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### **Document control**



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# **Appendix A**

Botanical species list

# Background

# 1.1 Project description

Santos Ltd (Santos) have commissioned Aurecon Australia Pty Ltd (Aurecon) to undertake ecological investigations of proposed areas of development for the Roma gas fields.

The Roma gas fields are located near the township of Roma in south-west Queensland and are characterised by undulating terrain with small elevated areas including the Thomby and Grafton Ranges. The dominant vegetation types within the Roma gas fields include Eucalypt and/or Brigalow woodlands, Blue grass or Mitchell grass downs, and smaller areas of White cypress pine and Mulga (Eddie 2007). The Roma gas fields are located within the Balonne River catchment.

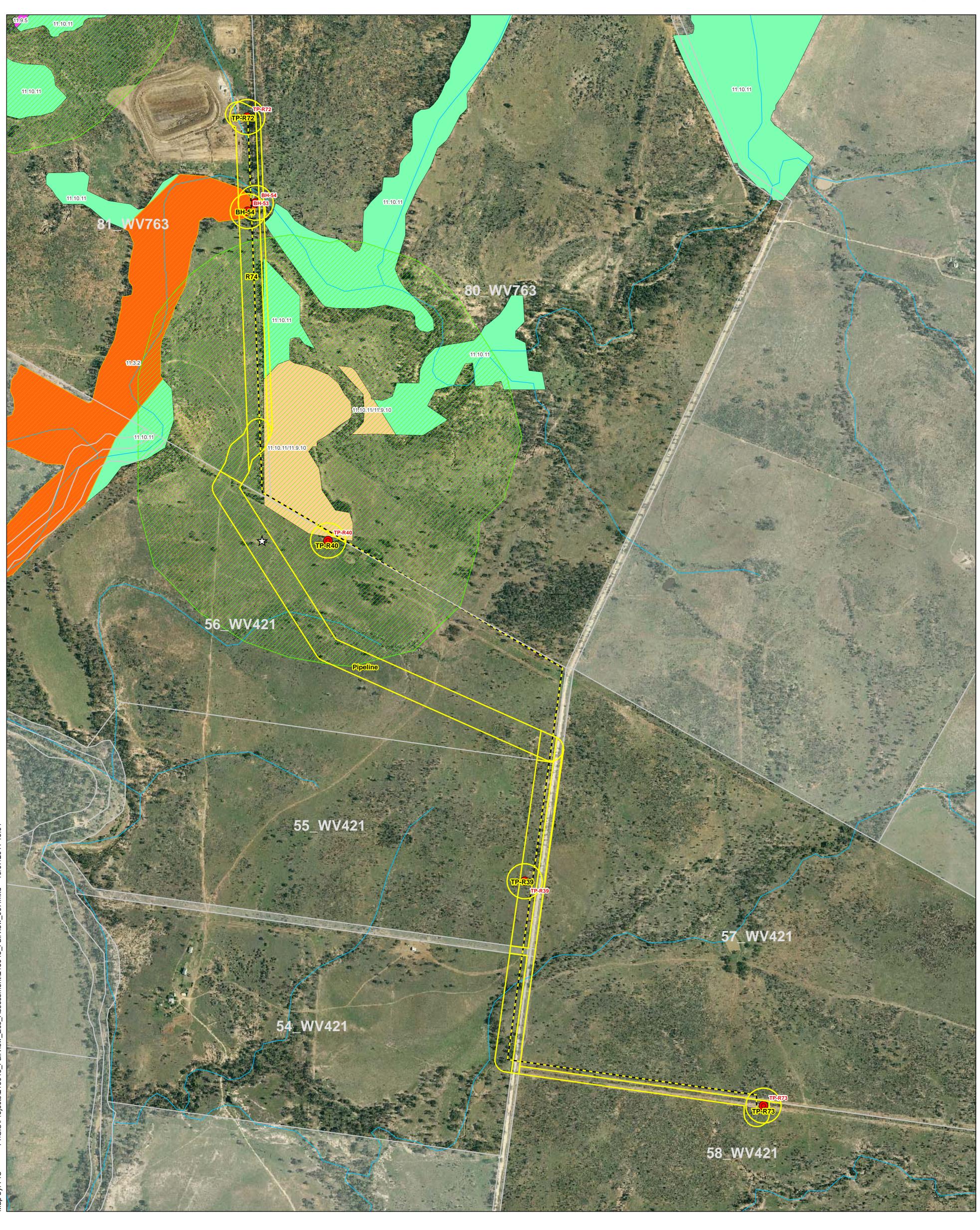
The majority of the Roma Gas Field area has been subject to cattle grazing and other agricultural practices, in addition to previous development associated with the Roma gas fields.

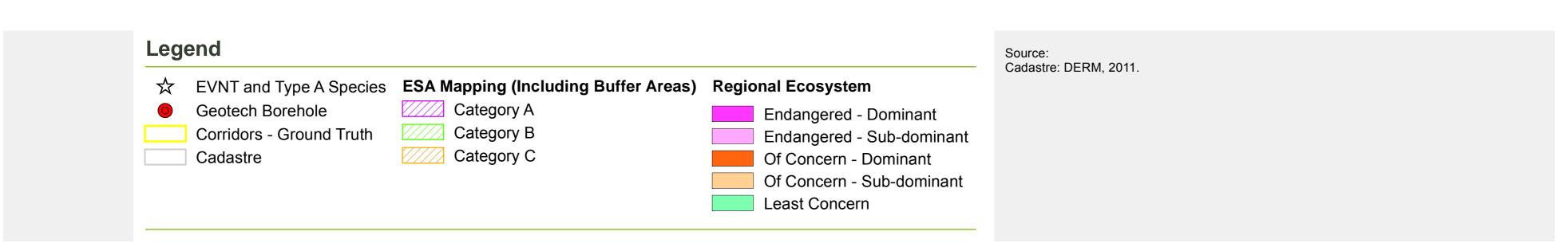
This report addresses corridor R74 and associated well sites and geotechnical sites, as shown on Figure 1.1. These areas are collectively referred to as the 'proposed development area', and are located entirely within Lots 54 to 58 on WV421 and Lots 80 and 81 on WV763. Note that the subject of this report is solely related to these properties.

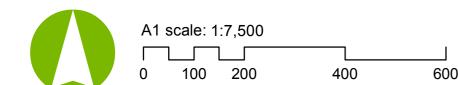
# 1.2 Purpose of the report

The aim of this report is to provide an ecological assessment of the proposed development areas located within Lots 54 to 58 on WV421 and Lots 80 and 81 on WV763 (Figure 1.1), and to identify areas and species of notable ecological or conservation value. This report does not make any recommendations regarding the development in relation to any Santos environmental authorities or other approvals.









# 2. Methodology

# 2.1 Desktop methodology

Proposed development areas have been projected on a range of maps provided by Santos. These maps include Regional Ecosystem (RE) Mapping (version 6.0; Department of Environment and Resource Management [DERM]), Environmentally Sensitive Areas (ESA) mapping, drainage mapping and aerial photography. Where available ahead of time, these resources were reviewed to determine target areas for the field inspection. It is important to note that the RE classifications used in this report are based on the 'biodiversity status' of the vegetation and not the 'Vegetation Management Act 1999 (VM Act) status' of the vegetation.

### 2.2 Field methodology

The proposed development areas were assessed by four (4) ecologists (S. Stone, L. Leathbridge, S. Schulz and M. Bailey) on the 25 June 2011. The assessments were conducted to determine the existing vegetation communities and habitat value within the proposed development areas, and to verify the RE mapping as produced by DERM.

GIS environmental constraints layers (eg RE Mapping, ESA mapping etc) and high resolution aerial photography were uploaded onto a toughbook (C5 mobile clinical assistant CFT-001 – Motion computing), with an integrated GPS used to locate surveys areas. Handheld Garmin GPS units (GPS map 76) were also used during the field investigations. It should be noted that while efforts were made to ensure the GPS co-ordinates provided in this report are accurate, a margin of error approximately +/- 15 m is expected due to the limitations of the devices used and the recording environment.

The corridors were 100 m wide and of varying lengths, and the circular well pad areas had a radius of 175 m. Geotechnical survey locations were also assessed as part of the survey areas (a 50 m buffer zone around each survey location was assessed).

The ground-truthing of the proposed development areas included undertaking detailed flora species surveys including sampling of unknown flora, and recording all incidental fauna observations. All species known to be of conservation significance (such as endangered, vulnerable, near threatened [EVNT] or Type A restricted species under the *Nature Conservation Act 1992* [NC Act] or endangered, vulnerable or rare species under the *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act]) were recorded using the toughbook.

A list of flora species observed in the proposed development areas has been included in Appendix A. Incidental fauna observations are provided in the relevant sections throughout this report.

# 3. Ecological assessment

#### 3.1 Corridor R74

#### General

The proposed pipeline corridors R74 are located on Lots 80-81 on WV763 and Lots 54-58 on WV421 (Figure 1.1). The site is gently undulating with silty-sandy soils. The proposed development area has been extensively disturbed due to previous vegetation clearing and heavy grazing by stock. This corridor largely follows existing internal access tracks and roads (Figure 1.1).

The majority of the survey area is currently mapped by DERM as non-remnant vegetation, however 'Endangered sub-dominate' (RE11.10.11/11.9.10), 'Of Concern' (RE 11.3.2) and 'No Concern at Present' (RE 11.10.11) RE communities are mapped within Lots 80 and 81 on WV763 (Figure 1.1). Ground-truthing of these areas have confirmed that the RE mapping is accurate. As a result of the proximity to both Of Concern and Endangered REs, Corridor R74 occurs within ESA Categories B and C

There are four (4) ephemeral watercourses mapped within the survey area (two stream order 1 watercourses, and a 2 and 5). These watercourses are characterised by clearly defined banks with sandy beds. None of the watercourses were flowing at the time of survey, however the stream order 2 watercourse in the central region of the survey area exhibited standing shallow pools.

#### **Geotechnical survey locations**

Six (6) geotechnical survey sites were assessed as part of study area, namely TP-R39, TP-R40, TP-R72, TPR-73, BH-53, and BH-54 (Figure 1-1). TPR-73 is located directly adjacent to a dam.

The floristic composition and habitat values of these sites are discussed in the following sections.

#### **Floristics**

The survey area is considered to be a highly modified environment as a result of historical land clearing, current agricultural activities, construction of access tracks and the construction of a high-pressure gas pipeline in the southern leg of the corridor.

The canopy cover within the survey area is typically restricted to the riparian zones, and the mapped RE communities.

The canopy cover within the remnant vegetation (RE 11.3.2) surrounding the stream order 5 watercourse is generally represented by *Eucalyptus populnea* (Poplar box), and *Callitris glaucophylla* (White cypress pine), with *Eucalyptus chloroclada* (Baradine red gum), and *Angophora floribunda* (Rough-barked apple) existing closest to the watercourse.

Canopy cover within the areas mapped as RE 11.10.11 within the northern region of the proposed development area (Figure 1.1) is dominated by *Eucalyptus populnea* and *Callitris glaucophylla* (White cypress pine) with occurrences of *Eucalyptus melanophloia* (Silver-leaved ironbark), and *Eucalyptus chloroclada*. *Callitris glaucophylla* also dominates the understory.

Canopy cover within the areas mapped as RE 11.10.11/11.9.10 within the south-western corner of Lot 80 on WV763 (Figure 1.1) are dominated by *Eucalyptus populnea* and *Callitris glaucophylla*, with occurrences of *Eucalyptus melanophloia* and *Casuarina cristata* (Belah), with few occurrences of *Acacia harpophylla* (Brigalow).

The southern leg of the corridor which connects to TPR-73 is associated with a high-pressure gas corridor which is contained within a fenced easement. Vegetation either side of the easement is defined by cleared pasture paddocks dominated by *Pennisetum ciliare* (Buffel grass), however the

vegetation within the fenced easement areas is characterised by regrowth *Acacia decora* (Pretty wattle) (1.5 – 2 m high) with occasional *Eucalyptus populnea* and *Eucalyptus melanophloia* (regrowth.

Overall, the survey area is represented by a sparse (approximately 15%) shrub layer that averages approximately 2 m (m) in height. The shrub layer is often absent within the clearings of the proposed development area. Indicative species recorded include regrowth *Eucalyptus populnea*, *Eremophila mitchelli* (False sandalwood), *Acacia decora*, *Grevillea striata* (Beefwood), *Dodonaea viscosa* (Sticky hopbush), *Geijera parvifolia* (Wilga) and *Callitris glaucophylla*.

The ground layer of this proposed development area is typically dominated by *Pennisetum ciliare*, with associations of *Themeda triandra* (Kangaroo grass) in some areas, particularly along roadsides and close to the stream order 2 watercourse in the southern leg of the corridor. The survey area exhibited a high proportion (90%) of exotic species present. Indicative species recorded within the proposed development area include *Sclerolaena birchii* (Galvanised burr), *Verbena tenuisecta* (Mayne's curse), *Sida rhombifolia* (Paddy's Lucerne), *Cirsium vulgare* (Spear thistle), *Eremophila debilis* (Winter apple), *Chloris pectinata* (Combed windmill grass) and *Tagetes minuta* (Stinking roger).

One juvenile Type A restricted species, namely *Brachychiton rupestris* (Bottle tree), was detected within the corridor. The location of this individual is recorded in Table 3.1.

Table 3.1 Location of Type A Restricted Plants (Nature Conservation Act 1992)

Species	Easting	Northing
	(GDA 94, Zone 55J)	(GDA 94, Zone 55J)
Brachychiton rupestris	0709304	7079779

No additional species of conservation significance under the provisions of the NC Act and/or the EPBC Act were observed within the survey area.

A list of flora species identified and recorded with the survey area is provided in **Appendix A**.

### **Habitat values**

Eight (8) incidental fauna species were recorded within the proposed development area, namely the Galah (*Cacatua roseicapilla*), Noisy miner (*Manorina melanocephala*), Magpie (*Gymnorhina tibicen*), Sulphur-crested cockatoo (*Cacatua galerita*), Masked lapwing (*Vanellus miles*), Crested pigeon (*Ocyphaps lophotes*), Happy jack (*Struthidea cinerea*), and Magpie lark (*Grallina cyanoleuca*). All of these species are listed as Least Concern under the provisions of the NC Act and are not listed under the provisions of the EPBC Act.

Carnivorous scats possibly belonging to Feral dog (*Canis familaris*) and Fox (*Vulpes vulpes*) (which were also visually observed nearby) were also recorded along access tracks in the cleared regions of the survey area. These species are listed under the provisions of the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) as Class 2 pests.

Habitat features associated with the entire survey area include:

- Canopy cover suitable for shelter, foraging and perching
- Hollow-bearing trees and stags
- Fissured tree bark
- Dense groundcover vegetation (ie grassy tussocks)
- Woody debris (ie fallen/felled timber, including hollow-bearing logs)
- Watercourse habitat (including banks and shallow pools)

The overall habitat value of the survey area is considered low to moderate. The highest habitat value was typically recorded within the remnant vegetation and riparian zones within the survey area. These areas typically provide structural elements that fulfil various functional roles for native fauna species,

and exhibit important habitat features such as hollow-bearing trees and stags, fissured bark, and fallen woody debris (including hollow-bearing logs). The watercourse offers suitable habitat values for species whose life cycles are closely linked with ephemeral habitats and provides available drinking water for other fauna, at least after prolonged periods of rainfall.

Cleared regions of the survey area contain limited woody vegetation and have been extensively disturbed by grazing stock, previous vegetation clearing and the invasion of exotic pasture species. Accordingly, the species utilising resources in these regions of the survey area are most likely to be limited to common, generalist species that are able to adapt to significant habitat disturbances (ie House mouse (*Mus musculus*), macropods etc). Common birds of prey known from the area (ie Wedge-tailed eagle [*Aquila audax*] and Nankeen kestrel [*Falco cenchroides*]) would also be expected to utilise this site and the surrounding areas for foraging purposes.

# 4. Conclusion

The survey area is considered to be a highly modified environment as a result of historical land clearing for agricultural purposes, access tracks and the construction of a high-pressure gas pipeline in the southern leg of the corridor.

The majority of the survey area is currently mapped by DERM as non-remnant vegetation however 'Endangered sub-dominant', 'Of Concern' and 'No Concern at Present' RE communities are mapped within Lots 80 and 81 on WV763 (Figure 1.1). Ground-truthing of these areas have confirmed that the RE mapping is accurate. As a result of the proximity to Endangered and Of Concern RE, Corridor R74 occurs within ESA Categories B and C.

One juvenile Type A restricted species (under the provisions of the NC Act) was detected within Lot 56 on WV421. No additional species protected under the provisions of the NC Act or the EPBC Act were observed within the proposed development areas during these investigations.

There are four (4) ephemeral watercourses mapped within the survey area (stream order 1, 1, 2 and 5). None of the watercourses were flowing at the time of survey however the stream order 2 watercourse in the central region of the survey area exhibited standing shallow pools.

The overall habitat value of the survey area is considered to be low to moderate with the areas of higher habitat value recorded within the remnant vegetation and riparian zones.

# 5. References

Bostock, P.D. & Holland, A.E. (eds) (2010). *Census of the Queensland Flora 2010*. Queensland Herbarium, Department of Environment and Resource Management, Brisbane.

Eddie, C. (2007). Field Guide to Trees and Shrubs of Eastern Queensland Oil and Gas Fields, First Edition, Santos Ltd, Adelaide.

Regional Ecosystem Mapping, Version 6.0, Queensland Government Department of Environment and Resource Management (DERM).



# **Appendix A – Botanical Species List<sup>1</sup>**

Family Name	Scientific Name	Common Name
Adiantaceae	Cheilanthes sieberi	Mulga Fern
Amaranthaceae	Alternanthera dentata	Joy Weed
Amaranthaceae	Gomphrena celosioides	Gomphrena Weed
Amaranthaceae	Alternanthera denticulata	Lesser Joyweed
Apiaceae	Hydrocotyle laxiflora	Pennywort
Apocynaceae	Alstonia constricta	Bitter Bark
Apocynaceae	Carissa ovata	Currant Bush
Apocynaceae	Gomphocarpus physocarpus	Balloon Cotton Bush
Asteraceae	Bidens pilosa	Cobblers Pegs
Asteraceae	Brachycome dentata	Lobe-seed Daisy
Asteraceae	Xerochrysum bracteatum	Everlasting Daisy
Asteraceae	Calocephalus platycephalus	Billy Buttons
Asteraceae	Calotis cuneifolia	Purple Burr Daisy
Asteraceae	Calotis lappulacea	Yellow Burr Daisy
Asteraceae	Chrysocephalum apiculatum	Yellow Buttons
Asteraceae	Cirsium vulgare	Spear Thistle, Black Thistle
Asteraceae	Conyza bonariensis	Fleabane
Asteraceae	Podolepis jaceoides	Showy Copper Wire Daisy
Asteraceae	Pterocaulon sphacelatum	Apple Bush
Asteraceae	Sonchus oleraceus	Sow Thistle
Asteraceae	Tagetes minuta	Stinking Rodger
Asteraceae	Xanthium occidentale	Noogoora Burr

Family Name	Scientific Name	Common Name	
Bignoniaceae	Pandorea pandorana	Wonga Vine	
Brassicaceae	Lepidium sagittulatum	Pepper Cress	
Brassicaceae	Capsella bursa-pastoris	Shepherd's purse	
Cactaceae	Harrisia spp	Harrisia cactus	
Cactaceae	Opuntia stricta	Prickly Pear LPA2	
Cactaceae	Opuntia tomentosa	Velvety Tree Pear LPA2	
Campanulaceae	Wahlenbergia communis	Large Bluebells	
Campanulaceae	Wahlenbergia gracilis	Sprawling Bluebell	
Capparaceae	Capparis Ioranthifolia	Nipan, Wait a while	
Casuarinaceae	Allocasuarina luehmannii	Bull Oak	
Casuarinaceae	Casuarina cristata	Belah	
Chenopodiaceae	Einadia nutans	Climbing Saltbush	
Chenopodiaceae	Maireana microphylla	Small-leaf Bluebush	
Chenopodiaceae	Sclerolaena birchii	Galvanised Burr	
Chenopodiaceae	Enchylaena tomentosa var. glabra	Ruby Saltbush	
Convolvulaceae	Dichondra repens	Kidney Weed	
Cupressaceae	Callitris glaucophylla	White Cypress Pine	
Cyperaceae	Gahnia aspera	Gahnia	
Cyperaceae	Cyperus sp.	A sedge	
Fabaceae - Faboideae	Crotalaria novae-hollandiae	New Holland Rattlepod	
Fabaceae - Faboideae	Crotalaria sp	A Rattlepod	
Fabaceae - Faboideae	Desmodium varians	Tree Foil	
Fabaceae - Faboideae	Glycine falcata	Glycine	

Family Name	Scientific Name	Common Name
Fabaceae - Faboideae	Glycine tomentella	Hairy Glycine
Fabaceae - Faboideae	Glycine clandestina	
Fabaceae - Mimosoideae	Acacia decora	Pretty Wattle
Fabaceae - Mimosoideae	Acacia excelsa	Iron wood
Fabaceae - Mimosoideae	Acacia farnesiana	Prickly mimosa/ Needle bush
Fabaceae - Mimosoideae	Acacia harpophylla	Brigalow
Fabaceae - Mimosoideae	Acacia leiocalyx	Black Wattle
Fabaceae - Mimosoideae	Acacia macradenia	Zigzag Wattle
Geraniaceae	Erodium cicutarium	Stork's Bill Geranium
Goodeniaceae	Goodenia fascicularis	Goodenia
Juncaceae	Juncus usitatus	Juncus
Lamiaceae	Plectranthus parviflorus	Native Coleus
Lamiaceae	Spartothamnella juncea	native broom
Lomandraceae	Lomandra confertifolia	Lomandra
Lomandraceae	Lomandra longifolia	Lomandra
Lomandraceae	Lomandra multiflora	Lomandra
Lomandraceae	Lomandra spicata	Lomandra
Loranthaceae	Dendrophthoe glabrescens	Orange mistletoe
Malvaceae	Malva parviflora	Small-flowered Mallow
Malvaceae	Sida acuta	Spiny head Sida
Malvaceae	Sida cordifolia	Flannel weed
Malvaceae	Sida rhombifolia	Paddy's Lucerne
Malvaceae	Sida spinosa	Spiny Sida
Malvaceae	Sida subspicata	Queensland Hemp

Family Name	Scientific Name	Common Name
Malvaceae	Sida sp.	
Meliaceae	Owenia acidula	Emu Apple
Myoporaceae	Eremophila debilis	Winter Apple
Myoporaceae	Eremophila mitchellii	False Sandalwood
Myoporaceae	Eremophila longifolia	Emu Bush
Myrsinaceae	Anagallis arvensis	Scarlet Pimpernel
Myrtaceae	Angophora floribunda	Rough-barked Apple
Myrtaceae	Eucalyptus chloroclada	Baradine Red Gum
Myrtaceae	Eucalyptus melanophloia	Silver Leaved Ironbark
Myrtaceae	Eucalyptus populnea	Poplar Box
Myrtaceae	Eucalyptus tereticornis	Queensland Blue Gum
Phormiaceae	Dianella caerula	Blue Flax-lily
Phormiaceae	Dianella longifolia	Dianella
Pittosporaceae	Bursaria incana	Prickly Pine
Pittosporaceae	Pittosporum spinescens	Wallaby Apple
Poaceae	Aristida caput medusae	Many-headed Wire Grass
Poaceae	Aristida calycina	Wire Grass
Poaceae	Aristida jerichoensis	Jericho wire grass
Poaceae	Austrostipa verticillata	Slender Bamboo Grass
Poaceae	Bothriochloa bladhii	Forest Blue Grass
Poaceae	Bothriochloa decipiens var. decipiens	Pitted Bluegrass
Poaceae	Bothriochloa ewartiana	Desert Blue Grass
Poaceae	Capillipedium spicigerum	Scented-top grass
Poaceae	Chloris gayana	Rhodes Grass

Family Name	Scientific Name	Common Name	
Poaceae	Chloris pectinata	Comb chloris	
Poaceae	Chloris virgata	Silky Topped Rhodes Grass	
Poaceae	Cymbopogon refractus	Barbed-wire Grass	
Poaceae	Cynodon dactylon	Green Couch	
Poaceae	Dichanthium sericeum	Queensland Blue Grass	
Poaceae	Eragrostis brownii	Browns Lovegrass	
Poaceae	Eragrostis elastica	Elastic Grass	
Poaceae	Eragrostis sororia	Woodland Lovegrass	
Poaceae	Heteropogon contortus	Black Spear Grass	
Poaceae	Melinis repens	Red Natal	
Poaceae	Panicum effusum	Inquisitive Grass	
Poaceae	Paspalidium distichum	Water Couch	
Poaceae	Pennisetum ciliare	Buffel Grass	
Poaceae	Perotis rara	Comet Grass	
Poaceae	Phragmites australis	Common Reed	
Poaceae	Sorghum halepense	Johnson Grass	
Poaceae	Sporobolus caroli	Desert Sporobolus, Fairy Grass	
Poaceae	Sporobolus creber	Western Rats Tail Grass	
Poaceae	Themeda avenacea	Wild Oats Grass	
Poaceae	Themeda quadrivalvis	Grader Grass	
Poaceae	Themeda triandra	Kangaroo Grass	
Poaceae	Setaria sp.	Pigeon Grass	
Polygonaceae	Rumex brownii	Swamp Dock	
Polygonaceae	Emex australis	Goathead Burr	

Family Name	Scientific Name	Common Name	
Portulacaceae	Portulaca pilosa	Hairy Pigweed	
Proteaceae	Grevillea striata	Beefwood	
Rubiaceae	Psydrax odorata forma buxifolius	Round Leaf Psydrax	
Rubiaceae	Psydrax oleifolium	Canthium	
Rubiaceae	Richardia brasiliensis	Mexican clover	
Rutaceae	Geijera parviflora	Wilga	
Sapindaceae	Alectryon diversifolius	Scrub Boonaree	
Sapindaceae	Atalaya hemiglauca	Whitewood	
Sapindaceae	Dodonaea viscosa	Sticky Hopbush	
Solanaceae	Solanum chippendalei	Bush tomato	
Solanaceae	Solanum ellipticum	Potato Bush	
Solanaceae	Solanum nigrum	Blackberry nightshade	
Verbenaceae	Verbena officinalis	•	
Verbenaceae	Verbena tenuisecta	Mayne's Curse	
Violaceae	Viola hederacea	Native Viola	

Table Notes Taxonomic classifications, nomenclature and naturalised status of species is derived from the Census of Queensland Flora 2010 Land Protection (Pest and Stock Route Management) Act 2002 (Qld) – Class 2 weed