are located within 500 metres of the proposed routes.

The Easement and Land Acquisition Route Study Report (CP.01422) prepared by Powerlink states the following for each of the proposed routes:



- Northern Route - houses are located close to a possible route (less than 200 metres);
- Central Route - one house is in close proximity of the possible route (less than 200 metres); and
- Southern Route - there are two houses less than 500 metres to the south of the existing Kogan – Breamer easement.

In all instances, the preferred route will need to confirm that no habitable dwellings are located within 40 metres of the transmission lines easement.

4.3.8 Construction and Maintenance

As mentioned in Section 1.1, in relation to construction and maintenance of Transmission Lines, Powerlink Queensland is required by the National Electricity Rules to select the lowest cost option to electricity consumers. Certain construction and maintenance methods/issues are associated with each potential corridor option and are a potential impact upon the cost of construction.

The length of each corridor option has been determined to compare potential construction and maintenance costs. Longer corridor options will logically have greater costs for both construction and maintenance phases and are therefore less preferred. In addition, changing alignment direction with steep angles also increases cost with this to be considered further during the Environmental Impact Statement and detailed design stages.

4.4 SUMMARY

This assessment has focused upon the Study Area and area in the immediate vicinity. During this discussion, it has been determined that some of the considerations examined illustrated no discernable difference between corridor options. Therefore, these considerations provide no further assistance in the selection of the preferred alignment option. Whilst the potential impacts of these considerations will be further investigated (and mitigated for) at the Environmental Impact Statement stage, they will not be considered further within this selection report. Table 4.5 provides a summary of the issues raised for consideration in this section and provides advice pertaining to whether further analysis is required.

TABLE 4.6 SUMMARY OF KEY ISSUES FOR COMPARATIVE ASSESSMENT

CRITERION/ CONSIDERATION	SUMMARY OF ISSUES	FURTHER PAR ANALYSIS REQUIRED?
Topography	Topography does vary throughout the route alignments; however there are not significant topographical features that have the potential to impact on alignment of the transmission line.	No.
Geology	Geology is not significantly different for the alignment option. All routes traverse Kumbarella sandstone rises and alluvial valleys and there are no significant geological features that impact on the route alignment.	No.
Soils	Soils vary for the different for the route alignment options; more alluvial clays in the Northern option, Central and Southern tend to be more on the sandstone derived duplexes; all alignment options have sodic soils, but the degree of variability in sodicity is uncertain with current information. Management of sodicity issues could impact on the constructability and cost of the transmission lines.	Yes.



CRITERION/ CONSIDERATION	SUMMARY OF ISSUES	FURTHER PAR ANALYSIS REQUIRED?
Hydrology	Major hydrologic features are characterised. Northern route traverses the Condamine River and Cooranga Creek twice and Kogan and Braemar Creeks once, Central and Southern options both traverse Kogan and Braemar Creeks, the Central option also crosses Eastern Branch Creek. Potential for impacts at crossings could impact on the alignment of the transmission line.	Yes.
Flora and Fauna	Potential impacts on flora and fauna could vary throughout the route. Alignment options may influence the final alignment. The presence of 'endangered' remnant vegetation (namely River Red Gum communities along the Condamine River and tributaries and Brigalow dominant/subdominant communities) and endangered flora species such as <i>Philotheca sporadica</i> may require alternative alignment or construction management techniques.	Yes.
Contaminated Land	Contaminated land could impact on the alignment of the transmission line. Further investigations are warranted at a micro scale during the EIS.	No.
Cultural Heritage	Review of the Queensland Heritage Register (European) indicates an absence of non-indigenous cultural heritage sites within the immediate vicinity of the Study Area (DERM, 2009). Australian Heritage Database searches for the suburbs of Warra, Kogan, Dalby and Chinchilla, have identified the Boonarga Cactoblastis Memorial Hall, and the Chinchilla Sands Local Fossil Fauna Site, neither of which are located within the vicinity of the Study Area (DEWHA, 2009). The Project is not expected to impact upon areas or objects of social importance or cultural significance. The likely presence of remnants of cultural heritage has not been dismissed, however.	No.
Visual Amenity	Potential impacts due to the visibility of the preferred route from local roads and the visual impact of the route on the Condamine River corridor.	Yes.
Infrastructure	Each of the alignment options traverse roads and therefore may have associated impacts on construction and maintenance.	Yes.
Good Quality Agricultural Land	A desktop assessment of the mapping prepared by Council based upon the proposed routes indicate that approximately 9.8km of the Northern Route traverses land designated as Class A and B GQAL. The Central Route is estimated to affect 5.2km of Class A and B GQAL, and the Southern Route affects 2.7km of Class A and B GQAL.	Yes.
Bushfire Hazard Mapping	The entire Northern Route is mapped as being affected by 'Low Hazard' bushfire risk. The Central Route traverses land mapped as both 'Low Hazard' and 'Medium Hazard', with the majority of the Southern Route traversing land mapped as being of a 'High Hazard'. The central route is predominately located over land mapped as 'Low Hazard', with only approximately 500m of the corridor of the entire route traversing land identified as being of 'Medium Hazard'. The majority of the southern route traverses land mapped as having a 'Medium Hazard' bushfire risk.	Yes.
Mineral Development Licence Area	A visual assessment of Council's mapping indicates that the length of the northern and central routes that traverse these mapped areas is similar and the southern route does not traverse any land mapped as a Mineral Development Licence area.	Yes.

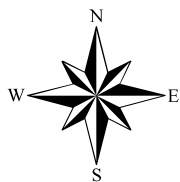
Powerlink Western Downs PAR Topography

Figure 4.1

Alignment Options

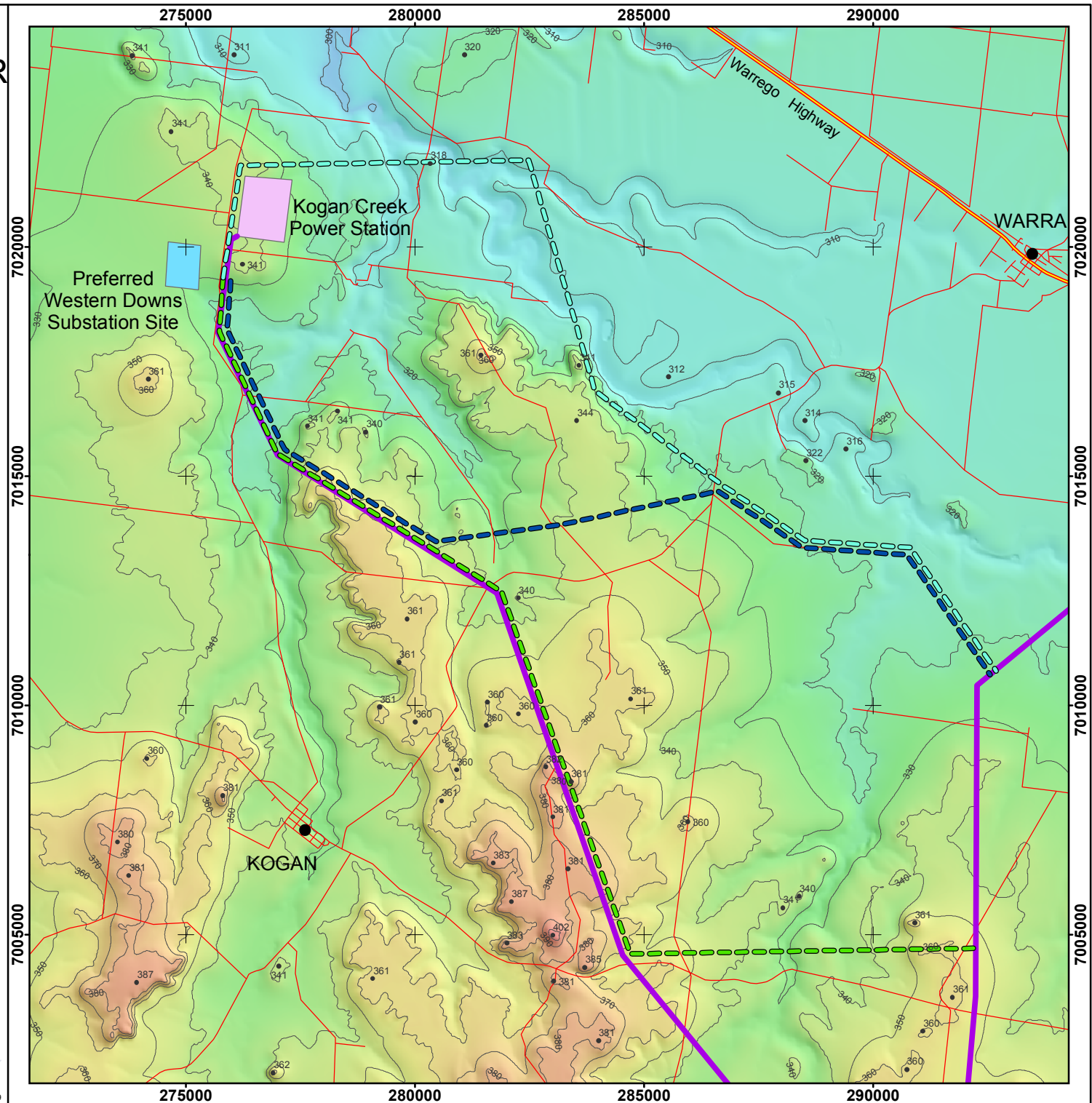
- Northern Route
- Central Route
- Southern Route

- Spot Height
- Contour
- Highway
- Road
- 275 kV
- Power Station
- Sub-station



0 500 1,000 2,000 3,000 4,000
Metres

Scale 1 : 120 000
Datum / Projection: GDA94 MGA Zone 56



Powerlink Western Downs PAR Soil

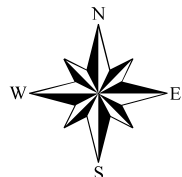
Figure 4.2

Alignment Options

- Northern Route
- Central Route
- Southern Route

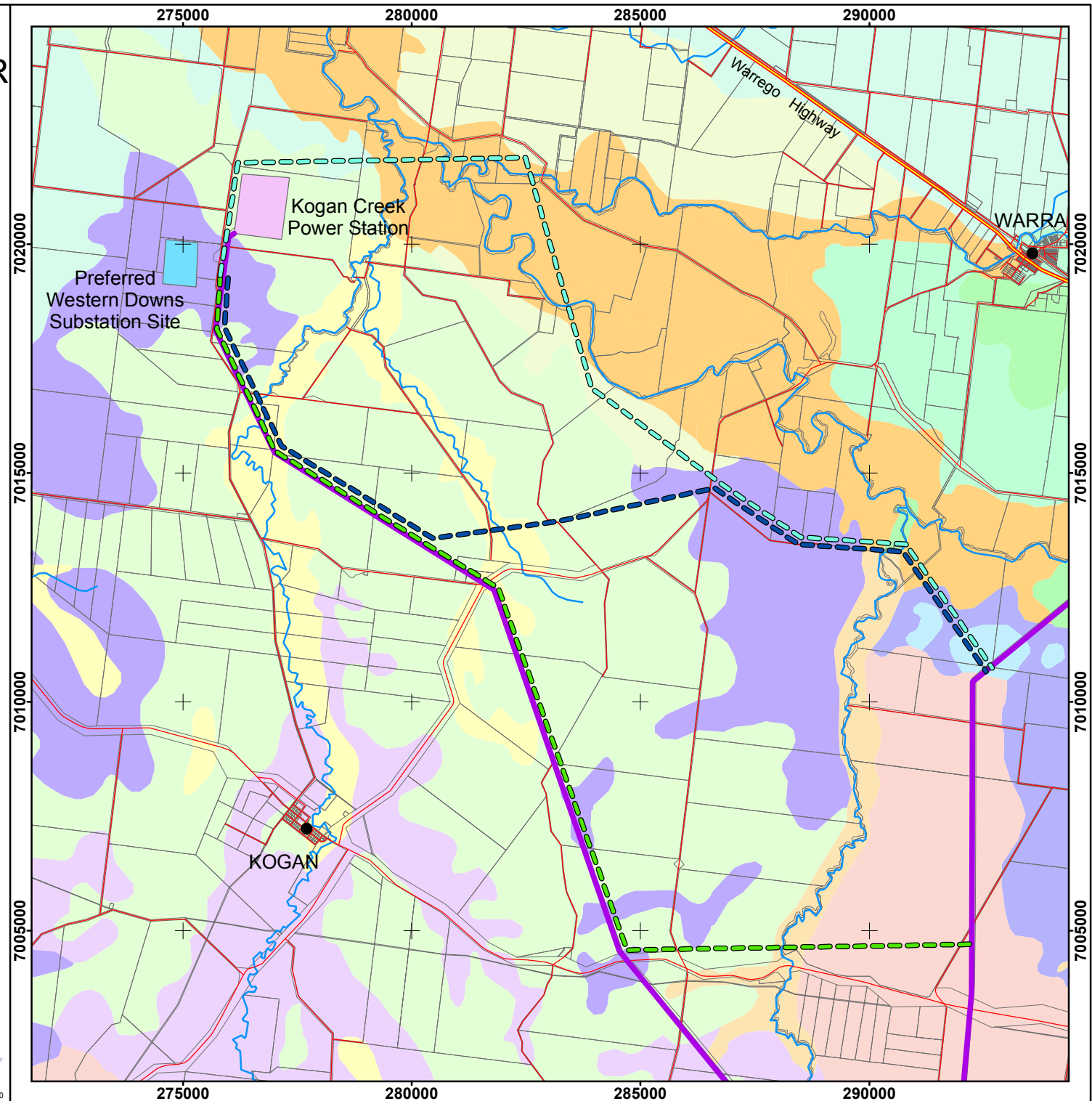
Land Resource Area

- Clay Alluvial Plains
- Poplar Box Flat Plains
- Cypress Pine Sands
- Brigalow Plains
- Ironbark / Bull Oak Forests
- Poplar Box Rises
- Light Forests
- Recent Alluvial Plains
- Older Alluvial Plains
- Alluvial Plains - Sandy Sodosols
- Brigalow Uplands
- Sandstone Forests
- Ironbark / Bull Oak Sodosols
- 275 kV
- Power Station
- Sub-station
- Highway
- Road
- Watercourse
- Cadastre



0 500 1,000 2,000 3,000 4,000 Metres

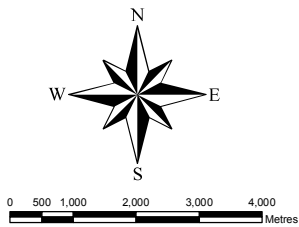
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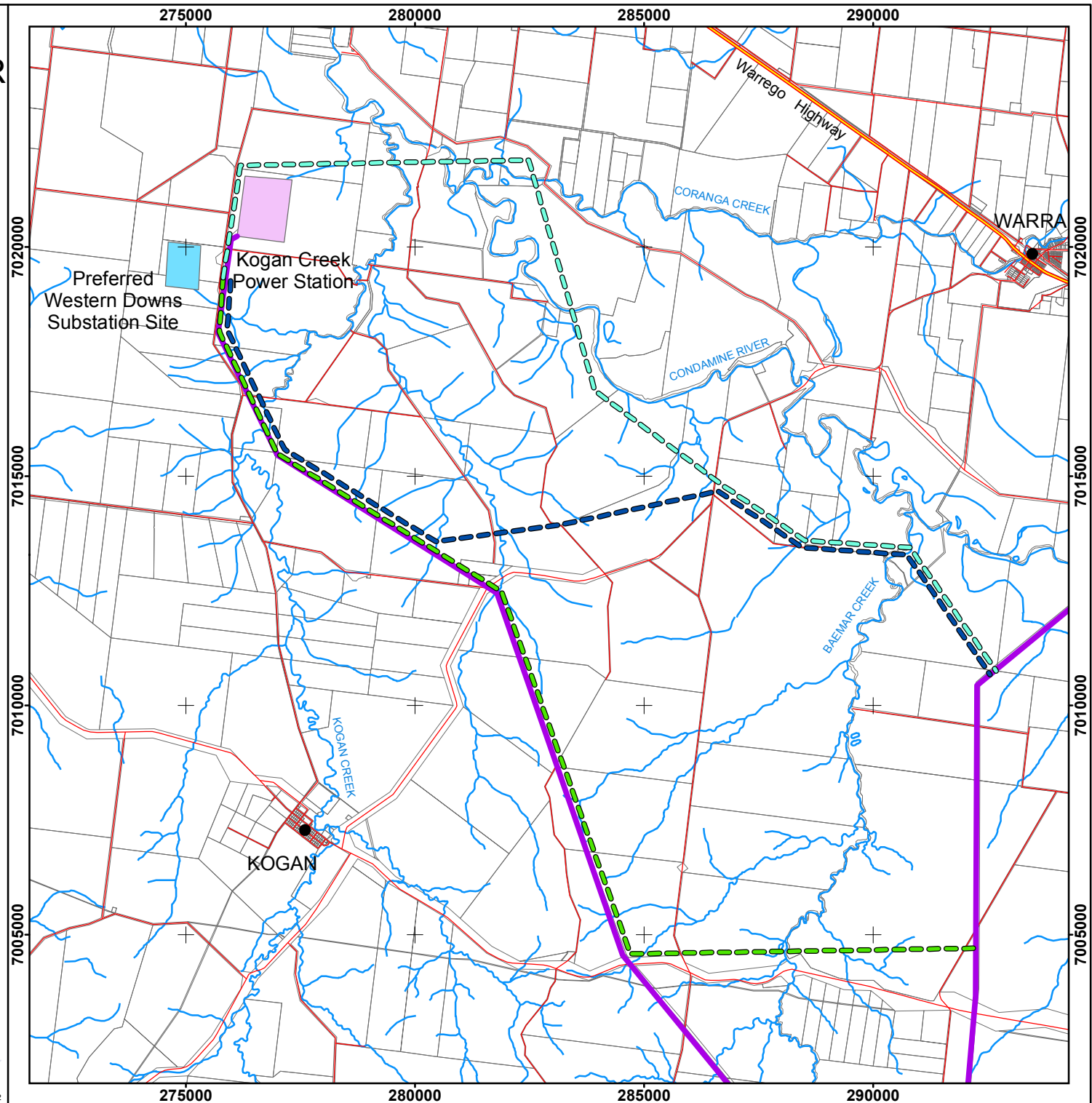
Powerlink Western Downs PAR Rivers and Creeks Figure 4.3

Alignment Options

- Northern Route
- Central Route
- Southern Route
- 275 kV
- Power Station
- Sub-station
- Highway
- Road
- Watercourse
- Cadastre



Scale 1 : 120 000
Datum / Projection: GDA94 MGA Zone 56



Powerlink Western Downs PAR Regional Ecosystems

Figure 4.4

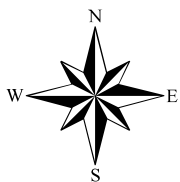
Alignment Options

- Northern Route
- Central Route
- Southern Route

Regional Ecosystems

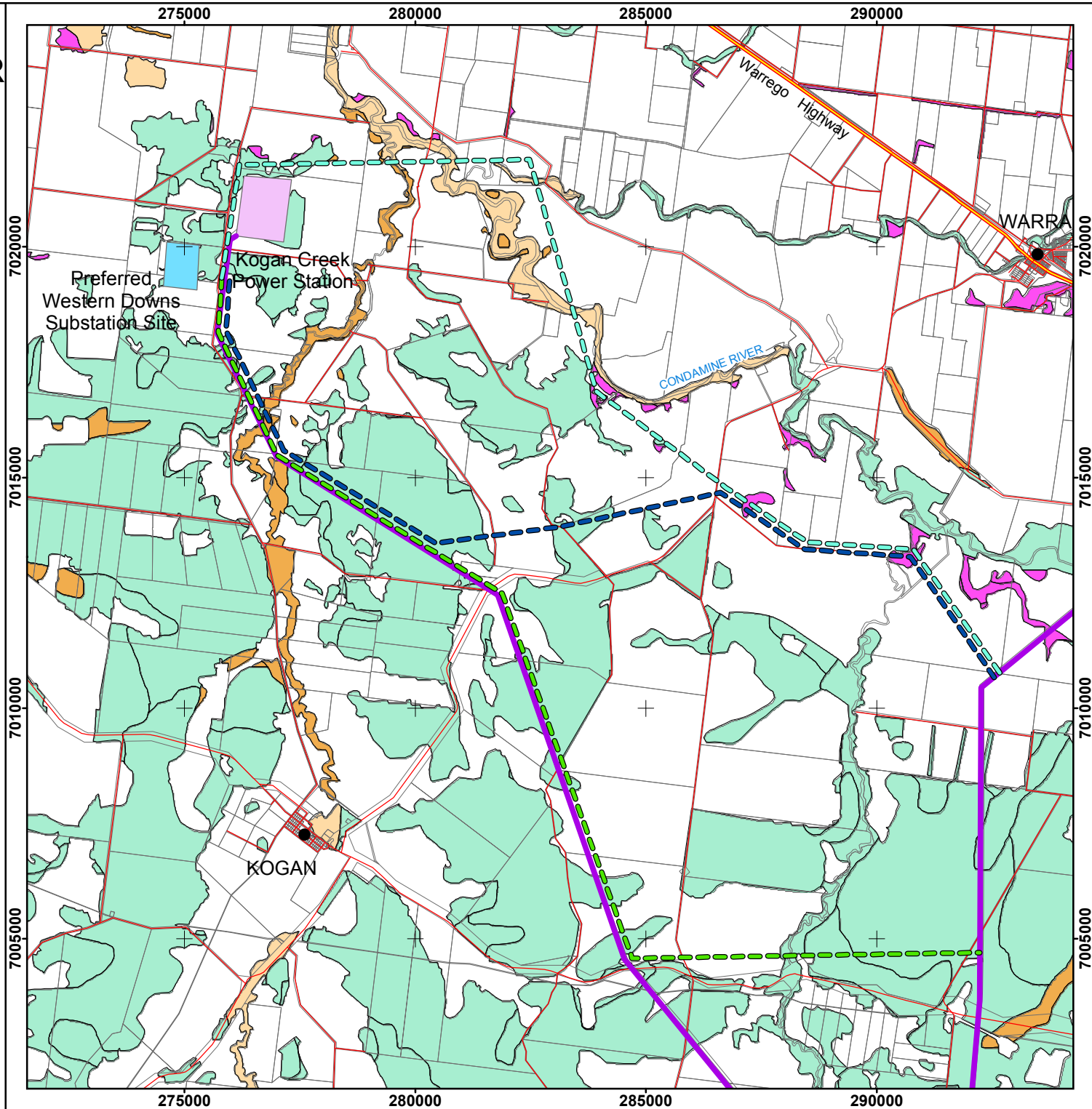
- Non-remnant / regrowth
- Endangered - Sub-dominant
- Endangered - Dominant
- Of Concern - Sub-dominant
- Of Concern - Dominant
- Not Of Concern
- Plantation forest

- 275 kV
- Power Station
- Sub-station
- Highway
- Road
- Cadastre



0 500 1,000 2,000 3,000 4,000
Metres

Scale 1 : 120 000
Datum / Projection: GDA94 MGA Zone 56



Powerlink Western Downs PAR Planning Scheme

Good Quality Agricultural Land
Figure 4.5

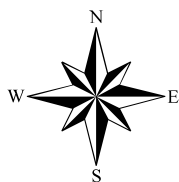
Alignment Options

- Northern Route
- Central Route
- Southern Route

- 275 kV
- Highway
- Road
- Power Station
- Sub-station
- Cadastre

Good Quality Agricultural Land

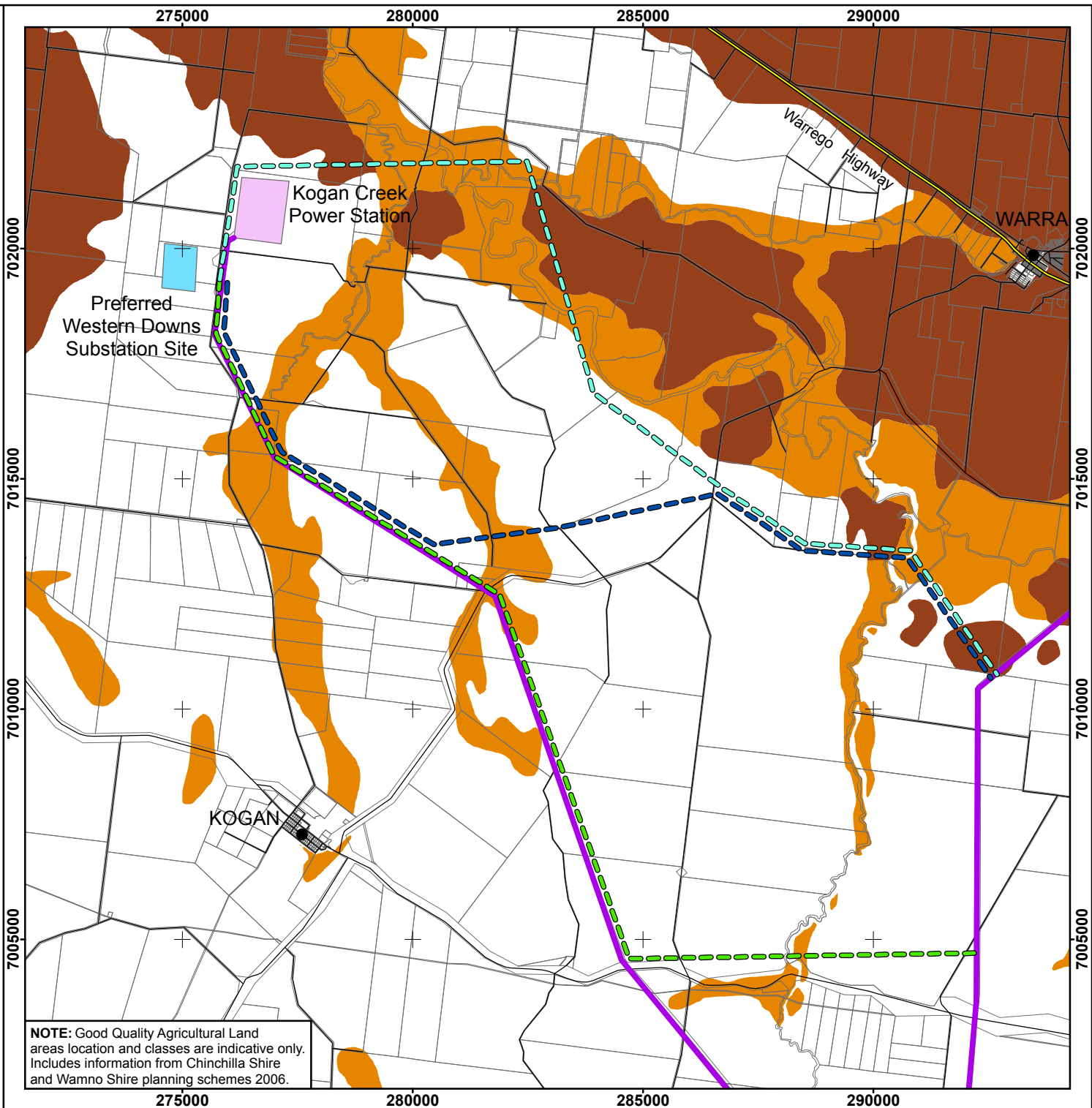
- Class A
- Class B



0 500 1,000 2,000 3,000 4,000
Metres

Scale 1 : 120 000

Datum / Projection: GDA94 MGA Zone 56

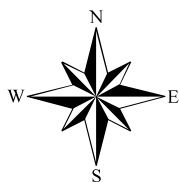


Powerlink Western Downs PAR Planning Scheme

Features
Figure 4.6

Alignment Options

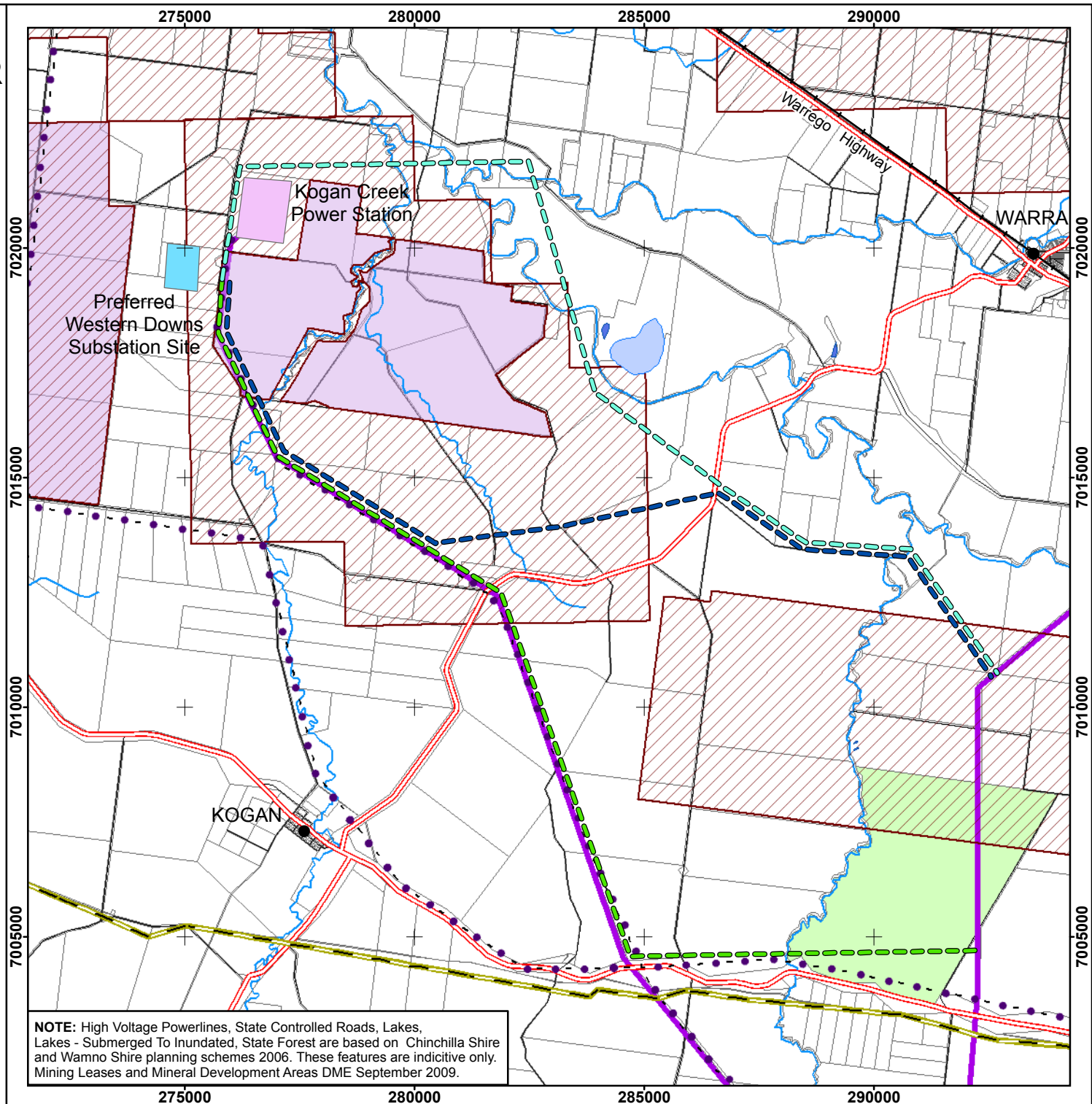
- Northern Route
- Central Route
- Southern Route
- State Controlled Roads
- Petroleum and Gas Pipeline
- Highway
- Road
- Railway
- High Voltage Powerline
- 275 kV
- Watercourse
- Power Station
- Sub-station
- Lake
- Lake - Submerged to Inundated
- Mineral Development License
- Mining Lease
- Cadastre
- State Forest



0 500 1,000 2,000 3,000 4,000
Metres

Scale 1 : 120 000

Datum / Projection: GDA94 MGA Zone 56





5.0 COMPARATIVE ASSESSMENT OF OPTIONS

5.1 QUANTITATIVE AND QUALITATIVE ANALYSIS OF OPTIONS

This section provides a comparative assessment of corridor options for criterion identified in Table 5.1 below to develop a preferred alignment. Table 5.1 provides a list of the criteria selected, a rationalisation for these selections and describes the performance measures used to comparatively assess the three alignment options.

A 'quantitative' and 'qualitative' assessment has been adopted in order to adequately select a preferred corridor. The 'quantitative' assessment involved comparing the issues associated with each alignment option for each criterion numerically (where possible). The 'qualitative' assessment involved outlining, comparing and discussing the issues associated with each alignment option for each criterion.

The 'quantitative' assessment is outlined in Table 5.2. The 'qualitative' assessment is outlined in Table 5.3 and provides the reasons behind or the 'why' and 'how' of the results of the 'quantitative' assessment.

TABLE 5.1 CRITERIA RATIONALISATION AND PERFORMANCE MEASURES

CRITERION	REASON FOR UTILISATION AND PERFORMANCE MEASURES
Water Crossings	There are possible impacts on waterways due to construction of the proposed transmission line. In order to comparatively assess the options, the impact was determined by counting the number of times an option traversed a mapped watercourse or wetland.
Vegetation Cover and Clearing	There are possible impacts on site ecology due to construction of the proposed transmission line. In order to comparatively assess the alignment options, the impact was determined by measuring (in length) the amount of mapped REs each option spans.
Houses and Land Titles	There is a potential impact on residents and land (title) owners in the Study Area. In order to comparatively assess the options, the impact was determined by counting the number of buildings within a 50m and 100m buffer of each alignment option. The impact for land (title) owners was determined by counting the number of land titles traversed by an option.
Good Quality Agricultural Land	There is a potential impact on Good Quality Agricultural Land in the Study Area. In order to comparatively assess the alignment options, the impact was determined by measuring (in length) the amount of Good Quality Class A and B land traversed by each option.
Infrastructure	The presence of infrastructure along each option is a potential impact upon the cost of construction/maintenance and the feasibility of the proposed alignment option. In order to comparatively assess the alignment options, the impact was determined by counting the number of times each option crossed a road.
Visual Amenity	There is a potential impact on visual amenity within the Study Area. The impact on visual amenity was determined by counting the number of major roads (i.e. the number of times the proposed option would be seen from the road), the amount (in length) of the proposed option crossing a major public road (i.e. for how long would the proposed option be seen from the road) and the presence of any natural/visual screening.
Construction and Maintenance	Certain construction and maintenance methods/issues are associated with each option and are a potential impact upon the cost of construction and maintenance and the feasibility of the proposed option. For ease of assessment it is assumed that the construction cost/km remains the same for each option. Therefore, in order to comparatively assess the options, the impact was determined by measuring the length of each option.
Proximity to Tong Park Piggery	Tong Park Piggery is the largest piggery in the southern hemisphere. Where possible, disturbance to this area should be minimised. In order to comparatively assess the options, the impact was determined by measuring the length that the alignment option traverses in close proximity to the piggery.
Irrigation Country Traversed	There are irrigation properties along the Condamine Floodplain in the northern part of the Study Area. In order to comparatively assess the alignment options, the impact was determined by measuring the length of irrigation country traversed.

TABLE 5.2 QUANTITATIVE ASSESSMENT OF PROPOSED ALIGNMENT OPTIONS

CRITERIA CATEGORY	CRITERIA	NORTHERN OPTIONS	CENTRAL OPTION	SOUTHERN OPTION
Waterway Crossings	Number of 'watercourses' or 'wetlands' traversed	6	3	2
Vegetation Cover and Clearing	Length of Remnant Vegetation Traversed	4.3km	8.3km	13.6km
	Length of Endangered Remnant Vegetation Traversed	0.8km	0.3km	0.0km
Houses and Land Titles	Number of houses within 500m of the proposed alignment	2	2	2
	Number of land titles affected	24	16	17
Good Quality Agricultural Land	Length of Good Quality Class A and B land traversed by each proposed alignment	11.8	5.4	2.8
Infrastructure	Number of times roads crossed by proposed alignment	3	2	5
Visual Amenity	Number of principal roads or rail line crossed	0	0	0
	Length of line traversing major public roads	0	0	0
	Natural/visual screening	Low	Medium	Medium
Construction and Maintenance	Length of each proposed alignment	24.5km	24.6km	35.5km
Proximity to Tong Park Piggery	Length of proposed alignment within close proximity to Tong Park Piggery	2.8km	2.8km	8.2km
Irrigation Country Traversed	Length of irrigation country traversed by proposed alignment	3km	0	0

TABLE 5.3 QUALITATIVE COMPARATIVE ASSESSMENT OF ALIGNMENT OPTIONS

CONSTRAINT TYPE	NORTHERN ALIGNMENT	CENTRAL ALIGNMENT	SOUTHERN ALIGNMENT	COMPARISON OF CRITERIA
Water Crossings	The alignment traverses the Condamine River and Cooranga Creek twice and Braemar Creek and Kogan Creek once.	- The alignment traverses Kogan, Eastern Branch and Braemar Creek. - The alignment is downstream of a lacustrine wetland on Braemar Creek.	The alignment traverses Kogan and Braemar Creek.	- All options cross creeks and drainage lines. - The northern option has the most creek/river crossings including two crossing of the Condamine River. - The central option traverses three creeks - The southern option traverses two creeks. - Therefore, the Central and Southern Options are the preferred options.
Vegetation Cover and Clearing	- The alignment traverses a number of riparian corridors and involves traversing 0.8km of endangered remnant vegetation (largest spans through 'endangered' and 'of concern' remnant vegetation of the three options). - Relatively high risk of endangered ecological grassland communities to be found within this alignment.	- The alignment traverses 0.3km of endangered and 0.9km of 'of concern' remnant vegetation. There is potential to deviate the alignment slightly to minimise or avoid disturbance of these endangered REs. - Moderate risk of impacting upon Weeping Myall woodlands endangered ecological communities, particularly throughout RE 11.3.2. - The amount of vegetation which may be impacted is relatively high given the large tracts of mapped remnant vegetation this alignment traverses.	- The alignment traverses the highest amount of remnant vegetation, spanning across 13.6km. - Moderate risk of risk of impacting upon Weeping Myall woodlands endangered ecological communities, particularly throughout RE 11.3.2. - The amount of vegetation which may be impacted is relatively high given the large tracts of mapped remnant vegetation this alignment traverses. - Incremental clearing along existing line.	- The southern option will require the longest span over mapped REs followed by the central route. - The northern options traverses the longest length of 'endangered' RE. - The southern option traverses no 'endangered' RE. - There is a high risk of encountering threatened grassland ecological communities protected under the EPBC Act in the northern option. - Therefore, the Central option is the preferred option, particularly if the option can be deviated slightly to avoid crossing the 0.3km of 'endangered' RE, in terms of vegetation cover and clearing.
House and Land Titles	- There are two houses within 500m of the northern alignment. - The northern alignment traverses 24 separate land titles.	- There are two houses within 500m of the central alignment. - The central alignment traverses 16 separate land titles.	- There are two houses within 500m of the southern alignment. - The southern alignment traverses 17 separate land titles.	- All three options pass within 500m of two houses. - The northern option traverses the highest number of land titles, followed by the southern option.

CONSTRAINT TYPE	NORTHERN ALIGNMENT	CENTRAL ALIGNMENT	SOUTHERN ALIGNMENT	COMPARISON OF CRITERIA
				Therefore, the Central option is the marginally preferred option in terms of potential impacts on house and land titles.
Good Quality Agricultural Land	Traverses 9.8km of A and B Class Good Quality Agricultural Land (GQAL).	Traverses 5.2km of A and B Class GQAL.	Traverses 2.7km of B Class GQAL.	- The Northern and Central options both traverse land which is designated Class A GQAL. The Northern option crosses substantially more of this GQAL land compared with the Central option. The Southern option does not cross any Class A land. - Therefore, the Southern option is the preferred option in terms of the potential impacts on GQAL.
Flora and Fauna	The risk of impacting on endangered species known to the study area is moderate.	The risk of impacting on endangered species known to the study area is moderate.	The risk of impacting on endangered species known to the study area is moderate.	- There is potential for species of conservation significance to occur across the Study Area and the three options. - Due to a lack of site specific investigations, it is difficult to determine which option may have the least impact on flora and fauna of conservation significance. - Therefore, there is no clear preferred option for this criteria due to a lack of detailed understanding of the potential impacts on flora and fauna of conservation significance and potential mitigation measures.
Infrastructure	The northern option crosses 3 roads.	The central alignment option crosses over 2 roads.	The southern alignment option crosses over 5 roads.	- The southern and central options cross over the most roads. - Therefore, the northern option is the preferred alignment with regard to infrastructure.

CONSTRAINT TYPE	NORTHERN ALIGNMENT	CENTRAL ALIGNMENT	SOUTHERN ALIGNMENT	COMPARISON OF CRITERIA
Visual Amenity	- The two crossings of the Condamine River will have a significant impact on the scenic amenity of the river corridor. - The section of the route north of the Condamine River is likely to be visible from the Warrego Highway. - Houses are within 200m of the route.	- One house is located within 200m of the route. - The route will be intermittently visible to the east of the Warra Kogan Road where the route rises up a ridge.	The route will be intermittently visible from the Kogan Condamine Road.	The southern option has the least visual impact and therefore the Southern option is the preferred alignment from a visual impact perspective.
Forest and Conservation Areas	Alignment does not traverse any State Forest or Conservation Area.	Alignment does not traverse any State Forest or Conservation Area.	Traverses 3.8km of Dalby State Forest.	The southern option is least preferred and either the northern or central options would have a lesser impact on Conservation areas.



5.2 SUMMARY OF ANALYSIS

A three-tiered approach to this corridor selection process has been undertaken to consider the three tenets of sustainable development: social, economic and environment.

When considering the potential social impacts of the alignment options, this assessment considered the number of houses within proximity to each of the alignments, the number of land titles affected and visual amenity issues. It is considered that the potential social impacts of all three alignments are low because of the location of the Project as well as the surrounding land uses and low population density. From a visual impact perspective, the central and southern alignment options have the potential to have a lesser impact due to greater natural screening afforded by existing vegetation. As the northern alignment crosses vast areas of open pasture and cropping country, there is a higher probability that visual impacts will occur. The northern alignment also crosses the highest number of land titles which may result in impacts to a larger number of landholders than the central and southern alignments. From a social impact perspective, the southern and central alignments are preferred over the northern alignment.

When addressing the potential economic impacts of the alignment options, this assessment considered the number of land titles affected, the length of GQAL to be traversed, the number of times the alignment crosses infrastructure such as roads, the length of irrigated country traversed, the proximity to Tong Park Piggery and the total length of the alignment. The southern and northern alignments both pose potential threats to the economic values of the study area and additionally, may result in higher acquisition, construction and maintenance costs for Powerlink. Over 8km of the southern route travels within close proximity to Tong Park which may impact on the piggery operations. In addition to this, the southern route is approximately 10km longer than both the northern and central routes and thus higher construction and maintenance costs can be expected. Of the three alignment options considered, the northern alignment traverses the most GQAL Class A and B land. In addition to this, the northern alignment is the only alignment option that traversed irrigated country which could result in disruption of farming practices for landholders and increased acquisition costs should Powerlink need to acquire this land. Overall, the central alignment has the least potential to negatively impact the area's economic values. In addition to this, the central option provides the most economically viable option for Powerlink when considering acquisition, construction and maintenance costs.

The environmental criteria considered during this assessment included the number of watercourses traversed, the length of remnant vegetation traversed, the length of endangered REs traversed, potential for impacts on flora and fauna and the potential to impact on forest and conservation areas. Whilst all options cross creeks and drainage lines, the northern option is the least preferred option from a waterways perspective due to the fact that it has the most creek crossings and additionally requires two crossings of the Condamine River. When considering potential impacts on vegetation, the southern options will require the longest span over mapped REs (13.6km) however the northern option will traverse the largest amount of Endangered RE. In addition to this, there is a high risk of encountering threatened grassland ecological communities protected under the EPBC Act along the northern alignment. When considering potential impacts to forest and conservation areas, the southern option is the only option which will impact such values, traversing 3.8km through Dalby State Forest. Therefore, from an environmental perspective, the central alignment is the preferred alignment.



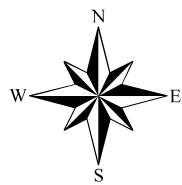
6.0 CONCLUSION

This Preferred Alignment Report has considered the social, economic and environmental values of the Study Area and has assessed the potential for each corridor alignment to impact these values. A range of criteria were developed to assess the potential impacts on these values. On balance and in consideration of all criteria, the Central Option is the preferred alignment.

In consideration of the adoption of the central alignment as the preferred alignment for the proposed route, a Study Corridor has been created around this alignment. It is now intended that this alignment will form the basis of the environmental impact assessment and community consultation to determine the preferred alignment for the transmission line.

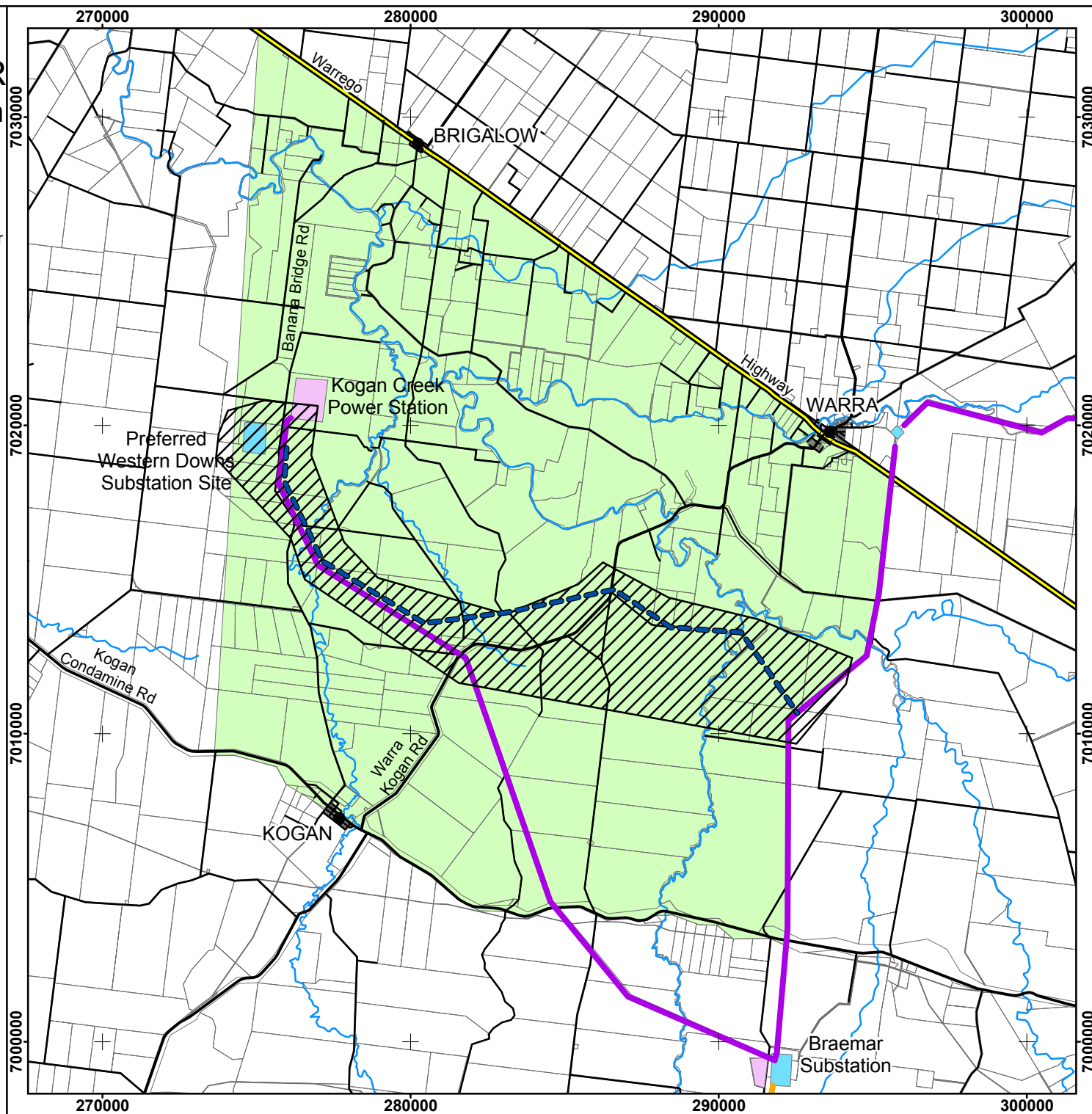
Powerlink Western Downs PAR Preferred Transmission Corridor Figure 6.1

-  Preliminary Alignment
-  Preferred Transmission Corridor
-  275 kV
-  330 kV
-  Power Station
-  Sub-station
-  Highway
-  Main Road
-  Local Road
-  Watercourse
-  Cadastre
-  Study Area



0 1,000 2,000 4,000 6,000 8,000 Metres

Scale 1 : 180 000
Datum / Projection: GDA94 MGA Zone 56



APPENDIX A APPENDIX NAME

Table A1 Flora Species of Conservation Significance

SPECIES	COMMON NAME	NCA STATUS	EPBC STATUS	HABITAT
<i>Eucalyptus curtisii</i>	Plunkett Mallee	R	-	Sandstone ridges in woodland / open forest
<i>Philotheca sporadica</i>		V	V	Condamine River catchment on soils derived from low fertility laterised Cretaceous sandstones
<i>Solanum papaverifolium</i>		E	-	Grows in heavy clay soils, sometimes as a weed of crops
<i>Acacia chinchillensis</i>		NT	V	Confined to sandy or gravelly soil in the Chinchilla area.
<i>Cadellia pentastylis</i>	Ooline	V	V	Occurs in vine thickets or dry rainforest, and more rarely woodlands. It is a relict rainforest species and tends to favour upper and mid slope positions, often with a northerly aspect. It commonly occurs on sandy-loam to clay soils of low to medium fertility
<i>Dichanthium queenslandicum</i>	King Blue-grass	V	V	Confined to black clay soils that support Bluegrass communities.
<i>Digitaria porrecta</i>	Finger Panic Grass	R	E	Grasslands and grassy woodlands, particularly Qld bluegrass communities
<i>Diuris sheaffiana</i>	Tricolour Diuris	-	V	Dry sclerophyll woodland and forest among grass; often with Callitris. Soils are often sandy or lateritic and landform ranges from flat to low lateritic hills
<i>Homopholis belsonii</i>	Belson's Panic	E	V	Dry woodlands including Mountain Coolibah, Wilga, Poplar Box and Belah, on basaltic and other soils.
<i>Rhaponticum australe</i>	Austral Cornflower	V	V	Grasslands and grassy woodlands on heavy soils

(Source: Wildlife Online (DERM) & EPBC Database (DEWHA)) E = Endangered V = Vulnerable R= Rare NT= Near Threatened

Table 1B Fauna Species of Conservation Significance

SPECIES	COMMON NAME	NCA STATUS	EPBC STATUS	HABITAT
<i>Furina dunmalli</i>	Dunmall's Snake	V	V	Prefers Brigalow (<i>Acacia harpophylla</i>) forest and woodland growing on cracking black clay and clay loam soils on the Darling Downs.
<i>Hemiaspis damelii</i>	Grey Snake	E	-	Favours cracking flood-prone soils in the Brigalow Belt. Shelters in soil cavities.
<i>Anomalopus mackayi</i>	Five-clawed Worm-skink	E	V	Natural grasslands on deep cracking clays.
<i>Tympanocryptis pinguicolla</i>	Grassland Earless Dragon	E	V	All specimens are known from highly modified agricultural land. Large areas of native and introduced grasses existing as headlands, and along drainage lines are a feature of the farmlands where the dragon exists. Soils are essentially black, cracking clays of the Condamine River flood plain.
<i>Apis pacificus</i>	Fork-tailed Swift	-	M	Low to very high airspace over varied habitat, rainforest to semi-desert.
<i>Ardea alba</i>	Great Egret	-	M	Wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs.
<i>Ardea ibis</i>	Cattle Egret	-	M	Wide range of open habitats from grazing paddocks to wetlands and tidal mudflats.
<i>Lophoictinia isura</i>	Square-tailed Kite	R	-	Eucalyptus woodland, open forest and heath-woodland.
<i>Erythroriorchis radiatus</i>	Red Goshawk	E	V	Open forests, woodlands especially near rivers, wetlands, rainforest fringes
<i>Gallinago hardwickii</i>	Latham's snipe	-	M	Soft wet ground or shallow tussocks and other green or dead growth.
<i>Geophaps scripta scripta</i>	Squatter Pigeon	V	V	Grassy understorey of eucalypt woodland, usually with ready access to water
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	-	M	Usually coastal, over islands, reefs, headlands, beaches, bays, estuaries, mangroves, seasonally flooded inland swamps, lagoons and floodplains.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	High open spaces above almost any habitat.
<i>Lathamus discolor</i>	Swift Parrot	E	E	Eucalypt forests and woodlands, plantations and banksias
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	Forests and woodlands with abundant Casuarina trees.
<i>Lophochroa leadbeteri</i>	Major Mitchell's Cockatoo	V	-	Open, sparsely timbered grasslands, drier farmlands with well-treed paddocks, Callitris and Casuarina country.
<i>Neophema pulchella</i>	Turquoise Parrot	R	-	Woodland and open grassland, natural or partially cleared.
<i>Merops ornatus</i>	Rainbow Bee-eater	-	M	Open country of woodlands, open forest, semi-arid scrub, grasslands, clearings in heavier forests and farmlands.

SPECIES	COMMON NAME	NCA STATUS	EPBC STATUS	HABITAT
<i>Nettapus coromandelianus</i>	Cotton Pygmy-Goose	R	M	Deeper freshwater swamps, lagoons, dams.
<i>Neochima ruficauda ruficauda</i>	Star Finch	E	E	Swamp vegetation, open grassland with sparse vegetation, cultivated land.
<i>Rostratula australis</i>	Australian Painted Snipe	-	V	Well vegetated shallows and margins of wetlands and other water courses.
<i>Rostratula benghalensis</i>	Painted Snipe	V	V/M	Surrounds and shallows of wetlands that are well vegetated with dense low cover.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	R	V	Caves and mines in dry sclerophyll forests and woodlands as well as higher altitude moist eucalypt forest and edges of rainforest.
<i>Dasyurus hallucatus</i>	Northern Quoll	-	E	Variety of vegetation types, but particularly in rocky eucalypt woodlands and near creeks.
<i>Nyctophilus timoriensis</i> (South-eastern form)	Eastern Long-eared Bat	V	V	A range of dry woodland and shrubland communities, roosts mainly in tree hollows, forages low amongst the canopy and shrub layers.
<i>Maccullochella peelii peelii</i>	Murray Cod	-	V	Prefers deep holes with abundant snags in slow-moving rivers

(Source: Wildlife Online (DERM) & EPBC Database (DEWHA)) E = Endangered V = Vulnerable R= Rare NT= Near Threatened M = Migratory