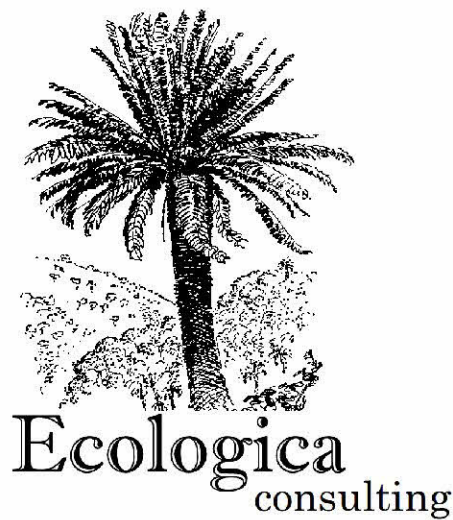


Pre-Clearance Survey Report
for
KP0-KP130 of the GLNG Pipeline Project

Report prepared for
GLNG Pty Ltd

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Glossary

Acronym	Details
CSG	Coal Seam Gas
DERM	Department of Environment and Resource Management
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
E	Endangered
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVNT	Endangered, Vulnerable or Near Threatened
GTP	Gas Transmission Pipeline
Ha	Hectare
km	Kilometre
KP	Kilometre Point
LC	Least Concern
LNG	Liquefied natural gas
M	Metre
NC Act	<i>Nature Conservation Act 1992</i>
NCN	No Common Name
NSW	New South Wales
NT	Near Threatened
Qld	Queensland
RE	Regional Ecosystem
ROW	Right of Way
SEVT	Semi-evergreen Vine Thicket
SMP	Species Management Plan
SPRAT	Species Profile and Threats Database
SSMP	Significant Species Management Plan
TEC	Threatened Ecological Community
V	Vulnerable
Vic.	Victoria
VM Act	<i>Vegetation Management Act 1999</i>

1. Introduction

1.1 Background and context

The GLNG project is run in partnership between Santos GLNG Pty Ltd (including GLNG Operations and its shareholders), PETRONAS Australia Pty Ltd, Total E&P Australia and KOGAS (from here on in referred to as the Proponent) and involves the development of coal seam gas resources in the Bowen and Surat Basins around Roma, construction of a pipeline from the gas fields to the coast, and construction of up to three processing trains at a liquefied natural gas (LNG) plant and export facility on Curtis Island, off Gladstone.

On 16 July 2007, the Coordinator-General declared the Project to be a ‘significant project’ for which an environmental impact statement (EIS) is required in accordance with Part 4 of the *State Development and Public Works Organisation Act 1971* (Qld).

On 31 March 2008 and 14 April 2008, the Australian Government Minister for the Environment, Heritage and the Arts determined that the five referrals relating to the project, being Coal Seam Gas (CSG) fields, the gas transmission pipeline (GTP), LNG terminal, marine environment and bridge to Curtis Island, were each a ‘controlled action’ pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The EIS process was finalised during February 2010 and on the 28 May 2010, GLNG became Australia’s first major coal seam gas to LNG project to receive its environmental approval from the Qld Coordinator-General. On 22 October 2010, the project received its environmental approval from the Commonwealth Environment Minister under the EPBC Act (2008/4096).

In accordance with Condition 5, 6 and 7 of the EPBC Act approval conditions, pre-clearing ecological surveys began in October 2011. As instructed by GLNG, all surveys have been undertaken based on the Revision C2 alignment.

Due to the length of the pipeline it was necessary to divide the pipeline into three sections with separate survey teams and three separate reports. The breakdown is as follows:

- KP0 – KP130 (Fairview CSG Fields to Expedition Range)
- KP130 – KP350 (Expedition Range to Calliope River)
- KP350-KP420 (Calliope River to LNG Facility, Curtis Island)

This report discusses the findings of the pre-clearing ecological surveys between KP0-KP130 which have been undertaken in accordance with Condition 5 and 6 of the EPBC Act Approval for the GLNG Pipeline Project. Where relevant, the findings of other ecological surveys undertaken during 2010, 2011 and 2012 have also been discussed.

It should be noted that the purpose of this document is not to provide species specific information as would normally be provided in an ecological survey report. This information can be found in the Species Management Plan (SMP) and the Significant Species Management Plan (SSMP).

1.2 Previous Survey Effort

As part of the preliminary environment investigations, an EPBC Referral and an EIS were completed for the GLNG project. The findings of the EIS did not identify the presence of any conservation significant species between KP0 and KP130 of the GTP ROW. This is likely attributable to the scope of works and methodology adopted.

However, since 2008, numerous ecological studies have been conducted on behalf of Santos and GLNG. These studies have identified the presence/absence of: Threatened Ecological Communities; Endangered and Of Concern Regional Ecosystems; as well as a number of conservation significant flora and fauna and where applicable, these findings have also been included within this report.

2. Limitations

Database results

It should be noted that the data derived from Government environmental databases to support this assessment have caveats regarding the robustness or completeness of the information. This includes DERM's Wildlife Online database, DERM's Wetlandinfo Database and the Queensland Herbarium's HERBRECS data which are based on specimens actually recorded as present in the given area.

Species record data received through the Queensland Herbarium (HERBRECS) may vary in precision (accuracy), up to approximately 100km in some cases. Furthermore, some of the species records may be dated (i.e. pre 1950), and thus may not provide an accurate representation of species that currently exist within the region.

Data extracted from the Commonwealth's EPBC Act Protected Matters Reporting Tool is sourced from a combination of actual records, primarily from State Government databases, combined with modelled distributions of species according to their ecological characteristics. Not all species listed under the EPBC Act have been mapped and therefore the EPBC Act Protected Matters Report is to be used as a general guide only.

The absence of species from a search of the above-mentioned databases for a defined area does not imply that that species does not occur in that area. Furthermore, species records may be dated, and thus may not provide an accurate representation of the species currently found within the region. In addition, it can also be said that a record for the area does not directly imply that the species will occur within the defined study area.

Field results

The following limitations or constraints were relevant to the fieldwork activities:

- It is important to note that not all species noted as potentially inhabiting the area were identified during the monitoring programme. Factors include the intensity and resourcing of the programme, cryptic nature and behaviour of some species, resource availability (food, habitat and water), breeding patterns, migration, vagrancy as well as seasonal and spatial variation. The use of existing database information and studies relevant to the area with consideration to the precautionary principle and habitat associations was used to limit the risk.
- The works were generally confined to the GTP ROW footprint due to access constraints outside this area. This restricted the field team's ability to map the extent and accurately delineate TEC communities and REs.
- The sampling was a one off event, limiting temporal variation. However, data is further supplemented by desktop studies, habitat assessments and data collected by Ecologica Consulting staff during other survey works in the area.
- Fires in the lead up to the surveys have impacted on local floral and faunal assemblages.
- Access and OHS constraints also impacted on the methodology and level of assessment (eg storms in the afternoon were frequent and thus leaving traps open posed a risk to the animals (direct due to drowning put also indirectly by weather delaying access). As such pitfall and cage trapping was not undertaken in these areas.

- The surveys were largely confined to KP0 to KP37 as this area was identified as key habitat for a number of species. Areas between KP36 and KP130 were not comprehensively assessed as they are primarily attenuated pastoral grasslands. Despite this, targeted surveys (threatened flora, vegetation and habitat assessment) of major watercourses and large areas of Brigalow regrowth were undertaken (KP67 to KP69 and KP98 to KP101). Given the length of the pipeline and the current land uses in these areas, it is not practicable to survey these sections of the ROW. As such it is necessary to identify representative sites within the ROW, which, after in-depth desktop and site assessments, were confirmed as occurring within KP0-KP37. These sites were then surveyed comprehensively and in accordance with the CG's Conditions and the National Survey Guidelines for Australia's Threatened Species. Pastoral grasslands provide very little habitat for many species, particularly Endangered, Vulnerable or Near Threatened (EVNT) species which are typically of a threatened status due to habitat clearing and/or disturbances. Limited survey effort between KP36 to KP130 is not considered a major limitation due to the lack of habitat values this area exhibits and the low potential for EVNT species occurring.
- Saipem, the Principal Contractor is responsible for undertaking ecological surveys in non-remnant and regrowth areas to confirm the absence/presence of EVNT species or threatened ecological communities. Between KP37 to KP130 AusEcology are the nominated consultancies responsible for undertaking these surveys.

3. Methodology

In accordance with Condition 6 of the EPBC Act approval, the surveys have:

- Been undertaken in accordance with any relevant Commonwealth guidelines.
- Used best practice methods in the field.
- Been led by suitably qualified Ecologists approved by the Commonwealth in writing.

Additionally, species listed as Endangered, Vulnerable or Near Threatened under the *Nature Conservation Act 1992* (NC Act) were also targeted. Where applicable, these species were surveyed in accordance with the same EPBC Act approval conditions. Special Least Concern and Back on Track species were recorded as opportunistic sightings.

All surveys have been undertaken in accordance with the relevant scientific purposes permit and ethics approval.

3.1 Survey Personnel

Pre-clearance ecological surveys between KP0 and KP37 were undertaken by Boobook Consulting and led by Mr Craig Eddie who is approved to undertake pre-clearing surveys along the GTP ROW in accordance with the EPBC Act approval conditions.

Boobook personnel have extensive survey experience particularly within the Central Queensland and Brigalow Belt regions, including Arcadia valley and Fairview CSG Fields. The field teams involved both Botanists and Ecologists familiar with the Commonwealths survey guidelines for threatened species.

Incidental surveys undertaken between KP0 and KP130 have been undertaken by both Boobook Consulting and Ecologica Consulting. These surveys have been led by either Craig Eddie (Boobook), Alicia Wain, Michael Price or Bree Wilson (Ecologica) who are all EPBC Act approved.

3.2 Desktop Analysis

Prior to developing and implementing the survey methodology, a desktop analysis for this section of the GTP ROW and its immediate surrounds was undertaken. This analysis was used to obtain background information on the mapped vegetation communities and their status; the floral and faunal assemblages likely to occur and their status on a local, regional, state and national level; and the potential presence of significant species.

As part of this analysis, a number of databases and mapping were reviewed. Key information reviewed included the following:

- The Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) EPBC Act Protected Matters Search (EPBC Report) Tool.
- DSEWPC Species Profile and Threats Database.
- The Queensland Department of Environment and Resource Management's (DERM) Wildlife Online database.
- DERM WetlandMaps and WetlandInfo databases.
- DERM's Regional Ecosystem (RE) Mapping and Essential Habitat data.
- DERM's High Value Regrowth Mapping.
- DERM's Regional Ecosystem Description Database.
- Queensland Herbarium's HERBRECS database extract.
- Birdata.
- Queensland Museum data.
- Atlas of Living Australia.
- Aerial imagery (to gain an appreciation of local landscape and of the project's proximity to sensitive areas).

Spatial analysis of this section of the GTP ROW was undertaken to assess the extent of Regional Ecosystems (Regional Ecosystem mapping Version 6.1b). From DERM's RE mapping, the location of potential threatened, ecological communities were mapped (based on analogous REs).

Spatial analysis was also used to identify discrepancies within the RE mapping especially areas incorrectly mapped as remnant when they have been cleared (based on aerial imagery). However, it should be noted that due to restrictions with sampling outside the GTP ROW, the focus of remapping was the GTP ROW only or where the polygons were clearly defined.

A number of existing guidelines, reports and approvals were also used as references for conducting this study, both as a guide for developing the survey methodology as well as providing supporting information during the reporting. These documents are listed in Table 1 below.

Table 1 Document reference list

Document Title	Source	Year/Version
Significant Species Management Plan (Rev 4)	GLNG	2012
Species Management Plan (Rev 3)	GLNG	2012
Draft Referral Guidelines for the Nationally listed Brigalow Belt Reptiles	DSEWPC	2011
Survey Guidelines for Australia's Threatened Bats	DSEWPC	2010
Survey Guidelines for Australia's Threatened Birds	DSEWPC	2010
Survey Guidelines for Australia's Threatened Frogs	DSEWPC	2010
Survey Guidelines for Australia's Threatened Mammals	DSEWPC	2011
Survey Guidelines for Australia's Threatened Reptiles	DSEWPC	2011
Level 1 Environmental Authority #PEN102664411	DERM	2011
EPBC Act Approval #2008/4096	DSEWPC	2010
Nature Conservation Act Class Exemption, DERM Ref BNE2010/1181 BNE42736	DERM	2010
GLNG Supplementary Environmental Impact Statement	URS	2010
GLNG Environmental Impact Statement	URS	2009
Platypus Survey – Upgrade of Hutton and Moonah Creek – Fairview, Eastern Queensland Gas Fields	Connell Wagner	2008

3.3 Survey Timing

Pre-clearing fauna and flora surveys between KP0 and KP37 were conducted over 20 consecutive days between October 25 and November 14, 2011 inclusive. Follow up surveys were undertaken in March 2012 to map out the presence/absence of *Xerothamnella herbacea* (between KP32-KP36) and in May 2012 to map the locations of *Cadellia pentastylis* (KP92-KP108).

3.4 Flora Surveys

The area between KP0 and KP36 and KP92 to KP108 were traversed by suitably qualified and experienced Ecologists with the aim of collecting the following information:

- Location and extent of any Commonwealth and/or State listed threatened species within the GTP ROW. These searches were undertaken using a random meander technique (Cropper 1993) which allowed for detailed searches to be conducted along the GTP ROW.
- Identification of any Commonwealth listed Threatened Ecological Communities (TEC) within the GTP ROW, including verification of DERM's current RE mapping.
- Location and extent of any declared pest species and/or Weeds of National Significance. These searches were undertaken using a random meander technique (Cropper 1993) which allowed for detailed searches to be conducted along the GTP ROW.
- Map the location and extent of any Type A Restricted species under the NC Act. These searches were undertaken using a random meander technique (Cropper 1993) which allowed for detailed searches to be conducted along the GTP ROW.
- Quaternary assessments within relevant vegetation communities in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 3.1* (Neldner et al. 2005).
- Bio-condition assessment at four locations between KP0-KP37 in accordance with the *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland: Assessment Manual: Version 2.1* (Eyre et al. 2011).

Where threatened flora (State and/or Commonwealth listed) were encountered the following information was collected:

- GPS location
- Number or density of individuals
- Population size (subject to access constraints)
- Habit
- Habitat association
- Sample for submission to the Qld Herbarium

Nomenclature

The majority of flora species observed were identified using appropriate field guides and taxonomic keys. Species not readily identifiable or considered to be threatened were sampled during the survey period and forwarded to Queensland Herbarium for identification and/or verification. Botanic and common names used in the report to describe flora were obtained from, Stanley & Ross (1983, 1986 and 1989), Harden *et al* (2006), Maslin (2001), Melzer and Plumb (2007), Anderson (2003), Santos (2007) and Jones (2006).

3.5 Fauna Surveys

3.5.1 Site Assessment Planning

In the lead up to the pre-clearance survey, time was spent planning the field work to ensure all threatened species potentially occurring within the area were identified and all EPBC listed targeted species would be surveyed in accordance with the species-specific EPBC survey guidelines. Where possible, threatened species under the NC Act were surveyed using the same methodology as EPBC listed species in order to maintain consistency throughout the survey.

Due to factors such as: accessibility; weather; resource availability; and the extensive area impacted by the GTP, it has not been possible to survey the entire area at this time. Consequently, representative sites were chosen based upon vegetation communities; topography; as well as known and potential suitable habitat for threatened species. Accessibility was a key limiting factor with respect to establishing survey locations. Accessibility was restricted in several areas within the GTP ROW due to factors such as landowner issues and/or the absence/unsuitability of access tracks. The absence of access tracks greatly limits the ability of the team to conduct the survey in an efficient and ethical manner (ie. long travel distances creates health and safety issues as well as impacts ability to clear traps within a suitable timeframe each morning).

3.5.2 Targeted Surveys

Due to the size and complexity of the local landscape and the composition of the local fauna assemblages, a variety of fauna survey techniques were adopted. The survey techniques aim as a minimum was to encapsulate the survey requirements for EPBC Listed species known or likely to occur in the area (ie as outlined in the relevant Survey guidelines for Australia's threatened animals).

Table 2, summarises the details each survey technique, the species targeted and the total trap effort for each species. NB. It should be noted that the linear nature of the development and the focused study does pose a degree of limitation to the survey technique and intensity.

Table 2 Survey Methodologies

Survey technique	Targeted EPBC listed species	Incidental	Intensity
Habitat assessment	All EPBC listed species	State listed fauna	At 40 sites between KP0 and KP136
Diurnal searches of key habitat areas	Northern quoll (<i>Dasyurus hallucatus</i>), Ornamental snake (<i>Denisonia maculata</i>), Yakka skink (<i>Egernia rugosa</i>), Dunmall's snake (<i>Furina dunmalli</i>), Brigalow scaly-foot (<i>Paradelma orientalis</i>), Collared delma (<i>Delma torquata</i>)	Other reptile species	Daily – minimum of two people
Nocturnal searches of key habitat areas	Northern quoll, Dunmall's snake, Ornamental snake, Brigalow scaly-foot	Nocturnal fauna, including owls, Koalas, gliders, geckoes and snakes	Variable due to the weather - minimum of two people
Roost searches - diurnal search of key roosting habitat (eg Baffle Creek) to identify roost sites (active or potential).	Large-eared pied bat (<i>Chalinolous dwyeri</i>) and South-eastern long-eared bat (<i>Nyctophilus corbeni</i>)	Other microbats, including the Little pied bat (<i>Chalinolous picatus</i>)	Initial survey by Ecologica Consulting in 2010. Follow up survey in 2011 by Boobook Consulting. Surveys were each at least two days by a minimum of two people.
Harp trapping	Large-eared pied bat and South-eastern long-eared bat	Other microbats, including the Little	Four harp traps over four nights^

Survey technique	Targeted EPBC listed species	Incidental	Intensity
		pied bat	
Passive and active acoustic	Large-eared pied bat Echolocation for the South-eastern long-eared bat is inconclusive – echolocation to genus possible though (ie <i>Nyctophilus</i> spp.)	Other microbats, including the Little pied bat	Minimum of five nights at a number five locations within this section of the GTP ROW
Cage trapping [^]	Northern quoll (<i>Daysurus hallactus</i>)	Other ground dwelling mammals	Not undertaken
Elliot trapping [^]	Northern quoll and Yakka skink (<i>Egernia rugosa</i>)	Other ground dwelling mammals, toads	Not undertaken
Call playbacks	Not applicable	Koalas, owls, including the Powerful owl, gliders and frogs	Undertaken over three nights
Pitfall trapping	Collared delma, Ornamental snake, Dunmall's snake and Brigalow scaly-foot	Other reptile species and ground dwelling mammals	Not undertaken
Cathedral traps, fyke nets, muddling, dip netting, diurnal and nocturnal observations from the bank and boat	Fitzroy River turtle (<i>Rheodytes leukops</i>)	Freshwater turtles, including the White-throated snapping turtle, and fish	3 days at each permanent watercourse crossing (Hutton Creek, Baffle Creek and Dawson River)
Remote cameras (baited or along runs)	Northern quoll	All large fauna	Over minimum of five nights
Flushing surveys	Squatter pigeons (<i>Geophaps scripta scripta</i>)	Other bird species	Daily – minimum of two people
Land-based area searches	Black-breasted button quail (<i>Turnix melanogaster</i>), Red goshawk (<i>Erythrotriorchis radiatus</i>), Australian painted snipe (<i>Rostratula australis</i>), Black-throated finch (<i>Poephila cincta cincta</i>), Star finch (<i>Neochmia ruficauda ruficauda</i>), Squatter pigeons	Other bird species	Daily – minimum of two people
Targeted searches (subject to available and size of habitat)	Red goshawk, Black-throated finch, Star finch and Australian painted snipe	Other bird species	Three days – minimum of two people
Flushing surveys	Squatter pigeons, Australian painted snipe	Other cryptic bird species	Daily – minimum of two people
Road traversing at night	Ornamental snake and Dunmall's snake	Other nocturnal fauna	Variable due to the weather
Scats, hair and traces	Northern quoll, Large-eared pied bat, South-eastern long-eared bat	Koala, gliders, macropods	Scats, hair and other traces were collected (where necessary) and sent to Barbara Triggs for analysis

Table notes:

[^] constrained by access and weather

3.5.3 Habitat Assessments

At each site, a habitat assessment was completed using a fauna survey habitat assessment pro-forma to ensure consistency in assessments. The key features forming the basis of the pro-forma include the following:

- Vegetation structure and species.
- Disturbance level of site and surrounds.
- Presence of habitat features including tree hollows, coarse woody debris, rocky outcrops, and water sources.
- Evidence of fauna including scats, tracks, bones, nests, scratch marks.
- Suitability of habitat for targeted threatened species.

Photos of each site were taken including GPS recordings of trap locations (including ANABAT and camera locations) and any sightings of threatened species.

Nomenclature

Fauna specimens were identified in the field using the following field guides:

- Pizzey and Knight (2007) and Simpson and Day (2010) for birds.
- Cogger (2000), Wilson and Swan (2010) and Wilson (2005) for reptiles.
- Robinson (2000), Cogger (2000) and Frogs Australia Database for amphibians.
- Menkhorst and Knight (2010), Churchill (2010) and Van Dyck and Strahan (2008) for mammals.

4. Results

As shown in the figure set (refer Appendix A), this section of the GTP ROW extends northwards through a section of the Fairview CSG Fields, intersecting Hutton Creek, Baffle Creek and gorge, Edwards Creek, prior to descending into Arcadia Valley. The GTP ROW continues northward through the Dawson River and the grazing lands of Arcadia Valley prior to heading in a roughly easterly direction towards Expedition Range.

As well as traversing several permanent creeks such as those discussed above, numerous ephemeral waterway crossings, and drainage lines are also impacted. The topography within this area is highly varied due to the number of ranges and valleys, as are the habitats and vegetation communities that are impacted as a result of the project. Woodlands, palustrine wetlands, floodplains, Semi-Evergreen Vine Thickets (SEVT) and Brigalow communities as well as gilgai habitat are prevalent throughout the GTP in varying degrees. Whilst the route selection for the GTP ROW aimed to avoid sensitive areas such as wetlands, in some situations numerous constraints within an area meant that impacting such areas could not be avoided.

As a general rule, the GTP ROW is 40m wide. Within sensitive areas (including threatened species habitats), the ROW has been reduced to a maximum width of 30m.

4.1 Threatened Ecological Communities

A search of the Commonwealth's Protected Matters Tool (DSEWPC 2012a) identified the following six nationally listed Threatened Ecological Communities (TEC) as potentially occurring within the GTP ROW.

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin
- Weeping Myall Woodlands

Of these, two were present within the GTP ROW whilst one community was observed adjacent as regrowth. The presence of these communities is discussed in further detail below.

Brigalow (*Acacia harpophylla* dominant and co-dominant)

Brigalow is a TEC listed as Endangered under the Commonwealth EPBC Act.

This community is commonly characterised by either the dominance or co-dominance of *Acacia harpophylla* (Brigalow) in the tree layer(s) (DSEWPC 2012b). Species with which it may be co-dominant include: *Casuarina cristata* (Belah); other *Acacia* species; and/or *Eucalypt* species.

Structurally, the community may exist in a variety of forms from low open woodlands to open forests with dominant tree layers ranging between 9m in height in low rainfall regions to 25m in height in higher rainfall areas (DSEWPC 2012b).

The commonwealth listing includes both remnant and regrowth communities that meet the criteria outlined in the SPRAT¹ profile.

In Queensland, the term Brigalow is used to describe a number of Regional Ecosystems² (RE) gazetted under the *Vegetation Management Act 1999* (VM Act). A number of these REs (16) are consistent with the EPBC Act's TEC listing and are therefore pursuant to the EPBC Act. Additionally, a number of high value regrowth³ communities mapped by DERM may also meet the criteria for inclusion within the TEC listing and are discussed in further detail below.

The Brigalow communities present between KP0-KP130 of the GTP ROW are associated with the following REs:

- RE11.9.5 - Open-forest dominated by *Acacia harpophylla* and/or *Casuarina cristata* (10-20m) or *Acacia harpophylla* with a SEVT understorey. Open-forest dominated by *C. cristata* is more common in southern parts of the bioregion. A prominent low tree or tall shrub layer dominated by species such as *Geijera parviflora* and *Eremophila mitchellii*, and often with SEVT species is often present. The latter include *Flindersia dissosperma*, *Brachychiton rupestris*, *Excoecaria dallachyana*, *Macropteranthes leichhardtii* and *Acalypha eremorum* in eastern areas, and species such as *Carissa ovata*, *Owenia acidula*, *Croton insularis*, *Denhamia oleaster* and *Notelaea microcarpa* in south-western areas. *Melaleuca bracteata* may be present along watercourses. Occurs on fine-grained sediments. The topography includes gently undulating plains, valley floors

¹ Species Profile and Threats Database.

² Regional Ecosystems are considered to be remnant ecological communities.

³ In Qld, high value regrowth communities are considered to be those that have not been cleared since December 1989.

and undulating footslopes and rarely on low hills. The soils are generally deep texture-contrast and cracking clays. The cracking clays are usually black or grey to brown or reddish-brown in colour, often self mulching and sometimes with gilgai microrelief in flatter areas. Some texture contrast soils are shallow to only (Queensland Herbarium 2011).

- RE11.9.5a - *Acacia harpophylla* predominates and forms a fairly continuous canopy (10-18m high). Other tree species such as *Eucalyptus populnea*, *Casuarina cristata*, *Cadellia pentastylis* and *Brachychiton* spp. may also be present in some areas and form part of the canopy or emerge above it. Scattered *Eucalyptus orgadophila* may occur, especially on upper slopes and crests. A dense tall shrub layer dominated by a range of species is usually present, while a more open low shrub layer often occurs. Common species in these layers include *Croton insularis*, *Denhamia oleaster*, *Apophyllum anomalum*, *Croton phebalioides*, *Alectryon diversifolius* and *Carissa ovata*. The ground layer is sparse; most frequently composed of *Ancistrachne uncinulata* and *Eragrostis megalosperma* and varies with the density of the shrub layers. Occurs on undulating plains and rises formed mainly on shales. The soils are predominantly cracking clay soils, which are strongly alkaline at or near the surface and acidic beneath, or dark brown and grey-brown gradational soils, with a coarse-textured surface grading into an alkaline, clayey subsoil (Queensland Herbarium 2011).

Based on DERM's RE mapping, remnant Brigalow communities occur within and directly adjacent the following sections of the GTP ROW:

- KP0.52 to KP1.14 (RE11.10.1/11.9.5a)
- KP1.73 to KP1.82 (RE11.10.1/11.9.5a)
- KP28.77 to KP29.09 (RE11.9.5a)
- KP32.99 to KP34.02 (11.9.5/11.9.5a/11.9.5a)
- KP34.93 to KP35.16 (11.9.5/11.9.5a/11.9.5a)
- KP36.21 to KP36.37 (11.9.5/11.9.5a/11.9.5a)
- KP45.88 to KP46.04 (11.9.5/11.9.5a/11.9.5a)

Based on the findings of the ground truthing surveys, the majority of the RE mapping is correct however the following inconsistencies have been noted:

- There is no Brigalow within or directly adjacent (200m either side) the GTP ROW between KP0.52 to KP1.14. The vegetation in this area is comprised of *Callitris glaucophylla* (dominant) with scattered *Corymbia clarksoniana*, *C. tessellaris* and *Eucalyptus melanophloia*. This is consistent with RE11.10.11 not the current mapping of RE11.10.1/11.9.5a.
- There is no Brigalow within or directly adjacent (200m either side) the GTP ROW between KP1.73 and KP1.82. The vegetation in this area is described as *E. populnea* open woodland with scattered vine thicket species in canopy + mid layer on rocky ridge slope. This is consistent with RE11.10.11 not the current mapping of RE11.1.1/11.9.5a.
- Despite the prominence of *Acacia harpophylla* within the vegetation communities between KP32 to KP36, some of this section is consistent with RE11.3.17, an Of Concern community not recognised as Brigalow under the EPBC Act.
- A small patch (~0.1ha) of Brigalow (RE11.9.5) is present within the GTP ROW corridor where it intercepts Bully Frog Creek around KP45.88 to KP46.04. However, the dominant vegetation in this area is *Eucalyptus melanopholia*.

Based on DERM's Regrowth mapping, the GTP ROW intercepts high value regrowth at the following locations:

- KP35.5 to KP36.5
- KP44 to KP45.5
- KP54 to KP55
- KP68 to KP69
- KP86 to KP87.5
- KP92 to KP92.5
- KP98 to KP101
- KP124.25 to KP124.5 (Deep Creek)

In consideration of the criteria for regrowth communities meeting the Brigalow TEC listing, the following observations have been made during ground truthing surveys:

- The regrowth communities at KP68 and KP69 are not consistent with the definition of Brigalow under the EPBC Act. In this area, the GTP ROW follows an existing fenceline where the vegetation is less than 10 years old. This is also the case for the regrowth communities between KP54 to KP55, KP92 to 92.5 and KP124.25 to KP124.5.
- There is a large patch of mapped regrowth between KP86 to KP87.5 follows a fenceline. This is also the case for Brigalow in association with Deep Creek. The GTP ROW avoids the vegetation in these areas.
- *Acacia harpophylla* is scattered throughout the GTP ROW between KP37 and KP130 as individual trees or small clumps. Larger patches of Brigalow also occur as isolated patches, including areas along fencelines and some drainage lines. However, these areas generally do not match the definition of Brigalow regrowth.

The GTP ROW generally avoids these larger patches, however two large areas of Brigalow will be intersected. These include sections of Clematis Creek upstream of the GTP ROW and a patch near KP101.

Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions

The TEC, Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions community is listed as Endangered under the EPBC Act. Compositionally, this woodland community includes *Eucalyptus coolabah* subsp. *coolabah* (Coolibah) and/or *E. largiflorens* (Black box) as the dominant canopy species. Structurally, the dominant tree layer will range between 5-15m in height with the understorey of this community tending to comprise of a grassy ground layer only (TSSC 2011).

This community type is analogous with a number of REs within Queensland, including RE11.3.3 and RE11.3.15. Based on DERM's RE mapping, no Coolibah communities are mapped as present within the KP0-KP130 section of the GTP ROW. This was confirmed during the field investigations, however it should be noted that small patches of *Eucalyptus coolabah* were identified outside the GTP ROW. This included a small community (approx. 2 ha) of *E. coolabah* on a drainage line near KP116 and a small patch of *E. coolabah* currently mapped as Brigalow near KP101.5.

Based on the criteria outlined in the conservation advice for this community, these areas do not meet the EPBC requirements for this community (TSSC 2011).

Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

This TEC is listed as Endangered under the EPBC Act. Based on the Conservation Advice for this community (DSEWPC 2012b), it is known to occur on fine textured soils derived from basalt or fine grained sedimentary rock and is generally comprised of perennial native grasses.

Compositionally, the species within this community may change both annually and seasonally in response to rainfall, temperature, fire, grazing and other land management practices. However the *Dichanthium* spp., *Aristida* spp. and *Panicum* spp. should remain dominant. Herbaceous species are typically present within this community also.

Seven REs under the VM Act are analogous with this TEC. Based on DERM's RE mapping, there are no mapped grassland communities present within or adjacent the KP0-KP130 section of the GTP ROW. Ground truthing surveys have also confirmed its absence within the GTP ROW for this area.

Semi-evergreen Vine Thicket of the Brigalow Belt (North and South) and Nandewar Bioregions

Semi-evergreen Vine Thicket of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT) is a TEC listed as Endangered under the EPBC Act.

SEVT is a form of dry, seasonal, subtropical rainforest present throughout Qld, NSW and Vic. on undulating plains on fine-grained sedimentary rocks (frequently shale) and on basalt hills and plains. These thickets also occur on coastal dunes, Quaternary alluvium, Tertiary clay plains, old loamy and sandy plains, or hills and lowlands on metamorphic rocks (McDonald 2010).

The composition of SEVT in the Brigalow Belt South (central region) is floristically diverse and heterogeneous. These communities are generally characterised by the prominence of trees with microphyll sized leaves and the frequent presence of *Brachychiton australis* and *B. rupestris* as emergents from the vegetation (McDonald 2010).

The thickets typically have an uneven canopy 4–15m high with mixed evergreen, semi-evergreen and deciduous emergent tree species between 9–25m high. The shrub understorey may be up to 2m high however the canopy can be quite dense and a distinct shrub layer may be absent. The ground stratum is usually sparse or absent. Vines, twining or scrambling plants are prominent (McDonald 2010).

In Queensland there are 15 types of SEVT communities described for the Brigalow Belt (North and South) Bioregion. Of this, 10 of these communities are included within the EPBC Act listing. Based on DERM's RE mapping, the GTP ROW does not intersect any REs analogous with SEVT, however this community is associated with the sandstone cliffs within the Fairview CSG Fields.

Ground truthing activities along the GTP ROW confirmed a small patch of SEVT between KP3.25 and KP3.5. This area is incorrectly mapped as RE11.10.1/11.10.13a. SEVT was also present in close proximity to the GTP ROW at KP7, but is mapped incorrectly as RE11.3.2.

The proposed works between KP0-KP130 of the GTP ROW will result in the removal of approximately 0.2ha of SEVT.

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin

This TEC is listed as Endangered under the EPBC Act and as outlined within the SPRAT database, is characterised by the following:

- *The native species that comprise the ecological community are assemblages of plant and animal taxa associated with and dependent on the springs and wetland areas located at points where the Great Artesian Basin groundwater is discharged naturally. The species include plants and animals that are endemic to one or more springs/wetlands and species that occur more widely in the Great*

Artesian Basin or beyond it. Not every species that is part of the listed ecological community will be present at every spring.

- *The groundwater is artesian water that has its origin in the Great Artesian Basin aquifer.*
- *The groundwater comes to the surface at points within Great Artesian Basin discharge areas which are the natural surface discharge points of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequences of the Basin. The discharge points and their associated wetland areas are variously called springs, artesian springs, mound springs, mud springs, boggomoss springs, spring pools and groundwater seeps.*

There are no known natural discharges, including: springs; mound springs; mud springs; boggomoss springs; spring pools; or groundwater seeps from the Great Artesian Basin within this section of the GTP ROW.

Weeping Myall Woodlands

Weeping Myall Woodlands are a TEC listed as Endangered under the EPBC Act. These woodlands primarily occur on alluvial plains as open woodlands to woodlands to 12m tall, in which *Acacia pendula* (Myall) trees are either the sole or dominant upper storey species. The under storey usually includes an open layer of shrubs above an open ground layer of grasses and herbs, however the community can exist naturally as either a shrubby, or grassy woodland (Commonwealth Australia, 2009).

Although the *Acacia pendula* occurs widely throughout Queensland, this community type is typically restricted to small patches that occur within the following two REs:

- 11.3.2 *Eucalyptus populnea* woodland on alluvial plains.
- 11.3.28 *Casuarina cristata* ± *Eucalyptus coolabah* open woodland on alluvial plains (Commonwealth Australia 2009).

Based on DERM's RE mapping (refer Appendix A) there is the potential for this community to occur both within and adjacent the GTP ROW as RE11.3.2 at the following locations:

- Near Christmas and Hutton Creeks between KP2.00 and KP3.00.
- Between Fairview 33 Access Rd and the Dawson River around KP30.00.
- South of Baffle Creek between KP20.00 and KP20.50.
- Ironbark Creek (East of Arcadia Valley South Rd) between KP62.00 and KP62.50.
- Clematis Creek (East of Arcadia Valley North Rd) between KP108.50 and KP108.75.

However, during the field surveys within the above-mentioned areas, no *Acacia pendula* was identified. Additionally, *Acacia pendula* has not been located in other areas between KP0-KP130. It is therefore considered that this community is not present in this section of works and the community will not be impacted.

4.2 Threatened Flora

Analysis of existing literature, GLNG data and reporting and Government databases and websites revealed the potential for six threatened plants protected under the EPBC Act and nine species under the NC Act to occur between KP0 and KP130 of the GTP ROW.

During the pre-clearing ecological surveys, a total of nine threatened flora species under the both EPBC and NC Acts were identified from within and/or adjacent the GTP ROW (KP0 - KP130). Two of these species are protected under the EPBC Act however one of those species, *Xerothamnella herbacea* has not been previously recorded from the local region.

Those found both within and adjacent the GTP ROW are outlined in Table 3.

Table 3 Threatened flora within and adjacent the GTP ROW

Species Name	Status		Location
	EPBC Act	NC Act	
<i>Cadellia pentastylis</i> (Ooline)	V	V	Inside the GTP ROW
<i>Gonocarpus urceolatus</i> (Raspweed)	-	V	Inside the GTP ROW
<i>Melaleuca irbyana</i> (NCN)	-	E	Inside the GTP ROW
<i>Wahlenbergia islensis</i> (NCN)	-	NT	Inside the GTP ROW
<i>Xerothamnella herbacea</i> (NCN)	E	E	Inside the GTP ROW
<i>Acacia spania</i> (NCN)	-	NT	Adjacent the GTP ROW
<i>Apatophyllum teretifolium</i> (NCN)	-	NT	Adjacent the GTP ROW
<i>Leucopogon grandifloris</i> (NCN)	-	NT	Adjacent the GTP ROW
<i>Macrozamia fearnsidei</i> (NCN)	V	LC	Adjacent the GTP ROW

Table notes:

EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999*

NC Act = *Nature Conservation Act 1992*

E = Endangered

V = Vulnerable

NT = Near Threatened

LC = Least Concern

NCN = no common name

With the exception of *Macrozamia fearnsidei*, those adjacent the GTP ROW were observed a sufficient distance away that impacts to these species is not considered likely and are therefore not discussed further. All other species are discussed in more detail below.

***Cadellia pentastylis* (Ooline)**

Cadellia pentastylis is listed as Vulnerable under both the EPBC Act and the NC Act and is known to occur between the Gunnedah area, the Carnarvon Range and the Callide Valley in Central Queensland (2008a).

This species is commonly associated with *Acacia harpophylla*, *Casuarina cristata* (Belah), *Acacia atemulata* (Bendee) and *Lysiphyllum carronii* (Red bauhinia) species in dry rainforest, vine thicket and sclerophyll communities on clay plains, sandstone slopes, and ridgelines (2008a).

The species is a fairly common feature throughout Arcadia Valley and has been observed as isolated individuals within the Carnarvon Highway road reserve; along Mulcahy's Road; and along Arcadia Valley Road. Additionally, a number of mature individuals were identified along an existing access track from Arcadia Valley Road to the GTP ROW between KP67-KP71.

During the 2012 pre-clearance survey period, *Cadellia pentastylis* (Ooline) was located in open pastoral grasslands and Brigalow regrowth between KP98 and KP101. The individuals observed from this area were generally isolated individuals, which ranged in height between 1.3m to 5m. Based on their form these individuals appear to be regularly managed by the landholder (ie coppicing).

Further survey effort in the form of direct count surveys between KP70 and KP130 were undertaken by Boobook Consulting and AusEcology during April and May 2012. These surveys have located approximately 260 individuals within the local vicinity of the GTP ROW and approximately 120 individuals within the GTP ROW (40m wide).

The majority of the individuals were recorded from a small patch of vegetation (<5ha) analogous with RE11.9.10 (*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks) near KP108. The high number of saplings and juveniles (based on height only) within this local population is likely due to landholder maintaining the local population (ie coppicing) however taller individuals to 30m in height were also present in this area.

Other individuals observed between KP70 and KP130 were mainly associated with open pastoral grasslands and were mainly juvenile specimens.

Where avoidance of individuals present was achievable, these sections of the GTP ROW have been reduced from 40m wide to a maximum of 30m wide. Additionally, a re-alignment of the current GTP ROW between KP107 and KP108 is currently being designed to avoid the bulk of *Cadellia pentastylis* located. These measures have reduced the total direct impact to approximately 20 individuals.

***Gonocarpus urceolatus* (Raspweed)**

Gonocarpus urceolatus is listed as Vulnerable under the NC Act. This species is a trailing herb to 45cm tall and has been observed as either occasional and/or sparse specimens or as very dense mats at least 25m² in size. Information is limited regarding habitat associations for this species with new populations being found outside of its originally recorded distribution range over the past few years.

During 2010 (Ecologica), 2011 (Boobook) and 2012 (Ecologica) survey periods, *Gonocarpus urceolatus* has been observed both within and adjacent the GTP ROW between KP8.5 and KP16.25. Two populations of *Gonocarpus urceolatus* have been located within the ironbark and cypress communities between KP8.75 and KP10.25. Within this area, the species was within an existing pipeline corridor (east of the GTP ROW) as well as the margins of a woodland community intersected by the GTP ROW. It is considered likely that this species had flourished in the area due to the recent fire and rainfall events within the month(s) prior to the 2010 and 2011 survey periods.

Another two populations were identified from Acacia regrowth between KP13.5 and KP14.5 and within and adjacent a quarry area KP15.5 and 16.25. The quarry population was originally identified during the 2010 survey, however since this initial survey, a pipeline has been constructed near these sections of the GTP ROW and it has begun to colonise the recently disturbed area.

The GTP ROW has been reduced from 40m to 30m wide in these areas. Based on a maximum ROW width of 30m wide, it is expected that approximately 2.1ha of this species will be impacted as a result of construction works.

***Melaleuca irbyana* (Bush house paperbark)**

Melaleuca irbyana is listed as Endangered under the NC Act and is a small tree to 8m tall with spongy, papery bark and slightly weeping foliage. *Melaleuca irbyana* is associated with flat environments that are periodically waterlogged (poor draining) including tablelands on sandstone derived soils. It is also associated with sclerophyll woodlands/forests (particularly ironbark), mixed forest and *Melaleuca* woodland communities with a sparse, understory (DERM 2009).

The species is present both as individuals and as pure dense stands throughout sections of the Fairview CSG Fields. As individuals *Melaleuca irbyana* is typically observed within disturbed environments such as roadsides, Acacia and Eucalypt regrowth (<5yrs) and in cleared paddocks. The dense stands are usually monotypic in nature and surrounded by Ironbark and Cypress Pine woodlands/forests.

Essential habitat for this species is present between KP8.25 and KP10.25 (refer Figure set, Appendix A). However, during field investigations, only one specimen was identified within this area.

During the pre clearing surveys, approximately 267 individuals were recorded within and adjacent the GTP ROW. Due to the presence of this species, the GTP ROW has been reduced to a maximum width of 30m through these areas. It is expected that approximately 16 individuals will be directly impacted as a result of construction works.

Within the GTP ROW, individuals to 3m in height were recorded at several locations between KP10.50 and KP15.50. With the exception of the one specimen found within the mapped Essential habitat for this species all other individuals were located within Acacia and Eucalypt regrowth less than 5yrs old.

***Wahlenbergia islensis* (NCN)**

Wahlenbergia islensis is listed as Near Threatened under the NC Act. This species is a multi-stemmed trailing herb commonly found on sandstone cliffs and rock faces (pers comms Eddie 2010). The distribution range of this species continues to be extended with records now indicating the species to occur in Isla and Robinson Gorges, Carnarvon, Expedition and Chesterton Ranges and the Fairview CSG fields (including the Baffle Creek area) HERBRECS 2011)).

Surveys undertaken during 2010 (Ecologica) and 2011 (Boobook) have located approximately 430 individuals from moist sandstone habitats within and adjacent the GTP ROW, in particular, the southern facing sandstone cliffs associated with Baffle Creek (KP20 - KP21) and the north facing cliffs of Expedition Range (KP28 - KP29).

Approximately 20 individuals have been recorded within the GTP ROW. However based on the proposed construction methodology through the Baffle Creek system (horizontal directional drilling (HDD)) and the distance of the species from the GTP ROW in the Expedition Range section (KP28-KP29), this species should not be directly impacted as a result of the project.

***Xerothamnella herbacea* (NCN)**

Xerothamnella herbacea is a small ephemeral herb listed as Endangered under both the EPBC and NC Acts. Based on the findings of the pre-clearing surveys, this species is present within the southern extent of the Arcadia Valley between KP32 and KP35 of the GTP ROW. Within this area, it was observed as either occasional and/or sparse specimens or as very dense clusters generally ranging no more than 4m² in size.

Based on HERBRECS data, these findings are outside of its currently known distribution range (Chinchilla and Goondiwindi) with the closest record approximately 230km south-east of the GTP ROW (Queensland Herbarium 2011).

This species was observed both within and adjacent the ROW and appears to be associated with drainage lines/channels and watercourses within REs 11.3.17 and 11.9.5. It also appears to be confined to shaded areas with low canopies where it may be afforded protection from grazing cattle and other land management practices however, with only a small handful of people having observed this species in the wild and no research having been undertaken to date, information pertaining to its biology and habitat associations is extremely deficient.

The populations located within and adjacent the GTP ROW appear to be the largest recorded however, in order to make an appropriate assessment of the impact to this species, more comprehensive surveys including extent mapping surveys are proposed by GLNG.

***Macrozamia fearnsidei* (NCN)**

Macrozamia fearnsidei which is listed as Vulnerable under the EPBC Act, is a small cycad usually with a subterranean trunk and a crown at ground level (TSSC 2008b).

During incidental field surveys undertaken by Ecologica in mid 2011 two *Macrozamia fearnsidei* were identified from Eucalypt woodlands near KP25. The two specimens were located on the eastern margin of the GTP ROW near KP25.

The closest known population of *Macrozamia fearnsidei* is on a ridgeline approximately 1km north of their location. There are no direct pathways from this population to this area, suggesting the plants may have originated from a population further upstream along Edwards Creek.

Detailed design of the GTP is currently underway and following on from this it will be possible to confirm whether the individuals will be directly impacted. There is also the potential to reduce the corridor within this area to 30m considering the intact nature of the vegetation and the presence of a

watercourse crossing directly down gradient of the site. By reducing the GTP ROW to 30m in this area it is more likely that these individuals will not be impacted.

Other notable species

The findings of the 2010 and 2011 flora surveys have extended the distribution range for a number of Least Concern flora species the majority of which were identified from habitats within the Baffle Creek area and the Fairview CSG fields. Of particular note is a species which is yet to be described (*Acacia* sp. Boyd Creek) from Baffle Creek as well as *Hemisteptia lyrata* (NCN) a species currently listed as Least Concern but nominated for a higher level of protection under the NC Act.

Additionally, a number of species listed as Type A restricted plants under the NC Act were observed within this section of the GTP ROW. Table 4 summarises the species present.

Table 4 Type A restricted species (Category 1 flora)

Type A Restricted Species	Species identified from the GTP ROW (KP0 to KP130)
<i>Brachychiton</i> spp.	<i>Brachychiton australis</i> , <i>Brachychiton populneus</i> , <i>Brachychiton rupestris</i>
Family Orchidaceae	<i>Cymbidium caniculatum</i> , <i>Sarcochilus ceciliae</i>
<i>Platynerium</i> spp.	<i>Platynerium veitchii</i>
<i>Xanthorrhoea</i> spp.	<i>Xanthorrhoea johnsonii</i>

Actual numbers of individuals to be impacted by the Pipeline Project are currently being determined by the Principal Contractor through ground truthing activities.

There are no requirements under the class exemption to salvage Type A species (unless threatened under Commonwealth legislation). However, as part of the CG's approval conditions, a Salvage Plan will be developed by the Principal Contractor and submitted to DERM for approval and implementation prior to the construction phase of the project. The objective of this plan will be to minimise the long term loss of these commercially valuable species from the GTP ROW.

4.3 Threatened Fauna

Analysis of existing literature, GLNG data and reporting and Government databases and websites revealed the potential for a number of threatened fauna protected under the EPBC Act and NC Act to occur between KP0 and KP130 of the GTP ROW.

During the pre-clearing ecological surveys, a number of threatened fauna species under both EPBC and NC Acts were identified from within and/or adjacent the GTP ROW (KP0 - KP130).

The findings of these surveys are discussed within each relevant section below.

4.3.1 Amphibians

No Nationally listed amphibian species are known from the region. However, two species listed under the NC Act are known locally, the Rough-collared frog (*Cyclorana verrucosa*) and Tusked frog (*Adelotus brevis*).

In total, 11 native species of frog were recorded from within the KP0-130 section of the GTP during the pre-clearance surveys with the palustrine and riverine wetlands within this area providing habitat for the highest abundance and diversity of frogs.

No threatened amphibian species were recorded during the current or previous survey periods however suitable breeding habitat for the Rough-collared frog was identified both within and directly adjacent the GTP ROW between KP31.5 and 31.75.

The Cane toad (*Rhinella marina*), which is a non-declared pest species was also frequently recorded. DSEWPC has declared the biological effects of Cane toads as a Key Threatening Process⁴.

4.3.2 Birds

Targeted surveys of the GTP ROW were undertaken in accordance with the Commonwealth Survey Guidelines for Australia's Threatened Birds (DSEWPC 2010b) for the six nationally threatened bird species identified as potentially occurring in the area. Based on available information, two of these species, the Squatter pigeon (*Geophaps scripta scripta*) and the Star finch (*Neochmia ruficauda ruficauda*) have been recorded from the local region, including areas containing similar habitat values.

One Nationally listed bird species, the Squatter pigeon, was identified from this section of the GTP ROW during the 2011 survey period. Additionally, six migratory bird species were also identified from the area.

Squatter pigeon (*Geophaps scripta scripta*)

Squatter pigeons are listed as Vulnerable under both the EPBC and NC Acts. This species was also the most commonly encountered threatened bird along the entire GTP ROW. This species was generally observed along the margins of remnant communities or in cleared grassland areas along roads and other linear corridors. Within Arcadia Valley, the only record from the vicinity of the GTP ROW was of two individuals following an access track through the Brigalow regrowth near KP34, about 2km from the nearest water source. Two other individuals were identified from a dam west of the GTP ROW at KP60.

Squatter pigeons have been recorded regularly over a number of seasons (since 2008), throughout the Fairview CSG Fields, including areas within and adjacent the GTP ROW. The most recent record (21/02/2012) was from the access road/pipeline corridor through Christmas Creek (near KP3).

Red goshawk (*Erythrotriorchis radiatus*)

The Red goshawk is listed as Endangered under the EPBC Act and the NC Act. There are no known records from the region and the species was not observed during the pre-clearing surveys. However, suitable habitat for this species (ie mosaic vegetation near permanent water) is present within the GTP ROW, including nesting habitat, in particular the area surrounding the Dawson River and Baffle Creek (KP20 to KP35).

It should be noted that no raptor nests were identified during the pre-clearing surveys in this section of the GTP ROW.

Star finch (*Neochmia ruficauda ruficauda*)

The Star finch is listed as Endangered under the EPBC Act and the NC Act. Based on Wetland maps data, this species was recorded in 1994 from Arcadia Valley. However, no individuals were identified during any of the survey periods.

This species is a granivore and is normally associated with grasslands or grassy woodlands. Habitat is present within the GTP ROW, however it is considered to be both degraded and altered (eg Buffel grass) due to clearing and current land uses such as agriculture and grazing.

Black-throated finch (*Poephila cincta cincta*)

⁴ A process is considered such, if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

The Black-throated finch is listed as Endangered under the EPBC Act and the NC Act. This species has not been recorded from the local area. In addition, no individuals were identified during the recent pre-clearing surveys.

However, suitable habitat is present in the area especially in associated with Hutton Creek (permanent water) and to lesser extent the Dawson River.

Australian painted snipe (*Rostratula australis*)

The Australian painted snipe is listed as Vulnerable under the EPBC Act and the NC Act.

Suitable habitat for this species within the GTP ROW is considered to be severely limited and consequently, no individuals were identified during the pre-clearing survey period. However, habitat is considered to be present adjacent the GTP ROW within palustrine wetlands such as those near KP29 and KP101.

Black-breasted button quail (*Turnix melanogaster*)

The Black breasted button quail is listed as Vulnerable under the EPBC Act and the NC Act. This species has not been identified from the local area and was not identified during the pre-clearing surveys.

Preferred habitat (eg vine thicket) is limited within the GTP ROW however, this species is also known to utilise woodlands and ecotonal environs near vine thickets. As such there is the potential for the species to forage in the *E. crebra* + *C. clarksoniana* and *A. leiocarpa* woodlands near KP7 (ie SEVT was identified from the adjacent sandstone cliffs).

Migratory birds

The EPBC Report for the area identified the potential for ten migratory birds to inhabit the area. Surveys undertaken during 2010 (Ecologica), 2011 (Boobook) and 2012 (Ecologica) have recorded the following six species from habitats within and/or adjacent the GTP ROW:

- Cattle egret (*Ardea ibis*). This species is typically associated with livestock and is considered likely to occur throughout the GTP ROW, particularly in the areas between KP36 and KP131 given the cleared and pastoral nature of this area.
- Great egret (*Ardea modesta*). Likely to be associated with the pastoral areas between KP36 and KP131, in particular ephemeral wetlands.
- Rainbow bee-eater (*Merops ornatus*). This species was recorded throughout the survey area and is considered likely to occur in most habitats within the GTP ROW depending on time of year.
- Fork-tailed swift (*Apus pacificus*). This species is likely to occur in the airspace above all habitats with the GTP ROW.
- White-bellied sea-eagle (*Haliaeetus leucogaster*). The White-bellied sea-eagle has potential to occur throughout the area between KP0-130, with nesting potential around Baffle Creek and Dawson River and a home range of up to 100km². This species was observed nesting along the margin of a large permanent dam about 3km west of GTP ROW near KP60.
- Australian Cotton Pygmy-goose (*Nettapus coromandelianus albipennis*). There is limited habitat for this species within the GTP ROW, with wetland systems occurring within the Arcadia Valley likely to provide most of the suitable habitat.

It should be noted that these species are commonly occurring migratory species and have been recorded along the length of the GTP footprint. It is considered unlikely that the project is likely to have a significant impact on any of these species. The section of the GTP ROW associated with the marine habitats, discussed in the pre-clearance survey report for KP350-420, deals with migratory bird species occurring or with potential to occur within or nearby the GTP ROW in greater detail. The habitats associated with marine environments are typically the most significant for migratory species

given the number of birds that utilise these areas for breeding. No breeding habitats were identified within the GTP ROW.

Other Threatened Birds

Other threatened birds identified from the local area, include:

- The Black-necked stork (*Ephippiorhynchus asiaticus*) which is listed as Near Threatened under the NC Act. This species was identified from a dam to the west of the GTP ROW near KP60. Suitable habitat (palustrine/lacustrine wetlands) for this species is considered limited within the GTP ROW.
- The Cotton pygmy-goose (*Nettapus coromandelianus*) is listed as Near Threatened under the NC Act and Migratory under the EPBC Act. This species was identified from a dam to the west of the GTP ROW near KP60. The species is highly dependent on aquatic environments, including lagoons and dams (ie areas containing deep sections of still water). Suitable habitat, (lacustrine wetlands) for this species is limited within the GTP ROW.
- The Square-tailed kite (*Lophoictinia isura*) is listed as Near Threatened under the NC Act. This species was identified overflying grazing lands (pastoral grasslands) near KP36 and KP60 during the survey periods. It is likely to forage within KP0-KP130 especially in open eucalypt forests and woodlands. No nests were identified during pre-clearing surveys.

In addition to the abovementioned species, there is the potential for a number of other birds such as the Glossy black cockatoo (*Calyptorhynchus lathami lathami*), Black-chinned honeyeater (*Melithreptus gularis*) and Powerful owl (*Ninox strenua*) to inhabit the area. For example, the Powerful owl is known from the Arcadia Valley region (ie Expedition and Carnarvon Ranges including Carnarvon Gorge) and there is a high likelihood that this species occurs within the local area, especially given the species home range (400 to 4000ha) and the presence of prey species (eg Yellow-bellied gliders) within and adjacent the GTP ROW.

General Observations (birds)

In total, 125 birds species have been identified between KP0-KP130 of the GTP ROW, including four species listed as threatened under the EPBC and NC Acts.

The most significant habitats for birds within the GTP include riparian vegetation, eucalypt woodlands, and wetland/swamp habitat. These kinds of habitat are limited to the southern portion of this section of the GTP. The distribution and variation within the avian population can be attributed to a range of factors including:

- Habitat type and structure.
- Degree of disturbance.
- Sedentary nature of some species.
- Localised migration for breeding purposes.
- To exploit unpredictable food resources.

The most common species encountered along within this section of the GTP ROW were more disturbance tolerant species such as the Crested pigeon (*Ocyphaps lophotes*), Magpie-lark (*Grallina cyanoleuca*), Pied-currawong (*Strepera fuliginosa*), Torresian crow (*Corvus orru*) and Australian raven (*Corvus coronoides*). Other species observed in high abundance included the Red-winged parrot (*Aprosmictus erythropterus*), Sulphur crested cockatoo (*Cacatua galerita*), Double-barred finch (*Taeniopygia bichenovii*), Galah (*Cacatua roseicapilla*) and Brown quail (*Coturnix ypsilohora*).

Raptor species such as Wedge-tailed eagles (*Aquila audax*), Whistling kites (*Halia stursphenurus*), Brown falcons (*Falco berigora*), Black-shouldered kites (*Elanus axillaris*) and Nankeen kestrels (*Falco cenchroides*) were also commonly observed especially within Arcadia Valley. Two species of owls, the Southern boobook (*Ninox novaeseelandiae*) and Masked owl (*Tyto novachollandiae*) were also present plus three species of nightjars.

A large number of waterbirds were also identified from the area. These species were generally restricted to dams and wetlands within close proximity to the GTP ROW or along major access routes. However, some species such as the Pacific black duck (*Anas superciliosa*), Australian wood duck (*Chenonetta jubuata*), egrets and herons may occur throughout the GTP ROW depending on the presence of water.

4.3.3 Mammals

Targeted surveys of the GTP ROW were undertaken in accordance with the Commonwealth Survey Guidelines for Australia's Threatened Bats (DSEWPC 2010a) and Commonwealth Survey Guidelines for Australia's Threatened Mammals (DSEWPC 2011b) for the four Nationally threatened fauna species identified as potentially occurring in this section of the GTP ROW. It should be noted that all four species have been recorded from the local region, including similar and in some area contiguous habitats adjacent the GTP ROW (Wildlife Online and WetlandMaps).

Large-eared pied bat (*Chalinolobus dwyeri*)

The Large-eared pied bat is listed as Vulnerable under both the EPBC Act and the NC Act. The largest known populations of the Large-eared pied bat occur in those areas dominated by sandstone escarpments which are a major feature of the Arcadia Valley area (DERM 2011). Arcadia Valley is currently mapped as potential and known habitat for this species (DERM 2011).

The combination of the sandstone cliffs and fertile wooded valley habitat evident within this section of GTP ROW is considered to be habitat critical to the survival of this species under the National recovery plan for the Large-eared Pied Bat *Chalinolobus dwyeri*.

During the pre-clearing surveys this species was identified from two locations along this section of the GTP ROW with one specimen captured during harp trapping near KP34 and one specimen identified from Baffle Creek (KP20) from echolocation data.

This species usually forages in fertile areas particularly box gum woodlands or river/rainforest corridors. However, the species was captured from Brigalow regrowth near KP34. The other record is from Baffle Creek and may be attributed to foraging activities along Baffle Creek or from the species roosting in the area. A record for this species was also collected from a large farm dam along Arcadia Valley Road, 3km west of the GTP ROW at KP56 during the 2010 survey period.

No roosts were confirmed within the GTP ROW, however suitable roosting habitat (eg caves, crevices and pock-holes) are present within the project area, in particular the sandstone cliffs associated with Baffle Creek. A large cave was also located near KP34 in an isolated rocky peak. The adjacent sandstone cliffs of Expedition Range are also likely to provide suitable roosting habitat for this species with the Range located between 3 and 7km east of the GTP ROW. These observations are consistent with other records.

South-eastern long-eared bat (*Nyctophilus corbeni*⁵)

A *Nyctophilus* species was positively recorded from the GTP ROW, however at this stage it is not possible to positively identify this species from echolocation data. The South-eastern long-eared bat which is listed as Vulnerable under the EPBC and NC Acts, is known from the area (Expedition (Limited Depth) National Park) and suitable habitat is present in the area, including roosting (hollow bearing trees, cracks in trees, under bark) and foraging habitat (Churchill 2011). This species is known to fly great distances between roosts and foraging areas and has been previously located within open dry woodland and forests, including *Eucalyptus populnea*, *E. melanophloia*, *E. crebra* and *Acacia harpophylla* which are present in the GTP ROW. This species is also known to use dams and open waters as a drinking source (Churchill 2011).

⁵ Previously known as *Nyctophilus timoriensis*.

Harp trapping was unable to verify the presence of this species' during the 2011 pre-clearance survey. However, suitable habitat is present throughout this area, including the presence of potential roost sites.

Northern quoll (*Dasyurus hallucatus*)

The Northern quoll is listed as Endangered under the EPBC Act and Least Concern under the NC Act. This species is known from the local area, having been previously recorded from Carnarvon Gorge. However, it is unclear to what extent local populations have been impacted as a result of the colonisation of the area by Cane toads. Populations are known to exist in other areas, including upland rocky areas and coastal environments (Hill and Ward 2010).

Due to constraints during the survey periods, cage trapping within the GTP ROW was not undertaken, including where suitable habitat associated with Baffle Creek and the Dawson River is considered to be present.

Brush-tail rock wallaby (*Petrogale penicillata*)

The Brush-tail rock wallaby which is listed as Vulnerable under the EPBC Act and NC Act potentially occurs within the area (DSEWPC 2012a). This species is known from Carnarvon Gorge National Park and there is suitable habitat (though limited) within the GTP ROW (ie preferred habitat is rocky habitats, including rocky outcrops, steep rocky slopes, cliffs and gorges. Vegetation structure and composition is also an important factor with the species known from wet and dry sclerophyll forests, rainforests and open forests).

During the pre-clearing surveys one species of rock wallaby was identified from Expedition Range, Herbert's rock wallaby (*Petrogale herbeti*). No Brush-tailed rock wallabies were identified from the area, however the species may occur in Baffle Creek gorge (KP20) and along the sandstone cliff faces of the Expedition Range (KP27).

Koala (*Phascolarctos cinereus*)

The Koala has recently been listed (30 April 2012) as vulnerable under the EPBC Act, while under the NC Act as Special Least Concern within the Brigalow Belt Bioregion (district C) due to a generally lower perceived threat to their survival (EPA 2006).

The remnant vegetation intersected by the GTP ROW in this area is mapped as potential Koala habitat⁶ in the SSMP. In addition, koala habitat trees are associated with the remnant vegetation intersected by the GTP ROW, including *Eucalyptus tereticornis* which is a primary food resource and was mainly associated with riparian zones. Additionally, *Eucalyptus siderophloia* was also prominent along the margins of the Baffle Creek gorge.

A Koala was identified from the Fairview CSG Fields in early 2011. This was within the general vicinity of the GTP ROW. Additionally, Koalas are known to inhabit Nuga Nuga National Park which is approximately 5km west of the GTP ROW in the Arcadia Valley. However, during the past and present survey periods, no Koalas have been detected, with anecdotal discussions with landholders suggesting that Koalas had not been seen in the Arcadia Valley area in the last 5 years. There is a record from Arcadia Valley from 2005 on the Atlas of Living Australia.

The Expedition Ranges are considered to be suitable habitat as well as potential dispersal corridors for this species. Given the linkages and habitat values noted, it is considered likely that any Koalas inhabiting the area would utilise these dispersal corridors. Management measures specifically relating to Koalas with respect to mitigating impacts and rehabilitation/offset requirements are detailed in the

⁶ Based on the definition of koala habitat under the *Nature Conservation (Koala) Conservation Plan 2006*

Significant Species Management Plan. Specific management measures for Koala management during the construction phase are also detailed in the Fauna Handling Procedure.

Other conservation significant species

Other significant mammals identified from the local area, include:

- The Little pied bat (Near Threatened – NC Act) was recorded (echolocation) from a number of locations within this section of the GTP ROW, including Baffle Creek and the Dawson River. Suitable roosting (Hollow bearing trees and caves) are present within this section of the pipeline.
- Greater glider (*Petauroides volans*), Sugar glider (*Petaurus brevicepes*) and Yellow-bellied glider (*Petaurus australis*) which are colonial breeders were identified from the *Eucalyptus populnea* woodlands and Brigalow areas near KP34.
- Echidnas which are listed as Special Least Concern under the NC Act were frequently observed within areas throughout the GTP ROW.

General Observations (mammals)

During the pre-clearing surveys 39 native and 10 introduced mammalian species were identified. Of particular note are the microbats located over a number of survey periods.

Eighteen species of microbats, including the two threatened species, were positively identified from the area, while an additional three species could not be positively identified (echolocation). Bats were recorded in high abundance near Baffle Creek. Scat and hair analysis also identified the use of Baffle Creek cliffs and rocky outcrops by microbats.

A major factor influencing the distribution and abundance of bats in the GTP ROW is the abundance of roost sites within the local area. Within forest areas where there is a large choice of roost sites available, bats may use several roost areas regularly. However, cave dwelling species may be limited in the number of roosts available.

The bat species identified in this section, in particular between KP20-KP37, included both hollow-dependant species as well as those known to roost in caves, under overhangs and in rocky outcrops. The cave-dwelling species include the Large-eared pied bat (*Chalinolobus dwyeri*), Eastern cave bat (*Vespadelphus troughtoni*), Eastern bent-wing bat (*Miniopterus orianae oceanensis*) and Troughton's sheath-tailed bat (*Taphozous troughtoni*). Hollow dependent species included the Inland forest bat (*Vespadelphus baverstocki*), Little broad-nosed bat (*Scotorepens greyii*), Western broad-nosed bat (*Scotorepens orion*), Hoary wattled bat (*Chalinolobus nigrogriseus*) and Gould's wattled bat (*Chalinolobus gouldii*). The Little pied bat and the Chocolate wattled bat (*Chalinolobus morio*) are known to roost in both caves and tree hollows.

The Eastern grey kangaroo (*Macropus giganteus*) was the most commonly encountered mammal species. Other macropods included the Common wallaroo (*Macropus robustus*), Whiptail wallaby (*Macropus parryi*), Swamp wallaby (*Wallabia bicolor*), Red-necked wallaby (*Macropus rufogriseus*), Black-striped wallaby (*Macropus dorsalis*) and the Herbert's rock wallaby (*Petrogale herbeti*). The Rufous bettong (*Aepyprymmus rufescens*) was also recorded from the area.

Small ground-dwelling mammals, such as Dasyurids and Rodents were limited due to the nature of the works (ie no trapping). However, a Yellow-footed antechinus (*Antechinus flavipes*) was identified from the Brigalow and *Eucalyptus populnea*/*Acacia harpophylla* communities near KP35 with this the only record from the entire GTP ROW.

Pest Species

Ten exotic mammal species were recorded from this section of the GTP ROW, including the Feral cat (*Felis catus*), Feral pig (*Sus scrofa*), Rabbit (*Oryctolagus cuniculus*), Hare (*Lepus capensis*), Dog (*Canis familiaris familiaris*) and Dingo (*Canis lupis dingo*). Threat Abatement Plans, which aim to

provide a national framework to guide and coordinate Australia's response to the relevant key threatening processes, have been developed for some of these species.

4.3.4 Reptiles

The 2011 pre-clearance surveys were undertaken in accordance with the Commonwealth Survey Guidelines for Australia's Threatened Reptiles (DSEWPC 2011c) for the five Nationally threatened fauna species identified as potentially occurring in the area. It should be noted that all five species have been recorded from the local region, including similar and in some areas habitats contiguous with those within the GTP ROW (Queensland Museum data, Wildlife Online and WetlandMaps).

Under the Draft Referral guidelines for the Nationally listed Brigalow Belt Reptiles (DSEWPC 2011a), suitable habitat is considered important if it is:

- Habitat where the species has been identified during a survey⁷
- Near the limit of the species' known range
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations) or
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

Based on the abovementioned criteria there is important habitat for all five species within this section of the GTP ROW, in particular the section between KP28 – KP37.

During the pre-clearing surveys, a total of 52 reptile species were located between KP0-KP130 of the GTP ROW. Two of the five nationally threatened species were positively identified from the GTP ROW within advanced *Acacia harpophylla* and *E. populnea* regrowth. They are the Brigalow scaly-foot which is listed as Vulnerable under both the EPBC Act and NC Act and the Dunmall's snake which is also listed as Vulnerable under both Acts.

Additionally, the Golden-tailed gecko (*Strophurus taenicauda*) which is listed as Near Threatened under the NC Act was also recorded in this section of the GTP ROW.

Threatened species are discussed in further detail below however, other findings from these surveys include:

- Ten species of gecko, including terrestrial and arboreal species.
- Seventeen species of skinks, including the Eastern blue-tongue lizard (*Tiliqua scincoides*), *Morethia* spp., *Carlia schmeltzii*, *Ctenotus robustus*, *Egernia striolata* and *Eulamprus* spp.. *Eulamprus* species were regularly observed in rocky areas, including Baffle Creek and Expedition Range (south of the Dawson River).
- Five species of dragon, including the Eastern bearded dragon (*Pogona barbata*) which was frequently encountered.
- Three varanids were observed during the field surveys.
- Three pygopods, including the Brigalow scaly-foot were identified (refer above).
- Twelve snake species were recorded from habitats within this area. The main group of snakes encountered during the field activities were Elapids, which are the most diverse group of snakes in Australia. No blind snakes were identified during the surveys.

⁷ This criterion does not necessarily apply to the Brigalow scaly-foot. This species is known to occur where the vegetation characteristics of their habitats have been significantly altered from their natural conditions. Therefore, confirmation of the presence of the Brigalow scaly-foot during a targeted survey does not automatically qualify the surveyed habitat as important for this species, unless at least one other important habitat criterion (listed above), or any of the descriptions of known important habitats for the species are present.

Dunmall's snake (*Furina dunmalli*)

Based on the modelled distribution range of this species (DSEWPC 2011a) the Dunmall's snake was not likely to occur within the GTP ROW between KP0-KP130.

However, during the 2011 survey period, a Dunmall's snake was encountered during nocturnal searches. This species was identified from advanced regrowth dominated by *A. harpophylla* with scattered *E. populnea* on alluvium at KP34.75. This area can therefore be classified as important habitat for this species.

This area is a large contiguous patch of remnant vegetation comprising eucalypt woodlands and Brigalow on alluvium. This is also the largest area of remnant vegetation on alluvium in Arcadia Valley.

This species is highly cryptic and is likely to occur in other sections of the GTP ROW, with suitable habitat being forests to woodlands within the range of the species especially where microhabitats are present (eg cracking soils and ground cover (including perennial grass clumps, leaf litter, rocks, fallen timber etc)). Based on habitat assessments, this includes areas within the vicinity of: KP5 to KP6.5; KP8; KP9; KP22; and KP33 to KP35.

Brigalow scaly-foot (*Paradelma orientalis*)

The Brigalow scaly-foot is listed as Vulnerable under both the EPBC and NC Acts and has been located in a number of environs throughout the entire GTP ROW. During the recent pre-clearing surveys between KP0 and KP37 no individuals were recorded. However, during the habitat assessments in 2010 (Ecologica), an individual was located within a patch of advanced *Acacia harpophylla* and *Eucalyptus populnea* regrowth near KP34. The individual was identified during a diurnal search under decorticated bark from *Eucalyptus crebra* along the edge of an access track and watercourse.

This area is a large contiguous patch of remnant vegetation comprising *Eucalyptus populnea* woodlands and Brigalow on alluvium. This is also the largest area of remnant vegetation on alluvium in Arcadia Valley.

Based on the Commonwealth's criterion for suitable habitat (DSEWPC 2011a), the area may be considered important habitat due to the presence of the species during the survey period as well as the area being a large patch of contiguous, suitable habitat with viable landscape corridors.

Ornamental snake (*Denisonia maculata*)

The Ornamental snake is listed as Vulnerable under both the EPBC and NC Acts. Based on desktop studies this species is known from the local area (Comet River catchment near the township of Rolleston and Lake Nuga Nuga National Park). Suitable habitat for this species is mainly associated with gilgai formations and wetlands, including RE11.4.9 which is present in the GTP ROW.

This species was not encountered during either the pre-clearing surveys or previous surveys (EIS and 2010 surveys), however suitable habitat was identified between KP29 and KP35, though gilgai depressions were limited. Additionally, gilgai depressions with Brigalow regrowth were also identified between KP68-KP69 and near KP101.

Yakka skink (*Egernia rugosa*)

The Yakka skink is listed as Vulnerable under both the EPBC and NC Acts. No individuals or burrows were observed during the pre-clearing surveys however, this species is known from the local area, having been recorded from Expedition (Limited Depth) National Park (Wildlife Online) and from habitat contiguous with the area between KP28 and KP35 (WetlandMap). This record is from habitat contiguous with and similar to the habitat within the GTP ROW. It should be noted that there is also a record for this species from Arcadia Valley, however this record is from the mid-1970s (Queensland Museum).

Under the criteria for important habitats for Brigalow Belt reptiles (DSEWPC 2011a), the area between KP28 and KP37 may be described as an important habitat for this species. That is:

- Any contiguous patch of suitable habitat, particularly remnant vegetation, where a colony is known or identified.
- Any microhabitat where colonies are likely to be found.

Suitable habitat may also include Hutton Creek, the area around KP1 and between KP4 and KP6.5.

Collared delma (*Delma torquata*)

The Collared delma is listed as Vulnerable under the EPBC Act and the NC Act. This species is known from the local area, having been recorded from Expedition (Limited Depth) National Park (Wildlife Online).

During the clearing surveys no individuals were identified from the area. However suitable habitat is considered present in the areas around Baffle Creek (KP20-KP22) and the cliffs south of Dawson River (KP28). Additionally the area between KP24 and KP28 may also be suitable habitat for this species. Under the criteria for important habitats for Brigalow Belt reptiles, these areas may be described as an important habitat for this species.

Other conservation significant reptiles

During both the 2010 and 2011 survey periods the Golden-tailed gecko (*Strophurus taenicauda*) was identified from a number of locations within and adjacent the GTP ROW. This species is listed as Near Threatened under the NC Act.

Two individuals were identified within the vicinity of KP24 whilst a third individual was identified from fractured rocks on the ground at a rehabilitated well site near KP21. The area surrounding this well site is primarily eucalypt and acacia regrowth.

Whilst not located during the pre-clearing surveys, the Common death adder (*Acanthophis antarcticus*) which is listed as Near Threatened under the NC Act is also considered likely to occur within the GTP ROW area due to the presence of suitable habitat at KP29 and between KP30 and KP35.

No Least Concern species identified as a priority under the Back on Track Species Prioritisation Framework were identified from the area. However, there is anecdotal evidence of the Woma python (*Aspidites ramsayi*) occurring within Arcadia Valley, which is east of the species known distribution.

4.3.5 Aquatic fauna

The GTP ROW is located within the upper catchment of the Dawson River and Comet River. No threatened fish species are known from these catchments. However, these systems are known to support the Fitzroy River turtle (*Rheodytes leukops*) which is listed as Vulnerable under the EPBC Act and NC Act.

This species is likely to be associated with the deep pools located in Hutton Creek, Baffle Creek and the Dawson River which are intercepted by the GTP ROW. These pools provide refugia habitat during periods of low or no flow, while riffles and runs were identified within the local reach in relatively close proximity to the GTP ROW. Key habitat features of these creek systems are as follows:

- Hutton Creek - an artificial riffle as a result of a causeway through Hutton Creek is present approximately 1.5km downstream of the GTP ROW. A permanent pool extends upstream from the crossing at least 2km above the GTP ROW. There is also a large pool downstream of the riffle.

- Baffle Creek - a number of permanent pools were identified along this section of Baffle Creek. These pools are linked during times of flows via riffles and runs, or totally inundated depending on environmental flows.
- Dawson River – the Dawson River crossing area was initially dry when assessed in late 2010, with the closest pool at least 500m upstream of the proposed GTP ROW. However, since 2010, the geomorphology of the area has changed with scouring and other factors altering the instream structures and also resulting in a large pool.

A comprehensive survey where the GTP ROW intercepts Hutton Creek was undertaken in February 2012. This survey was undertaken over three days and involved cathedral traps, fyke netting, observations from a boat and banks and also muddling and dip netting.

No *Rheodytes leukops* were encountered during the survey. However, given the size of the pool (over 2kms long); the presence of suitable habitat; and the narrow survey area it is still considered highly likely that this species inhabits this reach. The large pool at the junction between Christmas creek and Hutton Creek is likely to be preferred habitat for this species, given the proximity to the riffle zone.

Other significant fauna species identified from the aquatic habitats of Hutton Creek are as follows:

- Four White-throated snapping turtles (*Elseya alboguttata*) were captured during the February 2012 turtle survey whilst a single individual was observed during the pre-clearing surveys (2011). This species is listed as Least Concern under the NC Act but is recognised as a high priority species under the Back on Track Species Prioritisation Framework.
- Platypus are known to inhabit Hutton Creek having been identified during a number of surveys over four years. The GTP ROW was relocated upstream to avoid a nest/rest burrow identified during a survey in 2010. Platypus are listed as Special Least Concern under the NC Act.

In addition to the abovementioned species, the Water rat (*Hydromys chrysogaster*) and a number of Least Concern turtles such as the Krefft's turtle (*Emydura krefftii*) and the Saw shell turtle (*Wollumbinia latisternum*) have also been identified from both Hutton Creek and Baffle Creek. These species are not listed as conservation significant at this time.

Due to current constraints, Baffle Creek and the Dawson River are scheduled for surveys during April 2012 however this will be subject to access and flow conditions.

Other major watercourses within this section of the GTP ROW will not be comprehensively assessed. This is due to the ephemeral nature of the watercourses, the location of the GTP ROW within the catchment (Mid to upper reaches), instream habitats and the distance between the crossing site and likely refugia habitat.

4.3.6 General Fauna Habitat

The following areas, whilst already captured within the specific habitat values described in the SMP, are considered to provide significant value as habitat for all faunal groups:

- Locally significant fauna habitat at Hutton Creek crossing KP2.
- Regionally/state significant fauna habitat at Baffle Creek gorge between KP20.5 and KP20.75. Baffle Creek is also likely to be important refugia habitat and may be recognised as an outstanding physical feature.
- Locally significant fauna habitat at watercourse crossing between KP22.0 and KP22.25.
- Locally significant fauna habitat at watercourse crossing between KP25.0 and KP25.25 consisting of ephemeral pools rock shelves and cavities. This habitat is less extensive than Edwards Creek and is currently impacted by discharge water from an existing CSG well.

- Locally significant fauna habitat at Edwards Creek (KP25.5) consisting of ephemeral pools, rock shelves and cavities.
- The area between KP27 and KP37 may be defined as important habitat as defined under the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DSEWPC 2011a) for five species of Brigalow Reptiles. This area includes sandstone cliffs, alluvial plains, gilgai depressions with the vegetation a mix of remnant and advanced regrowth
- Palustrine wetlands and ephemeral watercourses between KP28 and KP37.
- Brigalow regrowth between KP34-KP35. Four National and State listed threatened fauna species were identified from this 1km section of the GTP ROW.
- Between KP37 and KP130 the area is primarily pastoral grasslands however, remnant and regrowth vegetation is present including:
 - Brigalow regrowth at KP68 and between KP98 and KP101
 - Remnant vegetation is associated with major watercourse (Stream order greater than 2) such as Ironbark Gully and Bully Frog Creek.

5. Impact Management

As discussed throughout the document, potential habitat mapping, specific impacts and management measures for threatened species and ecological communities known to occur or with a high likelihood of occurring are detailed in the SSMP and the SMP.

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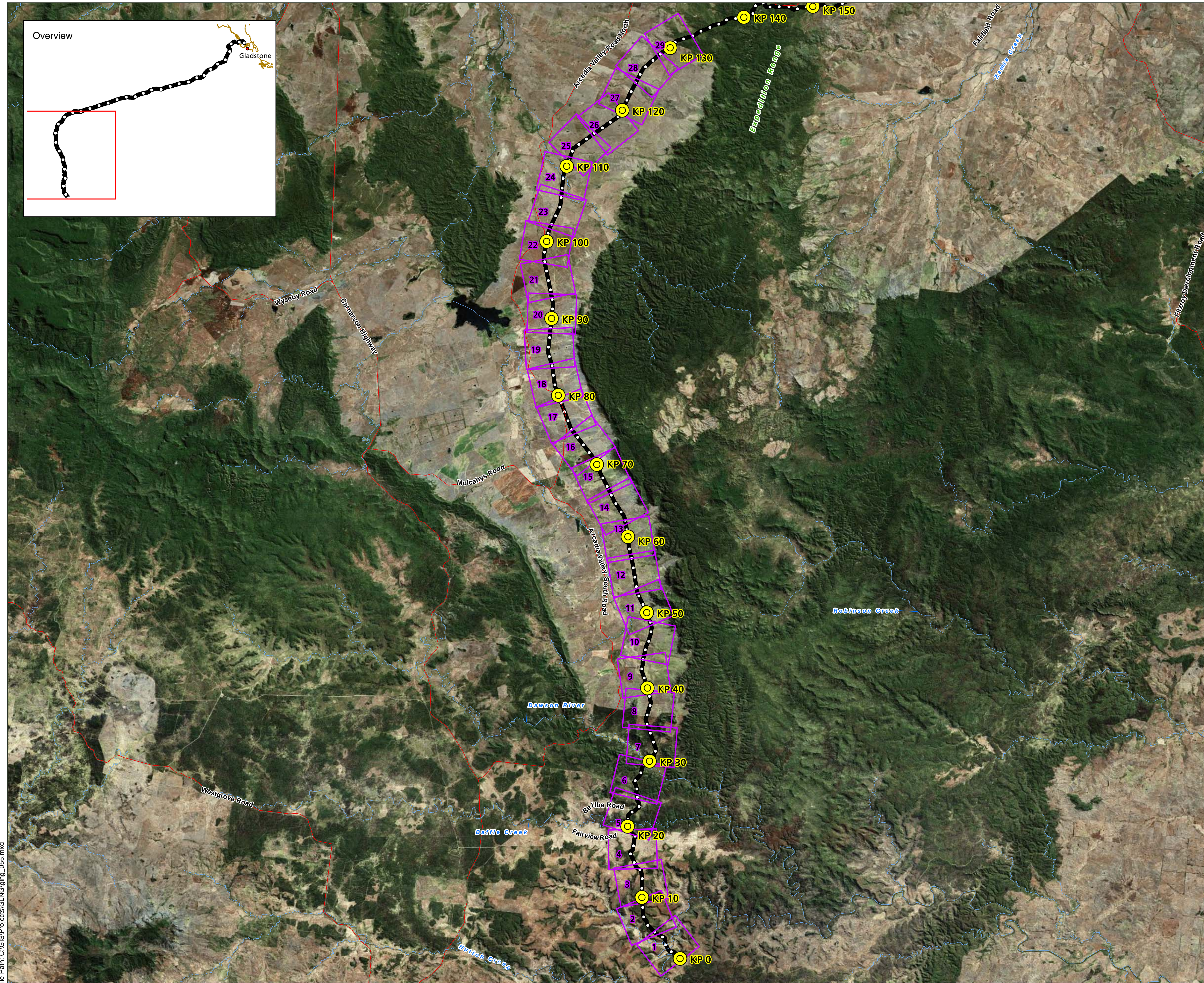
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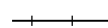

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Appendix A

Mapping

GLNG Gas Transmission Pipeline Corridor

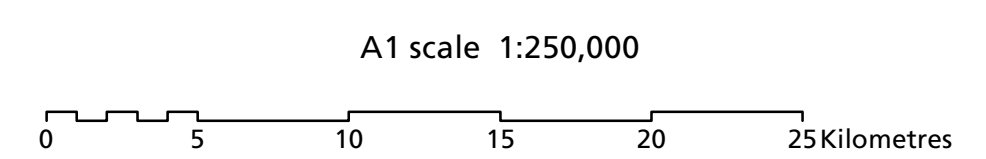


-  Proposed Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
-  Detailed Ecology Figure Extent (Page No. given)
-  Watercourse
-  Rail
-  Major Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2: Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Aerial: BING, 2011.

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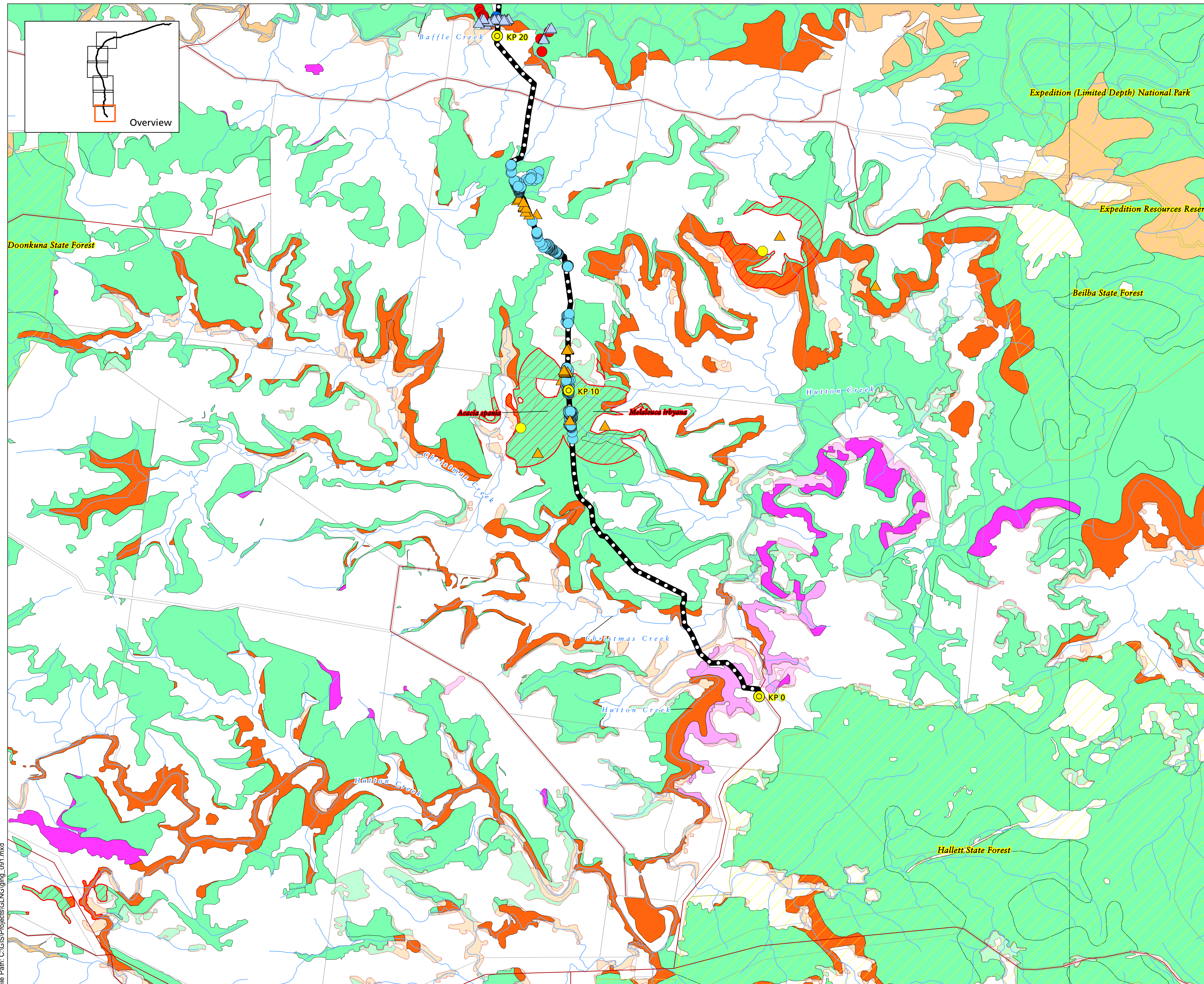
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








Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 1: Locality Plan (0-130km)

GLNG Gas Transmission Pipeline Corridor

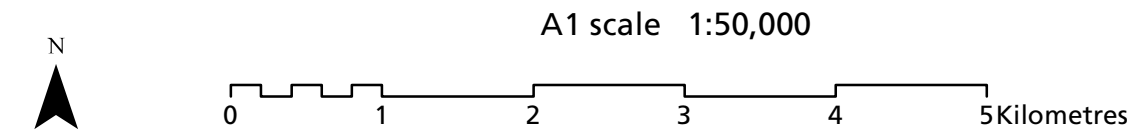


-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)**
-  *Acacia spania*
-  *Apatophyllum teretifolium*
-  *Cadellia pentastylis* (Ooline)
-  *Gonocarpus urceolatus*
-  *Leucopogon grandiflorus*
-  *Macrozamia fearnsidei*
-  *Melaleuca irbyana*
-  *Wahlenbergia islensis*
-  *Xerothamnella herbecea*
- Flora Observation (Saipem)**
-  *Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)**
-  Endangered - Dominant
-  Endangered - Sub-dominant
-  Of Concern - Dominant
-  Of Concern - Sub-dominant
-  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)**
-  Endangered Regional Ecosystem
-  Of Concern Regional Ecosystem
-  Least Concern Regional Ecosystem
-  Protected Area
-  Essential Habitat
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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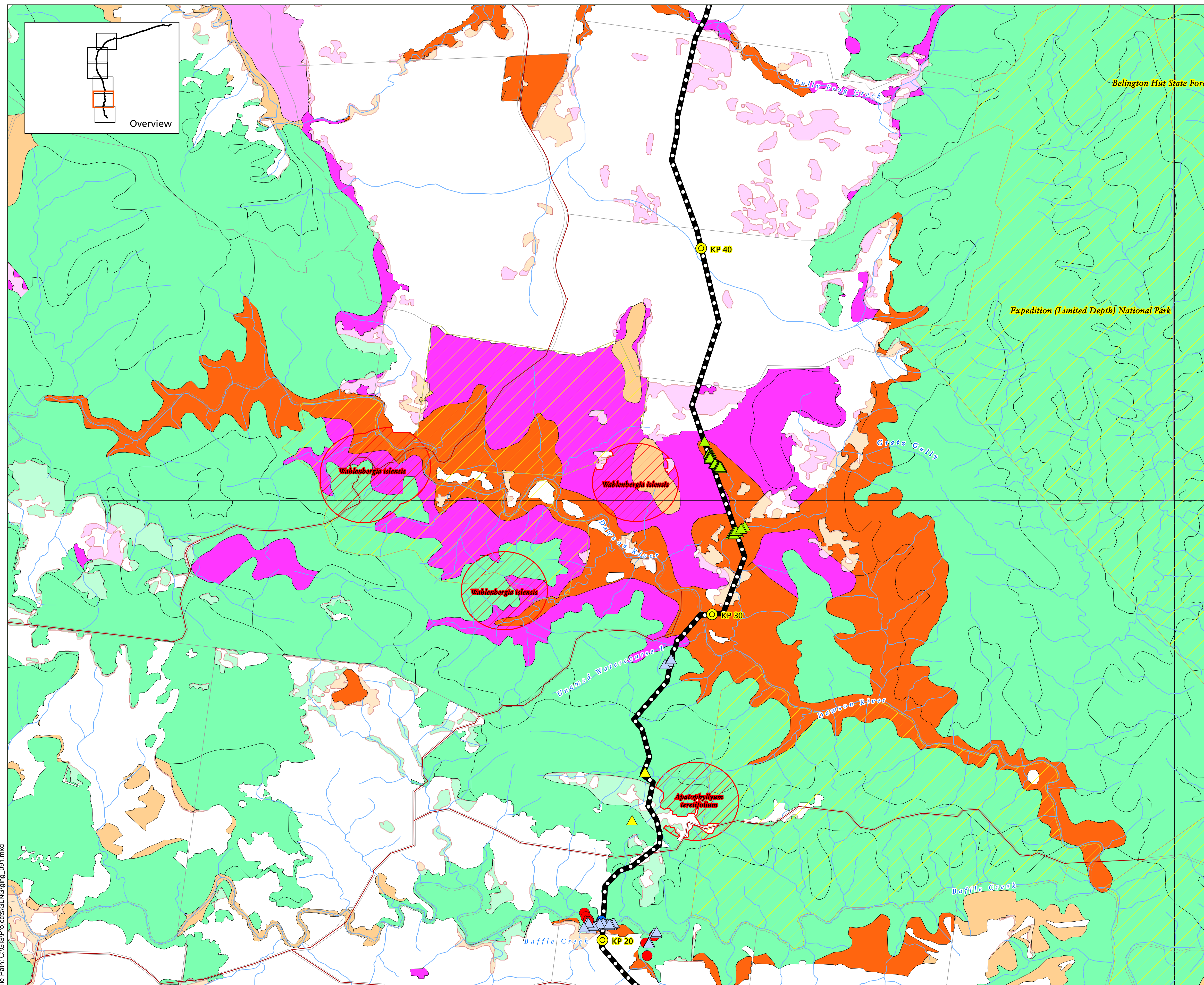
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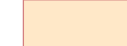









Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.1: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

GLNG Gas Transmission Pipeline Corridor

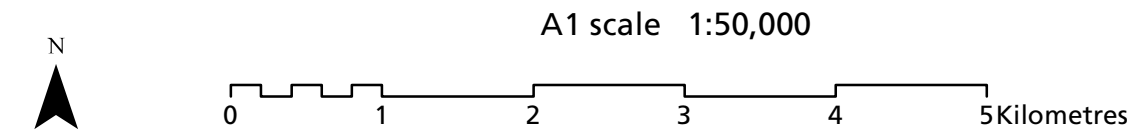


-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)
 -  *Acacia spania*
 -  *Apatophyllum teretifolium*
 -  *Cadellia pentastylis* (Ooline)
 -  *Gonocarpus urceolatus*
 -  *Leucopogon grandiflorus*
 -  *Macrozamia fearnsidei*
 -  *Melaleuca irbyana*
 -  *Wahlenbergia islensis*
 -  *Xerothamnella herbacea*
- Flora Observation (Saipem)
 -  *Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)
 -  Endangered - Dominant
 -  Endangered - Sub-dominant
 -  Of Concern - Dominant
 -  Of Concern - Sub-dominant
 -  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)
 -  Endangered Regional Ecosystem
 -  Of Concern Regional Ecosystem
 -  Least Concern Regional Ecosystem
 -  Protected Area
 -  Essential Habitat
 -  Cadastre
 -  Watercourse
 -  Rail
 -  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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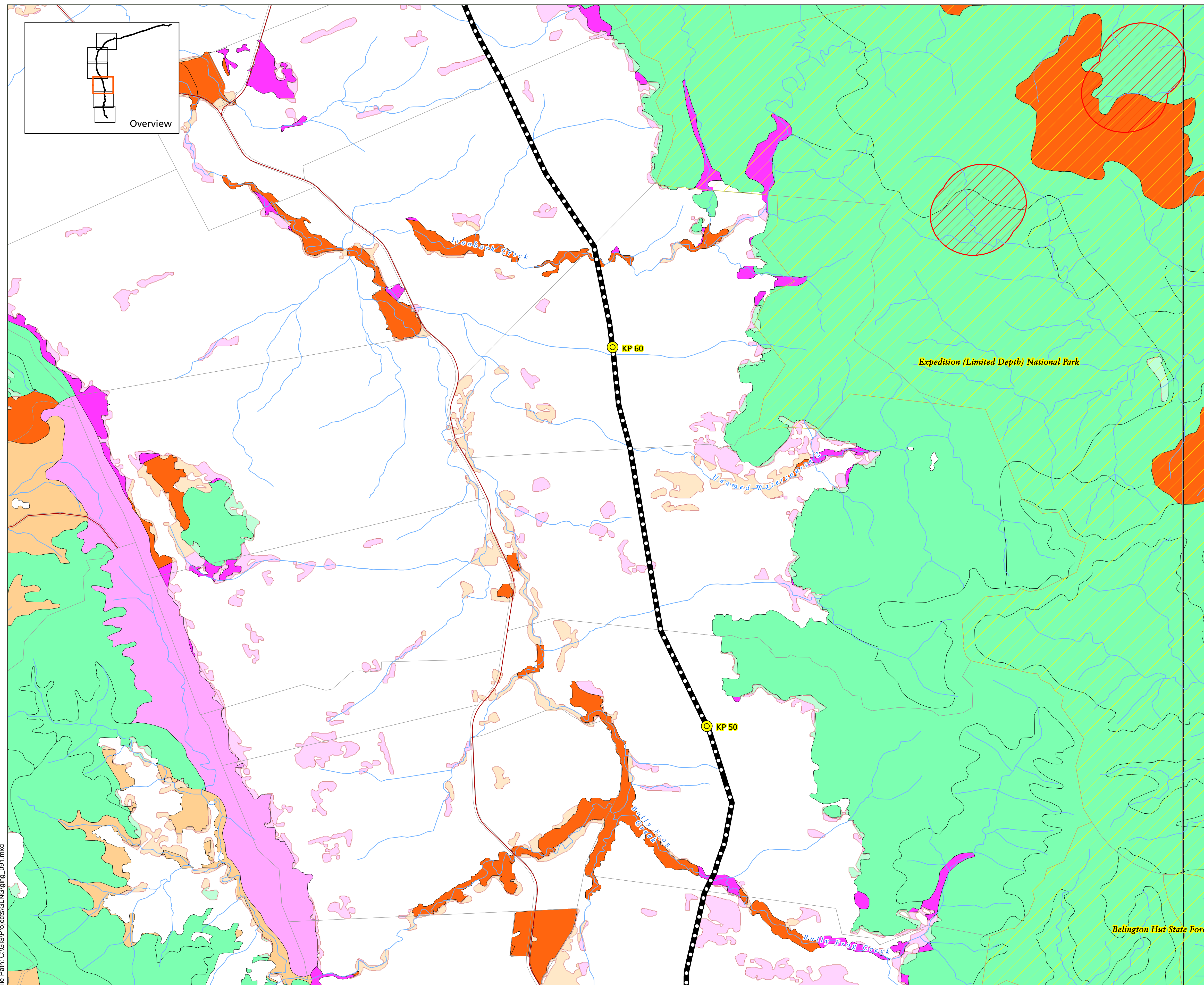
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








Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.2: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)
 -  *Acacia spania*
 -  *Apatophyllum teretifolium*
 -  *Cadellia pentastylis* (Ooline)
 -  *Gonocarpus urceolatus*
 -  *Leucopogon grandiflorus*
 -  *Macrozamia fearnsidei*
 -  *Melaleuca irbyana*
 -  *Wahlenbergia islensis*
 -  *Xerothamnella herbacea*
- Flora Observation (Saipem)
 -  *Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)
 -  Endangered - Dominant
 -  Endangered - Sub-dominant
 -  Of Concern - Dominant
 -  Of Concern - Sub-dominant
 -  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)
 -  Endangered Regional Ecosystem
 -  Of Concern Regional Ecosystem
 -  Least Concern Regional Ecosystem
-  Protected Area
-  Essential Habitat
-  Cadastre
-  Watercourse
-  Rail
-  Road

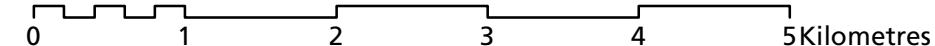
Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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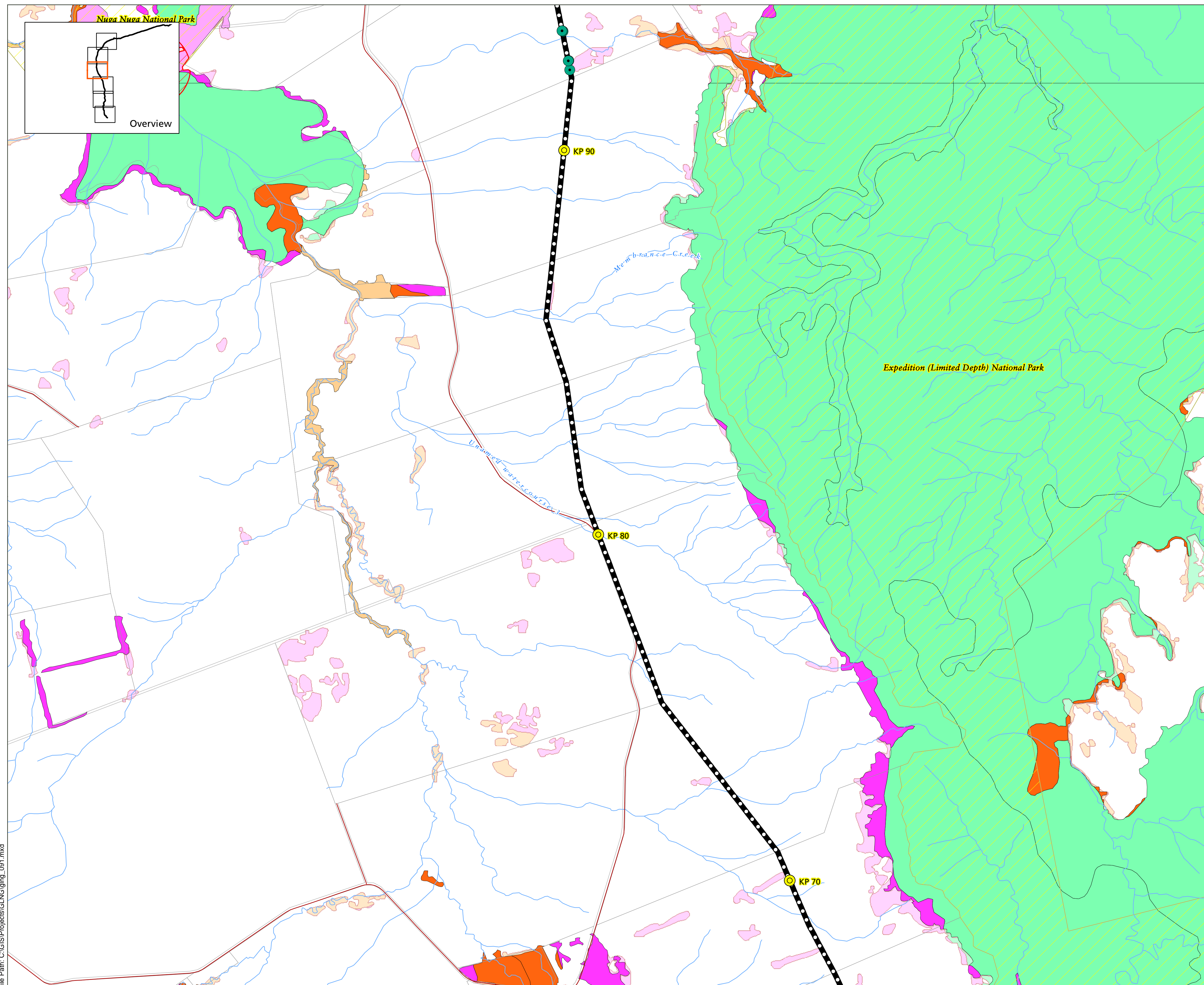
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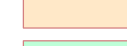
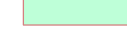








Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.3: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)
 -  *Acacia spania*
 -  *Apatophyllum teretifolium*
 -  *Cadellia pentastylis* (Ooline)
 -  *Gonocarpus urceolatus*
 -  *Leucopogon grandiflorus*
 -  *Macrozamia fearnsidei*
 -  *Melaleuca irbyana*
 -  *Wahlenbergia islensis*
 -  *Xerothamnella herbacea*
- Flora Observation (Saipem)
 -  *Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)
 -  Endangered - Dominant
 -  Endangered - Sub-dominant
 -  Of Concern - Dominant
 -  Of Concern - Sub-dominant
 -  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)
 -  Endangered Regional Ecosystem
 -  Of Concern Regional Ecosystem
 -  Least Concern Regional Ecosystem
 -  Protected Area
 -  Essential Habitat
 -  Cadastre
 -  Watercourse
 -  Rail
 -  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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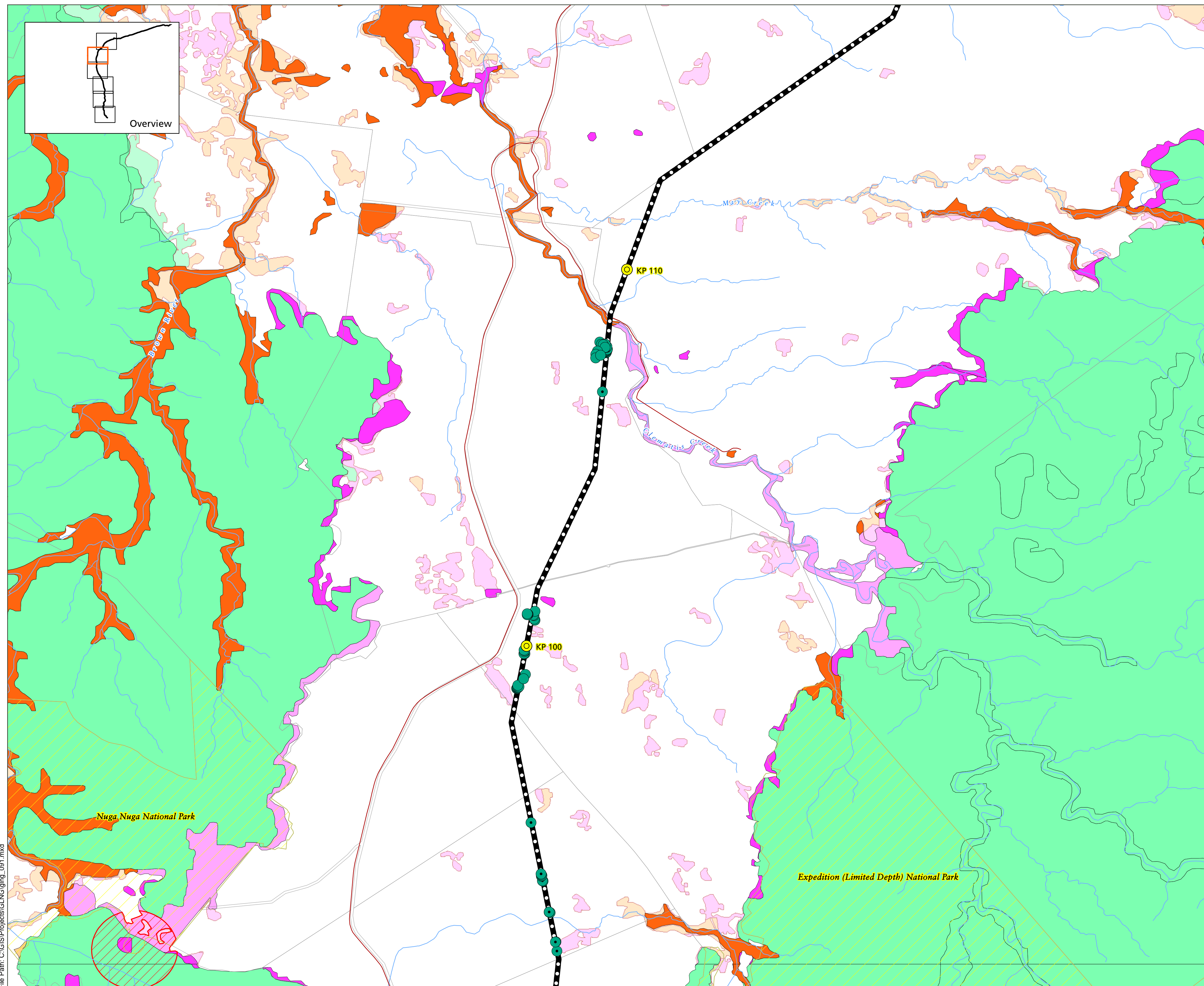
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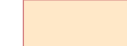







0 1 2 3 4 5 Kilometres

Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.4: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

GLNG Gas Transmission Pipeline Corridor



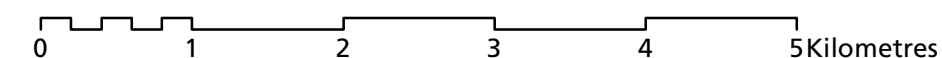
-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)
 -  *Acacia spania*
 -  *Apatophyllum teretifolium*
 -  *Cadellia pentastylis* (Ooline)
 -  *Gonocarpus urceolatus*
 -  *Leucopogon grandiflorus*
 -  *Macrozamia fearnsidei*
 -  *Melaleuca irbyana*
 -  *Wahlenbergia islensis*
 -  *Xerothamnella herbacea*
- Flora Observation (Saipem)
 -  *Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)
 -  Endangered - Dominant
 -  Endangered - Sub-dominant
 -  Of Concern - Dominant
 -  Of Concern - Sub-dominant
 -  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)
 -  Endangered Regional Ecosystem
 -  Of Concern Regional Ecosystem
 -  Least Concern Regional Ecosystem
 -  Protected Area
 -  Essential Habitat
 -  Cadastre
 -  Watercourse
 -  Rail
 -  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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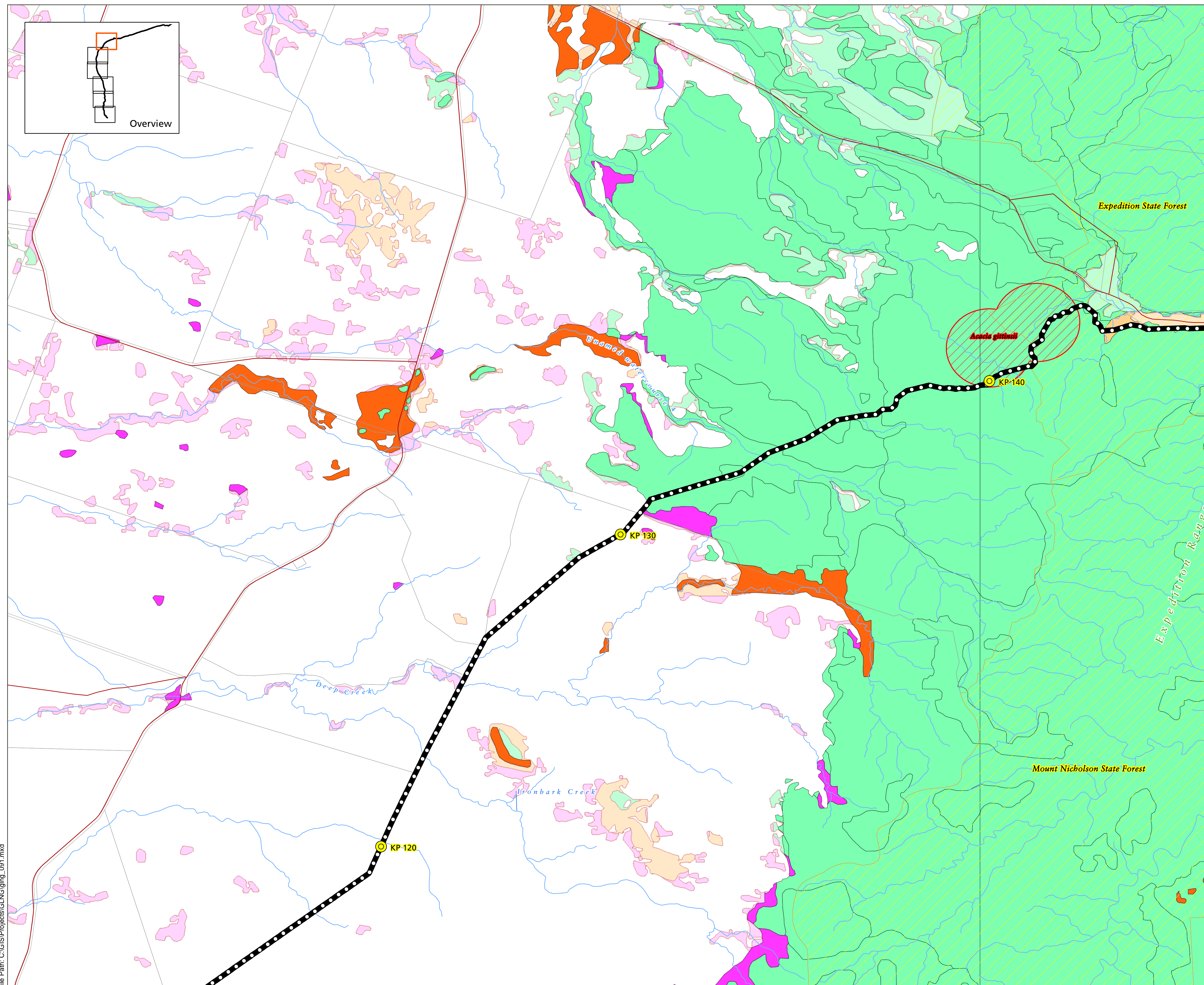


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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.5: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

GLNG Gas Transmission Pipeline Corridor

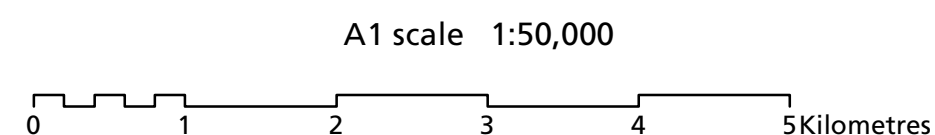


- Gas Transmission Pipeline (GTP)
- Kilometre Post Distance Marker (km)
- Flora Observation (GLNG)**
- Acacia spania*
- Apatophyllum teretifolium*
- Cadellia pentastylis* (Ooline)
- Gonocarpus urceolatus*
- Leucopogon grandiflorus*
- Macrozamia fearnsidei*
- Melaleuca irbyana*
- Wahlenbergia islensis*
- Xerothamnella herbacea*
- Flora Observation (Saipem)**
- Cadellia pentastylis* (Ooline)
- Regional Ecosystem (ground truthing within/surrounding RoW)**
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)**
- Endangered Regional Ecosystem
- Of Concern Regional Ecosystem
- Least Concern Regional Ecosystem
- Protected Area
- Essential Habitat
- Cadastre
- Watercourse
- Rail
- Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, Feb 2012.
 Threatened Species: Ecologica Consulting, Boobook Consultants, GLNG and Saipem 2010-2012.
 Cadastre: DERM, Nov 2011.

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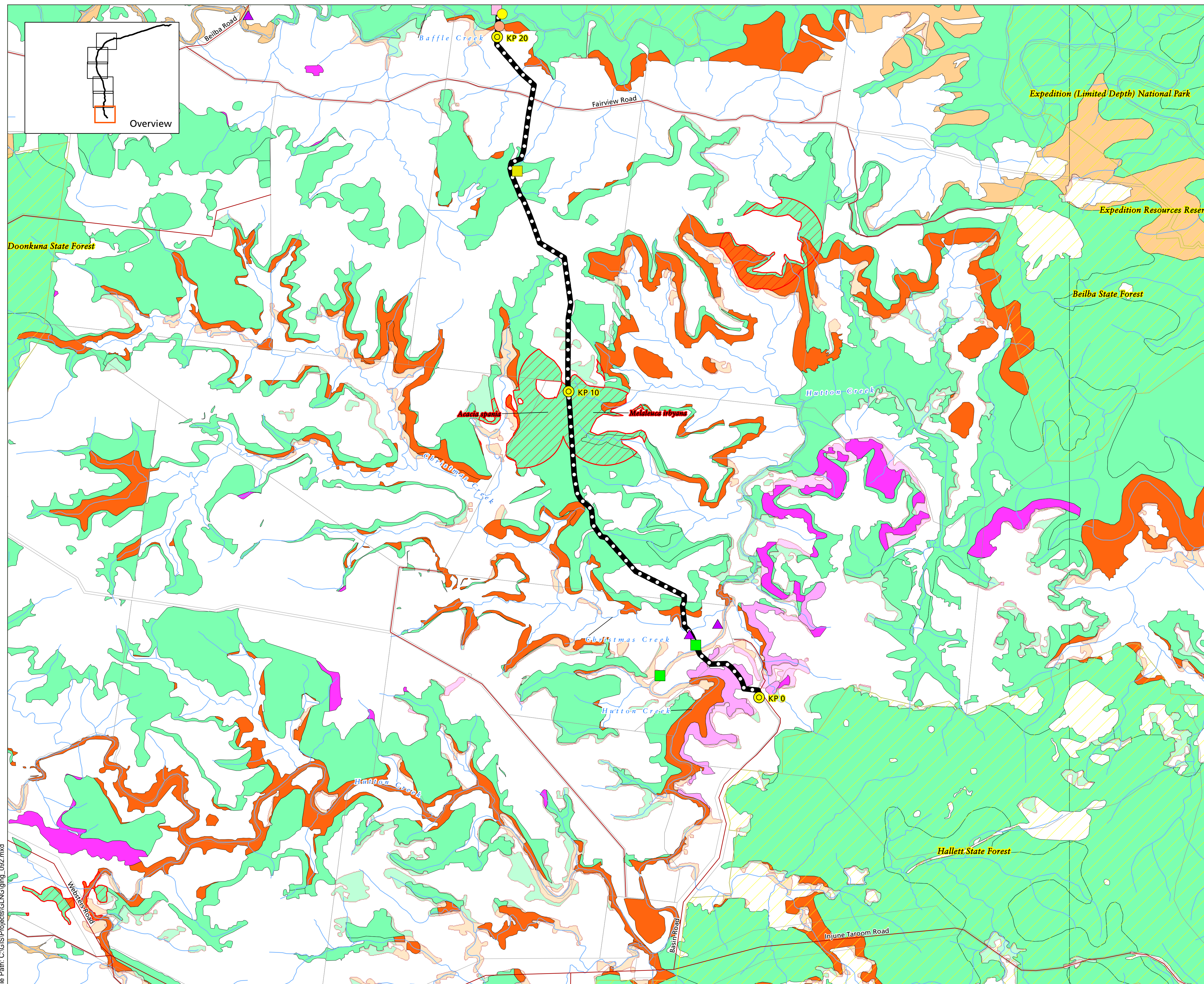
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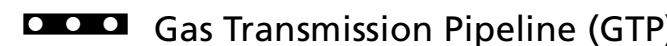





























Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 2.6: Regional Ecosystems, Essential Habitats and Threatened Species (Flora)

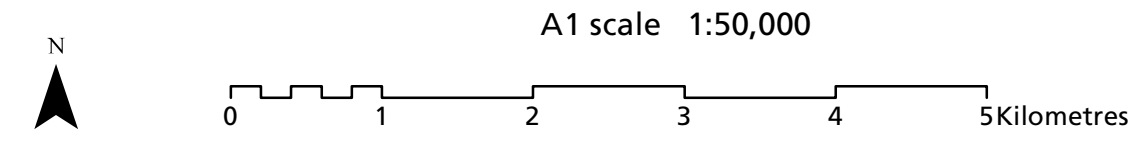
GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Fauna Observation**
-  *Chalinolobus dwyeri* Large-eared pied bat
-  *Chalinolobus picatus* Little pied bat
-  *Ephippiorhynchus asiaticus* Black-necked stork
-  *Furina dunmali* Dunmall's snake
-  *Geophaps scripta* Squatter pigeon
-  *Haliaeetus leucogaster* White-bellied sea eagle
-  *Lophoictinia isura* Square-tailed kite
-  *Nettapus coromandelianus* Cotton Pygmy-goose
-  *Ornithorhynchus anatinus* Platypus
-  *Paradelma orientalis* Brigalow scaly foot
-  *Phascolarctos cinereus* Koala
-  *Strophurus taenicauda* Golden-tailed gecko
- Regional Ecosystem (ground truthing within/surrounding RoW)**
-  Endangered - Dominant
-  Endangered - Sub-dominant
-  Of Concern - Dominant
-  Of Concern - Sub-dominant
-  Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)**
-  Endangered Regional Ecosystem
-  Of Concern regional Ecosystem
-  Least Concern Regional Ecosystem
-  Protected Area
-  Essential Habitat
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

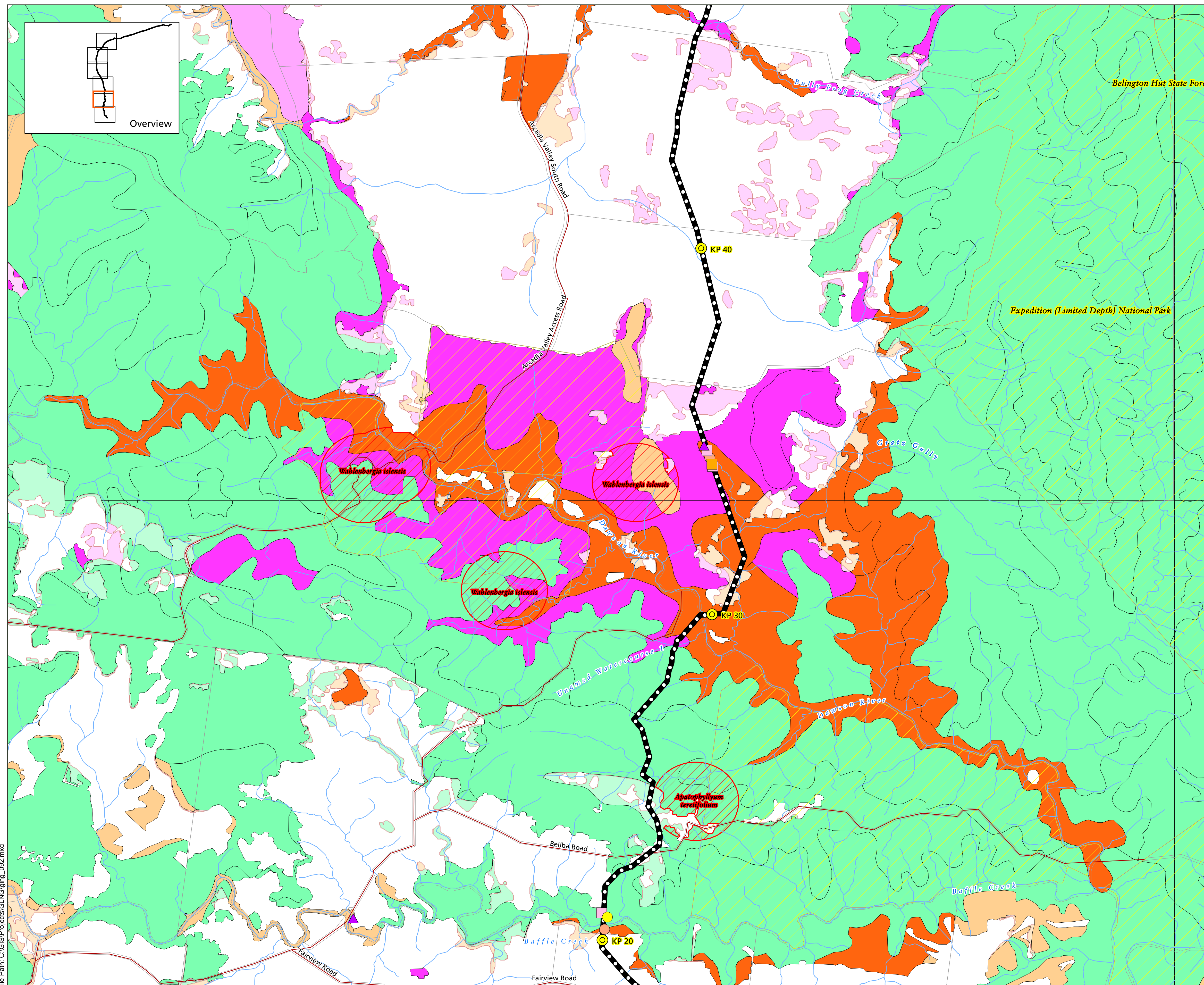
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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 3.1 : Regional Ecosystems, Essential Habitats and Threatened Species (Fauna)









GLNG Gas Transmission Pipeline Corridor








 Gas Transmission Pipeline (GTP)

 Kilometre Post Distance Marker (km)




Fauna Observation

-  *Chalinolobus dwyeri* Large-eared pied bat
-  *Chalinolobus picatus* Little pied bat
-  *Ephippiorhynchus asiaticus* Black-necked stork
-  *Furina dunmali* Dunmall's snake
-  *Geophaps scripta* Squatter pigeon
-  *Haliaeetus leucogaster* White-bellied sea eagle
-  *Lophoictinia isura* Square-tailed kite
-  *Nettapus coromandelianus* Cotton Pygmy-goose
-  *Ornithorhynchus anatinus* Platypus
-  *Paradelma orientalis* Brigalow scaly foot
-  *Phascolarctos cinereus* Koala
-  *Strophurus taenicauda* Golden-tailed gecko


Regional Ecosystem (ground truthing within/surrounding RoW)

-  Endangered - Dominant
-  Endangered - Sub-dominant
-  Of Concern - Dominant
-  Of Concern - Sub-dominant
-  Least Concern

High Value Regrowth Vegetation (ground truthing within/surrounding RoW)


-  Endangered Regional Ecosystem
-  Of Concern regional Ecosystem
-  Least Concern Regional Ecosystem

 Protected Area

 Essential Habitat

 Cadastre

 Watercourse

 Rail

 Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

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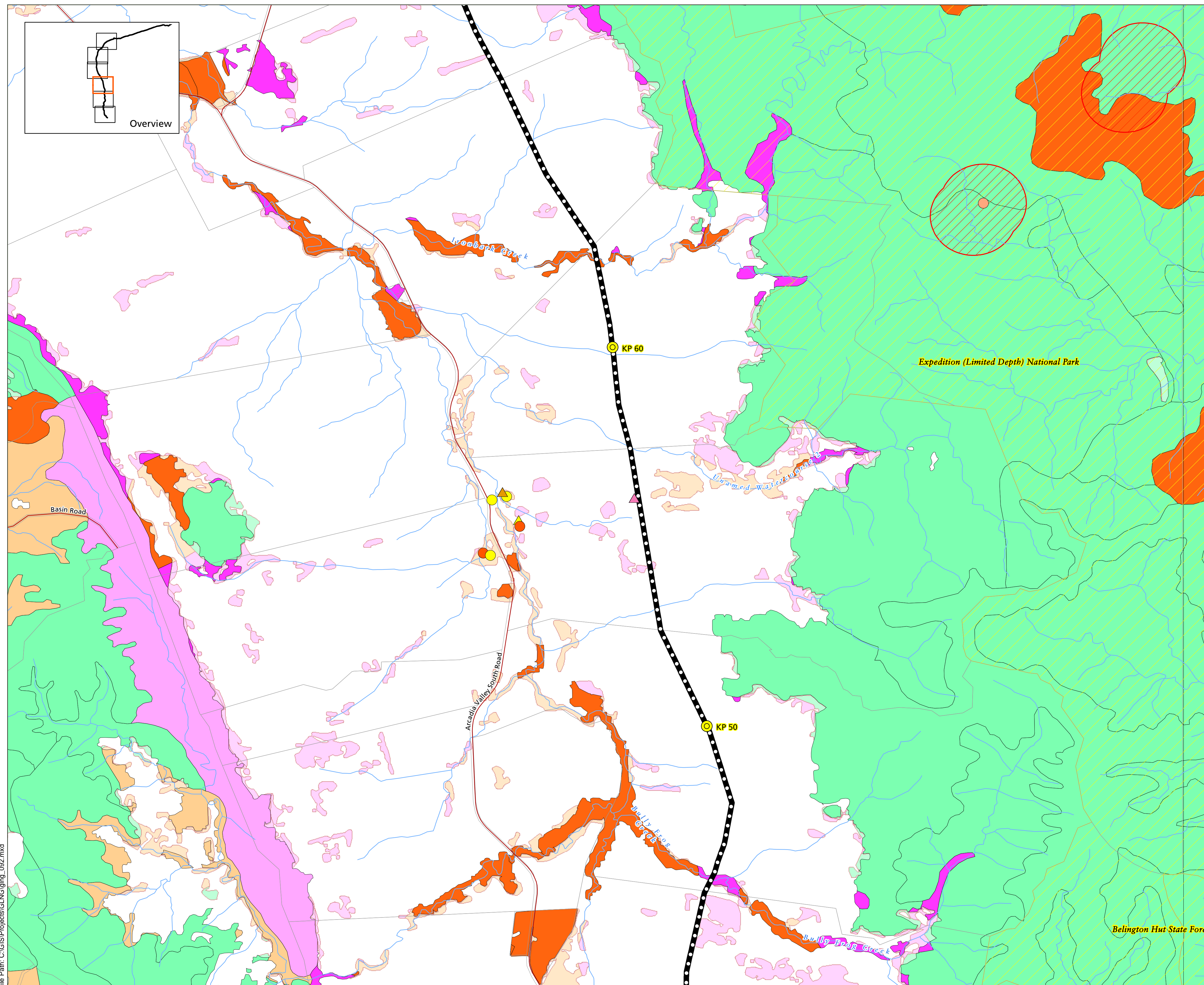
A1 scale 1:50,000


0 1 2 3 4 5 Kilometres

Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 3.2 : Regional Ecosystems, Essential Habitats and Threatened Species (Fauna)













GLNG Gas Transmission Pipeline Corridor








 Gas Transmission Pipeline (GTP)

 Kilometre Post Distance Marker (km)




Fauna Observation

- | | | |
|---|----------------------------------|-------------------------|
|  | <i>Chalinolobus dwyeri</i> | Large-eared pied bat |
|  | <i>Chalinolobus picatus</i> | Little pied bat |
|  | <i>Ehippiorhynchus asiaticus</i> | Black-necked stork |
|  | <i>Furina dunmali</i> | Dunmall's snake |
|  | <i>Geophaps scripta</i> | Squatter pigeon |
|  | <i>Haliaeetus leucogaster</i> | White-bellied sea eagle |
|  | <i>Lophoictinia isura</i> | Square-tailed kite |
|  | <i>Nettapus coromandelianus</i> | Cotton Pygmy-goose |
|  | <i>Ornithorhynchus anatinus</i> | Platypus |
|  | <i>Paradelma orientalis</i> | Brigalow scaly foot |
|  | <i>Phascolarctos cinereus</i> | Koala |
|  | <i>Strophurus taenicauda</i> | Golden-tailed gecko |

Regional Ecosystem (ground truthing within/surrounding RoW)

-  Endangered - Dominant
-  Endangered - Sub-dominant
-  Of Concern - Dominant
-  Of Concern - Sub-dominant
-  Least Concern


High Value Regrowth Vegetation (ground truthing within/surrounding RoW)

-  Endangered Regional Ecosystem
-  Of Concern regional Ecosystem
-  Least Concern Regional Ecosystem

 Protected Area

 Essential Habitat

 Cadastre

 Watercourse

 Rail

 Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

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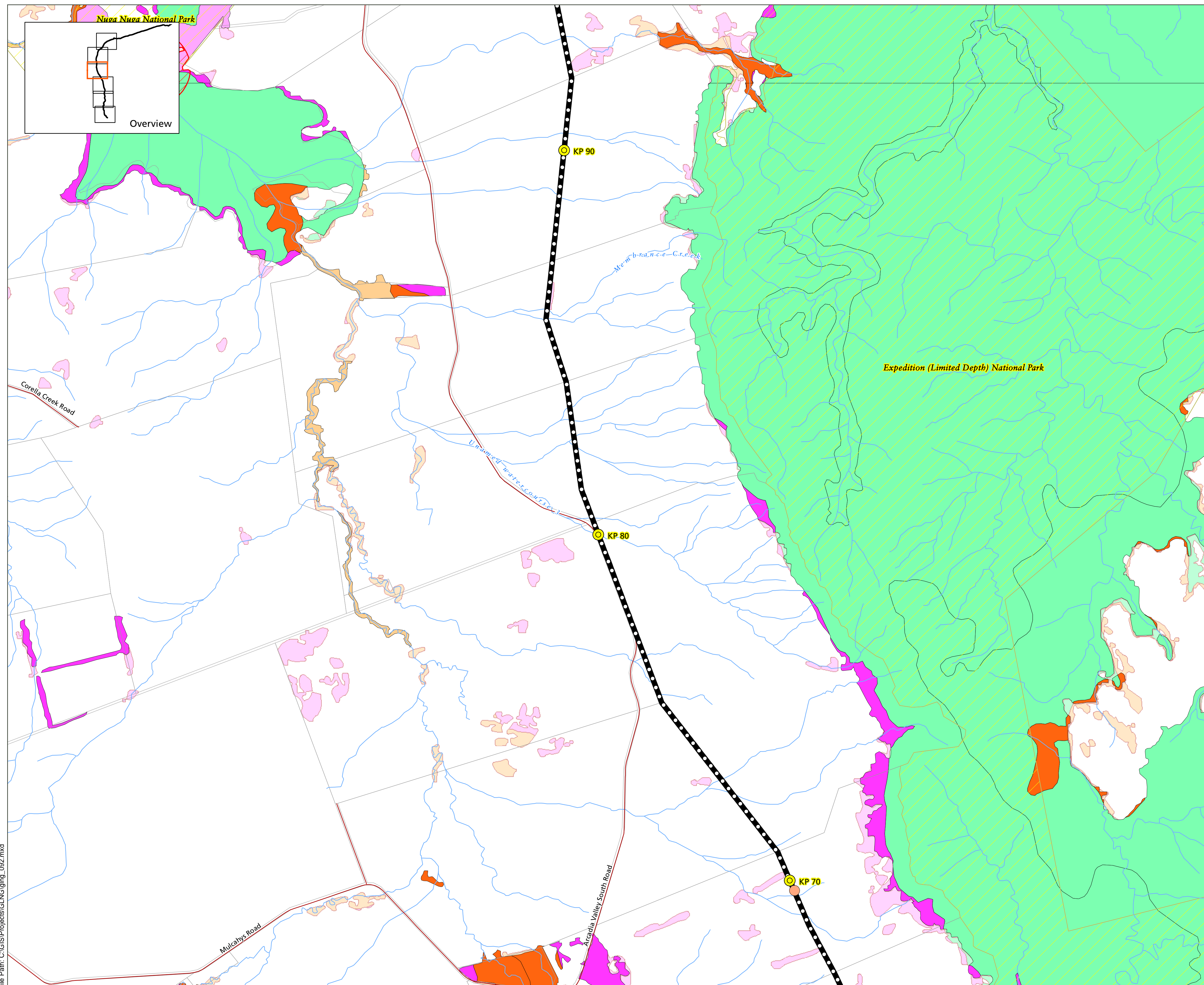
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0 1 2 3 4 5 Kilometres

Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 3.3 : Regional Ecosystems, Essential Habitats and Threatened Species (Fauna)












GLNG Gas Transmission Pipeline Corridor








 Gas Transmission Pipeline (GTP)

 Kilometre Post Distance Marker (km)


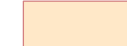
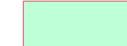
Fauna Observation

- | | | |
|---|-----------------------------------|-------------------------|
|  | <i>Chalinolobus dwyeri</i> | Large-eared pied bat |
|  | <i>Chalinolobus picatus</i> | Little pied bat |
|  | <i>Ephippiorhynchus asiaticus</i> | Black-necked stork |
|  | <i>Furina dunmali</i> | Dunmall's snake |
|  | <i>Geophaps scripta</i> | Squatter pigeon |
|  | <i>Haliaeetus leucogaster</i> | White-bellied sea eagle |
|  | <i>Lophoictinia isura</i> | Square-tailed kite |
|  | <i>Nettapus coromandelianus</i> | Cotton Pygmy-goose |
|  | <i>Ornithorhynchus anatinus</i> | Platypus |
|  | <i>Paradelma orientalis</i> | Brigalow scaly foot |
|  | <i>Phascolarctos cinereus</i> | Koala |
|  | <i>Strophurus taenicauda</i> | Golden-tailed gecko |


Regional Ecosystem (ground truthing within/surrounding RoW)

- | | |
|---|---------------------------|
|  | Endangered - Dominant |
|  | Endangered - Sub-dominant |
|  | Of Concern - Dominant |
|  | Of Concern - Sub-dominant |
|  | Least Concern |

High Value Regrowth Vegetation (ground truthing within/surrounding RoW)

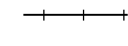
- | | |
|---|----------------------------------|
|  | Endangered Regional Ecosystem |
|  | Of Concern regional Ecosystem |
|  | Least Concern Regional Ecosystem |

 Protected Area

 Essential Habitat

 Cadastre

 Watercourse

 Rail

 Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

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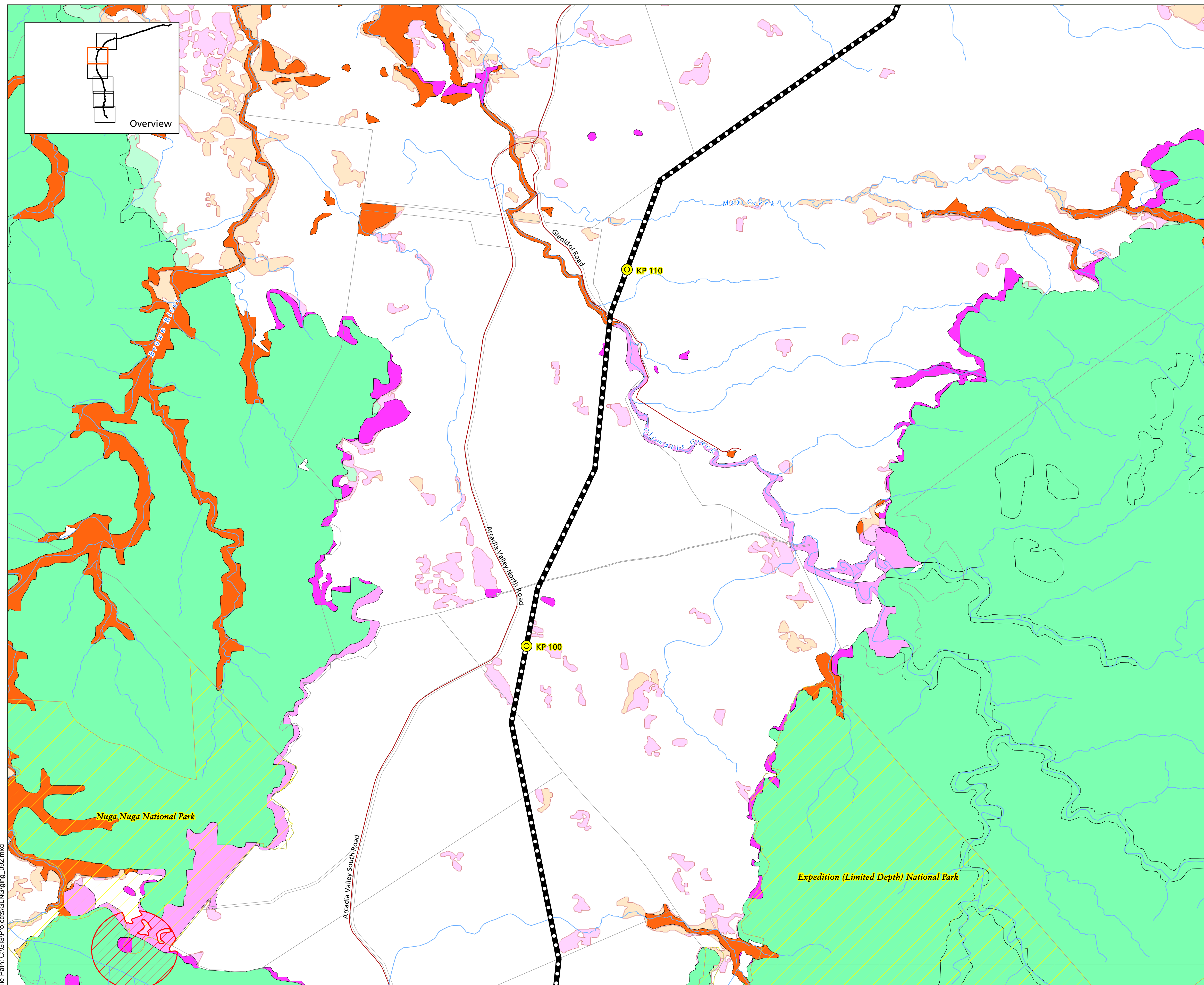
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0 1 2 3 4 5 Kilometres

Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 3.4 : Regional Ecosystems, Essential Habitats and Threatened Species (Fauna)

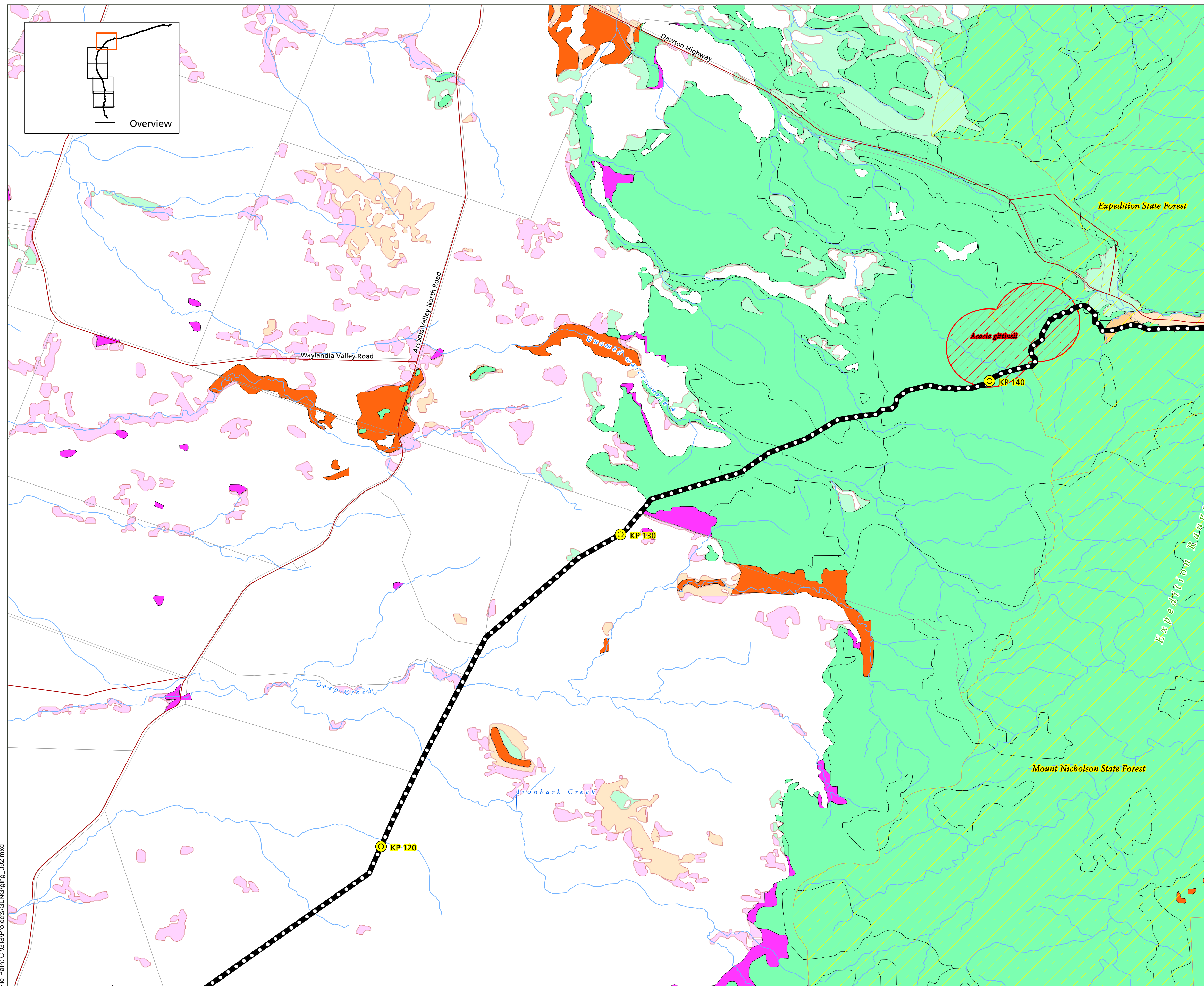
GLNG Gas Transmission Pipeline Corridor



- Gas Transmission Pipeline (GTP)
- Kilometre Post Distance Marker (km)
- Fauna Observation**
- Chalinolobus dwyeri* Large-eared pied bat
- Chalinolobus picatus* Little pied bat
- Ephippiorhynchus asiaticus* Black-necked stork
- Furina dunmali* Dunmall's snake
- Geophaps scripta* Squatter pigeon
- Haliaeetus leucogaster* White-bellied sea eagle
- Lophoictinia isura* Square-tailed kite
- Nettapus coromandelianus* Cotton Pygmy-goose
- Ornithorhynchus anatinus* Platypus
- Paradelma orientalis* Brigalow scaly foot
- Phascolarctos cinereus* Koala
- Strophurus taenicauda* Golden-tailed gecko
- Regional Ecosystem (ground truthing within/surrounding RoW)**
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)**
- Endangered Regional Ecosystem
- Of Concern regional Ecosystem
- Least Concern Regional Ecosystem
- Protected Area
- Essential Habitat
- Cadastre
- Watercourse
- Rail
- Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

GLNG Gas Transmission Pipeline Corridor



- Gas Transmission Pipeline (GTP)
- Kilometre Post Distance Marker (km)
- Fauna Observation**
- Chalinolobus dwyeri* Large-eared pied bat
- Chalinolobus picatus* Little pied bat
- Ephippiorhynchus asiaticus* Black-necked stork
- Furina dunmali* Dunmall's snake
- Geophaps scripta* Squatter pigeon
- Haliaeetus leucogaster* White-bellied sea eagle
- Lophoictinia isura* Square-tailed kite
- Nettapus coromandelianus* Cotton Pygmy-goose
- Ornithorhynchus anatinus* Platypus
- Paradelma orientalis* Brigalow scaly foot
- Phascolarctos cinereus* Koala
- Strophurus taenicauda* Golden-tailed gecko
- Regional Ecosystem (ground truthing within/surrounding RoW)**
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Least Concern
- High Value Regrowth Vegetation (ground truthing within/surrounding RoW)**
- Endangered Regional Ecosystem
- Of Concern regional Ecosystem
- Least Concern Regional Ecosystem
- Protected Area
- Essential Habitat
- Cadastre
- Watercourse
- Rail
- Road

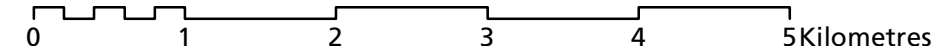
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 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 High Value Regrowth Vegetation: Version 2.1, DERM, Sept 2011 with amendments within and adjacent to C2/A8 pipeline corridor, Ecologica Consulting, May 2012.
 Essential Habitats: Version 3, DERM, Oct 2009.
 Essential Regrowth Habitats: Version 3, DERM, Oct 2009.
 Protected Area: DERM, June 2011.
 Threatened Species: Ecologica Consulting, Feb 2012, Boobook Consultants, 2011, GLNG 2011 and DERM Wetlands database, Feb 2012.
 Cadastre: DERM, Nov 2011.

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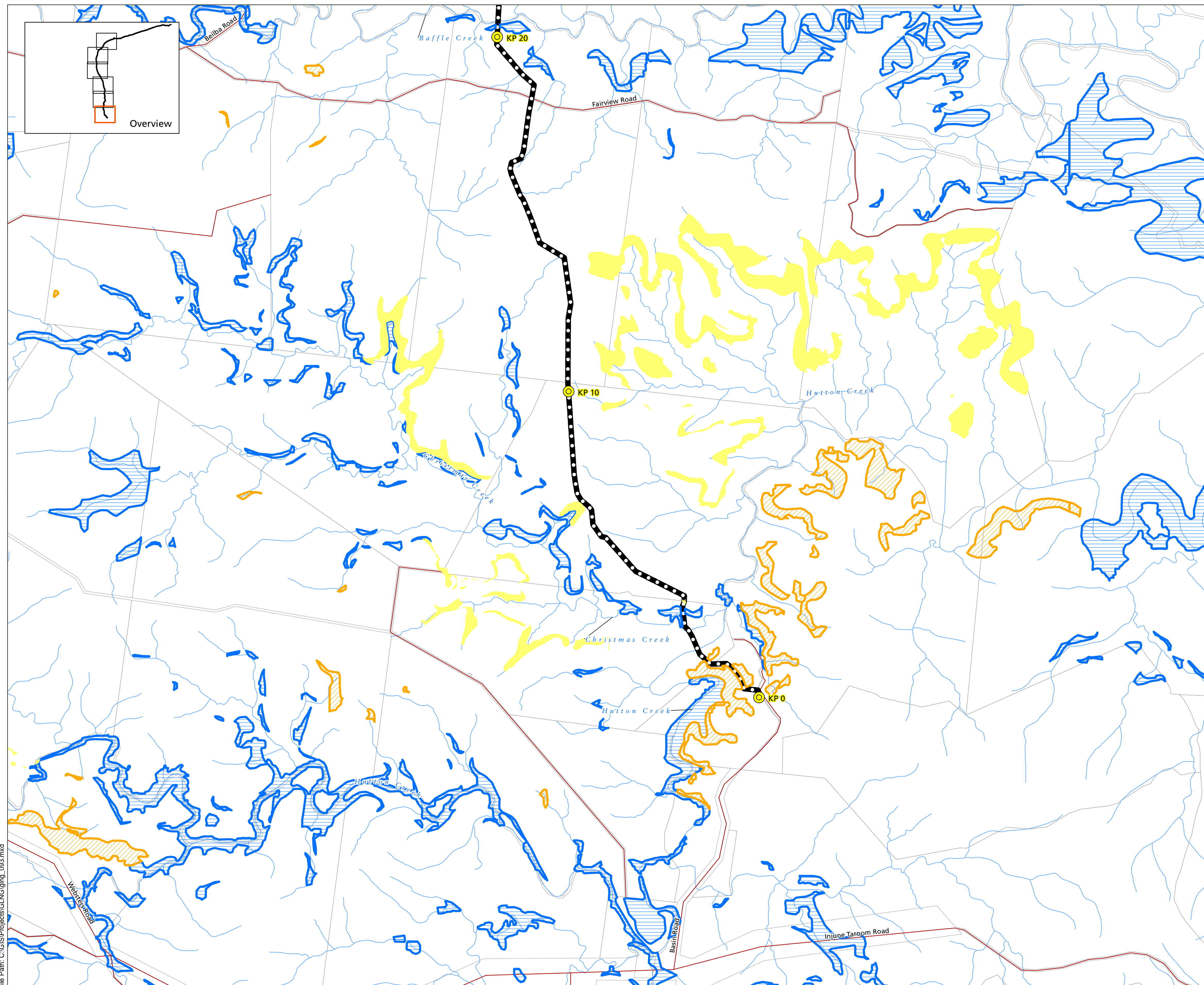
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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 3.6 : Regional Ecosystems, Essential Habitats and Threatened Species (Fauna)

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community**
-  Brigalow (*Acacia harpophylla* dominant and co-dominant)
-  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
-  Weeping Myall Woodland
-  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
-  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

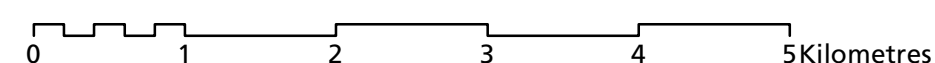
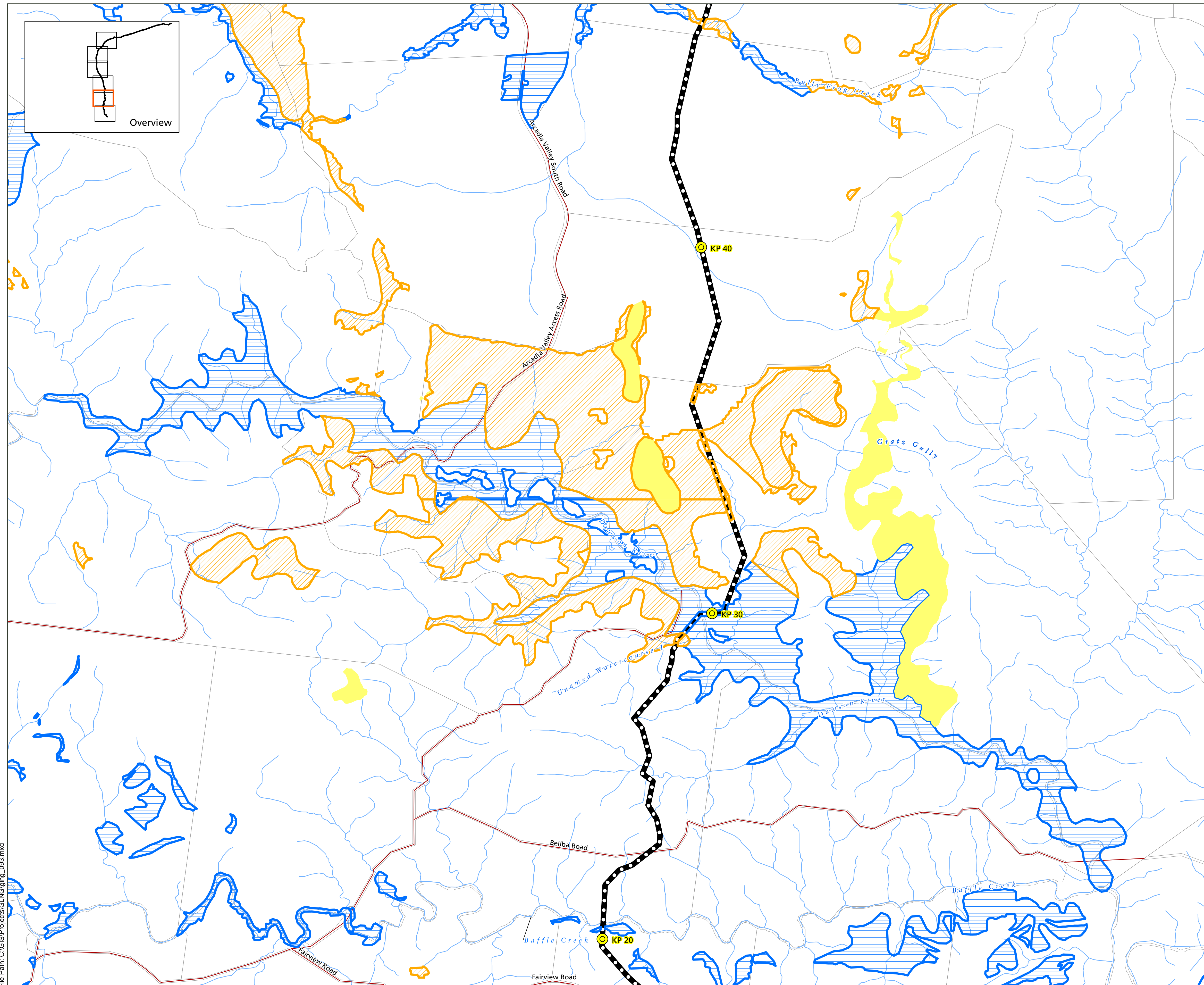




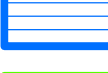
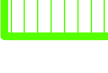


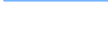
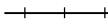



Figure 4.1: Threatened Ecological Communities

GLNG Gas Transmission Pipeline Corridor



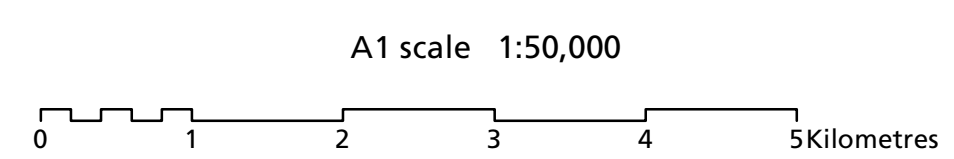
-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community**
-  Brigalow (*Acacia harpophylla* dominant and co-dominant)
-  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
-  Weeping Myall Woodland
-  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
-  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

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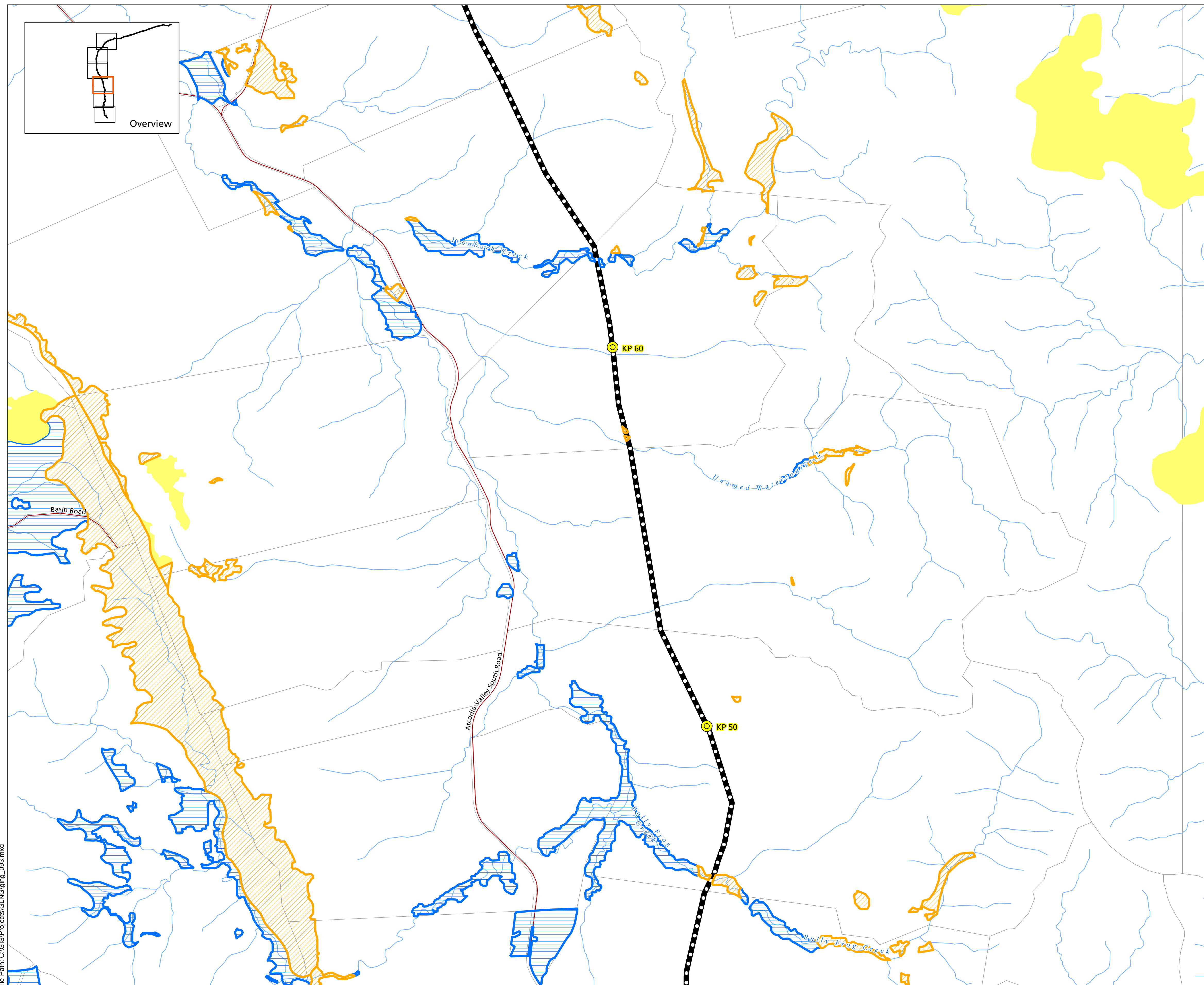
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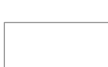






Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 4.2: Threatened Ecological Communities

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community**
-  Brigalow (Acacia harpophylla dominant and co-dominant)
-  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
-  Weeping Myall Woodland
-  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
-  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

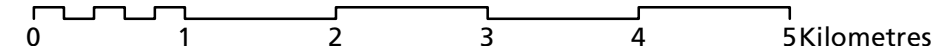
Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

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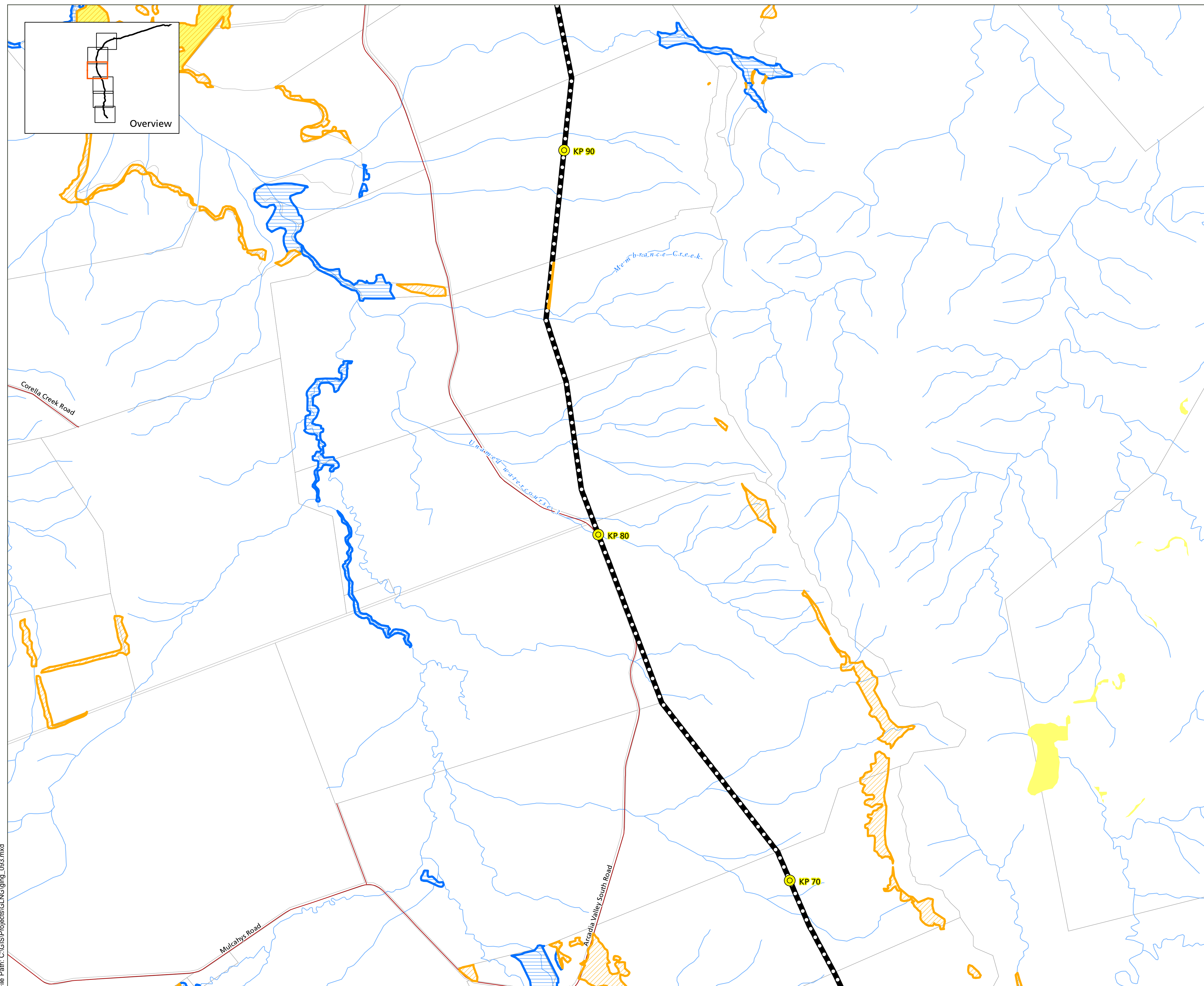
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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 4.3: Threatened Ecological Communities

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community**
-  Brigalow (*Acacia harpophylla* dominant and co-dominant)
-  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
-  Weeping Myall Woodland
-  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
-  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

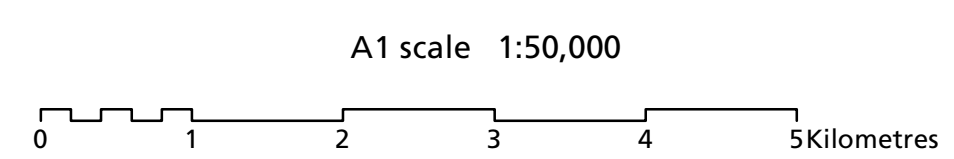
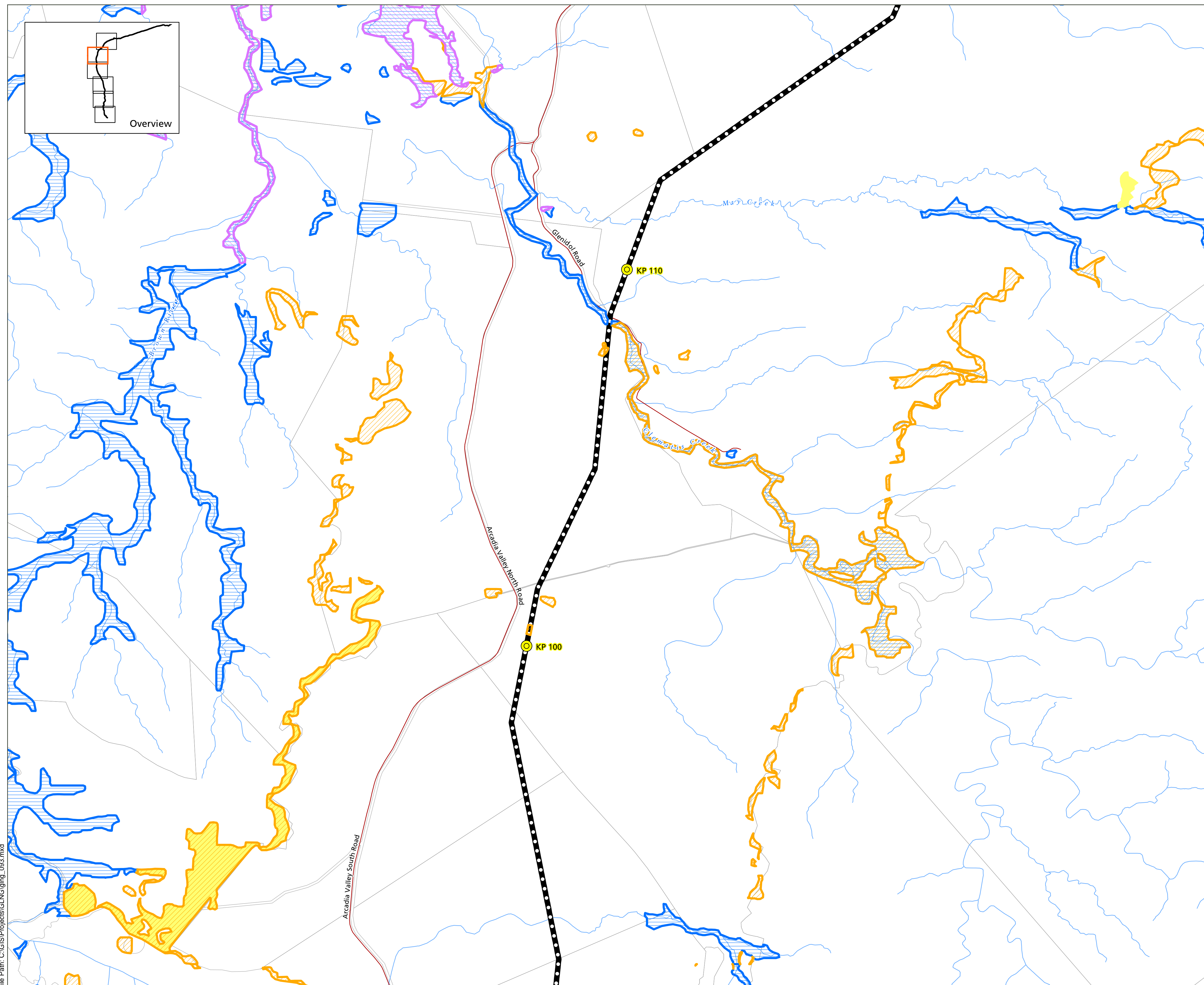









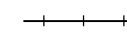



Figure 4.4: Threatened Ecological Communities

GLNG Gas Transmission Pipeline Corridor



-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community**
-  Brigalow (*Acacia harpophylla* dominant and co-dominant)
-  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
-  Weeping Myall Woodland
-  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
-  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

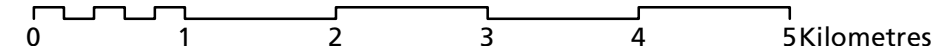
Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

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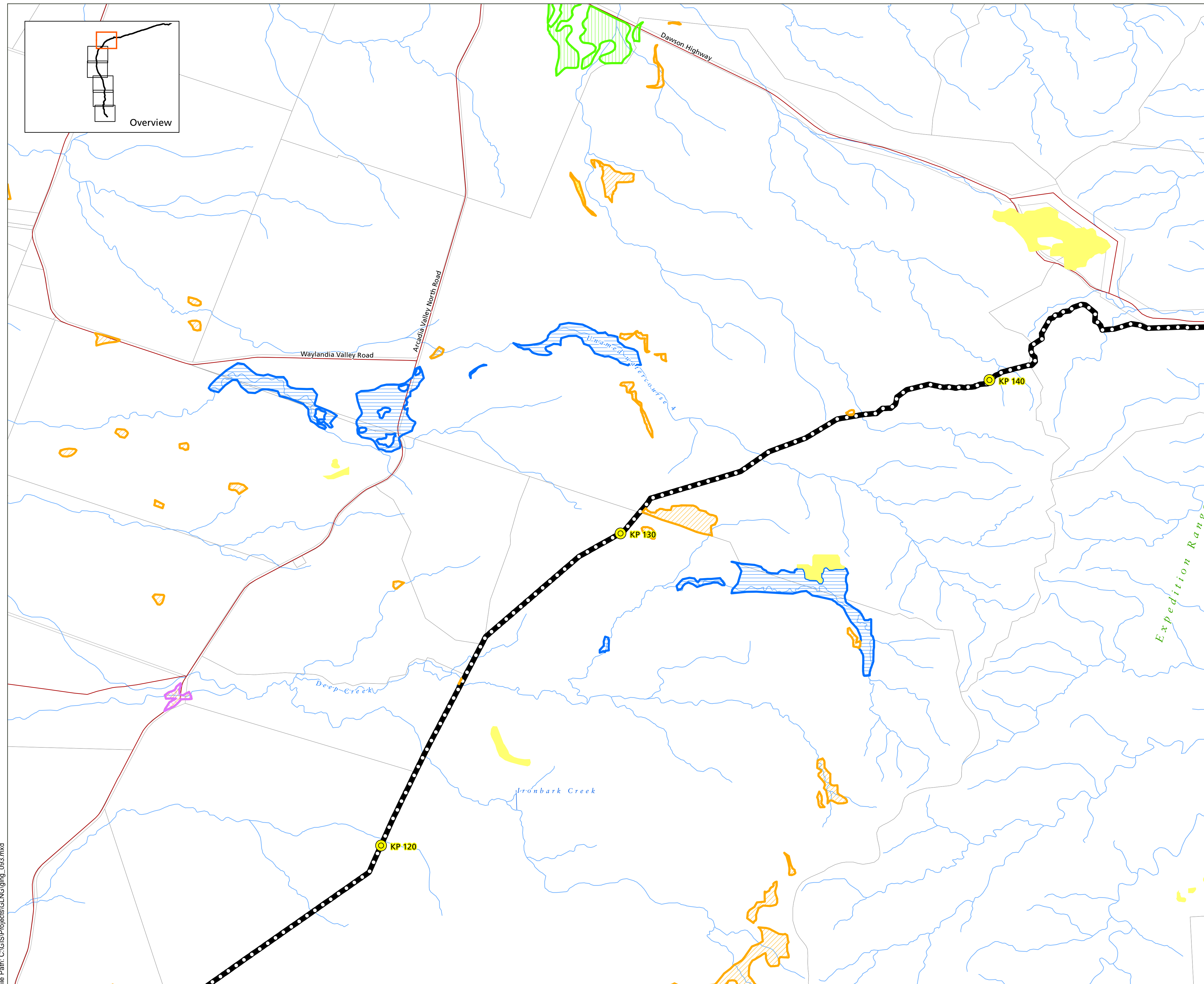
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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 4.5: Threatened Ecological Communities

GLNG Gas Transmission Pipeline Corridor



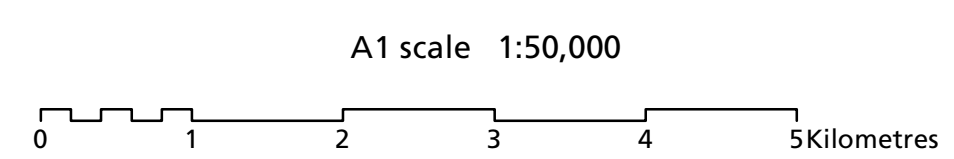
-  Gas Transmission Pipeline (GTP)
-  Kilometre Post Distance Marker (km)
- Threatened Ecological Community
 -  Brigalow (*Acacia harpophylla* dominant and co-dominant)
 -  Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
 -  Weeping Myall Woodland
 -  Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
 -  Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
-  Cadastre
-  Watercourse
-  Rail
-  Road

Source:
 Gas Transmission Pipeline (GTP): EMP, Rev C2, Santos, Jan 2011.
 Watercourses: DERM, July 2011.
 Regional Ecosystems: Version 6.1, DERM, Sept 2011.
 Threatened Ecological Communities: Data created using Sprat (Species Profile and Threats) database, Australian Government, Department of Sustainability, Environment, Water, Population and Communities (Feb 2012). Uses DERM v6.1 RE (Sept 2011), Regrowth v2.1 (Sept 2011), with RE amendments along pipeline corridor, and aerial observations, Ecologica Consulting, Boobook, 2012.
 Aerial: Santos, 2011.
 Cadastre: DERM, Feb 2011.

Note: Threatened Ecological Community (TEC) data is indicative only. Variations in TEC RE codes may occur.

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Coordinate System: GCS GDA 1994
 Datum: GDA 1994

Figure 4.6: Threatened Ecological Communities