APPENDIX O
INFRASTRUCTURE CORRIDOR ECOLOGICAL ASSESSMENT

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ABN: 51 128 698 108

REPORT

Central Eyre Iron Project: Infrastructure Corridor Ecological Assessment

E-F-34-RPT-0018

Revision	Issue Date	Revision Description	Document Author	Checked By	Approved By
A	23/06/2014	Draft for Client Comment	K Fels / Z Bull	N Bull	
0	23/06/2014	Final Approved	Z Bull	N Bull	

ABN: 51 128 698 108

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Executive Summary

Sinclair Knight Merz (now Jacobs SKM) was engaged by Iron Road Limited (Iron Road) to undertake an investigation of ecological values along a proposed Infrastructure Corridor, as part of the Central Eyre Iron Project (CEIP) on the Eyre Peninsula in South Australia. The proposed Infrastructure Corridor will facilitate transport of iron concentrate produced at a proposed mine (within Mineral Exploration Lease Application, EL4849) to a proposed port facility located at Cape Hardy. This report forms part of a suite of environmental impact and baseline studies associated with the project.

Key mine processing and transport decisions have influenced the make-up and width of the preferred corridor, including:

- Preferred transportation of iron concentrate product by rail (not slurry as described by the initial PFS (Iron Road Limited 2011b).
- Social and economic factors precluding possible upgrade and use of the existing Cummins Buckleboo Railway, followed by the decision to construct a new rail corridor linking the mine and port.
- Supply of saline groundwater extracted from a borefield rather than use of seawater via pipeline for ore processing, or the construction of a desalination plant and pipeline.

Study objectives

The preferred infrastructure corridor is approximately 130.3 km from the boundary of the proposed Mine Lease to the boundary of the proposed Cape Hardy Port, travelling close to the northern and eastern boundaries of Hambidge Wilderness Protection Area (WPA), and south to south west of Darke Peak through predominantly agricultural land to within 1 km of the coast. In addition, two infrastructure 'spurs' are proposed, one approximately 17 km in length for a proposed borefield and connecting pipeline, the other approximately 19.5 km in length for a transmission line connection (Figure 1-1). For the purposes of the ecological assessment, the main corridor is assumed to be an average width of between 60 m and 130m depending upon the combination of utilities proposed within particular sections (e.g. rail, power transmission line, water pipeline and maintenance track).

The ecological study of the Infrastructure Corridor has involved a staged assessment of approximately 200 km of potential corridor alignments from Cape Hardy (6km south of Port Neill) to the proposed mine site near Warramboo, including a number of alternate alignments reviewed as part of the final 130.3 km preferred route selection. Over 400 patches of vegetation along all of the alternate alignment options considered were assessed in the field in 2011 and 2012 or via desktop review between 2011 and 2014. The final preferred corridor alignment (and spurs) intersects 147 patches of remnant vegetation and these are the focus of this report. Key tasks completed to date include:

- Desktop constraints analysis of ecological values along the preferred corridor (and earlier options) from Cape Hardy to Warramboo, including review of ecological databases, literature and aerial imagery to provide preliminary information on ecological values present (e.g. vegetation type and condition, threatened or listed species / communities)
- Field surveys of the proposed Infrastructure Corridor (including earlier options) to provide information on environmental values present (e.g. vegetation type and condition, threatened or listed species / communities and or suitable habitat to support such species / communities)
- Classification of native vegetation patches (within preferred route option) which were unable to be assessed in the field due to restrictions on property access.
- Summary of field assessments, documentation of environmental values impacted by preferred alignment option
- A preliminary assessment on the extent of native vegetation loss as a result of the project, provided in the regional context, with consideration of impacts on any state or national species of conservation significance.

Context of study area

The study area occurs within the Eyre Yorke Bioregion, as described by Thackway and Cresswell (1995) in the Interim Bioregionalisation of Australia. The bioregion is characterised by Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of aeolian quartz sands, with mallee woodlands, shrublands and heaths on calcareous earths, duplex soils and calcareous to shallow sands.

The climate of the study area is semi -arid with mean annual rainfall between 402.3 mm (southern end) and 287 mm (northern end). Land-use is predominantly grazing or cropping agriculture in an area that has experienced significant historic clearance of native vegetation. Habitat fragmentation and degradation are the key threatening processes for native flora and fauna in the bioregion. Feral animals including rabbits, foxes, cats, goats and horses present threats to native plant and animal species through grazing, competition and predation. Competition from exotic weed species such as bridal creeper, wild oats and veldt grass presents a further threat to native vegetation. Common threats to native plants also include changes to fire regimes, soil disturbance and increasing salinity as a result of elevated groundwater. Several conservation areas and heritage agreements occur near the proposed corridor route and afford some protection to the remaining native vegetation.

Six broad, high-level IBRA (Interim Bioregionalisation of Australia) regional native vegetation associations are described across the study area; Koongawa, Hambidge, Wharminda, Butler, Waretta and Cleve (Laut *et al.* 1977). A number of common Eyre Peninsula Vegetation Communities are described in detail by Milne *et al.*

(2008) which provide a benchmark of condition. The community types relevant to the study area are EP 5 (Mallee with open to mid-dense sclerophyll shrub understorey on inland dunes and sandy-loams), EP 8 (Mallee and low open woodlands with an open sclerophyll shrub and chenopod understorey), EP 11 (Inland, sub-coastal and coastal mallee with a mid-dense sclerophyll shrub understorey on limestone soils), EP12 (Coastal dune and cliff vegetation), and EP 13 (Coastal and inland saline and freshwater swamp vegetation).

Habitat and condition

The majority of vegetation patches across the study area are small, isolated, oblong and narrow in shape resulting in large edge effects, and subject to ongoing disturbance through grazing and trampling by livestock, agricultural weed invasion, pest mammal invasion (e.g. cats, foxes), and direct human disturbance (e.g. trampling, vehicle tracks, rubbish etc.). The habitats encountered were largely disturbed remnants with the absence of one or more structural dominants, a lack of age and structural diversity, and poor species diversity. Weed occurrence is common with species located during site visits those which are common to the district and to agricultural regions (refer DEH 2002), including three Declared species under the *Natural Resources Management Act 2004* (Horehound, Boxthorn and False Caper). No patches of vegetation are subject to once regular, natural fire disturbance (as experienced pre-European settlement) leading to further declines in biodiversity.

The preferred alignment is a corridor (with two 'spurs' for a borefield and a transmission line connection) that directly intersects 147 discontinuous and isolated patches of native vegetation across 130.3 km from the proposed boundary of the ML to proposed boundary of the port site plus approxately 17km for the borefield and 19.5km for the transmission line spur. Preliminary condition ratings were estimated for 43% of native vegetation patches intersected by the preferred corridor, this accounts for 51% of native vegetation that occurs within the corridor. The remaining patches intersected by the alignment were inaccessible due to constraints in obtaining access to land, and conditions of these patches are inferred from available data. The majority of assessed patches were considered to be of poor to moderate quality using the Significant Environmental Benefit categories (DWLBC 2005). In comparison with the expected benchmarks for the Eyre Peninsula Vegetation Community Types encountered (as per Milne *et al.* 2008), diversity of flora was also generally considered to be moderate to poor with occasional better quality patches where vegetation structure was more intact, patch size was generally larger and edge effects such as weed invasion and anthropogenic disturbance is reduced.

Preliminary vegetation clearance estimates and impacts

To facilitate the development of the infrastructure corridor, a total of 133 ha of native vegetation (approximately 10 % of the total corridor footprint area) would need to be cleared, assuming a worst case scenario of total clearance of remnant vegetation patches within the width of the corridor (total area 1352 ha). In reality, the extent of clearance is likely to be less, given the transmission line will require clearance only for pole/tower footing locations. The remainder of the corridor (1218 ha or 90 %) is pasture land, cropping, roads or tracks and does not require clearance of native vegetation.

Due to considered placement of the alignment and an adherence to minimum construction envelopes, the preferred alignment will require the clearance of less than 1 % of each of the five IBRA vegetation association encountered. The greatest clearance by area (worst case scenario) will occur for native vegetation in the Hambidge Association (93.09 ha which accounts for 0.09% of the total vegetation cover that remains for this association). The Hambidge Association has the greatest area formally protected of all of the vegetation associations with 73,671 ha (or 74 % out of a total 99,967 ha) of native cover remaining within regional Conservation Parks, Wilderness Areas and Heritage Agreements.

Protected and conservation significant species

The conservation significance of flora, fauna and habitats recorded within and surrounding the project area was assessed with reference to species classified as threatened and or migratory in accordance with the national *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the state *National Parks and Wildlife Act 1972 (NPW Act*).

The desktop assessment identified 37 fauna and 9 flora species with national conservation significance (most with state significance also) and an additional 10 fauna and 21 flora species of state conservation significance with potential to occur in the study area. This assessment was based on searches of historic datasets and a review of the EPBC Act Protected Matters database.

Rapid assessments conducted in 2011 and 2012 (spring/summer) coupled with a rationalisation of historic data, recent regional studies and anecdotal information, have resulted in the determination of the following likelihood of occurrences for species of conservation significance within the study area:

- Of 37 fauna species with national conservation significance with the potential to occur in the study area, 22 are considered unlikely, and 14 are considered possible (this includes three Listed Marine species; the Cape Barren Goose, Hooded Plover and Rock Parrot). Additionally, one species (Slender-billed Thornbill) has been delisted and is included with the NPW species. It should be noted that for the three species that have EPBC Listed Marine status (but not Migratory status), this listing does not apply to the terrestrial environment, they do however have NPW ratings. Therefore of the 14 EPBC listed species considered a *possibility to* occur, only 11 are relevant to the project and these are: Australian Fairy Tern, Cattle Egret, Common Sandpiper, Osprey, Fork-tailed Swift, Malleefowl, Pacific Golden Plover, Rainbow Bee-eater, Red-lored Whistler, Sandhill Dunnart and White-bellied Sea-eagle.

- Of 9 flora with national conservation significance with the potential to occur, 6 are considered unlikely, 2 are possible, and 1 is known to occur (the Jumping Jack Wattle, *Acacia enterocarpa,* Endangered)

- Of the additional 10 fauna with state significance only (no national significance) with potential to occur, 1 is likely (Gilberts Whistler) and 5 are possible (i.e. Bardick snake, Purple-gaped Honeyeater, Shy Heathwren, Slender-billed Thornbill and Sooty Oyster Catcher). Four species are considered unlikely to occur.

- One additional fauna species with state significance was observed as present in the field (White-winged Chough, Rare)
- Of the 21 flora with state significance only with the potential to occur, 5 are considered unlikely to occur, 12 are considered as possibly occurring, and 4 are considered likely to occur
- A total of 78 national and state conservation significant flora and fauna species have been considered by this assessment. Significant impacts are not expected for any of the species. A large number of these species are migratory birds with large ranges, and the study area does not provide habitat features that are critical to the survival of any of these species at the population or species level. Mitigation measures outlined in the required construction Environmental Management Plans (EMPs) for the project will also mitigate some of the impacts to these species.

Up to three species of state conservation significance were observed in vegetation patches that are now not within the preferred alignment; *E. calycogona* was observed in patches 46a and 107 but was not further investigated to determine if it was *E. calycogona ssp. spaffordii* (Spafford's Square-fruit Mallee - rare), *A. dodonaeifolia* (Hop-bush Wattle – rare) was recorded in patch 46b and *E. cretata* (Darke Peak Mallee – rare) was recorded in patches 30, 46c, 47 and 82.

Vegetation in poor to moderate condition is unlikely to provide suitable habitat for flora or fauna of conservation significance, with the exception of Jumping-jack Wattle (Acacia enterocarpa, nationally and state endangered) that can colonise disturbed areas and was observed within the broader study area (but away from the preferred alignment). Significant impacts to species of conservation significance are not expected, however it is important to note that the rapid field surveys undertaken to produce this report did not constitute a targeted species search for any of the listed species considered for the study area.

There were no other matters of national environmental significance (MNES) identified as relevant to the study area (e.g. Commonwealth lands, Commonwealth Reserves, world or national heritage properties / places, threatened ecological communities, critical habitats or nationally important wetlands).

Summary

The preferred corridor alignment intersects 147 discontinuous and isolated patches of native vegetation across the study area (130.3 km corridor from the proposed boundary of the ML to proposed boundary of the port site plus approximately 17 km spur for the borefield and 19.5 km spur for the transmission line connection). Rapid assessments of vegetation type and condition were conducted for 44 of the 147 patches where access was available. In addition, where access was not available, condition was inferred for a number of patches (19) based on known condition of adjacent similar patches and / or observations from a distance (with binoculars). For the remainder of patches the condition was unclassified, but type of vegetation was inferred from aerial imagery and available metadata (e.g. DEWNR vegetation layer, IBRA vegetation association, landform and soil data).

Species of state conservation significance were observed in patches now outside of the preferred alignment. Vegetation was generally in poor to moderate condition, and is considered unlikely to provide critical habitat for flora or fauna of conservation significance, with the exception of Jumping-jack Wattle (*Acacia enterocarpa* (nationally and state endangered) that can colonise disturbed areas. Significant impacts to species of conservation significance are not expected, however the rapid field surveys undertaken to produce this report did not constitute a targeted species search for any of the listed species considered for the study area.

An application to clear native vegetation will be required under the *Native Vegetation Act 1991* and Regulations, together with a native vegetation offset and management plan. This will need endorsement by the Native Vegetation Council prior to any clearance.

An EPBC referral will be required for any action that will have or is likely to have a significant impact on a Matter of National Environmental Significance.

1 Introduction

Sinclair Knight Merz (SKM) (now Jacobs SKM) was engaged by Iron Road Limited (Iron Road) to undertake an investigation of ecological values along potential alignment options for a proposed Infrastructure Corridor, as part of the Central Eyre Iron Project (CEIP) on the Eyre Peninsula, South Australia. The proposed Infrastructure Corridor will facilitate transport of iron concentrate produced at the proposed mine near Warramboo (within Mineral Exploration Lease EL4849) to a proposed port and ship loading facility at Cape Hardy (hereafter referred to as 'the port site'). This report forms part of a suite of environmental impact and baseline studies associated with the project. It provides a brief history of considered corridor options since project inception, but primarily focuses on the ecological values of the final preferred alignment and infrastructure spurs which Iron Road are seeking government approval for. The outcomes of this and other studies provide background information required to facilitate the impact assessment, including approvals under state and federal legislation.

The desktop component of this report summarises information on the existing environment of the proposed Infrastructure Corridor options derived from State (e.g. Biological Database of South Australia) and Commonwealth (e.g. EPBC Protected Matters Search Tool) databases as well as general distribution texts and published information from previous ecological investigations in the region. This report also presents the outcomes of in-field flora assessment of the study area, used to broadly characterise vegetation patches, assess condition of the vegetation, and identify conservation significant values.

1.1 Iron Road Limited and EL4849

Iron Road is a South Australian focused resource company who target exploration, evaluation and development of iron ore projects in South Australia (SA) and Western Australia (WA). Iron Road acquired EL4849 (update from EL3699) from Adelaide Resources Limited in June 2008. Previous work undertaken by Adelaide Resources included the drilling of six Reverse Circulation (RC) drill holes during 2000 and performing associated metallurgical test work on samples collected. Iron Road is currently undertaking a staged drilling program within the EL. Drilling work at the time of this study estimates the resource to comprise 1.33 billion tonnes of iron ore within EL4849 (Iron Road Limited 2011a).

1.2 CEIP infrastructure requirements

The location of the Warramboo CEIP is favourable in terms of proximity to power and transport utilities and the geological and metallurgical results are considered outstanding. Site infrastructure requirements are detailed by the pre-feasibility study (Iron Road Limited 2011b) and ongoing engineering studies and will include facilities that support:

- Open pit excavation including crushing, grinding and milling facilities
- Processing plant including metallurgical facilities, product as concentrate or granulised pellet, tailings handling and retention

- Mine site infrastructure, including temporary and permanent camps, workshops, warehouses, airstrip, fire, security and emergency services
- Other associated infrastructure including rail, port, stockyards facilities, electrical power transmission line, borefield and delivery pipeline, accommodation village and airport upgrades in Wudinna.

1.3 Infrastructure corridor inception and development

Mine processing and transport decisions have influenced the make-up and width of the preferred corridor, including:

- Preferred transportation of iron concentrate product by rail (not as a slurry in a pipeline as described by the initial PFS (Iron Road Limited 2011b)
- Social and economic factors precluding possible upgrade and use of the Cummins Buckleboo Railway, resulting in a decision to construct a new rail corridor linking the mine and port
- Supply of saline groundwater from a borefield via pipeline for ore processing, compared with previously considered options of the construction of a desalination plant and pipeline on the west coast of the Eyre Peninsula, or pumping of seawater from the port site (both investigated)

The decision to co-locate water, power and rail infrastructure (with appropriate separation distances and associated maintenance access) results in a corridor which ranges between 60 m and 130m depending on the number of utilities to be located within each section (e.g. rail, water, power and maintenance tracks).

Route selection analysis began in 2011 with a preferred alignment finalised in 2014, which Iron Road are now seeking government approval for. Aside from ecological factors considered by this report, social, engineering design, topography and economic factors have all influenced the selection of a preferred route. These are summarised by Table 1-1.

Table 1-1 Summary of non-environmental evaluation criteria considered as part of alignment selection

Category	Option evaluation criteria
Social	• Number of properties impacted • Distance to dwellings • Impact to known cultural heritage sites or areas • Impacts to useable property (corridor located as close as practicable to property boundaries) • Impact to visual amenity
Design	• Water quality suitable for use in processing • Minimum radius for turns of 2km • Sufficient line of sight to provide visibility at level crossings • Transport capacity (minimum required to enable transport of at least 20Mtpa) • Natural topography (to minimise the volume of cut and fill needed to achieve the required grade of the rail line)
Economic	• Length of rail (minimised as much as possible) • Distance for a possible future connection to the national standard gauge network at Whyalla • Impact to known mineral deposits • Construction and operation costs • Number and length of bridges required for road or water crossings

Three main routes (with a number of sub-variants) have been considered since 2011, with ecological assessments feeding into the assessment process. This report focuses on the ecological values of the final preferred Infrastructure Corridor alignment (and 'spurs'), as this is the alignment which Iron Road are seeking approval for. A brief summary of works is undertaken on all considered alignments is provided below, but for the sake of clarity, detailed descriptions of vegetation communities and ecological values on corridor options that are no longer being considered have been removed from this report.

1.4 Infrastructure Corridor options studies

The ecological study of the infrastructure corridor has involved a staged assessment of approximately 200 km of alignment options between from Cape Hardy (6km south of Port Neill) and the proposed mine site near Warramboo. Table 1-2 provides a high level summary of the ecological assessment undertaken since December 2011.

Table 1-2 Ecological assessment of Infrastructure Corridor options

Date	Options assessed	Ecological assessments completed
Dec 2011	• Alignment option A/B north, A central (NE of Darke Peak), B central (SW of Darke Peak), A/B south	• Desktop review of ecological values • Rapid in field ecological assessment to identify potential ecological constraints. Conducted from public vantage points / roadsides
Nov 2012	• Option C – refined option variation of A/B	• Desktop review of ecological values • More detailed habitat characterisation and assessment, capture of new vegetation patches now impacted by increased width and alignment changes.
Jan-April 2014	• Final preferred alignment (the focus of this report)	• Final desktop reviews of preferred alignment • Consideration of infrastructure spurs (the borefield and pipeline plus the transmission line connection) • Consolidation of all existing field data to reflect final alignment only • classification of patches that were not visited due to restrictions of land access inferred using existing data, desktop assessment

As noted above, a number of vegetation patches along the final preferred alignment corridor could not be assessed in the field due to land access restrictions. The type and condition of these patches is inferred here based upon all available data (adjacent similar patches, BDBSA records, DEWNR vegetation data layer, visual assessment from afar using binoculars and review of aerial imagery to compare to similar benchmarked patches). Given the broadly homogeneous nature of the environment through which the infrastructure corridor traverses, and the generally highly degraded nature of remnant patches within agricultural land, this level of assessment is considered sufficient for broadly describing the ecological values along the corridor. Vegetation area clearance requirements are calculated more accurately using Arc GIS with the corridor footprint imposed over a data layer with all intersected patches defined.

The preferred infrastructure corridor is approximately 130.33 km from the boundary of the ML to the boundary of the port site, travelling close to the northern and eastern boundaries of Hambidge WPA, and south to south west of Darke Peak, primarily traversing through agricultural land to within 1 km of the coast. In addition, two infrastructure 'spurs' connect with the main corridor, one of approximately 16.95 km connecting a borefield via water pipeline to the main corridor, the other a 19.54 km transmission line connecting the main corridor to the Yadnarie sub-station (see Figure 1-1).

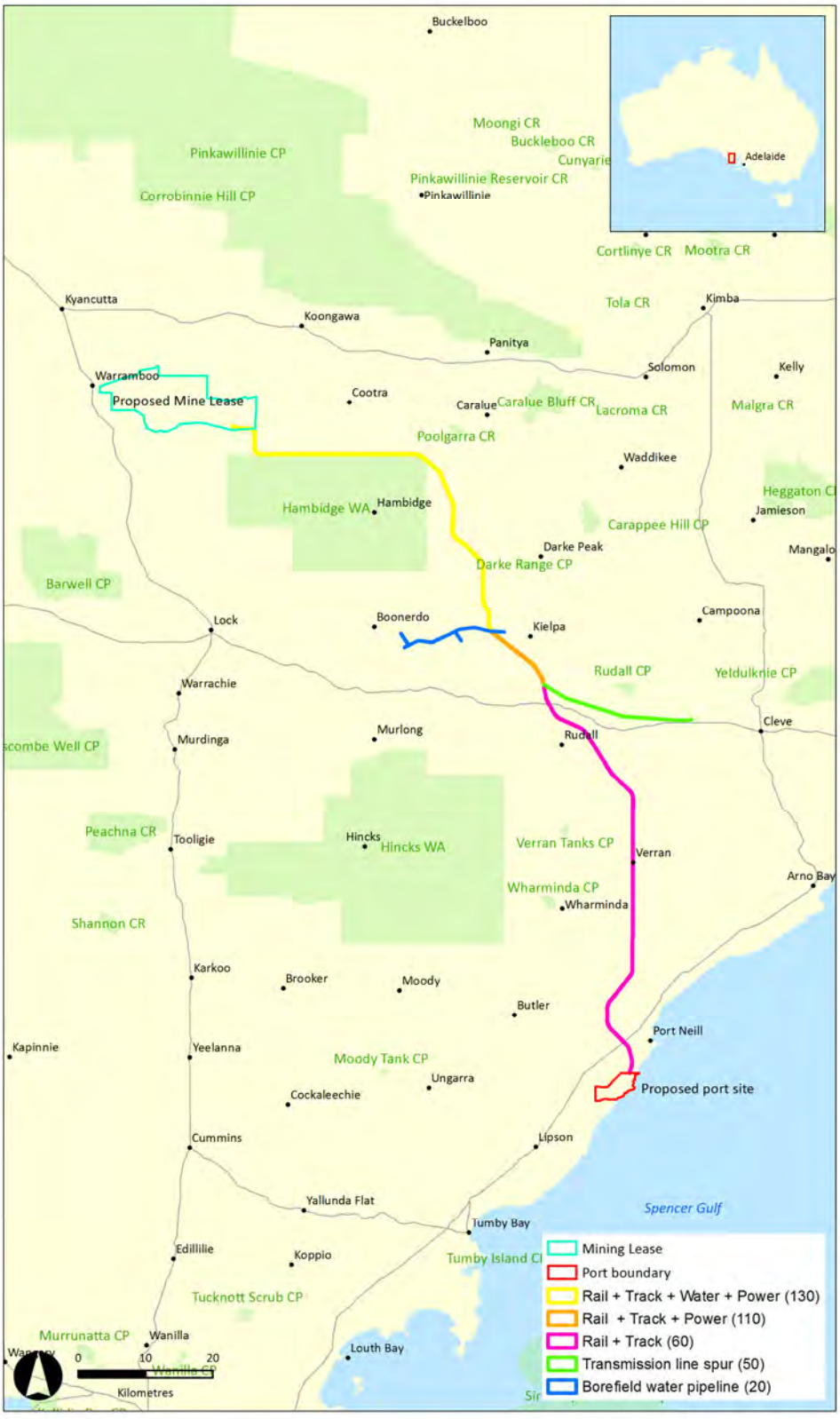


Figure 1-1 Location of proposed Infrastructure Corridor, Mine Lease and Port Site

1.5 Study Objectives

The aim of this study was to determine the ecological values present along the proposed preferred Infrastructure Corridor route, providing information to support the design and approvals processes for the CEIP. Key tasks of this study comprised:

- Desktop constraints analysis of ecological values along the preferred corridor (and earlier options) from Cape Hardy to Warramboo, including database and literature review and review of aerial imagery to provide preliminary information on ecological values present (e.g. vegetation type and condition, presence of threatened or listed species / communities)
- Field survey of proposed corridor (including options) where land access was possible to provide information on environmental values present (e.g. vegetation type and condition, threatened or listed species / communities and or suitable habitat to support such species / communities). This included the assignment of an individual numeric identifier to each native vegetation patch potentially impacted by the alignment
- Classification of native vegetation patches (within preferred route option) that were unable to be assessed in the field due to restrictions on property access
- A preliminary assessment on the extent of native vegetation loss as a result of the project provided in the regional context, with consideration of impact on any state or national species of conservation significance.

2 Legislation

This section presents key legislation relevant to ecological values and for government approval for development of an Infrastructure Corridor to support the CEIP.

2.1 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance (MNES). Under the environmental provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of National Environmental Significance are identified as 'controlled actions' and cannot be undertaken without referral to the Department of the Environment for consideration and approval under the EPBC Act.

The nine matters of national environmental significance identified in the EPBC Act are:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Threatened species and ecological communities
- Migratory species as listed under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining) and
- A water resource, in relation to coal seam gas development and large coal mining development

The EPBC Act is the applicable Commonwealth environmental legislation governing Iron Road's activities and they are required to comply with the EPBC Act to ensure protection of the environment and heritage values within its tenements.

The matters of national environmental significance that are considered of particular relevance to this terrestrial and coastal flora and fauna study of the proposed Infrastructure Corridor are:

- Listed threatened species and ecological communities
- Listed migratory species

In addition to the above listings, some species are listed as 'Marine' under the EPBC Act in recognition of the EPBC Act's role in the protection of Commonwealth waters. Listed-Marine species occur commonly within Australian Commonwealth Marine Areas. The Commonwealth marine area stretches from 3 to 200 nautical miles from the coast (i.e. is entirely marine) and is not considered relevant to the terrestrial and coastal nature of the Infrastructure Corridor.

2.2 Commonwealth policy

The Commonwealth government is also directed by the following policies and strategies relevant to native habitats, communities and species:

- Australia's Biodiversity Conservation Strategy 2010-2030 (National Biodiversity Strategy Review Task Group convened under the Natural Resource Management Ministerial Council – NRMMC 2010)
- National Principles and Guidelines for Rangeland Management (ANZECC and ARMCANZ 1999), the draft National Strategy for Rangeland Management (NRMWG 1996) and the National Land & Water Resources Audit on Rangelands (Karfs et al. 2000)

2.3 South Australian legislation

National Parks and Wildlife Act 1972

The National Parks and Wildlife Act 1972 (NPW Act) allows for the protection of habitat and wildlife through the establishment of parks and reserves (both on land and in State waters) and provides for the use of wildlife through a system of permits allowing certain actions, i.e. keeping, selling, trading, harvesting, farming, hunting and the destruction of native species.

The NPW Act assigns species to state conservation categories; *Endangered* (Schedule 7), *Vulnerable* (Schedule 8), and *Rare* (Schedule 9).

Native Vegetation Act 1991

The *Native Vegetation Act 1991* (NV Act) outlines incentives and assistance to land owners relative to the enhancement of native vegetation and acts to control the clearance of native vegetation. The broad objectives of the NV Act relevant to Iron Road's proposed development of an Infrastructure Corridor include:

- The conservation, protection and enhancement of the native vegetation of the State and, in particular, remnant native vegetation, in order to prevent further:
    - reduction of biological diversity and degradation of the land and its soil

  - loss of quantity and quality of native vegetation in the State
  - loss of critical habitat
- The provision of incentives and assistance to landowners to encourage the commonly held desire of landowners to preserve, enhance and properly manage the native vegetation on their land
- The limitation of the clearance of native vegetation to clearance in particular circumstances including circumstances in which the clearance will facilitate the management of other native vegetation or will facilitate the sustainable use of land for primary production
- The encouragement of research into the preservation, enhancement and management of native vegetation and
- The encouragement of the re-establishment of native vegetation in those parts of the State where native vegetation has been cleared or degraded

Natural Resources Management Act 2004

The *Natural Resources Management Act 2004* (NRM Act) is to assist in the achievement of ecologically sustainable development in the State by establishing an integrated scheme to promote the use and management of natural resources that recognises and protects the intrinsic values of natural resources. The NRM Act combines critical elements of the now repealed *Animal and Plant Control (Agricultural Protection and Other Purposes) Act 1986*, the *Soil Conservation and Land Care Act 1989* and the *Water Resources Act 1997*.

Environment Protection Act 1993

The *Environment Protection Act 1993* provides for the protection of the environment and defines the Environment Protection Authority's (EPA) functions and powers. The Act promotes ecologically sustainable development and the use of precautionary principles to minimise environmental harm. It requires polluters to bear an appropriate share of the costs and responsibilities of protecting the environment from their activities.

2.4 State policy

The SA government is guided by an additional policy and strategy regarding the conservation of native habitats, communities and species through the implementation of the following documents:

- No Species Loss: A Nature Conservation Strategy for South Australia 2007-2017 (DEH 2007)

This will be a key policy for protection of biodiversity in the State and is applicable to the project.

3 Methodology

3.1 Study area

The study area for this assessment was the preferred Infrastructure Corridor alignment. Desktop reviews applied a buffer from the centreline of the alignment, whilst field reviews and assessments of impacts upon native vegetation considered the actual width of the corridor to define which patches of vegetation were impacted and the extent of clearance that would be required. The proposed corridor alignment varies in width between 40 m and 110 m depending on which components of infrastructure are included in particular sections (see Figures 1.1, 5.1-5.3). The corridor may be wider than these estimates where cut or fill is required. For this reason, conservative widths for clearance impacts have been applied and used for this assessment as follows:

- The proposed corridor is a minimum of 40 m wide in the southern section where it contains only the rail line and maintenance track. A width of 60 m has been applied to this section.
- The proposed corridor is a minimum of 90 m wide in the central section where it contains a 275kv transmission powerline, the rail line and maintenance track. A width of 110 m has been applied to this section.
- The proposed corridor is 110m wide in the northern section where it contains a water pipeline, a transmission power line, the rail line and the maintenance track. A width of 130 m has been applied to this section.
- The two short spurs off the main corridor which contain a water pipeline to the borefield and a transmission line spur to the Yadnarie substation are also considered with an allowance of 20 m and 50 m respectively.

Each vegetation patch within (or intersected by) the study area (including those assessed on previous alignment options no longer considered as part of this project) was given a unique numerical identifier and captured in a GIS data layer as a polygon for future analysis.

3.2 Ecological desktop review

A desktop review of literature and databases was completed to determine the suite of ecological communities and species which may be present in the initial study area. The desktop review involved evaluation of the following datasets:

- Environment Protection and Biodiversity Conservation (EPBC) Act Protected Matters Database via the online Search Tool – modelled distributions of Commonwealth listed threatened species, habitat, vegetation communities and any other matters covered by Commonwealth Environmental legislation

- Biological Database of South Australia (BDBSA) historic flora and fauna records – records provided by the SA Government (Department of Environment, Water and Natural Resources) and include data from the following sources:
    - South Australian Herbarium
    - Birds Australia
    - South Australian Museum
- General flora and fauna texts which indicate high level species distributions
- Information published by the South Australian and Commonwealth Governments, including the online EPBC Protected Matters Database managed by the Department of the Environment. This database includes mapped locations of World Heritage properties, Ramsar listed wetlands, threatened, migratory and marine species, threatened ecological communities and protected areas.
- Information available from relevant local authorities and
- Previously published ecological investigations from the region (e.g. Biodiversity Plan for Eyre Peninsula, DEH 2002; draft recovery plan for 23 threatened flora taxa on Eyre Peninsula, Pobke 2007; EP Biological Survey, Brandle 2010; EP Coastal Action Plan, Caton *et al*. 2011).

The EPBC Protected Matters search covered the study area with a buffer of 5 km (either side of the proposed corridor centreline) (see Appendix A). Given the proximity of Conservation Parks along the route, it was deemed that this buffer would be adequate to highlight potential threatened species. Significant pre-selection work enabled a final preferred alignment selection that aims to minimise environmental impact (e.g. by avoiding key environmental features), while balancing social, economic and design costs with anticipated benefits.

Protected fauna and flora species that *may* occur within the project area are highlighted by the EPBC protected matters search tool (PMST) (see output in Appendix A). These searches use information such as species distributions, habitat requirements, migratory paths, and previous records to determine which threatened species *may* occur within the area of interest. The results from such searches are not necessarily based upon actual records and are therefore indicative only and should not take the place of on-ground investigations in terms of identifying the actual faunal composition of a site. The search was used to identify migratory species that may be found on the site, and terrestrial and non-migratory species that may be found within the area.

The BDBSA data base searches undertaken as part of the desktop study cover the study area plus an approximate 5 km buffer (5 km either side of the alignment centreline – refer Appendix B). This expanded area ensures a greater spread of fauna and flora survey records and was also selected to include records near Darke Peak Range, and Hambidge Wilderness Protection Area. A northern section of the preferred corridor alignment runs parallel with the northern boundary of Hambidge, and Darke Peak Range is located approximately 4.3 km

east of the alignment. The data provided includes flora and fauna records, including threatened flora and fauna and ecological communities.

3.2.1 Evaluation of conservation significance

The conservation significance of flora, fauna and habitats recorded within and surrounding the project area was assessed with reference to:

- Species classified as threatened Nationally in accordance with the EPBC Act
- Species classified as migratory in accordance with the EPBC Act and
- Species classified as threatened in South Australia in accordance with the NPW Act (as amended in 2000).

3.3 Field survey

Two field studies were undertaken as part of this assessment in December 2011 and November 2012. Field studies were undertaken to establish the environmental values present within the study area (e.g. vegetation type and condition, threatened or listed species / communities and or suitable habitat to support such species / communities), and to provide a baseline against which future changes can be measured. They also provide direct inputs to Development Approval under the *Development Act 1993* and/or the NV Act, and referrals and/or approval documentation under the EPBC Act and NPW Act.

The ecology field studies involved the following tasks:

- A rapid assessment of flora patches intersected by the proposed preferred Infrastructure Corridor (and options) where land access was approved
- Broad vegetation characterisation and condition assessment for all assessable patches
- Identification of potential 'hot spots' e.g. habitat for EPBC listed species and NPW Act listed species
- Assignment of 'condition' ratings for vegetation patches that can be used as a basis for determining SEB offsets and assessing potential regional impact (e.g. SEB ratios ranging from 2:1 representing poor condition to 10:1 representing excellent condition as per DLWBC 2005) (see Section 3.3.3 below for further detail).

3.3.1 Flora characterisation and condition assessment

The flora characterisation and condition assessment component of this study involved a broad valuation of vegetation at each accessible vegetation patch. In some cases, patches were not accessible (on private land with no approval to enter) in which case a representative habitat was assessed where possible (i.e. vegetation that was contiguous with road reserves, or appeared similar and adjacent in location on aerial imagery, or high level binocular assessment) was undertaken.

The following information was recorded for each vegetation patch assessed:

- Broad vegetation character with indication of density (based on standard DEH terminology), e.g. 'Mallee or Open Mallee'
- Dominant canopy species
- Dominant understorey/shrub layer
- Key weed presence and abundance
- Existing disturbance factors (at the site and adjacent where relevant),including pest species
- Presence of or potential for national or state protected flora or fauna species
- Capture of geo-referenced photos.

Broad vegetation characterisation and condition assessments were undertaken at each vegetation patch that could be accessed and estimates made for inaccessible patches where appropriate, through a combination of binocular assessment, review of aerial imagery and based on similarity to nearby accessible patches in similar location (e.g. dune crests surrounded by paddocks). The type of characterisation undertaken for each patch is indicated in Appendix C.

Where deemed appropriate, patches were further divided into subsections (e.g. 175a, 175b) based on geographical separation (e.g. if part of the patch was roadside vegetation and part was within a paddock), or significant variation in habitat condition or species composition. Representative photographs of each vegetation type encountered were taken, meaning that not all patches were photographed particularly when nearby patches were similar in composition.

Any plant species that could not confidently be identified in the field were sampled and preserved for later identification at base-camp or for independent identification by the SA Herbarium in Adelaide, so that the confirmed species names could be incorporated into this report. Field identifications of plant species were made using a variety of books and reference materials, including:

- Acacias of South Australia (Whibley and Symon 1992)
- Flora of South Australia Vol I-IV revised (Black 1986)
- Field Guide to Eucalypts – Volume 2: South-western and Southern Australia (Brooker and Kleinig 2006)
- Grasses of South Australia (Jessop et al. 2006)
- Native Eucalypts of South Australia (Nicolle 2013)

- Plants of Western New South Wales (Cunningham et al. 1993)
- Weeds of the South-East; An Identification Guide for Australia (Richardson et al. 2007)

3.3.2 Opportunistic observations and habitat potential

Opportunistic observations make up an important component of a flora survey in terms of determining whether habitat may be suitable for threatened or protected fauna species. These include any observations made while travelling around the project area or between the survey sites. Any plants and animals identified opportunistically, either via direct observation or by evidence (e.g. nests, tracks or scats), were recorded on data sheets with location and any useful notes. These species were added to site species lists, or to a general survey species list if from the broader project area (i.e. not attributed to a particular habitat type). Notes were taken also on the potential for various vegetation patches to provide habitat for threatened fauna and flora in the region.

3.3.3 Condition assessment

Vegetation patches intersected by the Infrastructure Corridor (including options) were rapidly assessed for condition based on the Native Vegetation Council "Guidelines for a Native Vegetation Significant Environmental Benefit (SEB) Policy" developed for the clearance of native vegetation associated with the minerals and petroleum industry (DWLBC 2005), patches were given initial SEB ratings from 10:1 through to 2:1 based on the following principles:

- 10:1 Intact vegetation
- 8:1 Native vegetation with little disturbance
- 6:1 Native vegetation with some disturbance
- 4:1 Native vegetation with considerable disturbance
- 2:1 Weed-dominated with only scattered areas or patches of native vegetation.

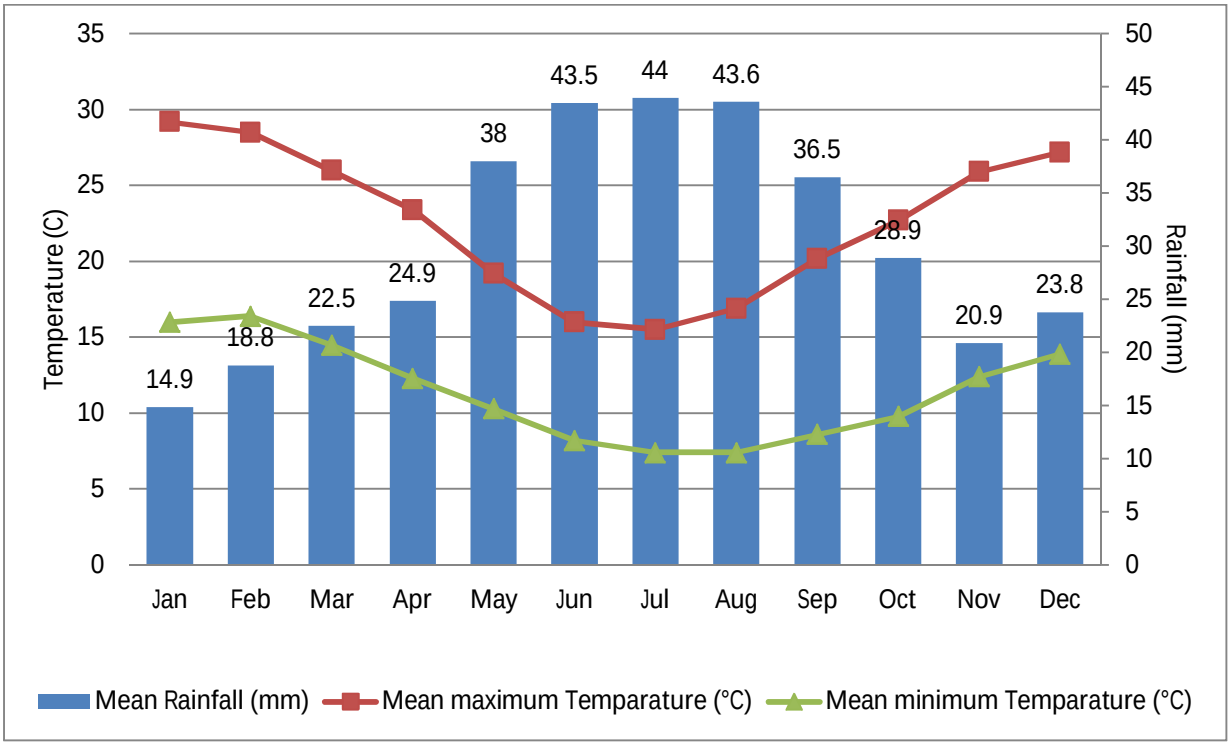
SEB offset requirements differ between ratings with greater offsets (e.g. financial and management activities) required for vegetation of condition 10:1, through to lesser offsets for vegetation rated 2:1. More detail about the SEB ratings is provided in Table 1 of the NVC Guidelines (DWLBC 2005). Photos for a subset of the patches are provided in Appendix D as representative of the various condition ratings. Detail about each patch, species composition, condition and weed presence is provided in Appendix E.

4 Results of desktop flora and fauna

4.1 Climate

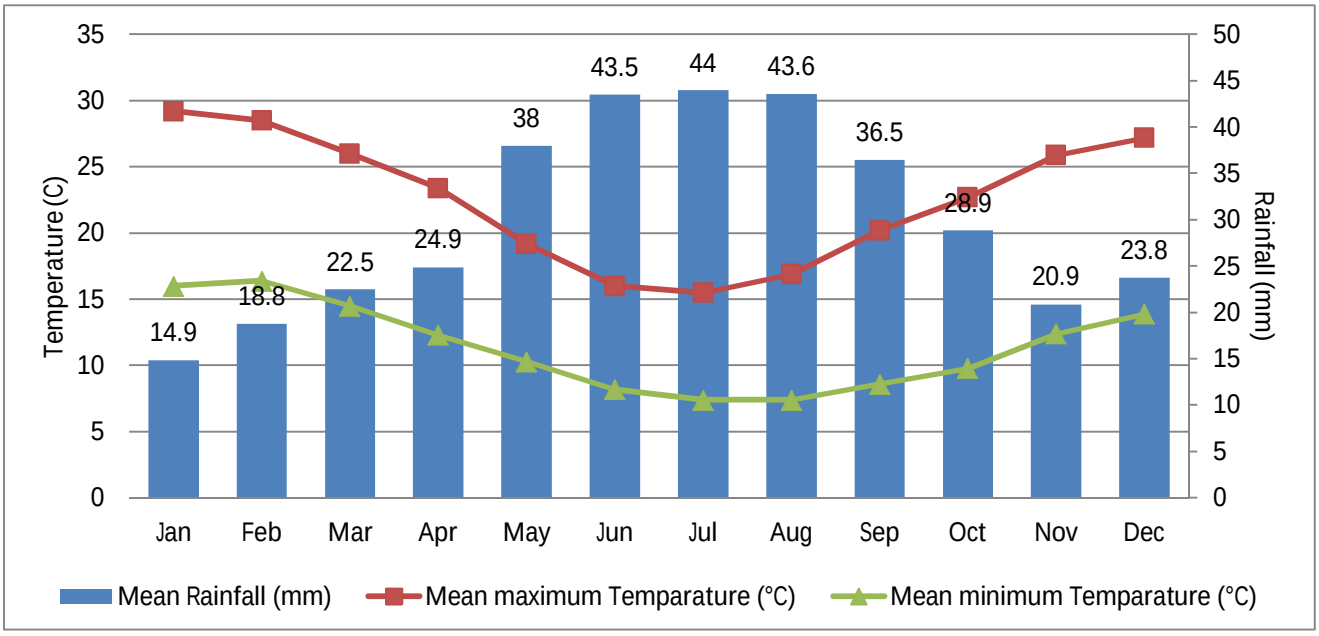
The climate of the study area is semi-arid with mean annual rainfall of approximately 402.33 mm (Southern end of corridor) to 287mm (Northern end) over the past 30 years (sourced from nearest meteorological stations at Cleve and Kyancutta, respectively, Bureau of Meteorology, 2014). Rainfall is typically winter dominant with relatively dry summer months which are characterised by warm to hot temperatures, with mean summer monthly maximums in the high 20s (South) to low 30s (North).

Figure 4-1 Climate summary for southern end of corridor



Source: Cleve Aerodrome (closest long-term climate data to Port Neil), BOM accessed 19/02/2014

Figure 4-2 Climate summary for northern end of corridor



Source: Kyancutta, BOM (data recorded 1930-2014) accessed 19/02/2014

4.2 Bioregion

The study area is located within the Eyre Yorke Block (EYB) bioregion as described by the Interim Bioregionalisation of Australia (IBRA) of Thackway and Cresswell (1995 cited in DEH 2002).

Due to the diverse landscapes and habitats found within the bioregion, sub-regions are used for the purposes of describing biodiversity issues. Within the EYB bioregion, there are three sub-regions located within the Eyre Peninsula (Eyre Hills, Talia and Eyre Mallee). The Infrastructure Corridor is located across the Eyre Mallee subregion in the north and the Eyre Hills western subregion to the southeast of Hincks Conservation Park.

The EYB bioregion is characterised by Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of aeolian quartz sands, with mallee woodlands, shrublands and heaths on calcareous earths, duplex soils and calcareous to shallow sands. Habitat fragmentation and habitat degradation are the key threatening processes for native flora and fauna in the bioregion as a result of the significant clearance of native vegetation which has occurred for agriculture and grazing. The bioregion comprises an overlap point for several species at the western or eastern range of their distribution. The area also contains the transition from semi-arid to arid plant and animal species, with at least 25 plant species endemic to the bioregion.

Feral animals including rabbits, foxes, cats, goats and horses present threats to native plant and animal species through grazing, competition and predation. Competition from exotic weed species such as bridal creeper, wild oats and veldt grass presents a further threat to native vegetation.

The landscape of the bioregion is unique and varied, comprising limestone rolling plains, granite inselbergs, coastal and inland wetlands, salt lakes, ephemeral lakes, stands of mangroves and offshore islands.

4.2.1 Eyre Mallee (EYB5) sub-region

The climate of the Eyre Mallee subregion is more arid than the other two subregions of the Eyre Peninsula. Consistent with the history of the broader bioregion, the mallee vegetation that previously dominated the subregion has been significantly cleared for agriculture and livestock grazing (DEH, 2002). However, the Eyre Mallee sub-region has a significantly higher proportion of native vegetation in reserves than the other two subregions of the Eyre Peninsula, with Eyre Mallee containing 44 % compared to 25 % for Eyre Hills and 17 % for Talia (DEH, 2002).

The subregion consists of undulating planes with an extensive cover of dunes and sand sheets. The shallow calcareous earths or deeper duplex soils of the plains support a mallee association of *Eucalyptus socialis* and *E. gracilis,* with *E. Incrassata* mallee over *Melaleuca uncinata* occurring on the dune sands (DEH, 2002).

Landcover within the bioregion includes:

- Grazing – native pastures (37 %)
- Conservation (14 %)
- Native forest outside public land (12.8 %)
- Vacant Crown land and Crown Reserves (0.02 %).

The Eyre Mallee subregion has the highest biodiversity within the EYB bioregion with 1,212 recorded plant species (6 endemic), 177 bird species, 82 reptile species and 23 species of mammals (DEH 2002). Nationally endangered flora species that occur within this subregion include: *Acacia cretacea* (Chalky Wattle), *A. enterocarpa* (Jumping-jack Wattle), *A. pinguifolia* (Fat-leaved Wattle), *A. whibleyana* (Whibley Wattle), *Haloragis eyreana* (Prickly Raspwort), *Pterostylis aff. despectans* "Mt Bryan" (Mt Bryan Greenhood) and *Thelymitra epipactoides* (Metallic Sun-orchid) (ANRA 2009).There are also a number of flora species with Vulnerable or Rare ratings under the EPBC Act and the NPW Act, see section 4.8 for further detail.

4.2.2 Eyre Hills (EYB3) sub-region

The Eyre Hills subregion has two areas (southern and eastern uplands) that occur spatially either side of the Eyre Mallee subregion. Consistent with the history of the broader bioregion, the mallee vegetation that previously dominated the subregion has been significantly cleared for agriculture and livestock grazing (DEH

2002, Rogers 2013). This sub-region only has 25% of native vegetation in reserves and those areas are primarily located in the eastern subregion, apart from a section of Lincoln National Park in the south-eastern tip of the western area. The proposed Infrastructure Corridor will be located in the western area of this subregion at least 75km north of Lincoln National Park.

The subregion consists of undulating plains with an extensive cover of dunes and sand sheets. The plains to the south and west are predominantly formed on old alluvium or on calcarenite near the coastal fringe. Shallow reddish loams with rock outcrops support Mallee *Eucalyptus incrassata,* with *Melalueca uncinata* on the plains or *Melaleuca lanceolata* Woodland occurring along the coast fringe (DEH 2002).

Landcover within the bioregion (southern and eastern uplands combined) includes (DEH 2002):

- Grazing – native pastures (42.9%)
- Conservation (6.9%)
- Native forest outside public land (7.4%)
- Vacant Crown land and Crown Reserves (0.8%).

The Eyre Hills subregion has the highest occurrence of endemism within the EYB bioregion. Nineteen endemic plant species and two endemic plant communities have been recorded within the area; Eyre Peninsula Blue Gum (*Eucalyptus petiolaris)* Grassy Woodland on heavy fertile soils on plains and *E. Peninsularis* (Cummins Mallee), *E. Dumosa complex* Mallee on loams or clay-loam flats (DEH 2002). The Eyre Peninsula Blue Gum Woodland community has recently been listed under the EPBC Act, as endangered (August 2013). Areas where this community are known to occur and may occur have been mapped (SPRAT Profile August 2013). These key areas occur south of Ungarra and North of Cleve. Endangered flora species that occur within this subregion are the same as those of the Eyre Mallee subregion (ANRA 2009).

It should be noted that previous records for *E. dumosa* on the Eyre Peninsula are now considered to be *E. calcareana* (Nundroo Mallee) (Nicolle 2013).

4.3 Regional native vegetation associations (IBRA)

Native vegetation associations have been inferred from IBRA regionalisation (Thackway and Cresswell 1995), from each unifying set of environmental influences (e.g. geology, landform patterns, climate and other ecological features) that define the bioregion. The native vegetation associations provide a high level overview of typical vegetation structure and composition. Six distinct IBRA regional native vegetation associations are described across the study area; Koongawa, Hambidge, Wharminda, Butler, Waretta and Cleve (Laut *et al*. 1977). The associations are described by (Table 4-1) and Figure 4-3.

Table 4-1 IBRA regional native vegetation associations of the Infrastructure Corridor

Association	Environmental characteristics[1]	Total # of native vegetation patches[2] intersected by corridor	Total area of native vegetation[1] in corridor[3] (% of total)
Koongawa	Veg: Open scrub of Ridge-fruited Mallee, Narrow-leaved Red Mallee or Broombush. Landform: Undulating plain with parallel dunes and occasional quartzite or granite inselbergs. Soil: Brown calcareous earths or sandy apedal mottled-yellow duplex soils, brownish sands and dense brown loams.	25	18.69 ha (14.03%)
Hambidge	Veg: Open scrub of Ridge-fruited Mallee, Narrow-leaved Red Mallee and Broombush, Low Woodland of Melaleuca, Low shrublands (Samphire, Chenopod, Coastal Wattle and Coast Beard Heath). Landform: Extensive undulating plain with parallel dunes and occasional low inselbergs and with tidal flats and sand dunes on the coastal margin. Soil: Sandy pedal mottled-yellow duplex soils, brownish sands, dense brown loams, grey calcareous loams and whitish calcareous sands.	95	93.09 ha (69.9%)
Wharminda	Veg: Chenopod shrubland (Samphire and Nitrebush). Landform: Undulating plain with sand sheets and dunes, and isolated hills. Soil: Sandy pedal mottled-yellow duplex soils, brownish sands, dense brown loams, crusty red duplex soils and whitish calcareous sands.	15	13.98 ha (10.5%)
Butler	Veg: Open scrub of Ridge-fruited Mallee and Broombush and Chenopod shrubland (Samphire and Nitrebush). Landform: Undulating plain on partly calcreted alluvium with isolated quartzite hills, ending in low cliffs along the coastline. Soil: Hard pedal mottled-yellow duplex soils, red friable loams and crusty red duplex soils.	7	4.84 ha (3.63 %)
Waretta	Veg: Grasslands. Landform: Undulating plain and low hills on metasediments, with cliffs along the coastline Soil: Hard pedal mottled-yellow duplex soils and red duplex soils.	1	0.75 ha (0.6 %)
Cleve	Veg: Open scrub of Beaked Red Mallee and Yorrell, +/- Ridge-fruited Mallee and Broombush, Tall shrubland (Coast Daisy Bush, Coast Beard Heath and Coastal Wattle). Landform: Gently sloping sandy plains and footslopes with some dunes and low cliffs along the coastline. Soil: Red calcareous earths, hard pedal red duplex soils, brownish sands and whitish calcareous sands.	4	1.82 ha (1.4%)
	Totals	*147*	*133.2 ha*

[1] Laut *et. al*. 1977 as adopted into IBRA v. 7.0

[2] Patches and area calculated from DEWNR 2004 Native Vegetation (Floristic) – state-wide dataset, and updated by SKM using detailed aerial imagery (2013).

[3] Corridor width varies, ~ 60m for rail only section, 110m for rail and power, 130m for rail, water and power; all sections include 20m of maintenance track.

The Koongawa Association lies most in the northern portion of the study area, covering the proposed minesite and the first approximately 11 km of Infrastructure Corridor from the mine site to part way along the top of Hambidge WPA. The native vegetation of this association is described as an open scrub of Ridge-fruited Mallee, Narrow-leaved Red Mallee or Broombush, and accounts for approximately 14 % of the total native vegetation found within the corridor. This association has moderate remnancy (35%) of which 51% is protected in reserves, parks or heritage agreement areas across the region (DEWNR 2013a).

The Hambidge Association is the most widespread association within the study area, covering approximately 78 km of the preferred corridor from the northern side of Hambidge WPA to just south of Rudall and the Cummins-Buckleboo Railway crossing (70% of vegetation within the corridor). The native vegetation of Hambidge is defined by open scrub of Ridge-fruited Mallee, Narrow-leaved Mallee and Broombush, with pockets of low Chenopod shrubland of Samphire, and where coastal also includes low woodland of mangroves (where coastal) and low shrubland of coastal wattle and coast beard heath (neither relevant in this case). The Hambidge Association has similar remnancy to Koongawa at 28 %, of which 74 % is protected due to a number of large (and small) conservation parks and heritage agreements (DEWNR 2013a).

The Wharminda Association continues on from just south of Rudall for approximately 33 km to around 5 km NW of the Lincoln Highway. This Association has native vegetation dominated by Chenopod shrubland of Samphire and Nitrebush, and accounts for approximately 10.5 % of the native vegetation of the corridor. Preliminary ground and aerial assessments suggest the presence also of mallee communities probably similar to the Hambidge association. At a regional scale this association has poor remnancy (9 %) and very limited protection of remaining remnants through parks or agreements representing only 3 %.

The Butler and Waretta Associations are both small in size and are constricted to coastal environments. The Butler Association covers approximately 7 km of the preferred alignment either side of the Lincoln Highway. The Butler Association is defined by open scrub of Ridge-fruited Mallee and Broombush and Chenopod shrubland of Samphire and Nitrebush, and accounts for less than 3.6 % of total native vegetation cover within the corridor. The Butler Association has poor remnancy (7 %), none of which is protected formally with the majority located on boundaries and roadsides.

The Waretta Association covers the final 3.5 km of the corridor south of Lincoln Highway and to the proposed port site boundary. This Association is predominately grassland, but an examination of aerial imagery also reveals patches of sparse shrubland that probably includes coastal wattle and coast beard heath (as for the Hambidge association). This vegetation type accounts for less than 1 % of total native vegetation cover across the corridor. This Association has poor remnancy (13 %), none of which is formally protected by conservation parks or heritage agreements.

The Cleve Association occurs in a small area of the corridor which is proposed for a transmission line spur from the main corridor to the Yadnarie substation. This Association is predominantly open scrub of Beaked Red Mallee and Yorrell, sometimes with Ridge-fruited Mallee and Broombush, open heath of Coast daisy Bush, Coast Beard Heath and Coastal Wattle. This vegetation type accounts for approximately 1.4% of the vegetation of the corridor. This Association has poor to moderate remnancy (18%), and only 3% is formally protected.

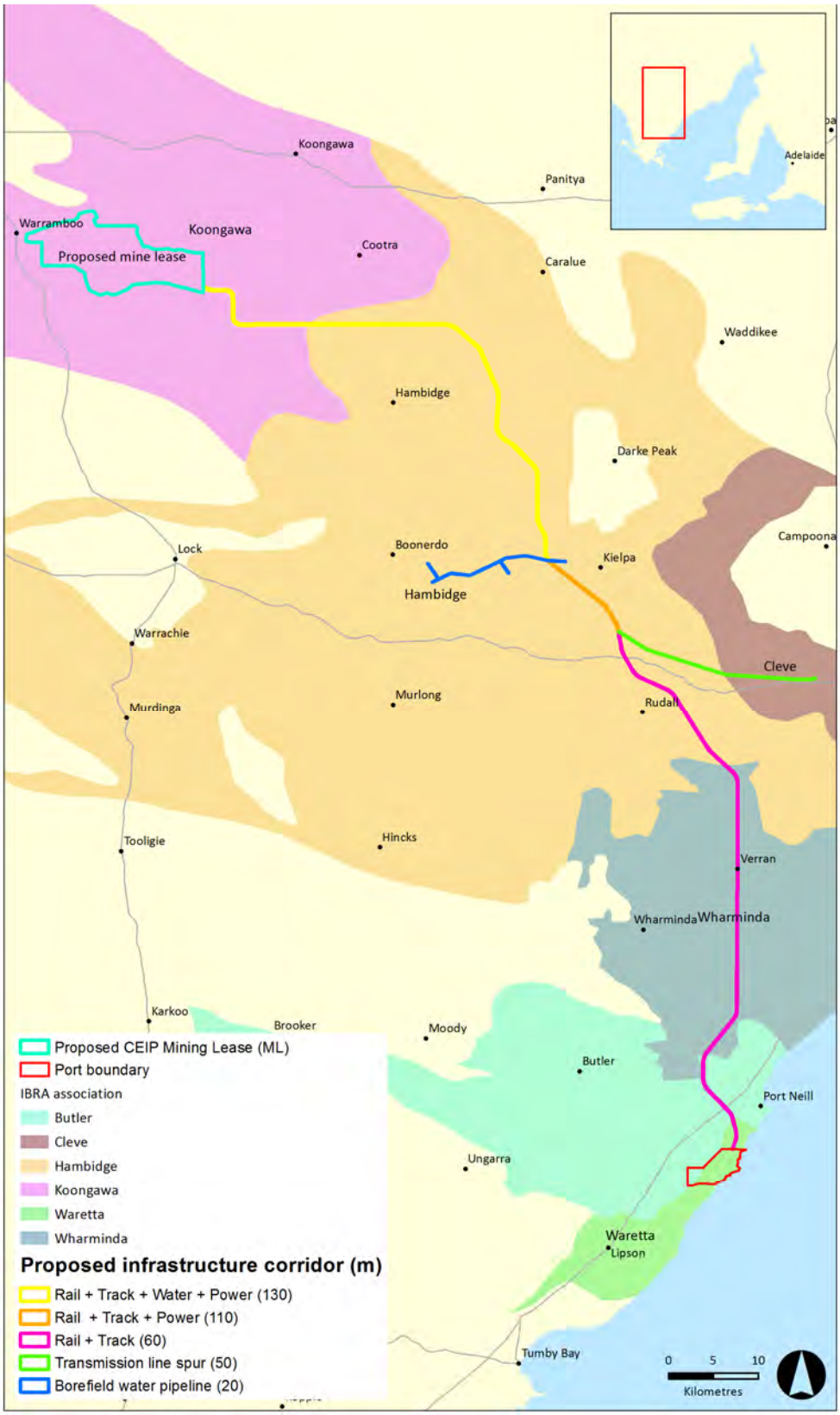


Figure 4-3 IBRA Regional Native Vegetation Associations of the Corridor

4.4 Regional vegetation community types

The IBRA provides very broad high level vegetation associations, however given the current land use and degraded condition that are not particularly effective at describing the habitats encountered. Eyre Peninsula Vegetation Communities, here in referred to as EP Community Types, provide richer descriptions that have been benchmarked and therefore allow a more accurate assessment of condition against regional examples (Milne *et al.* 2008).

Broadly, 14 vegetation communities are noted to occur across the Eyre Peninsula as defined by Milne *et al.* 2008. These communities are further divided into subgroups, based on soil type and depth of sand. Condition characteristics are described for each sub-group. Factors that cause natural variance are also taken into account. For example, for some vegetation communities moderate to high condition or health is evident in Spring when diversity of native species is greater than 31; however species diversity can decrease with decreasing rainfall. In contrast other communities types of moderate health or condition will have naturally decreased species diversity (eg. 16 + species) due to the presence of certain species e.g. *Melaleuca pauperiflora* (Boree) (Spring estimates). Similar variation occurs for other 'Bush Condition' estimates such as number and threat of weed species per vegetation community.

Table 4-2 below relates IBRA native vegetation associations as described by Section 4.3, with EP Community types predicted to occur within the study area (determined from an examination of location, soil type, state native vegetation mapping, relevant regional documents). Remnant vegetation in the study area would have originally been defined by up to five Eyre Peninsula Community Types, as per Milne et al (2008). The community types are EP 5 (Mallee with open to mid-dense sclerophyll shrub understorey on inland dunes and sandy-loams), EP 8 (Mallee and low open woodlands with an open sclerophyll shrub and chenopod understorey), EP 11 (Inland, sub-coastal and coastal mallee with a mid-dense sclerophyll shrub understorey on limestone soils), EP12 (Coastal dune and cliff vegetation), EP 13 (Coastal and inland saline and freshwater swamp vegetation). As more information is collected and vegetation classified to sub-group level (of the overarching EP Community Types), original predicted compositions can be used as a benchmark for assessing the current condition of remnant vegetation in the study area.

Table 4-2 Summary of IBRA Vegetation Associations and EP Community Types of the corridor

Association	EP Community Types and Characteristics[1]
Koongawa	EP 5.1: Mallee on inland sand dunes and deep sands (Nullabor-Spencer Dune System) EP 5.2 Mallee on sandy-loams of inland swales and low dunes EP 8.1: Mallee and low woodlands with an open sclerophyll shrub and chenopod understory EP 8.2: Mallee and low woodlands with sclerophyll and Chenopod understorey dominated by Boree
Hambidge	EP 5.1: Mallee on inland sand dunes and deep sands (Nullabor-Spencer Dune System) EP 5.2: Mallee on sandy-loams of inland swales and low dunes EP 8.1: Mallee and low woodlands with an open sclerophyll shrub and chenopod understory EP 8.2: Mallee and low woodlands with sclerophyll and Chenopod understorey dominated by Boree
Wharminda	EP 5 Mallee with open to mid-dense sclerophyll shrub understorey on inland dunes and sandy-loams EP 5.1: Mallee on inland sand dunes and deep sands (Nullabor-Spencer Dune System) EP 8.1 Mallee and low woodlands with an open sclerophyll shrub and chenopod understory EP 8.2: Mallee and low woodlands with sclerophyll and Chenopod understorey dominated by Boree EP 13: Coastal and inland salinge and freshwater swamp vegetation EP13.2: Samphire or chenopod shrublands with infrequent inundation / saline soils
Butler	EP 5 Mallee with open to mid-dense sclerophyll shrub understorey on inland dunes and sandy-loams EP 11.1: Inland Mallee and Low Woodlands with mid-dense sclerophyll scrub understory on limestone soils EP 11.2: Sub-coastal and Coastal low mallee and woodlands with mid-dense sclerophyll on limestone soils
Waretta	EP 11.1: Inland Mallee and Low Woodlands with mid-dense sclerophyll scrub understory on limestone soils EP 11.2: Sub-coastal and Coastal low mallee and woodlands with mid-dense sclerophyll on limestone soils EP 12.2: Coastal shrublands of stable dunes and cliff-top dunes
Cleve	EP 5.1 Mallee on inland sand dunes and deep sands (Nullabor-Spencer Dune System) EP 5.2 Mallee on sandy-loams of inland swales and low dunes

[1] Milne *et. al*. 2008. Note community sub-groups are specified where possible. Community types have been referenced also if supporting desktop information does not provide enough information to distinguish sub-group level.

4.5 Nearby conservation areas

Several conservation areas occur near the proposed corridor route (Figure 1-1). These areas are likely to contain higher numbers of threatened species (flora and fauna) as they are generally managed for conservation through little or no clearing of habitat, regeneration, weed control and feral animal control. Table 4-3 provides details about the names and distance of conservation areas (namely Conservation Parks, National Parks, Heritage Agreements, and Wilderness Protection Areas) in the vicinity of the proposed routes.

Table 4-3 Conservation Areas in proximity to the preferred corridor alignment.

Conservation Area	Size of Area (ha)	Distance from Preferred Corridor
Hambidge Wilderness Protection Area	38,048	10 m for 23 km section
Darke Range Conservation Park	311	4.3 km
Carapee Hill Conservation Park	311	13 km
Heritage Agreement Area 625[1]	175	3.2 km
Rudall Conservation Park[1]	359	8.5 km
Heritage Agreement 61 (7 vegetation patches)	87	4.7-5.7 km
Hincks Wilderness Protection Area	66,873	10.7 km
Hincks Conservation Park	881	46 km
Verran Tanks Conservation Park	119	7.7 km
Wharminda Conservation Park	269	9.5 km
Lincoln Conservation Park	1035	82.4 km
Lincoln National Park	354	67.4 km

[1]HA 625 (shaped like a boot) is ~ 4 km and Rudall CP is ~ 2 km from the Yadnarie transmission line spur

4.6 Threatened Fauna

The desktop review identified a number of fauna species of national or state conservation significance as potentially occurring in the survey area (based on EPBC PMST and BDBSA results). Note for the purposes of this terrestrial based study, marine mammals, reptiles and fish (e.g. species such as whales, dolphins sharks, turtles and pipefish) have been disregarded. Only marine avifauna are considered in further detail.

The EPBC Protected Matters Search Tool (EPBC PMST) was examined using a 5 km buffer zone around the study area (5km either side of alignment centreline) and compared to BDBSA records for a 5 km buffer (i.e. 5 km either side of alignment centreline). Regional records (i.e. for the Eyre Peninsula) were also reviewed where records for any individual species were limited. In total, 30 individual fauna species, mostly birds, have been raised by the EPBC search tool (Appendix A). The EPBC PMST results indicated 15 protected fauna species (1 terrestrial mammal, 14 birds, mostly Migratory or Listed Marine) that are considered 'likely to occur' or their habitat is ‘known to occur’ within the study area. Another 15 threatened and or Migratory / listed Marine birds ‘may occur’ in the area. Table 4-4 below summaries these species. The actual likelihood of occurrence for each

species within the project area and justification of this is discussed further in Section 6. Note that as 1 Dec 2013, the Federal Minister for Environment formally delisted one species (Slender-billed Thornbill – western, *Acanthiza iredalei iredalei*) which is no longer protected by the EPBC Act. Another species (the Osprey or Eastern Osprey) is taxonomically controversial and while recognised by some as individual species is listed as Migratory Marine and Listed Marine for only the Osprey (*Pandion haliaetus*). For the purposes of this discussion we have grouped both references of the Osprey together. Marine mammals and marine reptiles that were highlighted during the PMST results are not discussed in this report, but are covered in the Marine and Coastal Ecology Baseline Survey (Jacobs 2014a).

A review of the Biological Database of South Australia (BDBSA) indicated that fifteen EPBC listed fauna have been recorded within 5 km of the proposed Infrastructure Corridor (Table 4-4). Eight of these species were also highlighted by the PMST, including the Malleefowl (*Leipoa ocellata*), Sandhill Dunnart (*Sminthopsis psammophila*), Black-browed Albatross (*Thalassarche melanophris*), Fairy Tern (*Sternula nereis*), and as the alignment moves closer to the coast, Hooded Plover (*Thinornis rubricollis rubricollis*), Eastern Osprey (*Pandion cristatus*), Oriental Plover (*Charadrius veredus)* and White-bellied Sea-Eagle (*Haliaeetus leucogaster*). An additional seven species have NPW Act ratings as well as Listed Marine and / or Migratory Ratings under the EPBC Act; including the Cape Barren Goose, Common Sandpiper (*Actis hypoleucos),* Grey-tailed Tattler *(Tringa brevipes*), Lesser Sand Plover (*Charadrius mongolus*), Pacific Golden Plover (*Pluvialis fulva)*, Rock Parrot (*Neophema petrophila*) and Ruddy Turnstone (*Arenaria interpres*).

Additional searches were undertaken for the borefield and associated pipeline and the Yadnarie transmission line spur. There were historical records within a 5 km buffer of the borefield for two EPBC listed species; Sandhill Dunnart (from 1969) and the Malleefowl (date unknown, 2 records for birds and inactive mounds on farm). Sandhill Dunnart record reliability was within 11-25 km, (3 records Section 45, Hundred of Boonerdo, SA Museum Coordinates=33 33 0 S, 135 59 0 E). The location of these historical records was 3 km from the end of the proposed Borefield. There were 2 historical records for Malleefowl within 5 km of the transmission line spur (most recent was 1950). There were no other records for EPBC listed fauna within 5 km of the transmission line spur. There were however several recent comments (DEWNR 2010) about potential habitat for Malleefowl and Sandhill Dunnart within good quality patches of vegetation patches near Rudall.

BDBSA records also indicate that a further ten species (9 birds, 1 reptile) listed under the South Australian NPW Act have previously been recorded within 5 kilometres of the alignment, and two of these have been recorded within 1 km of the corridor centreline; Australian Bustard (*Ardeotis australis*) and Shy Heathwren (*Calamanthus cautus*).

More detail about the BDBSA records and the likelihood of occurrence of all these species is discussed further in Section 6 below. The distribution of BDBSA records for EPBC and NPW SA Fauna are shown on Figure 4-4 for the study area and surrounds; with clusters of species occurring around the numerous regional conservation areas that are present in the region.

Table 4-4 EPBC listed fauna species previously recorded (BDBSA) or flagged (EPBC PM Search Tool) as potentially present within the proposed Infrastructure Corridor (and 5 km buffer)

Species	EPBC Act[1]	SA NPW Act[2]	5 km Buffer[3]	EPBC Search Tool[5] or BDBSA Comments
Birds				
Antipodean Albatross (*Diomedea exulans antipodensis / Diomedea antipodensis*)	VU, MM, LM	-	No	Species Foraging, feeding or related behaviour likely to occur[5]
Australian Fairy Tern (*Sternula nereis nereis / Sternula nereis*)	VU	E	Yes	Species or species habitat likely to occur[5]. One (1) BDBSA record, 1998, 2.8 km from alignment, coastal.
Australian Painted Snipe (*Rostratula australis / Rostratula benghalensis* sensu lato)	E, MW, LM	V	No	Species or species habitat may occur[5]
Black-browed Albatross (*Thalassarche melanophris*)	VU, MM, LM	-	Yes	Species or species habitat may occur[5]. One (1) BDBSA record, 2.9 km from alignment, coastal, record dated 1989.
Black-faced Cormorant (*Phalacrocorax fuscescens*)	LM[4]	-	No	Foraging, feeding or related behaviour likely to occur[4,5]
Blue Petrel (*Halobaena caerulea*)	VU, LM	-	No	Species or species habitat may occur[5]
Buller's Albatross (*Thalassarche bulleri*)	VU, MM, LM	V	No	Species or species habitat may occur[5]
Campbell Albatross (*Thalassarche melanophris impavida*)	VU, MM, LM	V	No	Species or species habitat may occur[5]
Cattle Egret (*Ardea ibis*)	MW, LM	R	No	Species or species habitat likely to occur[5]
Cape Barren Goose (*Cereopsis novaehollandiae*)[7]	LM	R	Yes	2 BDBSA records, all coastal, closest 2.0 km from alignment (Port Neill), both records 1998
Common Sandpiper (*Actis hypoleucos*)[7]	MM, LM	R	Yes	6 BDBSA records, all coastal, latest records 2009, closest 2.9 km from alignment (Port Neill), 2/07/2009.
Flesh(y)-footed Shearwater (*Puffinus carneipes*)	MM, LM	R	No	Foraging, feeding or related behaviour likely to occur[5]
Fork-tailed Swift (*Apus pacificus*)	MM, LM	-	No	Species or species habitat likely to occur[5]
Great / White Egret (*Ardea alba*)	MW, LM	-	No	Species or species habitat likely to occur[5]
Great Skua (*Catharacta skua*)	LM[4]	ssp.	No	Species or species habitat may occur[5]
Grey-tailed Tattler (*Tringa brevipes*)[7]	MM, LM	R	Yes	1 BDBSA record, 2000, 2.8 km from alignment (Port Neill), coastal
Hooded Plover (*Thinornis rubricollis rubricollis / Thinornis rubricollis*)	LM	V	Yes	Species or species habitat likely to occur[5]. Numerous BDBSA records, all coastal, closest 1.2 km from alignment. Latest record 2009.
Latham's Snipe (*Gallinago hardwickii*)	MW, LM	R	No	Species or species habitat may occur within area[5]
Lesser Sand Plover (*Charadrius mongolus*)[7]	MM, LM	R	Yes	1 BDBSA record, 1982, 4.3 km from alignment, coastal
Malleefowl (*Leipoa ocellata*)	VU, MT	V	Yes	Species or species habitat likely to occur[5] 4 BDBSA records, 1km to 4.8 km from alignment. Latest record 1999.
Northern Giant-Petrel (*Macronectes*	VU, MM,	-	No	Species or species habitat may occur[5]

Species	EPBC Act[1]	SA NPW Act[2]	5 km Buffer[3]	EPBC Search Tool[5] or BDBSA Comments
halli)	LM			
Oriental Plover / Dotterel (*Charadrius veredus)*	MW, LM	-	Yes	Species or species habitat may occur[5]. BDBSA record 660 m from alignment within terrestrial port site, 1977.
Osprey (*Pandion haliaetus)* / Eastern Osprey (*Pandion cristatus*)	MM, LM	E	Yes	Breeding likely to occur within area[5]. Closest BDBSA record 2.8 km from alignment. Latest record 2009. Note the taxonomy of this species is controversial; refer Section 6.1 for further details.
Pacific Golden Plover (Pluvialis fulva)[7]	MM, LM	R	Yes	2 BDBSA record, latest 1982, closest record 4.3 km from alignment, coastal
Rainbow Bee-eater (*Merops ornatus)*	MT, LM	-	No	Species or species habitat may occur[5]
Red-lored Whistler (*Pachycephala rufogularis*)	VU	R	No	Species or species habitat likely to occur[5]
Rock Parrot (*Neophema petrophila*)[7]	LM	R	Yes	2 BDBSA records, latest 2001, closest record 2.8 km from alignment, coastal
Ruddy Turnstone (*Arenaria interpres*)[7]	MM, LM	R	Yes	8 BDBSA records, latest 2009, closest record 4.2 km from alignment, coastal.
Shy Albatross (*Thalassarche cauta cauta / Thalassarche cauta* sensu stricto*)*	VU, MM, LM	V	No	Species or species habitat may occur[5]
Soft-plumaged Petrel (*Pterodroma mollis*)	VU, LM		No	Species or species habitat may occur[5]
Southern Giant-Petrel (*Macronectes giganteus)*	EN, MM, LM	V	No	Species or species habitat may occur[5]
Tristan Albatross (*Diomedea exulans exulans / Diomedea dabbenena)*	E, MM, LM	-	No	Species or species habitat may occur[5]
Wandering Albatross (*Diomedea exulans* sensu lato)	VU, MM, LM	V	No	Foraging, feeding or related behaviour likely to occur[5]
Western Whipbird eastern (*Psophodes nigrogularis leucogaster)*	VU	E	No	Species or species habitat may occur[5]
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	MT, LM	E	Yes	Species or species habitat known to occur (breeding) [5]. 3 BDBSA records, closest 2.8 km from alignment, all coastal[3]. Latest record 2009.
Mammals				
Sandhill Dunnart (*Sminthopsis psammophila*)	EN	V	Yes	Species or species habitat likely to occur[5]. Three historical BDBSA records, within 5km buffer of Borefield. Records from 1969. Two records from 2011 within 5 km of corridor (in Hambidge WPA, SE corner).

[1] *Environment Protection and Biodiversity Conservation Act 1999* Status: Endangered (EN), Vulnerable (VU), Migratory Marine (MM), Migratory Terrestrial (MT), Migratory Wetland (MW), Listed Marine (LM); ssp = subspecies

[2] South Australian *National Parks and Wildlife Act 1972* Status: Endangered (E), Rare (R); Vulnerable (V).

[3] BDBSA records within 5 km buffer (5 km either side of corridor centreline)

[4] As per 2.1.1, Listed Marine species are not afforded EPBC protection in the terrestrial environment. Species with no other conservation rating other than Listed Marine will not be discussed further - refer Section 2.1 (e.g. Black-faced Cormorant, Great Skua).

[5] EPBC Protected Matters Search Tool Result (see Appendix A)

6 Note this species has Listed Marine / Marine Migratory status under the EPBC Act but was not raised as a protected matter in this area by the PMST (refer Appendix A).

Table 4-5 NPW listed fauna that have been recorded close to the preferred Infrastructure Corridor (BDBSA)

Species	SA NPW Act[1]	5 km Buffer[2]	BDBSA Comments
Birds			
Gilbert's Whistler (*Pachycephala inornata*)	R	Yes	4 records within 5 km of the transmission line spur (1993, Rudall CP), no records within 5 km of main corridor.
Australian Bustard (*Ardeotis australis)*	V	Yes	1 BDBSA record, within 1 km (1980),close to port site.
Australian Pied Oystercatcher (*Haematopus longirostris*)	R	Yes	9 BDBSA records, all coastal, latest record 2001, closest 2.9 km from alignment (Port Neill).
Brown Quail (*Coturnix ypsilophora*)	V	Yes	1 BDBSA records, all coastal, closest 2.9 km from alignment (Port Neill), 1975
Grey Currawong (*Strepera versicolor*)	E (ssp.)	Yes	3 BDBSA records, latest record 2003, North-western subspecies (E) in SA. Subspecies not specified within fauna records. Closest record 3.2 km from alignment (Port Neill).
Purple-gaped Honeyeater *(Lichenostomus cratitius*)	R (ssp.)	Yes	2 BDBSA records. Mainland subspecies is Rare in SA. Subspecies not specified within fauna records. Closest record 2.5 km from alignment. Both records 2000. Also records within 5 km of spur (Rudall CP).
Shy Heathwren (*Calamanthus cautus*)	R	Yes	2 BDBSA records, from 1951 and within 1 km of the alignment
Slender-billed Thornbill western (*Acanthiza iredalei iredalei*)	R	No	Species or species habitat likely to occur within the area[6]. Species delisted by Federal Minister for Environment on 1 December 2013.
Sooty Oystercatcher (*Haematopus fuliginosus*)	R	Yes	5 BDBSA records, latest record 2001, closest record 2.9 km from alignment, coastal.
Reptile			
Bardick (*Echiopsis curta*)	R	Yes	2 BDBSA records, latest record 1972, closest record 3.3 km from alignment.

[1] South Australian *National Parks and Wildlife Act 1972* (NPWA) Status: R, Rare; V, Vulnerable; E, Endangered.

[2] BDBSA records within 5 km buffer (5 km either side of proposed corridor centreline)

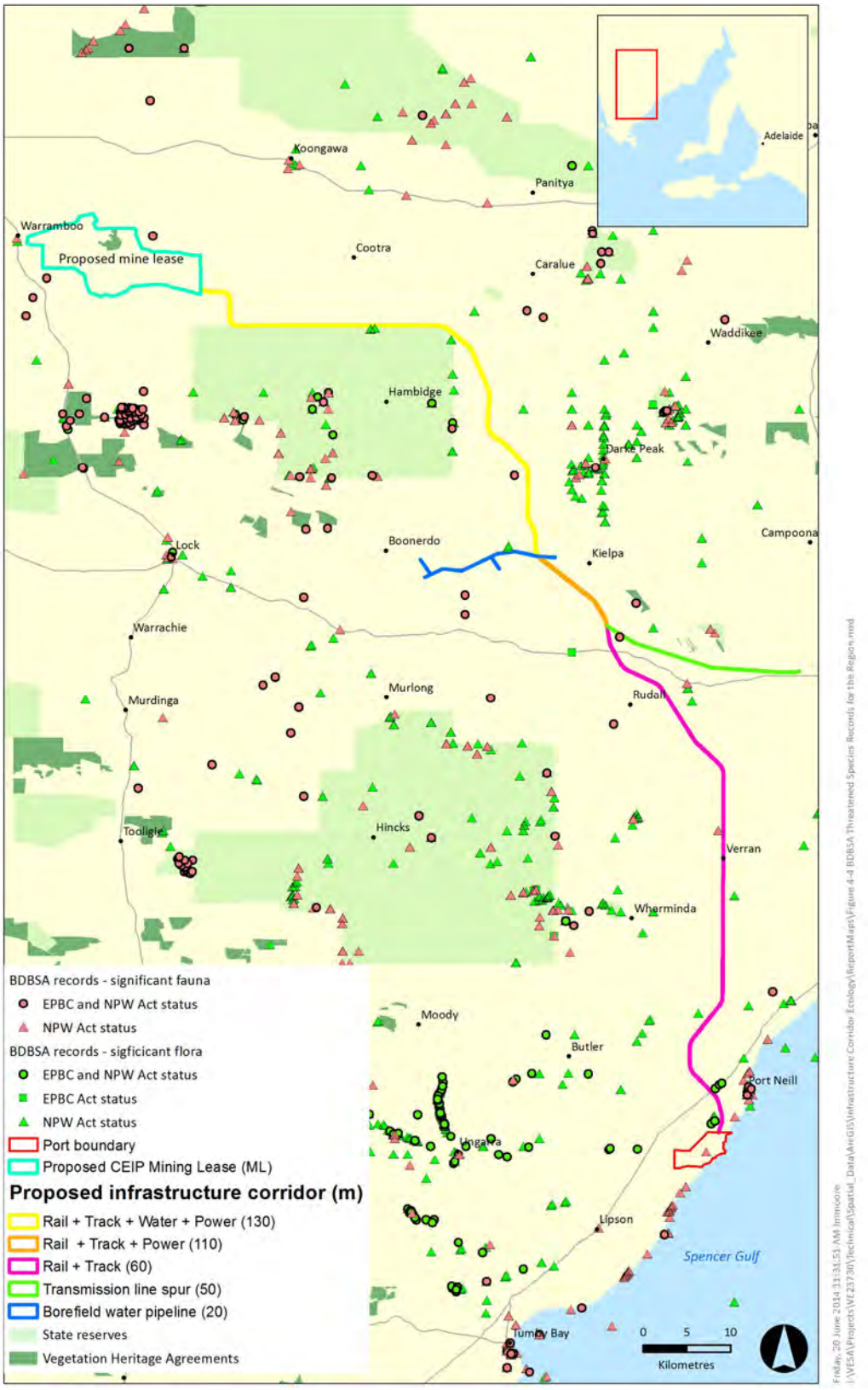


Figure 4-4 BDBSA threatened species records (flora and fauna) of the region.

4.7 Threatened Flora

The desktop review identified 30 flora species of national or state conservation significance as potentially occurring in the survey area (based on EPBC PMST and BDBDSA results). No threatened communities of national significance were identified for the study area.

The EPBC Act Protected Matters Search Tool was examined using a 5 km buffer zone (5 km either side of the corridor) and compared to BDBSA records for the study area (see Appendices A and B). Nine plant species were identified as potentially present in the search results (Table 4-6). Three endangered flora species (Jumping-jack Wattle, *Acacia enterocarpa*; Greencomb Spider-orchid, *Caladenia tensa*; and Frankenia, *Frankenia plicata*) and three vulnerable flora species (Resin Wattle, *Acacia rhetinocarpa*; West Coast Mintbush, *Prostanthera calycina* and Yellow Swainson-pea, *Swainsona pyrophila*) are classified as 'likely to occur' or suitable habitat 'likely' to occur within the study area. In addition, three other species were classified as 'may occur' or 'may have suitable habitat' occurring within the study area (Fat-leaved Wattle, Ironstone Mulla Mulla, Tufted Bush Pea). Historical presence of these species is reported below and conservation significance is discussed further in Section 6.

Historic records (BDBSA) of threatened species within the study area and buffer (5km) are shown below in Table 4-7 and Table 4-6 (EPBC species). The records indicate that only 2 EPBC listed species (Jumping Jack Wattle and Yellow Swainson Pea) have records within the study area or buffer. Presence of the other EPBC listed species in Table 4-6 was not supported by BDBSA records. In addition there were records for 20 species of conservation significance in SA (under the NPW Act) within 5 km of the alignment centreline (Table 4-7). Of the 20 species, only six have been recorded within 1 km of the alignment centreline.

In addition to the main Infrastructure Corridor, BDBSA records study areas for the borefield and Yadnarie transmission line spur and associated 5 km buffers were also investigated. There were no records for EPBC flora within 5 km of the borefield. There were two records for *Eucalyptus cretata* (Darke Peak Mallee, Rare NPW status) within 5 km of the proposed borefield. There was one record for EPBC listed flora within 5 km of the proposed transmission line spur (*Caladenia Tensa*, from 2001 near Rudall). There were also records for an additional four NPW listed flora; within the 5 km buffer of the transmission line spur, namely two Leek-orchids, Rohrlach's Bluebush and a Spear grass (see Table 4-7 below).

The transmission line spur study area crosses over roadside and remnant vegetation near Rudall that has some connectivity with Rudall CP and Heritage Agreement Area 625, as well as ten other HAs in the area. In addition to observations made during this study, DEWNR flora records indicate patches of vegetation that are suitable for Sandhilll Dunnart, Spinifex Hopping Mice and Blue Breasted Wren. Such vegetation includes Mallee of *E. incrassata / socialis*, +/- *E. gracilis* +/-*E. leptophylla*. This vegetation was assessed as an alternate corridor option as part of the broader works associated with this report, where it was also suggested that the vegetation was in good condition (patch 103b, SEB of 6:1). The vegetation of patch 103b also has connectivity with HA 625, which was determined to be in excellent condition (SEB 10:1), as part of alternate alignment, no longer part of preferred corridor.

Table 4-6 EPBC Listed flora species previously recorded (BDBSA) or flagged (EPBC PM Search Tool) as potentially present within the proposed Infrastructure Corridor (and 5 km buffer)

Species	EPBC Act[1]	SA NPW Act[2]	BDBSA 5 km Buffer[3]	EPBC Search Tool or BDBSA record Comments
Acacia enterocarpa (Jumping-jack Wattle)	EN	E	Yes	EPBC species or species habitat likely to occur. Seven BDBSA records, latest record 2004, closest record less than 490 m from alignment.
Acacia pinguifolia (Fat-leaved Wattle)	EN	E	No	EPBC species or species habitat may occur.
Acacia rhetinocarpa (Resin Wattle)	VU	V	No	EPBC species or species habitat likely to occur.
Caladenia tensa (Green-comb Spider-orchid)	EN	-	Yes	EPBC species or species habitat likely to occur. 1 record within 5 km of powerline spur (Rudall, 2001, R. Bates)
Frankenia plicata	EN	V	No	EPBC species or species habitat likely to occur.
Prostanthera calycina (West Coast Mintbush)	VU	V	No	EPBC species or species habitat likely to occur.
Ptilotus beckerianus (Ironstone Mulla Mulla)	VU	V	No	EPBC species or species habitat may occur.
Pultenaea trichophylla (Tufted Bush Pea)	EN	R	No	EPBC species or species habitat may occur.
Swainsona pyrophila (Yellow Swainson-pea)	VU	R	Yes	EPBC species or species habitat likely to occur. One BDBSA record, 2000, 3.4 km from main alignment within Hambidge WPA.

[1] *Environment Protection and Biodiversity Conservation Act 1999* status: Endangered (EN), Vulnerable (VU)

[2] *South Australian National Parks and Wildlife Act 1972* status: R, Rare; V, Vulnerable; E, Endangered

[3] BDBSA records within 5 km buffer (5 km either side of corridor centreline, borefield centreline or transmission line spur centreline)

Table 4-7 SA NPW Act listed species previously recorded (BDBSA) within proposed Infrastructure Corridor (and 5 km buffer).

Species	SA NPW Act[1]	5 km Buffer[3]	BDBSA[2] Comments
Acacia montana (Mallee Wattle)	R	Yes	2 records, both 1995, closest 685 m from alignment just north of the Port Site.
Anogramma leptophylla (Annual Fern)	R	Yes	3 records, all 1998, closest record 4.2 KM from corridor, located west of Darke Range CP.
Austrostipa echinata (Spiny Spear-grass)	R	Yes	1 record, 1998, 3.5 km from alignment (Port Neill).
Austrostipa tenuifolia (a Spear-grass)	R	Yes	3 records within 5 km of Transmission line spur, Mangalo area, from 1954.
Bothriochloa macra (Red-leg Grass)	R	Yes	1 record, 1997, 4.9 km from alignment
Caladenia bicalliata ssp. bicalliata (Western Daddy Long Legs)	R	Yes	1 record, 2001, 3.4 km from corridor.
Crassula exserta (Large-fruit Crassula)	R	Yes	1 record, 2000, approximately 660 m from alignment in Hambidge WPA.
Daviesia benthamii ssp. humilis (Mallee Bitter-pea)	R	Yes	1 record, 1966, 3.5 km from alignment (Port Neill); also 1 record within 5 km of powerline spur, Rudall CP, 1998.
Eremophila barbata (Blue Range Emubush)	R	Yes	1 record, 1979, 3.4 km from alignment;
Eucalyptus cretata (Darke Peak Mallee)	R	Yes	4 records, latest 2000, closest record 1.3 km from corridor. Species associated with Darke Peak region. 4 records within 5 km of transmission line spur, in road side and rail side vegetation 1977-2000.
Haeckeria cassiniiformis (Dogwood Haeckeria)	R	Yes	2 records, both 2001, 2.7 km from alignment (Hambidge WPA); and
Lawrencia berthae (Showy Lawrencia)	R	Yes	2 records, latest 2008, closest record 3.2 km from alignment (on edge of Hambidge WPA).
Lobelia heterophylla / Lobelia heterophylla NC / *Lobelia cleistogamoides*[4] (Wing-seeded lobelia)	R	Yes	1 record, 2001, approximately 490 m from alignment in Hambidge WPA.
Maireana rohrlachii (Rohrlach's Bluebush)	R	Yes	1 record (1998, Rudall CP).
Melaleuca armillaris ssp. akineta (Needle-leaf Honey-myrtle)	R	Yes	2 records, both 2003, 4.5 km from alignment (Darke Peak Range)
Melaleuca oxyphylla (Pointed-leaf Honey-myrtle)	R	Yes	2 records, latest record 2001, closest record within 380 m of alignment in Hambidge WPA
Myoporum parvifolium (Creeping Boobialla)	R	Yes	1 record, 1964, 3.5 km from alignment (Port Neill), coastal
Pimelea williamsonii (Williamson's Rice-flower)	R	Yes	1record, 2000, approximately 660 m from alignment in Hambidge WPA
Prasophyllum fecundum (Hidden Leek-orchid)	R	Yes	1 record within 5 km of transmission line (1998, R. Bates, near Mangalo)
Prasophyllum occultans (Self-pollinating Leek-orchid)	R	Yes	1 record within 5 km of transmission line (1989, R. Bates, near Mangalo)
Poa drummondiana (Knotted Poa)	R	Yes	1 record, 1996, 3.5 km from alignment (Port Neill), coastal
Scaevola myrtifolia (Myrtle Fanflower)	R	Yes	1 record, 1964, 1.2 km from alignment.
Stypandra glauca (Nodding Grass-lily)	V	Yes	1 record, 1996, 4.4 km from alignment on edge of Darke Peak CP

Species	SA NPW Act[1]	5 km Buffer[3]	BDBSA[2] Comments
Wurmbea decumbens (Trailing Nancy)	R	Yes	3 records, latest record 1998, closest record 4.3 km from alignment. All records from Darke Peak Ridge

[1] South Australian *National Parks and Wildlife Act 1972* (NPWA) Status: R, Rare; V, Vulnerable; E, Endangered.

[2] BDBSA extract 2011, 2012, 2013

[3] BDBSA records within 5 km buffer (5 km either side of corridor centreline, borefield centreline and transmission line spur centreline)

[4] *Lobelia cleistogamoides* is a newer species, recent separation from *Lobelia heterophylla*. Unresolvable taxonomic issues (Brandle 2010)

4.8 Introduced fauna

A total of twelve pest fauna species, seven birds and five mammals, were identified by the desktop review as potentially occurring in the study area. The introduced pest animals within the study area are summarised in Table 4-8.

The EPBC Protected Matters Search (Appendix A) indicated the potential presence of 12 pest species, all were classified as 'likely' to occur or have habitat that is 'likely' to occur in the study area (Table 4-8). BDBSA records support the existence of eight of these species, however anecdotal evidence (local farmer reports) and recent survey work (field work this report) suggest the presence of the Cat (*Felis catus)* and Skylark (*Alaudia arvensis*) as well. Both adult and young foxes were observed during field assessments for this report, primarily near Hambidge WPA. All of these pest fauna species are common to the greater Eyre Peninsula, with the exception of the Goldfinch (present on the southern EP in 1960s) which has not been located in recent Biological Surveys of the EP region (Brandle 2010).

Table 4-8 Exotic fauna species with potential or recorded presence along the proposed Infrastructure Corridor.

Common Name	Species	BDBSA[1] Comments	EPBC Search Tool[2]
Birds			
Common Black Bird	*Turdus merula*	Multiple records, approximately 3.0 km (Port Neill), associated with human habitation	Species or species habitat likely to occur
Common Starling	*Sturnus vulgaris*	Multiple BDBSA records, closest record within 1 km	Species or species habitat likely to occur
European Goldfinch	*Carduelis carduelis*	No BDBSA records	Species or species habitat likely to occur
House Sparrow	*Passer domesticus*	Multiple BDBSA records, closest 1.9 km associated with human habitation	Species or species habitat likely to occur
Rock Dove	*Columba livia*	Multiple BDBSA records, closest 1.9 km from alignment, associated with human habitation	Species or species habitat likely to occur
Skylark	*Alaudia arvensis*	No BDBSA record	Species or species habitat likely to occur
Spotted Turtle Dove	*Stigmatopelia chinensis*	Multiple BDBSA records, approximately 3.0 km (Port Neill).	Species or species habitat likely to occur
Mammals			
Cat	*Felis catus*	No BDBSA records	Species or species habitat likely to occur
European Red Fox	*Vulpes vulpes*	1 BDBSA record, Darke Peak Range, 4.6 km from alignment	Species or species habitat likely to occur
Goat	*Capra hircus*	No BDBSA records	Species or species habitat likely to occur
House Mouse	*Mus musculus*	Multiple BDBSA records, 1 and 5 km from alignment, generally widespread	Species or species habitat likely to occur
Rabbit	*Oryctolagus cuniculus*	One BDBSA record, 4.8 km from alignment (Darke Peak CP)	Species or species habitat likely to occur within area

[1] BDBSA extract 2011, 2012 and 2013; EPBC Act Protected Matters Search Tool Invasive Species suggestions based on National Land and Water Resources Audit maps 2001.

4.9 Weeds

The EPBC Protected Matters Search Tool (Appendix A) indicated nine species (or suitable habitat to support such species) that have the potential to occur in the study area (see Table 4-9). The potential presence of five of these weeds was supported by corresponding BDBSA records within 5 km of the alignment centreline; namely Bridal Creeper, Ward's Weed, Boneseed, African Boxthorn and Silver Nightshade. These species are known to exist in the greater Eyre Peninsula region (DEH 2002). These species are all Declared for the whole of South Australia under the NRM Act (i.e. if present they must be actively controlled), with the exception of

Ward's Weed. Bridal Creeper, Boneseed, Blackberry and Gorse are also recognised as Weeds of National Significance (AWC 2012).

In addition, since the initial preparation of this report Buffel Grass has been Declared as a weed of concern for the Eyre Peninsula.

Table 4-9 Exotic flora species with potential or recorded presence along the proposed Infrastructure Corridor

Species Name	Common Name	BDBSA[1] comments	EPBC Likelihood of Occurrence
Lycium ferocissimum	African Boxthorn	8 records (1995) within 5 km of corridor, >30 records within 5km of powerline spur	Species or species habitat may occur.
Chrysanthemoides monilifera / C. monilifera ssp. monilifera	Bitou Bush, Boneseed	1 record (1998) within 5 km of corridor	Species or species habitat may occur.
Rubus fruticosus aggregate	Blackberry	No records within 5 km of alignment	Species or species habitat likely to occur.
Asparagus asparagoides (NC)	Bridal Creeper	Multiple, recent records within 5 km of the corridor. 13 records within 5 km of powerline spur	Species or species habitat likely to occur.
Ulex europaeus	Gorse, Furze	No records within 5 km of alignment	Species or species habitat likely to occur.
Olea europaea	Olive, common olive	No records within 5 km of alignment.	Species or species habitat may occur.
Opuntia spp.	Prickly Pears	No records within 5 km of alignment.	Species or species habitat likely to occur.
Solanum elaeagnifolium	Silver Nightshade	3 records including 1 recent (2011) within 5 km of alignment, 2 records within 5 km of spur	Species or species habitat likely to occur.
Carrichtera annua	Ward's Weed	2 records (1995), and observed growing commonly on roadsides near Mine and Port sites (SKM 2014c and SKM 2014b), 3 records within 5 km of spur	Species or species habitat may occur.

[1] BDBSA extract 2011, 2012 and 2013, search conducted in study area and 5 km buffer (5km from centreline of proposed corridor)

Records from the BDBSA indicate 70 exotic floral species that have previously been recorded within 5 km of the corridor study area. This total includes five minor weed species that have been recorded in the transmission line spur study area, but not along the main corridor study area. Totals for the project areas are as follows: main corridor 65 species, borefield, 13 species and transmission line spur 46 species.. These numbers are reflective of the significant historical disturbance and widespread agriculture across the region. A subset of these weeds (from within a 1 km buffer of the main corridor and a 5 km buffer of the transmission line are provided in Table 4-10 below). The following Declared weeds have previous records within 5 km of the powerline spur: African Boxthorn, Boneseed, Bridal Creeper, Cut-leaf Mignonette, Salvation Jane, Silver

Nightshade and Horehound. Bridal creeper is considered very aggressive and has been flagged as a red alert weed along with African Boxthorn.

Table 4-10 Weeds previously recorded (BDBSA) within 1 km of the preferred Infrastructure Corridor

Species Name	Common Name	BDBSA Records within 1 km[2]	Comment[1]
Aira caryophyllea	Silvery Hair-grass	Last record 1993 within 5 km of spur	
Arctotheca calendula	Cape Weed	Last record 1995	Aggressive. WT2
Asparagus asparagoides f. asparagoides	Bridal Creeper	Last record 2010, 2006 within 5 km of spur	Very aggressive (Declared SA, WoNS), Red Alert weed for EP
Asphodelus fistulosus	Onion Weed	Last record 1995, 1998-2000 (94 records within 5 km of spur)	Non-aggressive (Not declared for area), WT2
Avellinia michelii	Avellinia	Last record 1998, 2000 (within 5 km of spur)	WT1
Avena barbata	Bearded Oat	Last record 1998	Aggressive, WT2
Brassica tournefortii	Wild Turnip	Last record 1998, and 2000 within 5 km of spur	Aggressive, WT2
Bromus diandrus	Great Brome	Last record 1995, and 2000 within 5 km of spur	Aggressive, WT2
Calendula arvensis		Last record 2010	
Carrichtera annua	Ward's Weed	Last record 1998 within 5 km of transmission line spur	Invasive, not Declared, not WoNS, WT2
Cenchrus ciliaris/pennisetiformis	Buffel Grass	Last record 2010 within 5 km of spur	WT3
Chrysanthemoides monilifera ssp. monilifera	Boneseed	Last record 2008 within 5 km of spur	Very aggressive, Declared SA, WoNS, WT4
Chondrilla juncea	Skeleton Weed	Last record 2011 within 5 km of spur	WT2
Conyza bonariensis	Flax-leaf Fleabane	Last record 2011, also within 5 km of spur	WT1
Cucumis myriocarpus	Paddy Melon	Last record 2011 within 5 km of spur	Aggressive
Diplotaxis tenuifolia	Lincoln Weed	Last record 1995	Aggressive, WT2
Echium plantagineum	Salvation Jane	Last record 1998 within 5 km of spur	Declared, WT2
Ehrharta calycina	Perennial Veldt Grass	Last record 2000 within 5 km of spur	Aggressive WT4
Eragrostis cilianensis	Stink Grass	Last record 2011 within 5 km of spur	
Galenia pubescens var. pubescens	Coastal Galenia	Last record 2011 within 5 km of spur	Aggressive, WT2
Hordeum glaucum	Blue Barley-grass	Last record 2001; and within 5 km of spur	WT1
Hypochaeris glabra	Smooth Cat's Ear	Last record 2001	WT1
Lolium rigidum	Wimmera Ryegrass	Last record 1998, and 2000 within 5 km of spur	Aggressive, WT2
Lycium ferocissimum	African Boxthorn	Last record 1995; 1998 (31 records) within 5 km of spur	Aggressive (Declared SA), WoNS, Red Alert weed for EP, WT4
Marrubium vulgare	Horehound	Last record 1998 within 5 km of spur	Aggressive, Declared SA, WT3
Medicago minima var. minima	Little Medic	Last record 1995	WT2

Species Name	Common Name	BDBSA Records within 1 km[2]	Comment[1]
Medicago polymorpha var. polymorpha	Burr-medic	Last record 1995; and 1998 within 5 km of spur	Aggressive, WT2
Mesembryanthemum aitonis	Angled Iceplant	Last record 2011, within 5 km of transmission line spur	
Mesembryanthemum crystallinum	Common Iceplant	Last record 1998, and within 5 km of spur	Aggressive, WT2
Mesembryanthemum nodiflorum	Slender Iceplant	Last record 1998 within 5 km of spur	WT2
Opuntia ficus-indica	Indian Fig	Last record 1995 within 5 km of spur	WT2
Oenothera stricta ssp. stricta	Common Evening Primrose	60 records in 1998 within 5 km of spur	WT2
Pentaschistis airoides	False Hair-grass	Last record 2001	WT1
Petrorhagia dubia	Velvet Pink	Last record 1998 within 5 km of spur	WT1
Piptatherum miliaceum	Rice Millet	Last record 1998 within 5 km of spur	WT2
Polygonum aviculare	Wireweed	Last record 1979 within 5 km of transmission line spur	WT2
Reichardia tingitana	False Sow thistle	Last record 2001, and 2011 within 5 km of spur	WT2
Reseda lutea	Cut-leaf Mignonette	Last record 1987 within 5 km of spur	Declared, WT2
Rostraria cristata	Annual Cat's-tail	Last record 1995	WT1
Salvia verbenaca var.	Wild Sage	Last record 1998 within 5 km of spur	WT2
Scabiosa atropurpurea	Pincusion	Last record 1998 within 5 km of transmission line spur	Aggressive, WT2
Silene nocturna	Mediterranean Catchfly	Last record 1998	WT1
Schinus molle	Pepper-tree	Last record 1998 within 5 km of spur	WT2
Solanum elaeagnifolium	Silver Nightshade	Last record 1965 (2011 record just outside 1 km from alignment); 2011 within 5 km of spur	Aggressive (Declared SA), WT2
Sisymbrium erysimoides	Smooth Mustard	Last record 1998 within 5 km of spur	WT1
Sonchus oleraceus (NC)	Common Sow-thistle	Last record 2001; and 1998 within 5 km of spur	WT1
Spergularia diandra	Lesser Sand-spurrey	Last record 1998 within 5 km of spur	WT1
Tamarix aphylla (NC)	Athel Pine	Last record 1998 within 5 km of transmission line spur	WT3
Vulpia fasciculata	Sand Fescue	Last record 1998	WT2
Vulpia myuros f. myuros	Rat's-tail Fescue	Last record 2001	WT2

[1] Proclaimed status as per *Natural Resources Management Act 2004,* WoNS = Weed of National Significance, Aggressiveness as per Appendix 4 (DWLBC 2005), Alert threat status as per Appendix 6, BushRAT Manual for Native Vegetation, where WT1 is low weed threat and WT3-5 are Red Alert Weeds (DEWNR 2013b). [2]All records are for within 1 km of main alignment unless otherwise mentioned (e.g. additional borefield or transmission spur searches are within 5km buffer, 5 km buffer results for main corridor are within Appendix B).

5 Results of rapid vegetation assessment

The preferred infrastructure corridor alignment directly intercepts 148 patches of discontinuous native vegetation across 130.33 km from the proposed boundary of the ML to proposed boundary of the port site. Broadly this study has considered over 400 patches regionally, due to previously considered corridor alignment options that are no longer part of the proposed development, and for ecological studies as part of port site and mine site investigations. With respect to the proposed infrastructure corridor, this study has ground-truthed in the field 43 of the 147 patches (29 %) that intersect the preferred corridor. In addition vegetation type and condition have been inferred from (with binoculars) and / or from location of adjacent similar patches for 21 patches (14 %). The remaining 84 patches were inferred for vegetation type and IBRA association, but not condition, from aerial imagery and available DEWNR data.

Broadly, the native vegetation of the corridor was comprised of various densities and composition of Mallee associations (often on dune crests), surrounded by agricultural paddocks. The preferred alignment and associated vegetation patches along the route are shown in detail by a series of maps in Appendix F, and northings and eastings of each site together with current assessment type (ground-truthed or inferred) are listed by Appendix C. Photos for representative patch types are provided in Appendix D. A detailed table with information per patch is provided in Appendix E.

5.1 Native flora

As mentioned earlier, the majority of vegetation associations encountered comprised Mallee. During the field assessments at least seven species of Eucalyptus were commonly observed including *Eucalyptus socialis* (Beaked Mallee), *E. incrassata* (Ridge-fruit Mallee), *E. leptophylla* (Narrow-leaved Red Mallee), *E. brachycalyx* (Gilja or Chindoo Mallee), *E. oleosa (*Red Mallee*), E. phenax subsp. phenax (*White Mallee*)* and *E. calcareana* (Nundroo Mallee). A number of these species are also known to hybridize but verification of such species was not undertaken. Species that were observed occasionally and occur in patches now avoided by the corridor include *E. peninsularis* (Cummins Mallee) (only patch 183, location avoided) and *E cretata* (Darke Peak Mallee). *E. calycogona* (square-fruited mallee) was also observed occasionally and whilst identification to subspecies was not undertaken, it is likely to be the more common subspecies *calycogona*, rather than the rare subspecies *spaffordii*, based on known distributions shown in Nicolle 2013. It should also be noted that the original field data recorded *Eucalyptus foecunda* (Freemantle Mallee), however Nicolle 2013 now suggests previous records for *E. foecunda* on the EP are now considered to be *E. leptophylla* (Narrow-leaved Mallee) and these records have accordingly been updated throughout. Similarly previous records for *E. dumosa* (White Mallee) on the EP are now considered to be *E. calcareana* (Nundroo Mallee), as per Nicolle (2013) and have also been updated. Mallee was the dominant overstorey species, with only occasional patches dominated by other overstorey species (e.g. *Allocasuarina verticillata*). Specific detail on the presence of each species per patch is provided in Appendix E (total patch records).

Key shrub species that were observed throughout the proposed Infrastructure Corridor included *Melaleuca uncinata* (Broombush) and *M. Lanceolata* (Dryland Tea-tree). Other shrub species that were observed occasionally included *Santalum acuminatum* (Quandong), *Pittosporum angustifolium* (Native Apricot), *Bursaria spinosa* (Christmas Bush), *Callitris verrucosa* (Mallee Cypress-pine), *Acacia merrallii (Merrall's Wattle), Acacia wilhelmiana* (Dwarf Nealie), *Cassytha melantha* (Coarse Dodder-laurel) and *Dodonaea baueri* (Crinkled Hop-bush).

Key understorey species that were observed throughout the proposed Infrastructure Corridor included: *Enchylaena tomentosa* (Ruby Salt bush), *Austrostipa* spp. (Spear grasses), *Austrodanthonia* spp. (Wallaby grasses), *Rhagodia candolleana* ssp. *candolleana* (Sea-berry Saltbush), *Triodia irritans* (Porcupine Grass), *Podolepis capillaris* (Wiry Podolepis) *Vittadinia* spp. (New Holland Daisies), *Lepidosperma* spp. (Sedge) and *Maireana brevifolia* (Small-leaved Bluebush). Other understorey species that were observed occasionally included: *Lomandra* spp., *Helichrysum leucopsidium* (Satin Everlasting), *Carpobrotus rossii (*Angular Pig Face), *Dianella revoluta* (Black-anther Flax-lily), *Sclerolaena uniflora* (Small-spine Bindyi), *Tecticornia pergranulata* (Samphire) and *Threlkeldia diffusa* (Coast Bonefruit).

A summary of the common habitat types and structural dominants is provided by Table 5-1 below, with per patch descriptions found in Appendix E.

5.2 Incidental native fauna

Birds constituted the majority of fauna recorded opportunistically while groundtruthing sites. Species included the White-winged Chough (*Corcorax melanorhamphos*), Yellow-throated Miner (*Manorina flavigula*), Spiny-Cheeked Honeyeater (*Acanthagenys rufogularis*), Emu (*Dromaius novaehollandiae*), Wedge-tailed Eagle (*Aquila audax)*, deceased Spinifex Hopping Mouse (*Notomys alexis*), Western Grey Kangaroo (*Macropus fuliginosus*), a small Dragon (possibly *Ctenophorus* sp.) a Sleepy Lizard (*Tiliqua rugosa*) and Peninsula Brown Snake (*Pseudonaja inframacula*). All species observed are common to a range of habitats types and conditions on the Eyre Peninsula and do not carry conservation ratings, with the exception of the White-winged Chough.

Observations were made on the potential for various vegetation patches to provide habitat for threatened fauna in the region. In particular, patches of 8:1 and 10:1 SEB condition (as per DLWBC 2005, refer Section 5.5 below) are expected to provide good habitat given a greater composition of vegetation structure, diversity of flora species and minimal or no presence of invasive weed species. Five patches were considered to be of 8:1 quality and are intersected by the preferred alignment (patches 10, 31, 45, 100, 183); three of these occur north of Hambidge WPA, two occur elsewhere along the corridor. Patch 183 is actually avoided, but a small section of roadside vegetation adjacent pastoral land that links to patch 183 will need to be cleared. Patches of 10:1 SEB have been deliberately avoided by the alignment (Appendix F).

A number of patches with 6:1 condition rating are also considered to provide good to moderate habitat for threatened species, particularly species that have wider home ranges. This includes areas along the proposed corridor where vegetation patches are contiguous with conservation areas and although there is fragmentation

of habitat, the patches may provide refuge and or a 'stepping stone' between larger tracts of vegetation (e.g. some of the better quality patches on the northern boundary of Hambidge WPA, and some large patches). Twenty one patches intersected by the preferred alignment were considered to be of good condition (SEB 6:1 condition, see Section 5.5 below).

5.3 Exotic Species

A similar suite of exotic flora and fauna were recorded across the whole of the alignment, most likely due to common agricultural land-uses and associated historic clearance throughout.

As mentioned earlier full species lists were not recorded for each patch, given that the initial scope of assessments was related to options analysis and broadscale identification of areas that should be avoided based on condition or threatened species habitat features. Seventeen exotic species have been recorded in the rapid patch assessments to date. Common weeds included Wild Mustard (*Sisymbrium* spp.), Onion Weed (*Asphodelus fistulosus*), Oats (*Avena* sp.), Common Iceplant (*Mesembryanthemum crystallinum*), Paddy Melon (*Cucumis myriocarpus*) and Common Sow-thistle (*Sonchus oleraceus*). Weeds recorded only occasionally or in isolated patches included Barrel Medic (*Medicago truncatula*), Prickly Lettuce (*Lactuca serriola*), Horehound (*Marrubium vulgare*), False Caper (*Euphorbia terracina*), Coastal Galenia (*Galenia pubescens*), Bridal Creeper (*Asparagus asparagoides*) and Boxthorn (*Lycium ferocissimum*). African Boxthorn, Bridal Creeper, False Caper and Horehound are aggressive red alert weeds (DEWNR 2013b, DWLBC 2005), are declared for the Eyre Peninsula under the NRM Act and must be controlled.

Introduced fauna were recorded opportunistically while completing rapid vegetation assessments, by way of direct (sited) or indirect (tracks, scats, grazing evidence, dens / warrens) observations. Sheep (*Ovis aries*) or evidence of sheep grazing was observed throughout the alignment for vegetation patches within pastoral holdings. Sheep had occasional access to roadsides vegetation patches or patches extending into Hambidge WPA where fences were in disrepair or had been left open. Cattle (subfamily *Bovidae*) were less commonly observed. Evidence was also observed for European Red Fox (*Vulpes Vulpes*), European Rabbit (*Oryctolagus cuniculus*) and Feral Cat (*Felis catus*) at three different sites. Foxes in particularly are not only destructive for farmers, but also impact native fauna (e.g. Malleefowl) and contribute to spread of some weed species. It was noted that several landholders in the region had established fox bait programs on their land.

5.4 Vegetation communities and types

The Mallee associations encountered can be broadly grouped into three the major Eyre Peninsula Communities (as per Milne *et al.* 2008):

- Community 5 (Mallee with open to mid-dense sclerophyll shrub understorey on inland dunes and sandy loams), including sub-type 5.1 (Mallee on inland sand dunes and deep sands) and sub-type 5.2 (Mallee on sandy-loams of inland swales and low dunes)
- Community 11 (Inland, sub-costal & coastal Mallee with a mid-dense sclerophyll shrub understorey on limestone soils), including sub-type 11.1 (Inland Mallee type)
- Community 13 (Saline and freshwater swamp and riparian vegetation), including sub-type 13.2 (Samphire or Chenopod shrublands with infrequent inundation / saline soils)

The specific community type for all intersected patches was not recorded in the field, but was inferred (see Appendix E). The proposed corridor primarily comprised vegetation of EP Community 5 (approximately 90 %) which is dominant in the northern two thirds of the alignment. EP Community 11 occurs only in the southern third of the alignment as the corridor nears the coast, and represents approximately 7 % of communities. EP Community 13 was associated with occasional saline or freshwater swamps encountered across the region (approximately 3 % of patches). In some cases EP Community could not be characterised in more detail (eg to sub-type level) due to a combination of the quality encountered (i.e. key species characterising sub-types were often absent - refer Section 5.5 for detail) and the rapid method used (i.e. not all species present were recorded per patch, particularly those of lesser dominance).

As mentioned above, the majority of the proposed corridor comprises EP Community 5 vegetation. The vegetation of subgroup 5.1 occurs on inland sand dunes where rainfall is less than 450mm, and also occurs on areas of deep sand in swales and on plains (Milne *et al*. 2008). The key overstorey type is Mallee that is < 5m tall (ranging from very low closed forest to very low open woodland depending on density of cover, as per Heard and Channon 1997). Key vegetation associations that occur within this community subgroup (Milne *et al*. 2008) and were encountered throughout the corridor include:

- Ridge-fruited Mallee (*Eucalyptus incrassata)* +/- Narrow-leaved Red Mallee (*E. leptophylla*) +/- Beaked Mallee (*E. socialis).* Broombush (*Melaleuca uncinata*) is a common understory species. This association occurs on the parallel dunes of Hincks CP and surrounds.
- Ridge-fruited Mallee also dominates most of Hambidge Conservation Park on the NW-SE ridges and surrounds.
- Red Mallee (*E. oleosa)* +/- Beaked Red Mallee +/- Ridge-fruit Mallee, Mallee is dominant NE of Cowell. Other species present include Nundroo Mallee *(E. calcareana*) and Narrow-leaf Mallee, Broombush, Dryland Tea-tree (*M. lanceolata),* False Sandalwood (*Myoporum platycarpum*) and Nealie (*Acacia rigens*).

Vegetation of EP community subgroup 5.2 occurs on flats and swales of shallow sandy loam to sandy clay loam soils where annual rainfall is 300mm to 450mm. It is distinguished from EP 5.1 by the slightly taller Mallee canopy, higher diversity of species (when in good condition) and shallower, slightly heavier textured soils

(Milne *et al.* 2008). Examples of vegetation associations that occur within this community subgroup (Milne *et al*. 2008) that were encountered along the corridor include:

- Merrit or Cummins Mallee (*E. peninsularis*), Nundroo Mallee (*E. calcareana),* White Mallee ssp. (*E. phenax)* +/- Square-fruit Mallee (*E. calycogona),* Narrow-leaved Red Mallee and Red Mallee, Mallee. Broombush, Dryland Tea-tree and other scheropyhll shrubs are common. Occurs in the Cummins-Yeelana region.
- Nundroo Mallee, White Mallee +/- Ridge-fruited Mallee, Mallee occurs in the swales adjoining sand dunes of EP 5.1 where Nundroo Mallee or White Mallee occur with Ridge-fruited Mallee, e.g.near Rudall.

Vegetation types of the patches that intercept the proposed corridor are summarised in Table 5-1. Further details about each patch, including whether information was groundtruthed or inferred, are provided in Appendix C and E. Location of patches along the corridor are shown in Figures F1-F7 of Appendix F.

Table 5-1 Summary of vegetation patches along the proposed corridor

Vegetation Patch Number	Habitat Type & Dominant Overstorey Species	Key Shrubs	Key understorey vary depending on condition of patch and level of assessment	IBRA Region Vegetation Association	EP Community Type[1]
75, 76	Mallee *E. calcareana,* with mixed shrubland	*Acacia merrallii, M. lanceolata, Grevillea* sp.	*E. tomentosa*	Hambidge	5.2
202	Open Mallee *E. brachycalyx*	*M. uncinata +Acacia enterocarpa* potential (given proximity to 98[a])	*Maireana brevifolia*	Butler	11
135	Very Open Mallee *E. leptophylla*	*Melaleuca spp.*	*Triodia irritans, Lomandra effusa*	Hambidge	5
165, 167, 201, 419, 423	Very Open Mallee to Very Low Woodland *Eucalyptus oleosa ssp*.	± M. uncinata	± *E tomentosa, M brevifolia*	Hambidge, Butler, Cleve	5
17, 32, 36, 43, 134, 130, 137, 195	Very Open to Low Open Mallee *E. incrassata*	*M. uncinata, M. lanceolata, Pittosporum angustifoliu m, Nitraria billardierei, Santalum acuminatum*	*Rhagodia candolleana* ssp. *candolleana., Carpobrotus rossii, Austrodanthonia spp., Lepidosperma D. revoluta,* ± *Triodia, Vittadinia, H. leucopsidium, Austrodanthoia caespitosa, Baeckea crassifolia*	Wharminda, Koongawa, Hambidge	5.1, 5.2
7, 10, 13, 22, 24, 31, 141, 40, 45, 48, 65, 66, 71, 68, 132, 155, 153, 154, 182b, 182c, 144, 427, 194, 429-430, 435	Low Open Mallee to Very Low Woodland *E. incrassata, E. socialis,* ± *E. brachycalyx,* ± *E. leptophylla* ± *E. calcareana,* ± *E. oleosa* ssp.	*M. uncinata*± *C. verrucosa,*± *M. lanceolata,* ± *Santalum acuminatum,* ± *Lycium ferocissimum**	*Austrostipa spp, Austrodanthonia spp., Dianella revoluta, Vittadinia sp., Carpobrotus rossii, H. leucopsidium, Enchylaena tomentosa, Rhagodia.,* ± *Triodia spp. ;* + *Lepidosperma sp.,* + *Podolepis, Chrysocephalum, Maireana brevifolia* ± *Threlkeldia, Avena*, Sisymbrium*, Mesembryanthemum*, Galenia pubescens* var. *pubescens**	Koongawa, Hambidge, Wharminda	5.1
85, 164	Mallee *E. calcareana, E. leptophylla*	*M. uncinata*	*E. tomentosa, Austrostipa sp. diversity in understorey, leaf litter. Impacts from road dust,*	Hambidge	5.2

			cropping, Sisymbrium and Indian head mustard*. Patch was divided into a and b. 85a is in alignment more edge effects (SEB 4:1),* 85b is adjacent corridor *(SEB 6:1).*		
183, 261-262	Open to Very Low Woodland *Eucalyptus peninsularis+/-E. incrassata+/-E. phenax ssp.+/-E. calcareana +/-E. calycogona* ssp.	*M. lanceolata, P. angustifolium, Grevillea huegellii*	*M. brevifolia, , T. diffusa, T. irritans*	Hambidge	5.2
19, 19a, 87, 94a (poor quality), 93b, 95, 100, 103b, 133, 136, 411, 434, 437, 441-443	Very Open Low Mallee to Mallee ± *Eucalyptus phenax ssp., ± E. oleosa ssp. ± E. leptophylla, ± E. socialis, ± E. incrassata, ± E. brachycalyx, ± E. calycogona*	*M. uncinata, ± M. lanceolata Allocasuarina (small sandy), Cassytha melantha, Acacia wilhelmiana, ± Callitris*	*± Triodia, Dodonaea baueri, Enchylaena tomentosa, C. rossii, Sclerolaena uniflora, Threlkeldia diffusa, , Austrostipa* spp., *Austrodanthonia* spp., *Lepidosperma viscidum, Maireana brevifolia, Sisymbrium orientale* ± R. candolleana* ssp. *candolleana Avena sp.*, Lactuca*, Asphodelus*, Carrichtera annua**	Cleve, Hambidge, Wharminda, Koongawa	5.2
395	Very Low Mallee Woodland *Eucalyptus socialis ssp.+/-E. leptophylla+/-E. phenax* ssp.			Butler	5.2 or 11
5, 138, 139, 263, 362, 389, 402, 406, 418	Very Low Mallee Woodland *Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis*		138 Appears same as 75, 76	Hambidge, Wharminda, Cleve	11.1 or 5.2
3, 129, 50, 60	Very Open Mallee to Very Low Woodland	*Melaleuca uncinata* shrubland	*Sisymbrium orientale** and very sparse *Triodia spp. (*patch 3) *; Avena*, Asphodelus**	Hambidge	5
396	Very Low Mallee Woodland *Eucalyptus diversifolia ssp. diversifolia+/-E. incrassata+/-E. leptophylla+/-E. peninsularis*			Butler	11.2
397, 399	Very Low Mallee Woodland *Eucalyptus incrassata+/- E. calcareana +/-E. gracilis*			Butler, Hambidge	5

41, 121 -128, 156 -158, 160 -163, 176, 258-260, 267, 269-270, 273, 377-381, 385-388, 392-393, 400-401, 403-404, 407-408, 428, 431-433, 436, 438-440, 90, 91, 92, 175a, 175b, 177, 89	Mallee *Eucalyptus incrassata+/- E. leptophylla*	*M. uncinata* shrubland ± *M. lanceolata,* ± *Exocarpus aphyllus*± *Callitris (*160 likely same 89, 90, 91, 92)	*Enchylaena tomentosa, Sonchus*, Avena**± *Triodia* ± *D. revoluta* ± *L viscidum* ±*M. brevifolia, Grazing and cropping impacts (*160 likely same 89, 90, 91, 92)	Hambidge, Koongawa, Wharminda	5, 5.1, 5.2
5	Mallee *E. gracilis* ± *E. socialis* over *Melaleuca* shrubland	*Melaleuca lanceolata* ± *P. angustifolium*	*E. tomentosa*	Waretta	5 or 11
64	Tall shrubland with emergent *E. incrassata, E. leptopylla*	*Melaleuca sp.* ± *emergent* Callitris	*R. candolleana, Helichrysum leucopsidium*	Koongawa	5.1
383	Very Sparse *Lomandra* shrubland		*Lomandra* sp.	Hambidge	5
391, 394	Tall open shrubland	*Melaleuca uncinata*		Hambidge, Wharminda	5
94b, 178	Revegetation, various species	*M. uncinata*	*Vittadinia*	Hambidge	n/a
131	absent (disturbed), scattered paddock trees (*E. incrassata, E. leptophylla*)	*M. uncinata*	*Exotic grasses*	Hambidge	5.1
191	Samphire Low Open Shrubland		*Tecticornia pergranulata*	Wharminda	13
192	Low Samphire / Chenopod flat fringed with Melaleuca shrubland	*M. uncinata shrubland* + *M. lanceolata* + *N. billardieria*	*Tecticornia sp., Maireana sp.*	Wharminda	13
193	Tussock Grassland		*Gramineae sp., Lomandra sp., Lepidosperma viscidum, Gahnia lanigera*	Wharminda	13
199	Open Shrubland		*Maireana oppositifolia, Atriplex paludosa ssp. cordata, Lycium australe*	Butler	11

[1] Community types vary with depth and type of soil and intergrade throughout the region

5.5 Vegetation condition assessment

Landuses surrounding the vegetation patches within the study area primarily consisted of cropping or pastoral lands, some vegetation patches are fenced and others are grazed by sheep. Some patches of vegetation were also adjacent dirt road access tracks and major dirt roads. Some of the major roads that appear to be dirt in aerial imagery have been upgraded to bitumen (e.g. Balumba-Kinnard Road) as these roads are currently being used by large haul trucks, and dust impacts are reduced compared with roadside vegetation that runs adjacent to other major dirt roads being used by haul trucks in the area.

The vegetation condition of patches within the preferred alignment is heavily influenced by anthropogenic factors. The project landscape is predominantly agricultural with remaining native vegetation largely confined to strips along parallel dune crests. The majority of patches are small to very small, isolated, oblong and very narrow in shape resulting in large edge effects, and subject to ongoing disturbance factors such as grazing and trampling by livestock, agricultural weed invasion, pest mammal invasion (e.g. Cats, Foxes), and direct human disturbance (e.g. trampling, vehicle tracks, dust from road trains, rubbish etc.). The habitats encountered were largely disturbed remnants with the absence of one or more structural dominants, a lack of age and structural diversity, and poor species diversity. No patches are subject to once regular, natural fire disturbance (as experienced pre-European settlement) leading to further declines in biodiversity.

Formal vegetation condition may be assessed in a number of ways and by various methodologies. Condition ratings have been estimated for 63 of 147 patches using the DWLBC Significant Environmental Benefit categories (DWLBC 2005), with the majority of patches considered to be of very poor to moderate quality (Table 5-2). The size of the patches vary considerably, hence 51% of the vegetation in the corridor has been assessed. The remainder of the patches have not been assigned a condition rating, but given the relative homogeneous nature of the broader project landscape, it may be appropriate to consider condition ratings of unclassified patches proportionately in line with the patches assessed (i.e. majority in poor to moderate condition, with a minority in very poor or good condition, but none in excellent condition).

Table 5-2 Summary of vegetation condition per patch.

No. of Patches	Vegetation Patches	Condition Rating (SEB)[1]	Cumulative Patch Area (ha) in corridor
0	-	10:1 (excellent)	0
5	10, 31, 45, 100, 183	8:1 (good)	13.94
19	7, 13, 19, 19a, 22, 24, 48, 50, 75, 76, 85, 95, 153, 155, 175a, 177, 182b, 182c, 103b,	6:1 (Moderate)	30.12
31	3, 5, 17, 32, 36, 40, 43, 60, 64, 65, 66, 68, 71, 87, 89, 90, 93b 130, 132, 134, 135, 137, 164, 165, 167, 192, 202, 175b, 131, 91, 92	4:1 (Poor)	22.05
8	94, 129, 133, 136, 178, 194, 195, 383	2:1 (Very Poor)	2.09
84	41, 121, 122, 123, 124, 125, 126, 127, 128, 138, 139, 141, 144, 154, 156, 157, 158, 160, 161, 162, 163, 176, 191, 193, 199, 201, 258, 259, 260, 261, 262, 263, 267, 269, 270, 273, 362, 377, 378, 379, 380, 381, 385, 386, 387, 388, 389, 391, 392, 393, 394, 395, 396, 397, 399, 400, 401, 402, 403, 404, 406, 407, 408, 411, 418, 419, 423, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443	unclassified	65
147		TOTAL:	133.2 ha

A visual assessment of condition is also useful. Community 5 (5.1 and 5.2), the most dominant community type, is best represented by protected regional remnants within Hambidge WPA. These can be assumed to be in good to excellent condition depending on the influence of edge effects. Plate 5-1 below shows a comparison of Hambidge WPA vegetation (Community 5 benchmark) to average examples of this EP Community encountered throughout the alignment.

Plate 5-1 Visual comparison of EP Community 5 compared to regional benchmark

Hambidge WPA (excellent condition, 10:1)

Patch 183 (good condition, 8:1)

Patch 175a (moderate condition, 6:1)

Patch 132 (poor condition, 4:1)

Patch 133 (very poor condition, 2:1)

(100% native clearance, 0:1)

In comparison with the expected benchmarks for EP Vegetation Types encountered, diversity of flora was generally considered to be moderate to poor with occasional patches of good diversity where vegetation structure was more intact, patch size generally larger and thus edge effects such as weed invasion and anthropogenic disturbance minimised.

Final SEB calculations will be influenced by the actual amount of clearance required within the corridor, and other factors such as threatened species presence, future rehabilitation activities and management plans for the vegetation patches. These will be documented by a separate application to clear native vegetation, and accompanying native vegetation clearance, offset and management plan.

Figures 5.1-5.3 present the condition of vegetation patches assessed or inferred throughout the infrastructure corridor. Higher resolution mapping is provided in Appendix F (Figures F1-F7).

5.6 Vegetation clearance and regional context

A total of 133.2 ha (9.85 % of the total corridor area) of native vegetation would need to be cleared for development of the preferred infrastructure corridor, assuming complete clearance within widths defined. By inference, the remainder of the corridor (1218.8 ha or 90 %) is pasture land or cropping (including small losses to roads).

The regional impact of this clearance can be assessed relative to the broad IBRA vegetation associations and an examination of statistics by association (DEWNR 2013a) as presented by Table 5-3.

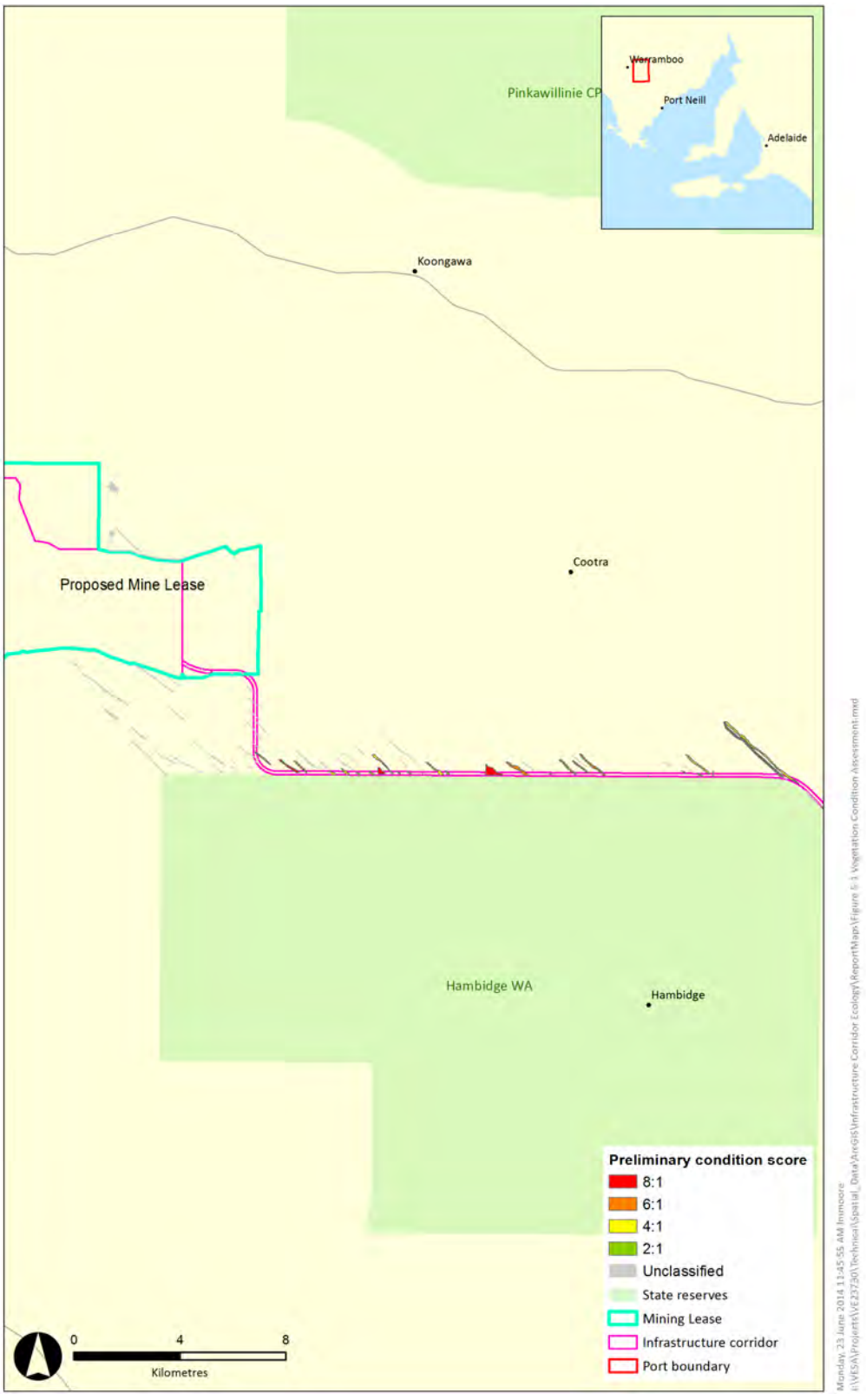


Figure 5-1 Patch condition assessment (northern portion of infrastructure corridor)

Figure 5-2 Patch condition assessment (central portion of infrastructure corridor)

Figure 5-3 Patch Condition Assessment (southern portion of infrastructure corridor)

Table 5-3 Proposed Clearance by IBRA Vegetation Association

Regional statistics (ha)[1]						Clearance Estimate	
IBRA Vegetation Association	Total Area of Association (ha)	Total Area of Native Vegetation Cover (2013) (ha)	Reserves (Protected Vegetation) (ha)	Remnancy (%)	% Remnancy protected in reserves	Maximum Native Vegetation to be cleared[2] (ha)	Percentage IBRA Association Vegetation Cleared (%)[3]
Koongawa	538,678	188,448	96,654	35	51	18.69	0.01
Hambidge	353,460	99,967	73,671	28	74	93.09	0.09
Cleve	97,765	17,456	3,222	18	3	1.81	0.01
Wharminda	70,255	6,179	158	9	3	13.98	0.23
Butler	77,299	5,127	0	7	0	4.84	0.09
Waretta	11,263	1,501	0	13	0	0.75	0.05
Totals		318,678				133.2	0.04%

[1] DEWNR 'statistics by association' table, 2013

[2] Based on 130m width for Rail/Water/Power section, 110, width for Rail/Power Section, 60m width for Rail only section, all sections include 20m maintenance track; also includes borefield and transline. Potential to reduce this in various locations depending on infrastructure layout.

[3] Percentage based on maximum vegetation cleared divided by DEWNR statistic of total area of IBRA association vegetation cover.

Due to considered placement and design and an adherence to minimum construction envelopes, the preferred alignment will require the clearance of less than 1 % of each IBRA vegetation association encountered. The greatest clearance by area will occur for native vegetation in the Hambidge Association (93.09 ha, 0.01% of the total vegetation cover for this association), but for which there is the greatest area formally protected by regional Conservation Parks, Wilderness Areas and Heritage Agreements (73,671 ha or 74 % out of a total 99,967 ha native cover remaining).

5.6.1 Matters of national environmental significance

Jumping-jack Wattle (*A. enterocarpa*, EPBC Act – Endangered) was identified at one location in 2011 adjacent the Lincoln Highway in a disturbed native vegetation patch near a borrow pit (Figure 5-4). The preferred alignment now avoids this area, however it is still within 500 m of this location. Acacia species are generally considered to be good colonisers of disturbed ground whether disturbance is from natural fires or anthropogenic activity.

Appropriate old growth Mallee with significant leaf litter levels likely to support the Endangered Malleefowl (*Leipoa ocellata*) were not observed in the patches that intersect the corridor. There are however several patches of vegetation in the vicinity of the alignment (e.g. patch 360) as well as Hambidge and Hincks Conservation Parks, that may provide habitat for Malleefowl. No other matters of National Environmental Significance, nor suitable habitat to support these matters, was observed along the preferred alignment.

5.6.2 Matters of state significance

Rapid surveys located up to three species of state conservation significance in vegetation patches that are now not within the preferred alignment; *Eucalyptus calycogona* was observed in patches 46b and 107 but was not further investigated to determine if it was *E. calycogona ssp. spaffordii* (Spafford's Square-fruit Mallee - rare), *A. dodonaeifolia* (Hop-bush Wattle – rare) was observed at patch 46b, and *E. cretata* (Darke Peak Mallee – rare) was observed at patches 30, 46c, 47 and 82 (Figure 5-4).

Eucalyptus calycogona was also observed in patch 103b which is intersected by the transmission line spur. Only the sub-species *E. calycogona ssp. spaffordii* has a conservation rating (rare in South Australia), and according to Nicole (2013) this sub species occurs only further to the south from this location around Cummins and Yeelanna, and potentially the Koppio Hills. Patch 103b is a north south linear patch of vegetation which is crossed by the transmission line spur in an east west direction. Given limited clearance for the transmission line spur is required for pole or tower locations, significant impacts to this species are not considered likely.

Whilst the surveys focused on vegetation, two birds observed opportunistically also warrant a short discussion. The Cape Barren Goose (*Cereopsis novaehollandiae,* EPBC Listed Marine, NPW Rare*)* was observed in pasture on the coast just north of Port Lincoln (Figure 5-4). While not observed within the study area, this mobile species may travel to and utilise similar habitat within the study area. A Quail was also observed near the Cummins-Buckleboo Railway easement away from the preferred alignment. This species may potentially be the protected Brown Quail (*Coturnix ypsilophora,* NPW Vulnerable), a vagrant to the Eyre Peninsula, but is more likely to be the common Stubble Quail (*Coturnix pectoralis*) that is supported by corresponding BDBSA records (see Section 6.2 for further discussion).

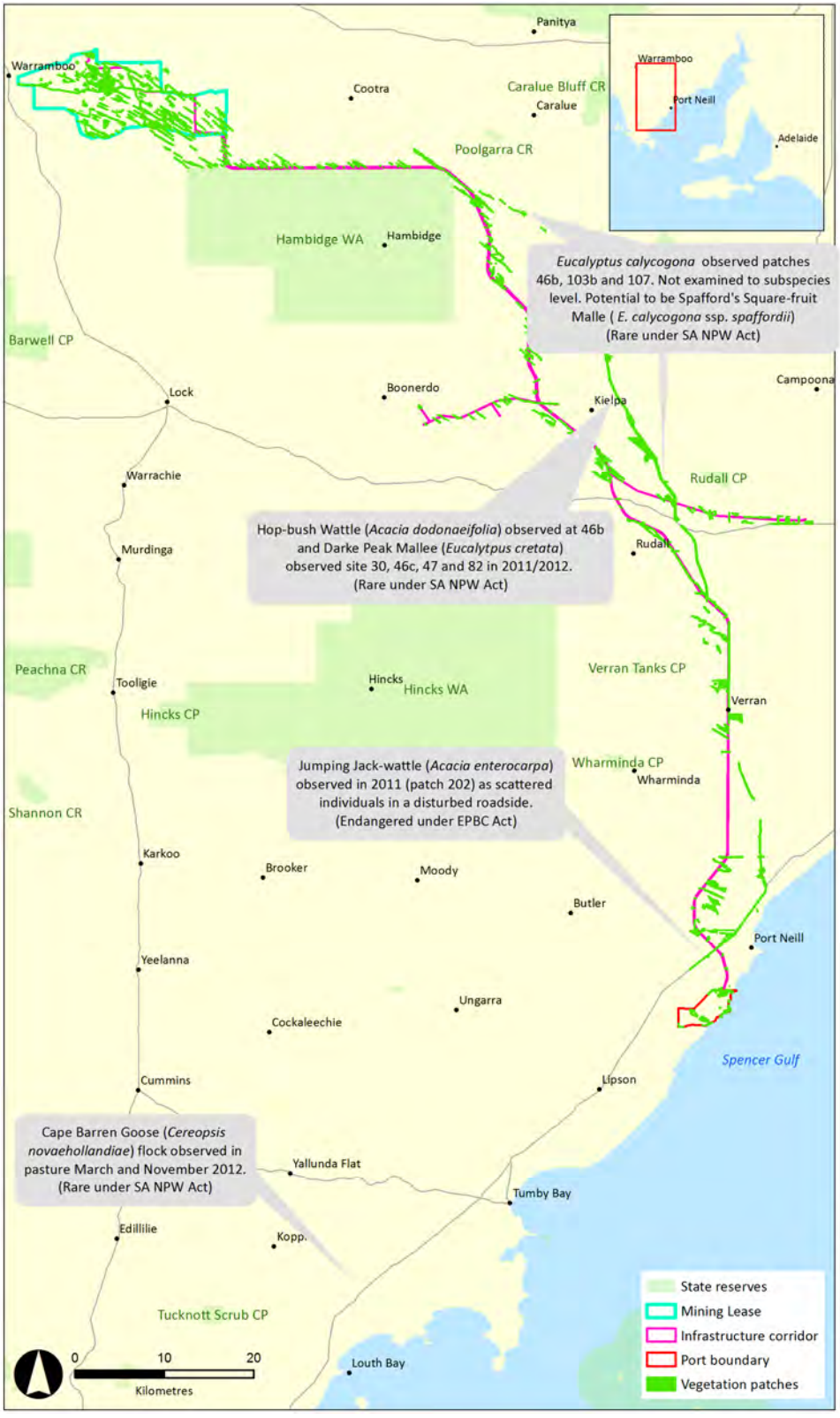


Figure 5-4 Matters of National (EPBC Act) and State (NPW Act) Conservation Significance identified during assessment

6 Matters of Conservation Significance

Native vegetation is scattered throughout the study area within conservation areas (Parks, Reserves, Wilderness Protection Areas and Heritage Agreements) and as discrete and isolated patches within cleared private land, as well as along roadsides. Some of these patches are contiguous with Conservation Areas. The average patch size varies wildly from as small as 0.03 ha (Patch 383) to as large as 88 ha (Patch 100), with the actual area proposed to be cleared only being a portion of this.

Within the study area a large portion of the remaining habitat available to native fauna and flora is subject to some form of degradation, and often multiple causes of degradation. Degradation of the available habitat is predominantly the result of historic clearance and fragmentation of remnant vegetation patches. In addition, subsequent invasion by weeds, apparent regional elevation of a saline groundwater table (as indicated by salt scarring and transitioning ecological communities) as well as predators and grazers, have contributed to degradation of the environment. Weeds are more predominant in patches that are small and narrow (i.e. higher edge effects such as in roadsides) and in areas that are open to grazing by livestock in periods between cropping. Alternatively, those sites which form part of larger remnants (e.g. 30 ha and above) tend to be more structurally intact, support fewer weeds, and retain diversity of native flora and fauna.

6.1 EPBC listed species

This section provides discussion on the likelihood of species presence. Species with a higher likelihood of occurrence or further justification is required are discussed in more detail.

On review of all appropriate datasets and in consideration of field results, habitat preferences, resource requirements and the condition of habitat patches in the study area, there are 13 birds that have the 'potential' to occur or that are 'known' to occur in the study area. Further details about species that may potentially occur or have a higher likelihood or occurrence or require further study are discussed in Section 6.1.2 below. As discussed previously, the Slender-billed Thornbill has been removed from this discussion due to recent delisting by the Federal Minister for Environment on 1 Dec 2013, but is discussed in the NPW section. The Osprey and Eastern Osprey have been grouped while the taxonomy is still in question. A further 23 species potentially present on site according to the EPBC search and BDBSA records are considered to unlikely to occur (usually due to a vagrant lifestyle or being a habitat generalist). Section 6.1.1 provides a brief synopsis of the reasons each species is unlikely to occur.

6.1.1 Species with low likelihood of occurrence

6.1.1.1 EPBC fauna unlikely to occur

Twenty two EPBC listed fauna species (all birds), highlighted by the desktop assessment, but considered unlikely to be present in the study area are summarised in Table 6-1. Justification for why they are considered unlikely to occur is also provided. As mentioned earlier, marine mammals and marine reptiles that were highlighted during the search are not discussed in this report, but are covered in the Marine Assessment report (Jacobs 2014a).

Table 6-1 EPBC listed fauna species unlikely to occur along the infrastructure corridor

Common Name	Species Name	EPBC Status[11]	NPW Status[11]	Justification for unlikely occurrence
Birds				
Diomedea exulans antipodensis	Antipodean Albatross	VU, MM, LM		Marine, pelagic and aerial species that is endemic to New Zealand but forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea. Subspecies of the Wandering Albatross[3]. No records within 5 km of the project site[2]. Not considered to be directly reliant upon habitat in the study area. Infrequent visitor to coastal EP and not considered in the Coastal Action Plan[4].
Rostratula australis / Rostratula benghalensis (sensu lato)	Australian Painted Snipe	E, MW, LM	V	Wader bird, preferred habitat includes wetlands, temporary and permanent lakes, swamps and clay pans. Typical habitat includes sedges, rushes, reeds or Samphire with scattered clumps or Lignum and sometimes *Melaleuca*[3]. No suitable habitat in study area. No previous BDBSA records within 5 km of study area[1].
Thalassarche melanophris	Black-browed Albatross	VU, MM, LM	-	Marine bird that inhabits Antarctic, sub-Antarctic, temperate waters and occasionally the tropics[1,3]. Known to breed on Heard and Macdonald Islands and occupy open ocean and waters near the continental shelf[1,5]. One BDBSA record 3 km from study area (Port Neill, 1989). Infrequent visitor to coastal EP and not considered in Coastal Action Plan[4]. Highly mobile species, likely to be a rare or occasional visitor to the region, and unlikely to be reliant on habitat within the study area.
Phalacrocorax fuscescens	Black-faced Cormorant	LM[12]	-	Marine species restricted to marine habitats, including offshore rock stacks and islets in the region[1]. Such habitat features are present in coastal regions surrounding the port site, including shorelines that feature large boulders sunk in shallow water, but not within the corridor study area. No BDBSA records within 5 km. A highly mobile that is not expected to be reliant upon habitat features within the study area.
Halobaena caerulea	Blue Petrel	VU, LM	-	Marine species, mainly known to occupy sub-Antarctic open ocean habitats, generally not far from breeding colonies in sub-Antarctic territory[1]. An uncommon visitor to Australian waters[3]. This species was not observed during site surveys and no BDBSA records exist within 5 km of the study area[2]. Not considered to be directly reliant upon habitat in the study area.
Thalassarche bulleri	Buller's Albatross	VU, MM, LM	V	Large, migratory bird that predominantly inhabits oceanic and coastal habitats[1]. Breeds on sub-Antarctic islands south of New Zealand[6], however this species is also known to visit south-eastern Australian waters during the non-breeding season, as far west as the Eyre Peninsula[6]. No BDBSA records within 5 km[2]. Likely to be an infrequent visitor to coastal EP and not considered in Coastal Action[4]. A highly mobile species with a broad distribution that it is not expected to be reliant on specific habitat features within the study area or nearby.

Common Name	Species Name	EPBC Status[11]	NPW Status[11]	Justification for unlikely occurrence
Thalassarche melanophris impavida	Campbell Albatross	VU, MM, LM	V	Species is known to visit south-eastern Australian waters but generally restricted to NSW, VIC and TAS[1,3]. No BDBSA records within 5 km[2]. Infrequent visitor to coastal EP and not considered in Coastal Action Plan[4]. Not considered to be directly reliant upon habitat near the study area
Puffinus carneipes	Flesh(y)-footed Shearwater	MM, LM	R	Predominantly marine species that is a trans-equatorial migrant, and known to use oceanic and coastal habitats[1,3]. Locally common visitor to continental shelf waters from south-western Western Australia to south-eastern Queensland. Known to breed on 41 Islands primarily from the southern coast of WA, but also SE of the Eyre Peninsula[3] (e.g. Smith Island). No BDBSA records within 5 km[2]. Not considered directly on the habitat near the study area, highly mobile species that may be a rare visitor.
Ardea alba	Great Egret	MW, LM	-	Species known to use floodwaters, rivers and shallow wetlands, as well as intertidal mudflats[1]. Species may retreat to permanent wetlands or coastal environments with the fluctuation of wet and dry seasons and with drought. No BDBSA records within 5 km[2]. Only 2 regional records, greater than 100 km from the study area (Lake Newland CP). No suitable permanent habitat within study area identified during rapid field assessment. Not considered to be directly reliant on habitat near the study area.
Catharacta skua	Great Skua	LM[12]	ssp.	Marine species that is known to visit southern Australian waters but is highly mobile and ranges widely, using open ocean habitats as well as coastal habitats[1]. This species was not observed during site surveys. No BDBSA records within 5km of the study area, no regional records[2]. Not considered to be directly reliant upon any habitat resources located within the study area.
Gallinago hardwickii	Latham's Snipe	MI, LM	R	Uses fresh wetlands and saltmarsh habitats[1]. Breeds outside Australia and migrates to Eastern Australia[7].Suitable habitat not identified within study area. No BDBSA records within 5 km[2]. Considered unlikely to occur or be very uncommon within coastal EP region[4].
Macronectes halli	Northern Giant-Petrel	VU, MI, MA	-	Marine species that inhabits Antarctic and sub-Antarctic territory but has been known to use Australian coastal waters during winter1[3]. No BDBSA records within 5 km[2]. Infrequent visitor to coastal EP and not considered in Coastal Action Plan[4]. Conspicuous and highly mobile species. It is unlikely that unique habitat is provided within the study area.
Tringa brevipes	Grey-tailed Tattler	LM, MM	R	Medium-sized shorebird that has global distribution. Within Australia this species primarily occurs in northern coastal areas[3]. These shorebirds are known to use coastal habitats including sheltered coasts, reefs, rock platforms and intertidal mudflats[7]. There are no BDBSA records for this species within the study area, however there is one record within 4-5 km from the study area from 2000. Historically, this species has rarely been recorded in South Australia[3]. Whilst habitat exists within the study area for this species, given the highly mobile nature of this species and known rare occurrence in SA, it is unlikely that habitat within the study area and surrounds is critical to the

Common Name	Species Name	EPBC Status[11]	NPW Status[11]	Justification for unlikely occurrence
				species. Consequently, if individuals do visit the study area it is not expected that the construction and operation of an infrastructure corridor would significantly impact the species.
Charadrius mongolus	Lesser Sand Plover	LM, MM	R	A medium shorebird that is known to breed in Siberia and migrates to China and Japan, parts of Asia, New Guinea and Australia[7]. Species uses coastal habitat types, including sandy shores, estuaries, sheltered bays, and tidal mudflats and rarely occurs inland[7]. Occurs in most coastal areas of Australia. Last BDBSA record within 5 km (north of Port Neill, 1982)[3].Not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. Unlikely to occur in the study area, if occurs, only as rare visitor, therefore unlikely to be impacted by the development.
Charadrius veredus	Oriental Plover	LM, MW		Small shorebird known to use dry plains and coastal habitat areas1. Breeds in China and Mongolia and migrates annually to northern Australia[3]. Stragglers sometimes found in southern Australia, where the EP is at the eastern edge of potential distribution area[7]. One record[2] within 1 km (from 1977). Has not been observed across the potential port, mine or infrastructure corridors (SKM 2014,b,c,d). Given the highly mobile nature of this species, it is considered unlikely that it relies directly upon habitat within the study area and surrounding districts. Therefore unlikely that the construction and operation of an infrastructure corridor will significantly impact this species.
Arenaria interpres	Ruddy Turnstone	LM	R	A migratory shorebird that breeds in the high arctic tundra across the globe and migrates to a number of continents, including Australia[7]. The Subspecies that occurs in Australia breeds in eastern Siberia and Alaska[7]. Known to use rocky shore habitats that feature washed up seaweed, as well as coral and sand islands and less commonly intertidal mudflats[1,7]. There are no BDBSA records for this species within the study area or 1 km of the study area, however there are 8 regional records 4-5 km from the study area (1998-2009) and another 33 records within the region (1998-2008). This species was observed at the port site (site with sandy beaches, large boulders, and washed up seaweed). However this type of habitat does not occur along the infrastructure corridor. Given the study area does not present unique habitat that is critical to this species and the mobile and migratory nature, it is unlikely the species will be impacted by this development.
Thalassarche cauta cauta / Thalassarche cauta sensu stricto	Shy Albatross	VU, MM, MA	V	Endemic Australian species that occurs in sub -Antarctic and subtropical waters. Species known to use southern Australian waters as far north as southern Queensland and as far west as Western Australia[1,3]. Breeding colonies occur off Tasmania (Albatross Island, the Mewstone, Pedra Branca), most adults remain in the waters[3]. No records within 5 km[2]. Infrequent visitor to coastal EP and not considered in Coastal Action Plan[4]. Highly mobile and not reliant upon habitat within the study area.
Pterodroma mollis	Soft-plumaged Petrel	VU, LM	-	Marine species. No records from BDBSA within 5 km of the development[2]. Not known to breed in Australian territory and inhabits sub-Antarctic oceanic areas[1,5]. A rare visitor to South Australian waters and not considered to be directly reliant upon habitat near the study area.

Common Name	Species Name	EPBC Status[11]	NPW Status[11]	Justification for unlikely occurrence
Macronectes giganteus	Southern Giant-Petrel	EN, MI, MA	V	Marine species that is widespread throughout Southern ocean, known to occur from Antarctic to subtropical waters[1,3]. They are known to over-winter in south-eastern Australian waters, along with South America, South Africa and New Zealand[3]. Highly mobile and conspicuous species. No BDBSA records within 5 km[2]. Not considered relevant to the area in EP Coastal Action Plan, however more recently known from the West coast of EP[4]. Conspicuous and highly mobile species. It is unlikely that coastal habitat at the southern end of the corridor study area provides essential habitat for this species.
Diomedea exulans exulans	Tristan Albatross	E, MM, LM	-	Marine species known to inhabit southern Atlantic oceanic territory[1,5,6]. Infrequent visitor to Australian waters[6]. No regional BDBSA records within 5 km. Not considered to be directly reliant upon habitat in the study area. Known to be an infrequent visitor to coastal EP, not considered in Coastal Action Plan[4].
Diomedea exulans sensu lato	Wandering Albatross	VU, MM, LM	V	Large, migratory marine species most commonly occupying oceanic and coastal sea habitats. On rare occasions, this species has been known to use coastal bay habitats[1,5] but is generally aerial and flies over pelagic, off-shore and in-shore water[3]. No records within 5 km. Not considered relevant to the area in EP Coastal Action Plan[4]. Species is highly mobile and it is not considered directly reliant on habitat in the study area.
Psophodes nigrogularis leucogaster	Western Whipbird (eastern)	VU	E	Species known to prefer dense mallee scrub4 as in Coffin Bay NP and Lincoln NP where populations are found[2]. Although small remnant patches of suitable habitat may occur within the study area, they are isolated, fragmented and surrounded by agricultural land. No BDBSA records within 5 km[2].

[1] Simpson and Day 2004; [2] BDBSA extracts 2011, 2012, 2013; [3] SPRAT 2013; [4] Caton, Detmar, Fotheringham, Laurence., Quinn, Royal, Rubbo, and Sandercock 2011; [5] Department for Environment, Water, Heritage and the Arts (2010); [6] Shirihai 2007; [7] Geering et al 2008; [8] Marchant and Higgins 1990; [9] Brandle 2010; [10] Menkhorst and Knight 2004; [11] EPBC Act Status: EN = endangered, VU = vulnerable, MT = Migratory Terrestrial, MM = Migratory Marine, MW = Migratory Wetland, LM = Listed Marine, SA NPW Act Status: R = Rare; V = Vulnerable; E = Endangered.
[12] Note: the EPBC rating of 'Listed Marine' is not applicable for the terrestrial study area (as per Section 2.1.1)

6.1.1.2 EPBC flora unlikely to occur

Six EPBC listed flora species, highlighted by the protected matters search, but considered unlikely to occur in the study area are summarised in Table 6-2. Justification for why they are considered unlikely is also provided.

Table 6-2 EPBC listed flora species unlikely to occur

Common Name	Species Name	EPBC Status[1]	NPW Status[1]	Justification for unlikely to occur
Acacia pinguifolia	Fat-leaved Wattle	EN	E	Priority 1 regional species[2]. Occurs within roadside reserves and rail reserves (e.g. near Cummins). Prefers a variety of subsoils and occurs with *E. dumosa*[3,4], *E. phenax, E. foecunda* and *E. calycogona*[4]. No BDBSA records within 5 km[5]. Known from 3 disjunct sub-populations (Ungarra and Butler Tanks, Cummins and Hundreds of Koppio and Hutchinson)[5]. Prefers the 400-500 mm rainfall zone. Not observed during corridor, port or mine site surveys[6].
Caladenia tensa	Greencomb Spider-orchid	EN	-	Known from south-east South Australia, rather than Eyre Peninsula[2,3]. Last BDBSA record 3.7 km from study area 2004[(5)]. Known from south-east South Australia, rather than Eyre Peninsula[5]. Key threats include habitat fragmentation, clearance, grazing pressure. Taxonomic confusion in SA relating to *C. tensa* and *C. clavula* (not protected), with EP BDBSA records likely to be *C. clavula*[2]. Mallee vegetation along the corridor likely to be too fragmented and disturbed. Not observed during surveys of proposed corridor, port or mine site[6].
Frankenia plicata	Frankenia/ Sea Heath	EN	V	Known to occupy a wide range of habitats, and difficult to identify. Generally overlaps with Buloke Woodlands, Temperate Grasslands and Peppermint Box Grassy Woodlands. Limited suitable and degraded habitat present along the corridor and not observed during surveys of proposed corridor, port or mine site[6]. BDBSA records for the species are found north and outside of the EP[5].
Prostanthera calycina	West Coast Mintbush	VU	V	Commonly occurs on calcarenite ridges and in sandy loams of undulating calcrete plains in Mallee communities (e.g. *Eucalyptus incrassata, E. oleosa, E. socialis,* and frequently with *Melaleuca, Pittosporum* and *Santalum acuminatum*)[8]. . Key populations near Streaky Bay[7]. Populations are mostly on western half of the EP with the closest regional records more than 50 km away near Mount Wedge (west of study area)[5]. Recorded from 17 sites in the Talia IBRA region during the EP Biological Survey [9]. Northern populations grow in a wide variety of mallee associations and outlying southern populations on the EP occur in areas surrounded by cleared and modified vegetation[7]. Key threats include grazing, lack of recruitment, habitat fragmentation and clearance of habitat[7]. No BDBSA records within 5 km of study area[5]. Not observed during surveys of proposed corridor, port or mine site[6].

Ptilotus beckerianus	Ironstone Mulla Mulla	VU	V	Species is endemic to South Australia, occurring on Kangaroo Island and lower Eyre Peninsula5. Priority 1 species on EP[7]. No BDBSA records[5] within study area or within 50 km. Grows on Ironstone gravel to yellow brown sandy loam on roadside verges and private property[7]. Known to inhabit 450-500 mm rainfall zone and occur in association with *Eucalyptus cladocalyx*[5]. Known populations in Wanilla CP and Tucknott's Scrub CP[5,7]. Not observed during surveys of proposed corridor, port or mine site[6].
Pultenaea trichophylla	Tufted Bush-pea	EN	R	Endemic to Eyre Peninsula, estimated to have a small area of occupancy. Fragmented subpopulations occur in isolated remnant vegetation interspersed by cleared land and roads[7]. Occurs in roadside vegetation in DC of Tumby Bay; Ungurra, Tucknott Scrub CP[4]. No records within 5 km of the corridor[5], nearest being 16 km away (1970). Has been recorded in Broombush tall shrubland over Silver Broombush and Cup Fringe-myrtle low shrubs with or without Spinifex and Hibbertia species' and inhabits 400-500mm rainfall zones[7]. Suitable habitat has not been identified in the study area.

[1] EPBC Act Status: EN = endangered, VU = vulnerable, MT = Migratory Terrestrial, MM = Migratory Marine, MW = Migratory Wetland, LM = Listed Marine; SA NPW Act Status: R = Rare; V = Vulnerable; E = Endangered; [2] Todd 2000; [3] Sprat 2013; [4] Note: Nicolle 2013 now suggests *E. dumosa* on the EP is *E. calcareana* (Nundroo Mallee) and *E. foecunda* (Freemantle Mallee) on the EP is now considered to be *E. leptophylla* (Narrow-leaved Mallee); [5] BDBSA records extracted for EP 2011, 2012, 2013; [6] SKM 2012b,c,d; [7] Pobke 2007; [8] Black 1986; [9] Brandle 2010

6.1.2 Species possibly present

6.1.2.1 EPBC fauna possibly present or known to occur in the study area

Thirteen (13) fauna species, all birds, have potential to occur in the study area as per the desktop review (Section 0). This is based on location of BDBSA records, habitat preferences, feeding / shelter requirements or physical conditions found in the study area. Of the species highlighted, three species (Cape Barren Goose, Hooded Plover and Rock Parrot) are 'Listed Marine' and hence EPBC conservation status does not apply to the terrestrial location of the study area (see Section 2.1). These species all have ratings under the NPW Act and are discussed at the end of this section. Justification for likelihood of occurrence and potential for impacts for the remaining species is discussed below. One species has recently been delisted (Slender-billed Thornbill) and is therefore discussed in the NPW Act section below (section 6.1.3).

Australian Fairy Tern / Fairy Tern *(Sternula nereis nereis / Sternula nereis)* – Vulnerable, Listed Marine (EPBC), Endangered (NPW)

There are three subspecies of Fairy Tern (they breed in Australia, New Zealand and New Caledonia), *Sterna nereis nereis* is the Australian subspecies. It is likely that BDBSA records for *Sterna nereis* (Fairy Tern) are actually *S. n. nereis (*Australian Fairy Tern).

The Fairy Tern is known to use coastal habitats, including estuaries and sheltered sandy beaches above the high tide line and below vegetation (Simpson and Day 2004, Caton *et al.* 2011, SPRAT 2013). This species is also known to congregate on coastal shores. Fairy Tern nesting occurs on sheltered sandy beaches, spits and banks above the high tide line and below vegetation and is also known to roost on beaches at night (Caton *et al.* 2011, SPRAT 2013, Golder Associates 2013). Breeding occurs from October to February and preferred habitat ranges from coral shingle to sandy islands or beaches or within estuaries. Key threats to the species include to disturbance of exposed nesting and roosting sites (e.g. storms, floods, high tides, strong winds) as well as predation of eggs and chicks from other birds (e.g. Silver Gulls, and White-bellied Sea Eagle) and mammals (foxes, domestic dogs and cats) (Caton *et al.* 2011, DENR 2012 cited in Golder Associates 2013).

There are no BDBSA records for this species within the study area or within 1 km, however there is one BDBSA record 2.8 km from the proposed alignment. Records for this species also exist within the region, from a recent South Australian Fairy Tern Census (DENR 2012 cited in Golder Associates 2013). The recent Fairy Tern Census located the Fairy Tern at Munyaroo CP (over 100 km from study are), no sightings were made along the east coast of the EP from Louth Bay (50 km South of the study area) to Whyalla (over 250 km North of the study area), and no sightings were made on Lipson Island (DENR 2012 cited in Golder Associates 2013). Similarly, this species was not observed as part of the current survey.

Although this species was not observed during the field survey, suitable habitat occurs within the study area and it is considered possible that this species may use habitat available in the area. The Fairy Tern is however, a highly mobile species and is not considered to be solely reliant on habitat present within the study area. It is not expected that the proposed development within the study area will significantly impact this species.

Cattle Egret (*Ardea ibis*) - Migratory Wetland, Listed Marine (EPBC), Rare (NPW)

The Cattle Egret is known to occupy pasture habitats, as well as floodwaters, wetlands and intertidal mudflats where it feeds on a variety of invertebrates, frogs and lizards (Simpson and Day 2004). Pasture habitats are known to be present within the study area and surrounding districts, although most are somewhat degraded due to weed invasion. It is possible that low-lying areas within the study area may hold water following heavy rain events however no permanent wetlands were observed within the study area. There are no BDBSA records for this species within 5 km of the study area. The Cattle Egret is a highly mobile species, and is not expected to be reliant upon habitat features present within the study area. Therefore, it is not expected that the construction and operation of infrastructure corridor will significantly impact this species.

Common Sandpiper *(Actitis hypoleucos)* – Listed Marine, Marine Migratory (EPBC), Rare (NPW)

The Common Sandpiper has global distribution and regularly migrates to Africa, Australia, southern Asia, Papua New Guinea and less often New Zealand (Geering et al. 2008, SPRAT 2013). In Australia the species occurs along the coastline and in many inland areas, with areas of national importance primarily in the north of Australia in the Northern Territory, Western Australia and Queensland (SPRAT 2013). In Australia the Common Sandpiper is widespread, but usually occurs in small numbers due to the amount of available suitable habitat (SPRAT 2013). Breeding occurs throughout Eurasia in a variety of habitats (Geering et al. 2008).

This shorebird rarely uses intertidal mudflats, but prefers rocky creeks, channels, dams, mangrove-lined inlets and occasionally prefers piers and jetties (Geering et al. 2008). They are also known to roost on rocks and branches of vegetation, particularly mangroves and also posts, jetties and artificial structures (Higgins and Davies 1996 cited in SPRAT 2013).

The Common Sandpiper was observed during the field survey of the port (i.e. not during this study), however no signs of nesting were observed (Jacobs 2014b). This species was not observed during vegetation assessments for the infrastructure corridor. This species is highly mobile, has wide distribution and preferred habitats for feeding, which do not occur in the study area. It is therefore not expected to be directly reliant upon habitat within the study area. It is not considered likely that works within the study area will constitute a significant impact for the Common Sandpiper.

Osprey *(Pandion haliaetus)* / Eastern Osprey *(Pandion cristatus)* – Listed Marine, Migratory Marine (EPBC), Endangered (NPW)

Previously known as *Pandion haliaetus,* the taxonomy of this species is controversial (SPRAT 2013). The Eastern Osprey is known to use coastal habitats, including elevated coastal cliffs exposed sites, sea stacks and elevated habitats (Simpson and Day 2004, Brandle 2010). Coastal habitat is present within the study area and although elevated habitats are preferred, they will use sandy or rocky shore habitats where elevated habitat or trees are unavailable. Consequently, the Eastern Osprey is vulnerable to human disturbance, particularly if breeding on the ground, rather than using elevated habitat (SPRAT 2013). In particular, bio-accumulation of toxic substances through the consumption of affected prey as well as destruction of habitat, are considered major threats to the Eastern Osprey (SPRAT 2013).

There are no BDBSA records within 1 km of the study are, but there are records 2- 4 km from the study area (2009, 2001). There are 12 regional records (140-175 km away from southern end of corridor) from 1975 to 2003. Previously a population has occurred at Spencer Gulf (Brandle 2010). The species is known to have a sparse distribution within SA including an estimated 52 breeding pairs, primarily located on the west coast of the Eyre Peninsula (Dennis 2004, 2007, cited in Brandle 2010).

The Eastern Osprey is known to occur sympatrically with the White-bellied Sea-eagle (SPRAT 2010) and these species sometimes interact with one another. This species was not observed during the field survey, but the White-bellied Sea-eagle was observed during a flora and fauna survey of the port area (SKM 2014b), which may indicate that suitable habitat features for the Eastern Osprey may be present within the southern end of the wider study area. Any potential threats to the Eastern Osprey as a result of development would also affect White-bellied Sea-eagles, where they occur sympatrically (Caton et al. 2011). Prior to any construction activities a targeted survey for both of these conspicuous species within the area would clarify the likelihood of risks associated with development and assist with developing appropriate mitigation measures.

Individual Osprey may have the potential to overfly the southern extent of the study area, but it is unlikely that key foraging and nesting locations occur here. The construction and operation of an infrastructure corridor within the study area may impact individual of this species, if they occur, but given the high mobility and wide distribution of the Osprey, as well as EMP mitigation activities that will be implemented it is unlikely that significant impacts would occur.

Fork-tailed Swift (*Apus pacificus*) - Migratory Marine, Listed Marine (EPBC)

The Fork-tailed Swift has global distribution, but is considered native to Australia where it is a non-breeding visitor to all states and territories of Australia (Higgins 1999 cited in SPRAT 2013). In South Australia this species occurs commonly in coastal areas of the Eyre Peninsula as far west as Streaky Bay and as far north as Wudinna (northern EP), however there have been records beyond this (SPRAT 2013). This species migrates to Australia between October and April and rarely occurs in Australia outside these times (SPRAT 2013). When in Australia, it is known to use many habitat types, including coastal, arid and urban areas (Simpson and Day 2004, SPRAT 2013). There are two BDBSA records within 5 km of the study area (from 1988 and 1998) and no other records in the wider region. Suitable habitat exists within the study area for this species.

The Fork-tailed Swift is highly mobile, does not breed in Australia and migrates to Australia between October and April. Threats to this species include habitat destruction and predation by feral animals, but given the wide range of this species potential impacts are thought to be negligible (SPRAT 2013). Based on the above information it is not expected that this species would be solely reliant upon habitat found within the study area. Therefore, it is not expected that construction and operation of an infrastructure corridor would significantly impact this species.

Malleefowl (*Leipoa ocellata*) – Vulnerable, Migratory Terrestrial (EPBC), Vulnerable (NPW)

Malleefowl are known to prefer sandy dune habitats throughout the north of the Eyre Peninsula, as well as scattered throughout mallee vegetation communities in the central west region. Malleefowl require organic

matter to build mounds used for incubating eggs within a narrow temperature range. Consequently, it is thought that long-unburnt mallee communities provide the most suitable habitat requirements for this species. Malleefowl are known to feed upon flowers, seeds, fruit and shoots, as well as insects. Where habitat is adjacent to cropping areas, malleefowl have also been known to feed upon grains from these areas (Benshemesh 2011). Malleefowl have declined in overall range and it is thought that several key threatening processes, including clearance of remnant vegetation and associated habitat fragmentation, inappropriate fire regimes, predation and competition from feral mammals are to blame (Benshemesh 2011).

The infrastructure corridor options traverse previously cleared agricultural land, and intersect a number of remnant, mostly degraded tracts of mallee. Some of the remnant mallee patches are long and contiguous with Hambidge WPA, but are in poor condition through grazing pressure and agricultural practices. There is potential for Malleefowl to occur along the infrastructure corridor, with four BDBSA records ranging from 1 – 5 km from the alignment (note only one of these is recent – 1999). Targeted surveys in the proposed ML did not locate this species or any suitable habitat likely to support the species (SKM 2014c). Remaining vegetation in the study area is primarily on dune crests, rather than swales, which is not preferred by Malleefowl. If present, Malleefowl area likely to be a rare visitor and may benefit more from potential significant environmental benefit offset projects planned for the region should this project proceed.

Pacific Golden Plover *(Pluvialis fulva)* – Listed Marine, Migratory (EPBC), Rare (NPW)

The Pacific Golden Plover occurs globally, breeds in Siberia and migrates annually from Siberia to southern areas, including Australia (SPRAT 2013). In Australia the species is widespread in coastal regions such as beaches, mudflats and rocky shore habitats, but is also known to inhabit inland areas, including samphire and sometimes pasture (Geering et al. 2007, SPRAT 2013). These birds usually congregate in small flocks, are highly mobile (SPRAT 2013). There are a number of nationally important sites for this species, but none of these occur within South Australia. There are no BDBSA records for this species within 1 km of the study area, but one record 4-5 km (1999) and four other regional records 7-22km from the study area (1973-2009).

Suitable habitat exists for this species within the study area and surrounding districts and there are regional records of this species. However, it is not expected that the Pacific Golden Plover relies on specific habitat features within the area, due to its highly mobile and migratory nature. Consequently, should individuals visit the study area it is not expected that the construction and operation of an infrastructure corridor would impact the species.

Rainbow Bee-eater (*Merops ornatus*) - Listed Marine, Migratory Terrestrial (EPBC)

The Rainbow Bee-eater is known to use a range of habitat types, including woodlands, shrublands, and various cleared and semi-cleared habitats (SPRAT 2013, Simpson and Day 2004). These habitat types include a wide variety of vegetation types that occur in terrestrial to coastal environments. This species is widely distributed throughout Australia, eastern Indonesia, and Papua New Guinea. Breeding populations of the Rainbow Bee-eater that inhabit southern Australia are known to migrate north during the southern winter (SPRAT). The majority of global breeding populations occur on Rottnest Island and in the south west of Torres Strait. In SA,

this species most frequently visits Dangalli Conservation Park (SPRAT). There is one BDBSA record within 5 km of the study area (from 1998), and there are regional records near Darke Peak CP from 2003. This species was observed as part of a flora and fauna survey of the mine site study area (SKM 2014c). The Rainbow-bee-eater was seen at site 2 located within remnant vegetation with a Heritage Agreement area of the mine site survey (Jacobs 2014c).

This species is considered to be highly mobile and wide ranging within Australia. Key threats to the species include predators (namely the Cane Toad, foxes, dingoes and other feral dogs). Although population sizes have not been quantified, it is considered the current population is large and this species is therefore given low priority for management (SPRAT 2014). Based on the above, this species is likely to occur along the infrastructure corridor, however, given the mobile nature of this species, and its ability to use a wide range of habitat types over a large range, it is not expected that the construction and operation of the proposed infrastructure corridor will significantly impact this species.

Red-lored Whistler (*Pachycephala rufogularis*) –Vulnerable (EPBC and NPW)

The Red-lored Whistler is endemic to southern Australia and primarily occurs in the Murray Mallee Region, with two small outlying populations occurring on the Eyre Peninsula and in NSW (Simpson and Day 2004, SPRAT 2013). On the Eyre Peninsula, the Red-lored Whistler is known from a population occupying Pinkawillinie CP, 17 km north of the northern extent of the study area (i.e. from adjacent Hambidge WPA). This population is considered to be an outlying population, separate from the main population centre around the South Australia/Victoria border and within the Murray Mallee region (SPRAT 2013). In Pinkawillinie CP a small population of Red-lored Whistlers were observed consistently between 1993 and 1995 in open Ridge-fruited Mallee (Mathew et al. 1995, Mathew et al. 1996 both cited in Brandle 2010). More recently, intensive searches for the species have been undertaken in similar habitat nearby and following fire, but no individual of this inconspicuus species were observed (Way 2007 cited in Brandle 2010). There are no other regional BDBSA records for this species.

The Red-lored Whistler is known to inhabit low mallee shrublands, heathlands and woodlands (Simpson and Day 2004, SPRAT 2013). In particular this species has been recorded in Mallee (up to 1.5 m tall) comprising species such as *Eucalyptus incrassata*, *E. calcareana, E. socialis* and *E. leptophylla* (SPRAT 2013). All of these species have been recorded during field visits and within the BDBSA as occurring near, or adjacent the study area. The understorey throughout the study area is however largely degraded, fragmented and sometimes absent due to grazing and other agricultural impacts.

Key threats for the Red-lored Whistler include clearance of native vegetation and subsequent destruction, fragmentation or alteration of habitat structure. Frequent fires may also alter habitat structure and may lead to reduction of habitat availability. Previous studies have noted that the Red-lored Whistler may be subject to competition by Gilbert's Whistler for habitat availability. Displacement may occur as direct competition, or may be a result of abandonment of habitat by the Red-lored Whistler following changes to habitat structure (SPRAT 2013).

The Red-lored Whistler may be present within the study area, primarily as a result of movement of the species between Pinkawillinie Conservation Park and outlying districts as well as other Wilderness Protection Areas in the region (e.g. Hambidge, Hincks, Darke Peak), but is not expected to rely primarily upon habitat within the study area. If present, it is likely to be a rare visitor and may benefit more from potential significant environmental benefit offset projects planned for the region should this project proceed.

Sandhill Dunnart *(Sminthopsis psammophila)* - Endangered (EPBC), Vulnerable (NPW)

The Sandhill Dunnart is an elusive species known primarily from three important populations (2 in SA, 1 in WA) (SPRAT 2013). In SA, populations are known to occur near Whyalla on the Eyre Peninsula and in Yellabinna Regional Reserve near Ooldea, north of Ceduna (SPRAT 2013).

This small mammal is known to occupy sand dunes and sand ridges, covered with hummock grasses (predominantly *Triodia* spp of particular age and structure), sandy plains with low woodland, and low open woodland vegetation communities with diverse understorey (Menkhorst and Knight 2004, Churchill 2001, EBS 2009, Iluka 2010, Brandle 2010). It is thought that the Sandhill Dunnart prefers the large, mature stands of *Triodia* in ring formation to nest and forage. Key threats to the Sandhill Dunnart include clearance of habitat vegetation and disturbance of habitat by fire, resulting in the destruction of large, mature stands of vegetation (Churchill 2001).

Records from the Eyre Peninsula include: one historic record within 25 kilometres of the corridor study area, from 1969; regional BDBSA record from 2005 (60+ km away in Hincks Wilderness Area) and records north west of Whyalla. More recently (2007) populations have been studied on the Shirrocoe Pastoral Lease (SE Gawler Ranges), and suggestions that populations may occur in Pinkawillinnie and Hincks CP (cited in Brandle 2010). There are recent BDBSA records within 5km of study area from 2011, the location of these records was from the SE corner of Hambidge WPA.

Based on the vegetation and recent (2011) records it is likely that suitable habitat for this species occurs within Hambidge WPA (south and southwest of the Infrastructure Corridor). However within the Infrastructure Corridor study area, suitable habitat is very limited. Potential habitat within the study area occurs immediately north of Hambidge WPA, but only in 2-3 fragmented patches that have *Triodia* habitat with older hummocks in ring formation. These patches are small, isolated and generally grazed. Whilst these patches are likely to be too small to support a viable population of Sandhill Dunnarts, small mammal footprints (potentially Spinifex Hopping Mouse) were observed coming and going from *Triodia* hummocks at one of the sites, along with dog/fox foot prints (see photos at the end of Appendix D). Recently deceased Spinifex Hopping Mice were also found along the northern track of Hambidge WPA during one of the vegetation assessment surveys near these patches of suitable habitat.

White-bellied Sea-eagle (*Haliaeetus leucogaster*) - Listed Marine, Migratory Terrestrial (EPBC), Endangered (NPW)

The White-bellied Sea-eagle is known to use many habitat types throughout Australia (Birds Australia 2012). Preferred habitat is characterised by the presence of large areas of open water (larger rivers, swamps, lakes,

the sea), but birds have been recorded in (or flying over) a variety of terrestrial habitats including those in semi-arid zones (Marchant & Higgins 1993). The White-bellied Sea-eagle was recorded overflying the proposed port site during the field survey of the site (Jacobs 2014b).

The White-bellied Sea-eagle may occasionally be present as an overfly species to the study area, given its ability for long distance movement and known presence on the Eyre Peninsula. Three BDBSA records have been noted for this species (2.8 km – 5 km) in the study area. However in the absence of preferred habitat, it would not be expected to breed or spend significant time within the study area. The development and construction of the proposed infrastructure corridor will not significantly impact this species.

6.1.2.2 Species that only have Listed Marine Ratings under the EPBC Act, not applicable to terrestrial location

The EPBC rating of 'Listed Marine' for these species is not applicable for the terrestrial port study area (as per Section 2.2).

Cape Barren Goose *(Cereopsis novaehollandiae)* – Listed Marine (EPBC), Rare (NPW)

Cape Barren Geese are known to occupy tussocky grassland and scrub and pasture-based habitat (Simpson and Day 2004, SPRAT 2013, Caton et al 2011). Known from the Eyre Peninsula, particularly near Port Lincoln (near North Shields and Little Swamp) (Brandle 2010). There are no BDBSA records within the study area or within 1 km, but there are two records within 5 km (Port Neil in 1998). The species has also been observed opportunistically between Port Lincoln and Tumby Bay during field surveys 2011/2012 for the Infrastructure corridor.

Suitable habitat features exist within the study area and surrounding districts, therefore it is considered likely that this species may use habitat within the study area. The Cape Barren Goose is a large conspicuous bird that disperses easily. The species generally breeds on offshore islands rather than remaining on mainland. Therefore, it is not expected that the construction and operation of an infrastructure corridor will significantly impact this species.

Rock Parrot *(Neophema petrophila)* – Listed Marine (EPBC), Rare (NPW)

The Rock Parrot is an endemic species. There are two races, *Neophema petrophila petrophila* and *Neophema petrophila zietzi,* the latter of which occurs in SA (Simpson and Day 2004). The conservation ratings are for the species level. The Rock Parrot (race *zietzi)* is known to inhabit off-shore islands, coastal heath and saltmarsh/samphire habitats on the EP (Simpson and Day 2004, Birds Australia 2006e, Brandle 2010). On the EP this species is known to breed on the off-shore islands and disperse to the mainland coastal habits from Summer to Autumn (Brandle 2010). Little is known about the ecology and the current population status of this species in South Australia (Brandle 2010). There are no BDBSA records for this species in the study area, 2 BDBSA records 4-5 km from the study area (2000-2001) and 19 additional regional records (26-154km from study area, 1968-2007). The EP Biological Survey recorded this species from 6 coastal sites (coastal heath and

samphire) in (Brandle 2010). The Rock Parrot (race *zietzi)* was observed in a coastal dune community during the field survey for the port (SKM 2014b).

Based on the information above this species is known to use habitat in the study area. It is unlikely that they are breeding within the study area, as they known to use coastal islands, but information for the species is limited. Whilst there may be short-term impacts to individuals of this species if habitat is disturbed or removed as a result of the project, it is unlikely that the habitat within the study area is critical to the survival of the local population or the species. This species is highly mobile and would likely move from the study area during construction activities to suitable habitat along the coastline either side of the project area. It is not anticipated that the proposed development will have a significant impact on this species.

Hooded Plover (*Thinornis rubricollis*) - Listed Marine (EPBC), Vulnerable (NPW)

The Hooded Plover is known to occupy coastal stretches in south-east Australia, as well as inland lakes in Western Australia (Simpson and Day 2004, Caton et al 2011). This species breeds in summer and incubates eggs directly on sandy oceans beaches (Caton et al. 2011). It is consequently very susceptible to disturbance (Birds Australia 2012). This species has been recorded breeding at various sites along the EP coast; 42 breeding pairs have been found between Streaky Bay and the Lipson area, as well at Port Neill (Cooper 2010 in prep. cited in Caton et al 2011). The EP region supports 50% of the state's population and is thus important for this species (Caton et al 2011).

The Hooded Plover was observed at Site C1 (Port site ecological survey – SKM 2014b) predominantly occupying large boulders on the beach. This species was easily disturbed and on several occasions flew directly away from field survey staff, a common behaviour of this species (Geering et al. 2008). Despite being disturbed by the survey team, the Hooded Plover still returned to this location and was observed during all subsequent visits.

The Hooded Plover is not expected to be impacted by the infrastructure corridor development due to its distance from preferred coastal habitats and inland lakes.

6.1.2.3 EPBC Flora possibly occurring

Three EPBC listed flora are thought to possibly occur within the study area due to suitable habitat and or the presence of recent regional BDBSA records. One EPBC listed plant, the Jumping-jack Wattle, is known to occur in the study area. A description is provided for each species below.

Acacia enterocarpa (Jumping-jack Wattle) - Endangered (EPBC and NPW)

This species occupies distinct sub-populations on Eyre Peninsula and is a priority 1 species in the Draft Recovery Plan for Threatened flora of the Eyre Peninsula (Pobke 2007). Approximately 95 % of the population for this species occurs within the Eyre Hills Subregion (Pobke 2007). Many sub-populations are located on roadsides managed by the distinct councils of the Lower Eyre Peninsula, Tumby Bay and Franklin Harbour. This species is

known to occur within rail reserves and amongst vegetation corridors along water pipelines maintained by SA Water.

Jumping-jack Wattle grows in sandy alkaline and hard neutral to yellow duplex, red shallow porous loam and grey cracking and self-mulching clays. This species often grows in association with a wide range of vegetation communities, including Ridge-fruit Mallee, Beaked Mallee with Broombush, Square Mallee and Yorrell. At least 34 plants have been recorded at roadside sites in the Eyre Peninsula (Pobke 2007).

Jumping-jack Wattle was observed within patch 98a along a previous proposed alignment adjacent the Lincoln Highway, and the alignment was changed to avoid this species (November 2011 assessment this study). It has not been observed by the survey team anywhere else within the study area. Given the degraded nature of the study area, it is unlikely that a significant population of Jumping-Jack Wattle occurs.

Acacia rhetinocarpa (Resin Wattle) – Vulnerable (EPBC and NPW)

Resin Wattle is broadly associated with mallee woodland, with species such as *E. incrassata, E. leptophylla* over *Leptospermum coriacea, Melaleuca uncinata*, *Callitris verrucosa, Babingtoni behrii, Hibbertia australis and Glischrocaryon behrii*. This species is known to occur in degraded roadside areas, and fire is thought to be important for regeneration (Pobke 2007). The small areas on Eyre Peninsula where Resin Wattle does grow in association with vegetation are classified as dune crest and dunes/hills, plains and swales; sand to clay loam; and sandy soils. This species is considered to be a 'priority 2 regional species' in threatened flora planning documents (Pobke 2007). This species is also known to occur in areas where rainfall is 250-250mm (Whibley and Symon 1992 cited in SPRAT). No BDBSA records occur within 5 km of the corridor area, and the nearest historic records are 7 and 11 km from the alignment and restricted to conservation areas (Hambidge WPA, 1967). A search for the species within Hambidge WPA was conducted in a 1995 survey, but it was not found again (Pobke 2007). The most recent BDBSA record (from 2001) is from Arno Bay. Recent conservation advice suggests that this species has fragmented distribution on the Eyre Peninsula, occurring between Streak Bay, Kimba and Arno Bay, but is also known from seven populations on the Eyre Peninsula (Pobke 2007 cited in Conservation Advice to Minister 17 Dec 2013).

Although it is likely that remnant vegetation along the corridor is too fragmented and disturbed, the potential for this species cannot be discounted, particularly given the number of patches that occur on areas classified as dune crest. In addition, a number of the common *Eucalypt* and *Melaleuca* species that occur with this species have been recorded in the study area and surrounds and the species is known to survive in degraded sites (e.g. at Arno Bay, Pobke 2007).

Known populations of this species have not been identified within the study area of the infrastructure corridor, if individuals of this species are found to occur it is unlikely they would be part of a significant and viable population. Therefore it is unlikely that construction and operation of an infrastructure corridor within the study area would significantly impact this species.

Swainsona pyrophila (Yellow Swainson-pea) - Vulnerable (EPBC) and Rare (NPW)

Swainsona pyrophila is known to occur on a variety of soil types amongst mallee vegetation communities (Pobke 2007). Historic distribution records for *S. pyrophila* have shown that vegetation communities may be dominated by different Eucalyptus species, including *E. brachycalyx, E. calcareana, E. calycogona, E. oleosa, E. incrassata and E. socialis* (Tonkinson and Robertson 2010). All of these mallee species have been recorded along the infrastructure corridor study area. A record exists within the BDBSA for the presence of *S. pyrophila* within 5 kilometres of the infrastructure corridor study area (recorded 30/9/2000, near Hambidge WPA).
S. pyrophila is known to germinate following fire events and current information suggests that the species may live for up to two years following a germination-inducing fire event. Following senescence, seeds occupy the seed bank and may germinate following other suitable fire events. In addition to stimulation by fire, it is also thought that soil disturbance may directly impact on germination success. Anecdotal evidence suggests that maintenance of fire-breaks and roadside reserves may have some impact on germination of *S. pyrophila* (Tonkinson and Robertson 2010).

Given the requirement of either a fire event, or soil disturbance, or both, for successful germination and subsequent growth of *S. pyrophila*, the species may not have been detected in long-unburnt areas, or areas which have not been recently disturbed. However, *S. pyrophila* seeds may still lie dormant within the local seed bank. *S. pyrophila* may therefore be present within the infrastructure corridor study area, if historic disturbance patterns have been suitable for germination and local survival of the species. However the specific requirements for germination of *S. pyrophila* indicate that if suitable conditions have not been met, the species may either be dormant within the seed bank or may not occur at all.

This species has not been detected in any previous surveys of the infrastructure corridor or proposed port or mine sites (Jacobs 2014b,c).

6.2 NPW Act species likelihood of occurrence and potential impact

6.2.1 NPW fauna

A total of eleven species area considered here. Ten fauna species listed under the NPW Act (but not under the EPBC Act) were either identified within the BDBSA as having been recorded near the study area or observed during surveys for the project. In addition, the Slender-billed Thornbill was originally highlighted as an EPBC species through the Protected Matters Search Tool, however this species has recently been delisted. Likelihood of occurrence for these species is outlined briefly in Table 6-3, of which four are unlikely to occur in the study area, have the potential to occur, one is likely and one is present. The Slender-Billed thornbill is discussed briefly in the table and in further detail below.

Table 6-3 Fauna listed under NPW Act, not listed under EPBC Act

Name	NPW[1] Status	Likelihood	Justification for likelihood of occurrence
White-winged Chough (*Corcorax melanorhamphos)*	R	Present	Known to occupy diverse habitat types, including open shrubland and Mallee habitats. Suitable habitat present across study area amongst remnant vegetation. EP population is isolated at the Western limit of distribution, with main population around Koppio Hills[7]. Although, no records[8] within 5 km of corridor, the species is common closer to mine site (~12 records since 2000). Observed in the mine site fauna survey and opportunistically in roadside Mallee to the north of the proposed rail corridor[4]. Species is not restricted to one habitat type, is mobile and appears locally common, therefore not expected to be significantly impacted by proposed rail corridor development.
Gilbert's Whistler *Pachycephala inornata*	R	Likely	Prefers drier Mallee dominated by larger shrubs in the understorey, and has been recorded in Ridge-fruited Mallee, Yorell low woodland and Black Oak/Native Pine woodland across northern EP[10]. Suitable remnant habitat present but patchy across study area and in surrounding districts. Last record[3] in Darke Peak, 1988 (48km away). Observed at sites 2 and 3 in the mine site survey[4], therefore likely to occur in the northern section of the proposed rail corridor.
Purple-gaped Honeyeater (*Lichenostomus cratitius*)	R (ssp.)	Possible	Known to use Mallee and heathland habitats, particularly Ridge-fruited Mallee and Coastal White Mallee 5,7. . Mainland subspecies Rare in SA. Subspecies not specified within BDBSA records[3]. Last BDBSA record within 5 km in 2000[3]. Suitable habitat present within study area amongst remnant vegetation patches, but majority of habitat largely fragmented and degraded. The study area does not present unique habitat that is critical to this species. Unlikely to be impacted significantly by this development.
Shy Heathwren (*Calamanthus cautus*)	R	Possible	Known to use Mallee with dense understorey and grass tussocks on sandy plains[5,7]. Suitable habitat present within remnant patches of vegetation mostly adjacent study area. Last BDBSA record within 1 km, of preferred rail alignment (patch 100, in 1951), over 70 regional records primarily from conservation parks[3]. Recorded from over 30 sites as part of EP Biological Survey in Mallee and Broomush[7]. Not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. Mobile species that is not considered directly reliant on habitat within study area, particularly mallee lacking dense understorey. Likely to be restricted to Conservation Parks and better quality remnants with dense understorey.
Slender-billed Thornbill (western) *Acanthiza iredalei iredalei*	R	Possible	Known most commonly from Samphire and Chenopod shrublands fringing salt pans, but also from sand plains and dense heathy shrublands in arid areas. There is potential for a small area of suitable habitat closer to the coast, however this area is between a major road and pastoral land. No records[8] within 5 km. REMOVED FROM EPBC LISTING IN 2014. Further detail below.
Sooty Oystercatcher (*Haematopus fuliginosus*)	R	Possible	Endemic to Australia with widespread distribution along most coastal areas, preferring rocky coastlines and occasional estuaries [5,9]. There are two subspecies, *H. fuliginosus* is the southern subspecies. Their ranges overlap on the Queensland coast. Suitable habitat can be found near the coastal section of infrastructure corridor. There are no BDBSA records within the study are or within 1 km, but there are 6 records within 4-5 km of the coastal section of the study area (Port Neill, from 2001 -2008)[3]. There are over 90 regional records for this species, primarily from Elliston, Waldegrave Island and Lipson Island (from 1968-2009). This species may occur in the study area, but is not likely to be dependent on habitat found within the study area, particularly further inland. Given the mobile habit of this species, it is unlikely to be

Name	NPW[1] Status	Likelihood	Justification for likelihood of occurrence
			significantly impacted by the development.
Australian Bustard (*Ardeotis australis*)	V	Unlikely	Species known to occupy grasslands, low shrublands, grassy woodlands and artificial habitats including croplands[2]. One BDBSA record within 1 km of the proposed alignment close to proposed port development site (1980)[3]. Not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. May be occasionally visitor to the area. Unlikely to be impacted by development.
Australian Pied Oystercatcher (*Haematopus longirostris*)	R	Unlikely	Shorebird known to use coastal habitats including beaches, mudflats, offshore islands, bays, inlets and rocky coasts and headlands[5]. Last BDBSA record within 5 km of alignment 2001 (Port Neill)[3]. Not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. May be occasionally visitor to the area. Unlikely to be impacted by development.
Brown Quail (*Coturnix ypsilophora*)	V	Unlikely	Species known to use diverse habitats including dense grasslands and sedgelands, near or at edge of open forest[5,7]. Appropriate habitat present throughout alignment, though fragmented. Last known record within 5 km (Port Neill), 1975[3]. Known to disperse widely and occur as a vagrant on the EP[5,7]. Quail sighted at patch 6 and patch 14 in Dec 2012, unconfirmed either Stubble or Brown Quail[4]. However, more likely to be common Stubble Quail known to occur on the EP[5]. Neither patch is in the final preferred alignment. The study area does not represent unique habitat to this species and it is unlikely to be impacted by the development.
Grey Currawong NW subspecies (*Strepera versicolor plumbea*)	E	Unlikely	Species known to occupy range of habitat types, including mallee, heath, and semi-desert habitats. Only the North-western subspecies is Endangered in SA, this species has known distribution in WA and NW SA[5]. Subspecies not specified within BDBSA records[3]. It is likely that the BDBSA records are for *Strepera versicolor intermedia*, which has known distribution on the EP[5] and has no formal legislative protection. Last BDBSA record within 5 km (Port Neill, 2003)[3]. Species not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. The study area does not present unique habitat for this species and it is unlikely to be impacted by the development
Bardick (*Echiopsis curta*)	R	Possible	Reptile species, occupies Mallee and Spinifex communities, using leaf litter and low-lying vegetation or logs for shelter[7]. Potential habitat could be available for this species, but much of the Mallee within the study area is either highly fragmented or disturbed or regrowth. Younger, disturbed communities are unlikely to have sufficient maturity and associated accumulation of leaf litter, but some of the better quality patches may be suitable. Last BDBSA record within 5 km but old (1972)[3]. Not observed in previous SKM surveys of proposed corridor, mine or port sites[4]. Only one record during the EP Biological survey (near Secret Rocks in 2002)[7]. This species is unlikely to be present in large numbers. Whilst individuals of the species may occur at some patches along the corridor, they are likely to move away from the area during construction. Standard CEMP procedures should avoid impacts to individuals if this species is present.

[1] SA NPW Act Status: R = Rare; V = Vulnerable; E = Endangered; [2] Ziembicki 2010; [3] BDBSA EP extract 2011, 2012, 2013; [4] Jacobs reports (2014 a, b, c); [5] Simpson and Day 2004; [6] Parks and Wildlife Service Tasmania 2011; [7] Brandle 2010; [8] Birds Australia 2006; [9] Geering *et al.* 2008; [10] Higgins and Davies 1996 cited in SPRAT 2013

Slender-billed Thornbill (western) *(Acanthiza iredalei iredalei)* –Rare (NPW)
The western subspecies of the Slender-billed Thornbill feeds primarily on insects and is found in arid and semi-arid regions of southern Western Australia and south-western South Australia (SPRAT 2012). A relatively sedentary bird, the Slender-billed Thornibill's core habitat is chenopod shrubland dominated by Samphire (*Sarcocornia* sp.), Bluebush (*Maireana* sp.) or Saltbush (*Atriplex* sp.), but it may also range into Mallee grassy woodlands and dense heathy shrublands (Pizzey and Knight 2006).

There is potential for a small area of suitable habitat closer to the coast, however this area is between a major road and pastoral land. There are no BDBSA records for this species within 25 km of the study area. The species was recorded northeast of Munyaroo CP in 2002 as part of the Biological Survey of the EP (Brandle 2010). The northeast of the EP is at the southern margin of known distribution for this species (Brandle 2010). This species was observed as part of a flora and fauna survey of the mine site study area (SKM 2014c). This bird was recorded at sites 2 and 3 in the shrub layer below a Mallee canopy. Interestingly, it was not recorded at site 5 (dominanted by Samphire), which could be considered core habitat for this species, but in poor condition. Whilst it is possible, that this species occurs throughout the infrastructure corridor study area, it is more likely to be a visitor to the area, given the amount of good quality suitable habitat is low. The species is also highly mobile, therefore it is not considered that impacts to the species or individuals will occur as a result of construction or operation activities for the proposed project.

This species has been recently delisted (2014) from EPBC conservation status (Vulnerable).

6.2.2 NPW flora

Table 4-7 in Section 4.7.1 indicates that 21 flora species listed under the South Australian NPW Act, have previously been recorded within 5 kilometres of the Study Area. Six (6) species were identified as occurring within 1 kilometres of the study area. Table 6-4 below, provides a brief justification for the current likelihood of occurrence for these species. One species was located in the field (Darke Peak Mallee, sites no longer along alignment), four species are considered 'likely' to occur, eleven of the species 'possibly' occur, and five species are 'unlikely' to occur. No species of conservation significance were observed to occur within the study area during the rapid field assessments in 2011 and 2012. Further detailed vegetation surveys of patches that are likely to be impacted by the proposed infrastructure corridor will provide more evidence about the occurrence of these species.

Table 6-4 Likelihood assessment for NPW Act listed flora species within the infrastructure corridor

Species	Common Name	SA NPW Act[1]	Likely to occur	Justification for likelihood of presence
Acacia montana	Mallee Wattle	R	Possible	Species occupies a wide variety of soil types. Known to occur within open forest and tall shrubland communities[2]. May occur within shrubland patches throughout the infrastructure corridor but not within dense mallee scrub. Last record within 1 km just north of the proposed port site.
Anogramma leptophylla	Annual Fern	R	Possible	Species occurs on damp banks among grassy areas or rocky crevices[3]. May occur within areas with poor drainage, or that retain runoff following heavy rain events. Three records within 5 km 1998 (e.g. Darke Range CP).
Austrostipa echinata	Spiny Spear-grass	R	Possible	Species associates with *Melaleuca lanceolata*, *Eucalyptus yalatensis*, *Gahnia lanigera*, *Lomandra effusa* and *Triodia compacta*. Occupies sand associated with limestone[4]. Last record within 5 km of alignment 1998 near Port Neill. Suitable habitat occurs in patches of the study area (mallee scrub remnants).
Bothriochloa macra	Red-leg Grass	R	Possible	Species occurs within disturbed areas and may be adept at colonising these areas. Occurs naturally in open grassland and grassy woodland communities[4]. Suitable habitat within disturbed patches of the study area but may be absent from denser mallee scrub communities, preferring open grassy woodland and grassland communities. Last record within 5 km of alignment 1997.
Caladenia bicalliata ssp. *bicalliata*	Western Daddy Long Legs	R	Likely	Species occupies calcareous sand over limestone substrate. Is known to occur in coastal areas and consolidated dune systems[5]. Coastal areas of study area may provide suitable substrate and soil type. Last record within 5 km of alignment 2001.
Crassula exserta	Large-fruit Crassula	R	Likely	Occupies diverse habitats including clay, sandy soils, low-lying depressions, saline areas and mudflats[5,6]. Species observed during field survey within proposed Mining Lease (ML). Last record within 1 km of alignment 2001 (Hambidge WPA).
Daviesia benthamii ssp. humilis	Mallee Bitter-pea	R	Likely	Known to occur in mallee communities on sandy to loamy, mainly calcareous soils[7]. Preferred habitat and soils dominate the study area. Last record within 5 km of alignment 1966 (Port Neill).
Eremophila barbata	Blue Range Emu bush	R	Unlikely	Species occupies very small range, restricted to Hincks Conservation Park and Ungarra on the Eyre Peninsula. Species known to occupy mallee scrub with *Eucalyptus calcareana*, *E. calycogona* and *E. flocktoniae* dominant in the overstorey. Species dominates understorey within some of its range, however is absent in areas dominated by *Melaleuca uncinata*[8]. Unlikely to occur due to restricted range and presence of *M. uncinata* throughout alignment. Last record within 5 km of alignment 1979.
Eucalyptus cretata	Darke Peak Mallee	R	Possible	Known to occupy loamy, clay soils on plains and low hills. Distributed within the Central Eyre Peninsula region[9]. Species observed at several patches no longer in preferred alignment, near Darke Peake. Last BDBSA record within 5 km 2000 (Darke Range CP).4 records within 5 km of transmission line spur, in road and rail reserves. Soil within study area comprises aeolian quartz sands, over undulating calcarenite and calcrete. Unlikely to occur along main corridor, may occur along transmission line spur.
Haeckeria	Dogwood	R	Possible	Species known to occupy mallee scrub, inclusive of *Eucalyptus*

Species	Common Name	SA NPW Act[1]	Likely to occur	Justification for likelihood of presence
cassiniiformis	Haeckeria			*incrassata*, *E. diversifolia* and *E. leptophylla*. Species has previously been known to occupy disturbed areas and life span is estimated at approximately 5 years[10]. Suitable habitat is available within disturbed remnant patches of vegetation in the study area. Last record within 5 km 2001 (Hambidge WPA).
Lawrencia berthae	Showy Lawrencia	R	Possible	Species occupies several soil types, including clay, sandy clay and sandy soils[11]. Suitable soil types exist across study area. Last record within 5 km 2008 (Hambidge WPA).
Lobelia cleistogamoides	Wing-seeded Lobelia	R	Possible	Newer species, recent separation from *Lobelia heterophylla*. Unresolvable taxonomic issues[13]. See information for *Lobelia heterophylla.*
Lobelia heterophylla	Wing-seeded Lobelia	R	Possible	Occurs on dunes often associated with Triodia spp[3]. Northern extent of study area is southern extent of distribution on EP[3]. Suitable soil types and substrates occur in study area. Last record within 1 km 2001 (Hambidge WPA).
Melaleuca armillaris ssp. akineta	Needle-leaf Honey-myrtle	R	Unlikely	Species known to associate with granite outcrop communities, creeks and drainage lines in narrow bands. Known to occur near Carappee Hill and Caralue Bluff[12]. Suitable habitat not identified in field surveys. Last record within 5 km 2003 (Darke Range CP).
Melaleuca oxyphylla	Pointed-leaf Honey-myrtle	R	Unlikely	Species associates with mixed mallee, including *Eucalyptus calycogona* and *Eucalyptus phenax*. Known to occur on rocky hillslopes and skeletal soils[3]. Suitable soils not present throughout the study area. Last record within 1 km 2001 (Hambidge WPA).
Myoporum parvifolium	Creeping Boobialla	R	Possible	Generally occurs in coastal or floodplain environments throughout Agricultural districts in SA[9]. May occur in vegetation patches on sandy soils close to the coast. Last record within 5 km of alignment 1964.
Pimelea williamsonii	Williamson's Rice-flower	R	Possible	Known from mallee communities on the Eyre Peninsula, including Hincks CP, and western Victoria/eastern South Australia[3]. May occur within mallee communities along infrastructure corridor and mine site. Last record within 1 km of alignment 2001 (Hambidge WPA).
Poa drummondiana	Knotted Poa	R	Possible	Occurs on sand, sandy loam, dunes and amongst shrubland. Associated with *Melaleuca lanceolata*, *Gahnia lanigera* and *Atriplex paludosa* ssp. *cordata*[4]. May occur in remnant vegetation patches with *Melaleuca, Gahnia* and *Atriplex* in the study area. Last record within 5 km of alignment 1996.
Scaevola myrtifolia	Myrtle Fanflower	R	Likely	Known from the eastern coast of the Eyre Peninsula, as well as the far west coast of South Australia. Species known to occur within mallee communities[3]. Mallee comprises the majority of remnant vegetation in the study area. Last Record within 5 km of alignment 1991.
Stypandra glauca	Nodding Grass-lily	V	Unlikely	Known to occur in sclerophyll forest and woodland communities[7]. Study area vegetation cover is not dense, but comprises open mallee. Last record within 5 km of north-east portion of alignment 1996 (also Darke Range CP).
Austrostipa tenuifolia	a Spear-grass	R	Unlikely	No records within 5 km of main corridor study area. 3 records within 5 km buffer of Transmission line spur, Mangalo area, from 1954. Historic records, few records on EP, main strongholds in WA and

Species	Common Name	SA NPW Act[1]	Likely to occur	Justification for likelihood of presence
				Northern Mt. Lofty.
Prasophyllum fecundum	Hidden Leek-orchid	R	Unlikely	No records within 5 km of main corridor study area. 1 record within 5 km buffer of transmission line (1998, R. Bates, Mangalo Hills). EP records primarily from Darke Peak CP and Carapee Hill CP.
Prasophyllum occultans	Self-pollinating Leek-orchid	R	Unlikely	No records within 5 km of main corridor study area. 1 record within 5 km buffer of transmission line (1998, R. Bates, Mangalo). EP records primarly from Darke Peak CP and Carapee Hill CP.
Maireana rohrlachii	Rohrlach's Bluebush	R	Unlikely	Small chenopod shrub. Populations known from southern lofty region to northern yorke, and few records on the EP[5]. No records within 5 km of infrastructure corridor, 1 record within 5 km buffer of transmission line spur (1998, Rudall CP).
Wurmbea decumbens	Trailing Nancy	R	Unlikely	Known to occur in mixed shrubland in northern Eyre Peninsula regions[3]. Most records are from further north within South Australia. Last record within 5 km of north-east portion of alignment 1998 (and Darke Range CP).

[1] South Australian National Parks and Wildlife Act 1972 (NPWA) Status: R, Rare; V, Vulnerable; E, Endangered; 2 WPA = Wilderness Protection Area

[2] Flora of Australia 1999

[3] Black 1986

[4] Jessop et al. 2006

[5] Eflora SA species fact sheet 2007

[6] Western Australian Department of Environment and Conservation 1996a

[7] Cunningham *et al.* 1993

[8] Chinnock 2007

[9] Berkinshaw 2009

[10] Orchard 2004

[11] Western Australian Department of Environment & Conservation 1996b

[12] Department for Environment and Heritage 2002

[13] Brandle 2010

7 Summary and Conclusion

This study provides a desktop and field based assessment of the flora and associated habitat values provided by remnant vegetation across the proposed infrastructure corridor linking the proposed CEIP mine site to proposed Cape Hardy port site. A comprehensive baseline provides a solid basis on which to frame future management and rehabilitation, and likewise against which to dismiss or confirm the influence of any particular activity on a particular species, community or environment.

Rapid flora survey of the preferred infrastructure corridor, coupled with a comprehensive desktop assessment of ecological values, provided the following key outcomes:

- The proposed infrastructure corridor is located within the Eyre Yorke Block (EYB) bioregion which is divided into three sub-regions. The Eyre Mallee sub-region is intersected by the corridor and has the highest biodiversity within the EYB bioregion with 1,212 recorded plant species (6 endemic), 177 bird species, 82 reptile species and 23 species of mammals (DEH, 2002)
- Of the 147 native vegetation patches intersected by the corridor, the majority are small, isolated, oblong and narrow in shape with large edge effects, subject to ongoing disturbance factors such as grazing and trampling by livestock, agricultural weed invasion, pest mammal invasion and direct human disturbance. The vast majority of remnant vegetation patches intersected by the infrastructure corridor are completely surrounded by agricultural land, and are restricted to linear dunal crests.
- The desktop assessment found 37 fauna and 9 flora with national conservation significance (most with state significance also), and an additional 8 fauna and 21 flora of state conservation significance, with potential to occur in the study area based on searches of historic datasets. One fauna species has recently been delisted from the EPBC list, the Slender-billed Thornbill, but still has a state rating. In addition, one state listed species was observed in the field; White-winged Chough.
- Rapid field assessments conducted in 2011 and 2012 (spring/summer) coupled with an rationalisation of historic data, literature review and anecdotal information, have resulted in the determination of the following likelihood of occurrences for species of conservation significance within the study area:
    - Of 37 fauna with national conservation significance and potential to occur, 22 are unlikely, and 14 are possible; including 3 Listed Marine species (EPBC rating Not Applicable to inland study area) Rock Parrot, Hooded Plover and Cape Barren Goose). The 11 other EPBC fauna that have potential to occur are: Australian Fairy Tern, Cattle Egret, Common Sandpiper, Osprey, Fork-tailed Swift, Malleefowl, Pacific Golden Plover, Rainbow Bee-eater, Red-lored Whistler, Sandhill Dunnart and White-bellied Sea-eagle. The Sandhill Dunnart has potential to occur in suitable habitat with *Triodia* (Spinifex) of a certain age. This is only applies to a few small patches immediately north of Hambidge Wilderness Area (WA) and near Rudall. The patches are likely to be too small and degraded (grazed) to support a viable population of Sandhill Dunnarts. In contrast, a large area of potentially suitable habitat exists in Hambidge WPA.

  - Of 9 flora with national conservation significance and potential to occur; 6 are unlikely, 2 are possible and 1 is known to occur (i.e. Jumping Jack Wattle).
  - Of the 10 fauna with state significance and potential to occur; 1 is likely (Gilbert-s Whistler), 5 are possible and 4 are unlikely.
  - One additional state listed species was observed as present (White-winged Chough)
  - Of the 21 flora with state significance and potential to occur; 5 are unlikely, 12 possibly occur are 4 are likely to occur.
  - A total of 78 national and state conservation significant flora and fauna species have been considered by this assessment. Impacts are not expected to any of the species, in particular the 18 fauna (mostly migratory birds) that have potential to visit the area. It is not considered that the study area provides habitat features that are critical to the survival of any of these fauna species at the individual, population or species level. Standard mitigation measures outlined in the required Construction Environmental Management Plans (CEMPs) should be sufficient to avoid impacts to these species.

- Vegetation condition has currently been assessed for approximately 43 % of the intersected patches, accounting for over 50% of the native vegetation within the corridor. The majority are considered of poor to moderate quality due to significant disturbance factors, the absence of one or more structural dominants, a lack of age and structural diversity, and or poor species diversity. It is considered reasonable to assume that the condition of remaining patches would be proportionally similar to those assessed, given the broadly homogeneous nature of the broader project landscape (i.e. mostly poor to moderate condition).
- Weed species already present within the preferred corridor area are common to the district and to agriculture (refer DEH 2002), including three declared species (Horehound, Boxthorn and False Caper) that will require control as under the *Natural Resources Management Act 2004*. Additional weed species are anticipated if detailed survey and or survey in different seasons were to be undertaken. Buffel Grass is also a weed of concern for the region (Declared early 2015).
- Introduced fauna recorded opportunistically within the preferred corridor area are common to the district and associated generally with human habitation and agriculture (refer DEH 2002), including Sheep, Cattle, European Red Fox, European Rabbit and Feral Cat.
- A total of 133.2 ha (10 % of the total corridor area) of native vegetation across 147 individual patches would need to be cleared assuming complete clearance within corridor widths of 60 m, 110 m, or 130 m depending upon infrastructure components planned for sections of the corridor. The remainder of the corridor (1218.8 ha or 90 %) is pasture land, cropping, roads or tracks.

- The preferred alignment will require the clearance of less than 1 % of each IBRA vegetation association encountered. Vegetation types identified during the surveys are common throughout the Eyre Peninsula. Clearance associated with the preferred infrastructure corridor is unlikely to have a significant impact on the abundance, diversity, geographic distribution and productivity of flora at the species and ecosystem level.
- Vegetation in poor to moderate condition is unlikely to provide suitable habitat for flora or fauna of conservation significance (with the exception of Jumping-jack Wattle that can colonise disturbed areas). Significant impacts to species conservation significance are not expected, however it is important to note that the rapid field surveys undertaken to produce this report did not constitute a targeted species search for any of the listed species considered for the study area.
- There were no other matters of national environmental significance (MNES) identified as relevant to the study area (e.g. Commonwealth lands, Commonwealth Reserves, world or national heritage properties / places, threatened ecological communities, critical habitats or nationally important wetlands).
- An EPBC referral will be required for any action that will have or is likely to have a significant impact on a MNES.
- An application to clear native vegetation will be required under the *Native Vegetation Act 1991* and Regulations, and a final assessment of actual areas of impact, the condition of these areas, and a determination of SEB offset together with a Native Vegetation Management Plan (to be approved by the Native Vegetation Council) will be required once design and layouts are finalised.

8 References

ANRA (2009) *Australian National Resources Atlas Biodiversity Assessment - Eyre Yorke Block*, http://www.anra.gov.au/topics/vegetation/assessment/sa/ibra-eyb-natural-values.html (Access online December 2011).

Natural Resource Management Ministerial Council (NRMMC) (2010*) Australia's Biodiversity Conservation Strategy 2010-2030*, Commonwealth of Australia, Canberra.

Australian & New Zealand Environment & Conservation Council (ANZECC) and Agriculture & Resource Management Council OF Australia & New Zealand (ARMCANZ) (1999) *National Principles and Guidelines for Rangeland Management*, Commonwealth of Australia, Canberra.

Australian Weeds Committee (AWC) (2012) *Weeds of National Significance*, http://www.weeds.org.au/WoNS/ (Accessed online February 2012).

Benshemesh J (2011). National Recovery Plan for Malleefowl *Leipoa ocellata*. Prepared for Department for Environment Heritage, South Australia.

Berkinshaw T (2009) *Mangroves to Mallee: The Complete Guide to the Vegetation of Temperate South Australia*, Greening Australia, Adelaide.

Birds Australia (2012) *Birds in Backyards fact sheets* (various species), accessed online at http://www.birdsinbackyards.net/, Feb 2012 – Jan 2013.

Black J M (1986) *Flora of South Australia*; *Vol I-IV revised*, edited by Jessop J P and Toelken H R, South Australian Government Printing Division, Adelaide

Brandle, R (2010) *A Biological Survey of the Eyre Peninsula, South Australia.* Dept. for Environment and Heritage, South Australia.

Brooker and Kleinig (2006) *Field Guide to Eucalypts – Volume 2: South-western and Southern Australia*, Bloomings Books, Melbourne

Caton B, Detmar S, Fotheringham D, Laurence S, Quinn J, Royal M, Rubbo N and Sandercock R (2011) *Eyre Peninsula Coastal Action Plan and Conservation Priority Study, Volume 1*, Eyre Peninsula NRM Board and Department of Environment and Natural Resources, Adelaide.

Chinnock RJ (2007) *Eremophila and Allied Genera; a monograph of the Myoporaceae*, Rosenberg Publishing Pty Ltd, Kenthurst NSW.

Churchill S (2001) Recovery Plan for the Sandhill Dunnart, *Sminthopsis psammophila*. Biodiversity Conservation Program, Department for Environment and Heritage SA, Adelaide.

Cunningham G, Mulham B, Milthorpe P and Leigh J (1993) *Plants of Western New South Wales*, Inkata Press, Sydney.

Department for Environment and Heritage(DEH) (2002) *Biodiversity Plan for Eyre Peninsula South Australia*, Dept. for Environment and Heritage, South Australia

Department for Environment, Water, Heritage and the Arts (DEWHA) (2010) *Survey guidelines for Australia's threatened birds – Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia, Canberra.

Department for Environment and Heritage (DEH) (2007) No Species Loss: A Nature Conservation Strategy for South Australia 2007-2017, Department for Environment and Heritage, Adelaide.

Department of Environment, Water and Natural Resources (2004) – native veg layer supplied by DEWNR (custodians).

Department of Environment, Water & Natural Resources (DEWNR) (2013a). *Statistics by Association* (table). Supplied by Native Vegetation Council (Tanya Milne) at Bushrat Training session, 6 December 2013.

DEWNR (2013) *BushRAT manual for native vegetation*; Native Vegetation & Biodiversity Management Unit, Department of Environment, Water & Natural Resources, Adelaide.

Department of the Environment (2012) *Approved Conservation Advices for Matters of National Environmental Significance,* accessed online at http://www.environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl, Oct 2011 – Nov 2012.

Department of Water, Land and Biodiversity Conservation (DWLBC) (2005) *Guidelines for a native vegetation significant environmental benefit policy for the clearance of native vegetation associated with the minerals and petroleum industry.* Prepared for the Native Vegetation Council, DWLBC, South Australia.

Endangered Species Advisory Committee (1992) An Australian national strategy for the conservation of Australian species and communities threatened with extinction, ANCA, Canberra.

Orchard A E and Thompson H S (eds) (1999). *Flora of Australia (2nd edit.),* ABRS / CSIRO, Canberra

Geering A, Agnew L and Harding S (eds.) (2007) *Shorebirds of Australia*. Melbourne: CSIRO Publishing.

Golder Associates (2013) Preliminary Documentation (EPBC Ref: 2012/6590): Port Spencer Stage 1 and 2,Eyre Peninsula, SA. Report 127663016-029-R-Rev1 prepared for Centrex Metals Limited.

Iron Road Ltd (2011a) *Application for Declaration of Environmental Factors to conduct exploration drilling work within a vegetation heritage agreement area (HA869) EL3699 Warramboo area, Eyre Peninsula, South Australia.* SKM and Iron Road Limited, Adelaide

Iron Road Limited (2011b) *Central Eyre Iron Project (South Australia); pre-feasibility study*. Iron Road Limited, Adelaide.

Jacobs (2014a) Central Eyre Iron Project; Port Site Marine Assessment. Jacobs, Adelaide.

Jacobs (2014b) Central Eyre Iron Project; Port Site Ecological Survey. Jacobs, Adelaide.

Jacobs (2014c) Central Eyre Iron Project; Mine Site Ecological Survey. Jacobs, Adelaide.

Jessop J, Dashorst G R M, James F M. (2006) *Grasses of South Australia; an illustrated guide to the native and naturalised species*, Wakefield Press, Adelaide.

Laut, P., Heyligers, P.C., Keig, G., Loffler, E., Margules, C., Scott, R.M., & Sullivan, M., E. (1977). *Environments of South Australia, Province 4: Eyre and Yorke Peninsulas*. CSIRO, Division of Land Use Research, Canberra.

Marchant S and Higgins P J (eds.) (1990). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 - Ratites to Ducks*. Melbourne, Victoria: Oxford University Press.

Menkhorst P and Knight F (2004) *A Field Guide to the Mammals of Australia*. Oxford University Press, Melbourne.

Milne TI, Croft SJ and Pedler JA (2008) Bushland Condition Monitoring Manual: Eyre Peninsula Region. Volume 3, vegetation communities of the Eyre Peninsula Region. The Nature Conservation Society of South Australia Inc.

National Rangeland Management Working Group (NRMWG) (1996) *Draft national strategy for rangeland management*, Dept. of the Environment, Sport and Territories on behalf of ANZECC and ARMCANZ, Canberra.

Nicolle, D (2013) *Native Eucalypts of South Australia*, Lane Print & Post, Adelaide.

Karfs R, Applegate R, Fisher R, Lynch D, Mullin D, Novelly P (2000) *Regional land condition and trend assessment in tropical savannas: National Land and Water Resources Audit rangeland monitoring implementation project, final report*, National Land and Water Resources Audit, Canberra, viewed 15 Sept 2013, http://nrmonline.nrm.gov.au/catalog/mql:38.

Orchard, A E (2004) *A reassessment of the genus Haeckeria (Asteraceae: Gnaphalieae), with definition of a new species in Cassinia*. Australian Systematic Botany 17(5) 447-467

Parks and Wildlife Service Tasmania (2011) Cape Barren Goose, Cereopsis novaehollandiae (online), Available: http://www.parks.tas.gov.au/index.aspx?base=5110, Accessed 24/1/12.

Pobke, K (2007) *Draft recovery plan for 23 threatened flora taxa on Eyre Peninsula, South Australia 2007-2012*, Department for Environment and Heritage, South Australia.

Richardson F J, Richardson R G and Shepherd R C H (2011) *Weeds of the south-east: an identification guide for Australia*, Richardson - Shepherd (self-published), Victoria

Rogers, D J (2013) *A landscape assessment for the northern Eyre Hills Landscape of the Eyre Peninsula NRM region*, Science, Monitoring & Knowledge Branch, Strategy & Advice (SMK), Dept. of Environment, Water and Natural Resources (DEWNR), Adelaide

Shirihai H (2007) *A Complete Guide to Antarctic Wildlife: the Birds and Marine Mammals of the Antarctic Continent and the Southern Ocean* (2nd edit.) A & C Black, London.

Simpson K and Day N (2004) *Field Guide to the Birds of Australia* (7th Edition). Penguin Books Australia.

Sinclair Knight Merz (SKM) (2012a) *Central Eyre Iron Project; rail hydrology - draft*. SKM, Adelaide.

SPRAT (2014) *Species Profile and Threat Database Profiles*, http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl accessed October 2012 - April 2014.

South Australian Government (2007), *No species loss - a nature conservation strategy for South Australia 2007-2017*, South Australian Government, Adelaide.

Thackway R and Cresswell I D (1995). *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program, Version 4.0.* Australian Nature Conservation Agency, Canberra.

Todd J A (2000) *Recovery Plan for twelve threatened Spider-orchid Caladenia taxa (Orchidaceae: Caladeniinae) of Victoria and South Australia 2000 – 2004*. Dept. of Natural Resources and Environment, Melbourne.

Tonkinson, D and Robertson, G. (2010) National Recovery Plan for Yellow Swainson-pea *Swainsona pyrophila*, Department of Sustainability and Environment, Victoria.

Western Australian Department of Environment and Conservation (1996a) *Crassula exserta*, (online), access online at http://florabase.dec.wa.gov.au/browse/profile.php/3139, 6/9/2011).

Western Australian Department of Environment and Conservation (1996a) *Lawrencia berthae,* accessed online at http://florabase.dec.wa.gov.au/browse/profile.php/2798, 6/9/2011).

Whibley D J E and Symon D E (1992) *Acacias of South Australia.* South Australian Government Printer, South Australia.

Ziembicki, Mark (2010) *Australian Bustard*. Australian Natural History Series, CSIRO, Collingwood, Vic,

Appendix A: EPBC Protected Matters Search Tool

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

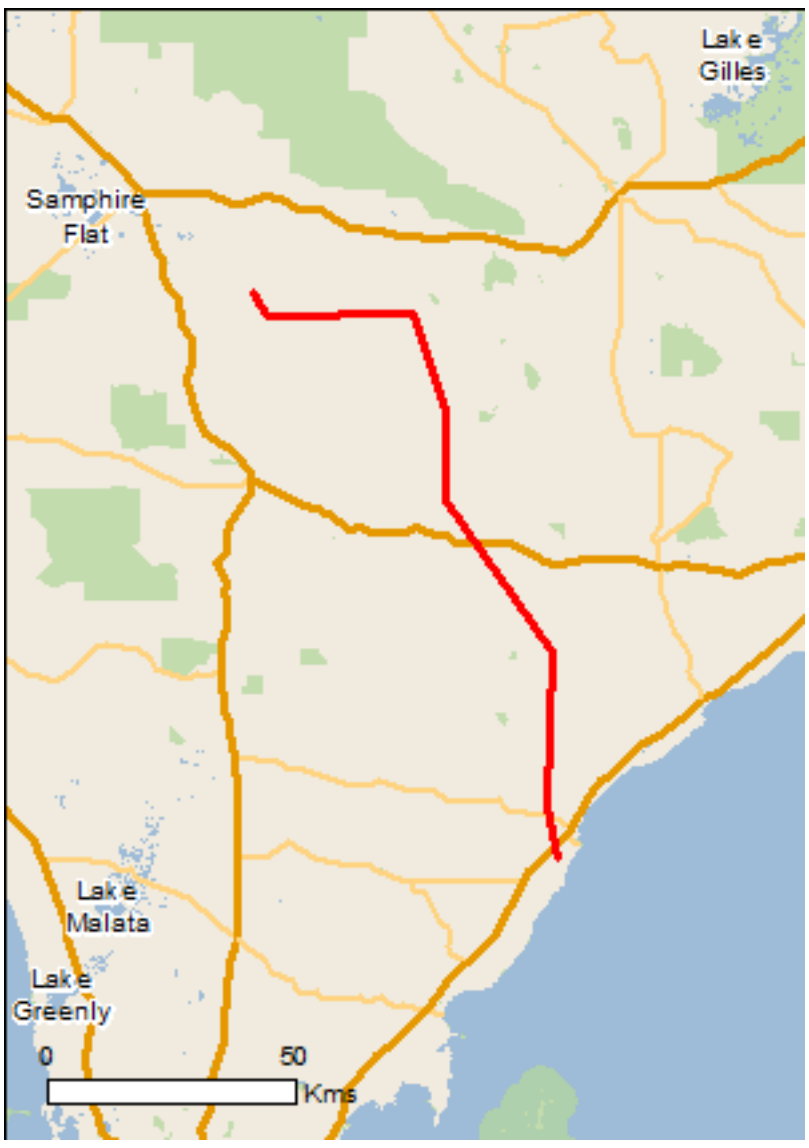
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 04/07/13 16:41:02



Coordinates

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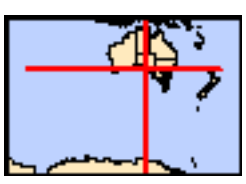

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	15
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	1
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	21
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Acanthiza iredalei iredalei		
Slender-billed Thornbill (western) [25967]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Pachycephala rufogularis		
Red-lored Whistler [601]	Vulnerable	Species or species habitat may occur within area
Psophodes nigrogularis leucogaster		
Western Whipbird (eastern) [64448]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Sminthopsis psammophila		
Sandhill Dunnart [291]	Endangered	Species or species habitat likely to occur within area
Plants		
Acacia enterocarpa		
Jumping-jack Wattle [17615]	Endangered	Species or species habitat likely to occur within area
Acacia pinguifolia		
Fat-leaved Wattle [5319]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Acacia rhetinocarpa Neat Wattle, Resin Wattle (SA) [11282]	Vulnerable	Species or species habitat likely to occur within area
Caladenia tensa Greencomb Spider-orchid, Rigid Spider-orchid [24390]	Endangered	Species or species habitat likely to occur within area
Frankenia plicata [4225]	Endangered	Species or species habitat likely to occur within area
Ptilotus beckerianus Ironstone Mulla Mulla [3787]	Vulnerable	Species or species habitat may occur within area
Pultenaea trichophylla Tufted Bush-pea [12715]	Endangered	Species or species habitat may occur within area
Swainsona pyrophila Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Places on the RNE	[Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Hambidge Conservation Park	SA	Registered

State and Territory Reserves	[Resource Information]
Name	State
Hambidge	SA

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
[Lycium ferocissimum](#) African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
[Olea europaea](#) Olive, Common Olive [9160]		Species or species habitat may occur within area
[Rubus fruticosus aggregate](#) Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
[Solanum elaeagnifolium](#) Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area
[Ulex europaeus](#) Gorse, Furze [7693]		Species or species habitat likely to occur within area

Coordinates

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Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix B: BDBSA Search Extract

Flora Results (Biological Database of South Australia)

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Babingtonia behrii	Silver Broombush				All
Baeckea crassifolia	Desert Baeckea				All
Billardiera cymosa (NC)	Sweet Apple-berry				All
Boronia coerulescens ssp. coerulescens	Blue Boronia				All
Brassica tournefortii	Wild Turnip	*			All
Bromus diandrus	Great Brome	*			All
Calandrinia calyptrata	Pink Purslane				All
Calandrinia eremaea	Dryland Purslane				All
Callitris gracilis	Southern Cypress Pine				All
Calytrix involucrata	Cup Fringe-myrtle				All
Carpobrotus modestus	Inland Pigface				All
Cassytha peninsularis	Peninsula Dodder-laurel				All
Correa backhouseana var. coriacea	Thick-leaf Correa				All
Crassula colorata var. colorata	Dense Crassula				All
Dianella revoluta var. revoluta	Black-anther Flax-lily				All
Dodonaea hexandra	Horned Hop-bush				All
Ehrharta calycina	Perennial Veldt Grass	*			All
Einadia nutans ssp. nutans	Climbing Saltbush				All
Enchylaena tomentosa var. tomentosa	Ruby Saltbush				All
Eremophila glabra ssp. glabra	Tar Bush				All
Eucalyptus calycogona ssp. calycogona	Square-fruit Mallee				All
Eucalyptus cretata	Darke Peak Mallee			R	All
Eucalyptus incrassata	Ridge-fruited Mallee				All
Eucalyptus leptophylla	Narrow-leaved Red Mallee				All
Eucalyptus oleosa (NC)	Red Mallee				All
Eucalyptus peninsularis	Merrit				All
Eucalyptus socialis (NC)	Beaked Red Mallee				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Gahnia deusta	Limestone Saw-sedge				All
Glischrocaryon behrii	Golden Pennants				All
Halgania cyanea	Rough Blue-flower				All
Hibbertia devitata	Smooth Guinea-flower				All
Hordeum glaucum	Blue Barley-grass	*			All
Lasiopetalum behrii	Pink Velvet-bush				All
Leucopogon cordifolius	Heart-leaf Beard-heath				All
Lichen sp.					All
Lolium rigidum	Wimmera Ryegrass	*			All
Moss sp.					All
Ozothamnus decurrens	Ridged Bush-everlasting				All
Phyllota remota	Slender Phyllota				All
Pittosporum angustifolium	Native Apricot				All
Podolepis capillaris	Wiry Podolepis				All
Podotheca angustifolia	Sticky Long-heads				All
Prostanthera serpyllifolia ssp. microphylla	Small-leaf Mintbush				All
Reichardia tingitana	False Sowthistle	*			All
Rhagodia preissii ssp. preissii	Mallee Saltbush				All
Rytidosperma caespitosum	Common Wallaby-grass				All
Santalum acuminatum	Quandong				All
Schoenus breviculmis	Matted Bog-rush				All
Schoenus racemosus	Sandhill Bog-rush				All
Sclerolaena diacantha	Grey Bindyi				All
Sisymbrium erysimoides	Smooth Mustard	*			All
Solanum elaeagnifolium	Silver-leaf Nightshade	*			All
Templetonia rossii	Flat Mallee-pea				All
Thryptomene micrantha	Ribbed Thryptomene				All
Tricoryne tenella	Tufted Yellow Rush-lily				All
Triodia irritans	Spinifex				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Westringia rigida	Stiff Westringia				All
Atriplex semibaccata	Berry Saltbush				Not TL
Austrostipa mundula	Neat Spear-grass				Not TL
Avellinia michelii	Avellinia	*			Not TL
Brachyscome lineariloba	Hard-head Daisy				Not TL
Caladenia capillata	Wispy Spider-orchid				Not TL
Calandrinia granulifera	Pigmy Purslane				Not TL
Crassula colorata var. acuminata	Dense Crassula				Not TL
Eremophila weldii	Purple Emubush				Not TL
Goodenia robusta	Woolly Goodenia				Not TL
Hypochaeris glabra	Smooth Cat's Ear	*			Not TL
Millotia muelleri	Common Bow-flower				Not TL
Millotia tenuifolia var. tenuifolia	Soft Millotia				Not TL
Pentameris airoides ssp. airoides	False Hair-grass	*			Not TL
Poranthera microphylla	Small Poranthera				Not TL
Pterostylis excelsa	Dryland Greenhood				Not TL
Pterostylis nana	Dwarf Greenhood				Not TL
Thysanotus baueri	Mallee Fringe-lily				Not TL
Trachymene pilosa	Dwarf Trachymene				Not TL
Vulpia fasciculata	Sand Fescue	*			Not TL
Vulpia myuros f. myuros	Rat's-tail Fescue	*			Not TL
Acacia ancistrophylla var. lissophylla	Hook-leaf Wattle				Not B
Acacia cupularis	Cup Wattle				Not B
Acacia gillii	Gill's Wattle				Not B
Acacia hakeoides	Hakea Wattle				Not B
Acacia microcarpa	Manna Wattle				Not B
Acacia notabilis	Notable Wattle				Not B
Acacia oswaldii	Umbrella Wattle				Not B
Acacia rigens	Nealie				Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Acacia sclerophylla var. sclerophylla	Hard-leaf Wattle				Not B
Actinobole uliginosum	Flannel Cudweed				Not B
Aira caryophyllea	Silvery Hair-grass	*			Not B
Aizoaceae sp.	Pigface Family				Not B
Allocasuarina verticillata	Drooping Sheoak				Not B
Aotus subspinescens	Mallee Aotus				Not B
Asparagus asparagoides f. asparagoides	Bridal Creeper	*			Not B
Asphodelus fistulosus	Onion Weed	*			Not B
Astroloma conostephioides	Flame Heath				Not B
Atriplex acutibractea ssp. acutibractea	Pointed Saltbush				Not B
Atriplex stipitata	Bitter Saltbush				Not B
Austrostipa drummondii	Cottony Spear-grass				Not B
Austrostipa platychaeta	Flat-awn Spear-grass				Not B
Austrostipa sp.	Spear-grass				Not B
Avena barbata	Bearded Oat	*			Not B
Avena sp.	Oat	*			Not B
Billardiera sericophora	Silky Apple-berry				Not B
Billardiera versicolor	Yellow-flower Apple-berry				Not B
Boronia inornata ssp. leptophylla	Dryland Boronia				Not B
Brachyscome ciliaris var. ciliaris	Variable Daisy				Not B
Caladenia tensa	Inland Green-comb Spider-orchid		EN		Not B
Callistemon sp.	Bottlebrush				Not B
Callitris sp.	Native Pine				Not B
Callitris verrucosa	Scrub Cypress Pine				Not B
Calytrix tetragona	Common Fringe-myrtle				Not B
Carpobrotus modestus/rossii	Native Pigface				Not B
Carrichtera annua	Ward's Weed	*			Not B
Cassytha glabella f. dispar	Slender Dodder-laurel				Not B
Cassytha melantha	Coarse Dodder-laurel				Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Cenchrus ciliaris/pennisetiformis	Buffel Grass	*			Not B
Chenopodium desertorum ssp. desertorum	Frosted Goosefoot				Not B
Chenopodium desertorum ssp. microphyllum	Small-leaf Goosefoot				Not B
Chloris truncata	Windmill Grass				Not B
Chondrilla juncea	Skeleton Weed	*			Not B
Chrysanthemoides monilifera ssp. monilifera	Boneseed	*			Not B
Clematis microphylla	Old Man's Beard				Not B
Comesperma scoparium	Broom Milkwort				Not B
Commersonia tatei	Trailing Commersonia				Not B
Compositae sp.	Daisy Family				Not B
Conyza bonariensis	Flax-leaf Fleabane	*			Not B
Correa reflexa (NC)	Common Correa				Not B
Dampiera rosmarinifolia	Rosemary Dampiera				Not B
Daviesia benthamii ssp.	Spiny Bitter-pea				Not B
Daviesia benthamii ssp. acanthoclona	Dryland Bitter-pea				Not B
Daviesia benthamii ssp. humilis	Mallee Bitter-pea			R	Not B
Dianella brevicaulis/revoluta var.	Black-anther Flax-lily				Not B
Dillwynia uncinata	Silky Parrot-pea				Not B
Dodonaea bursariifolia	Small Hop-bush				Not B
Dodonaea viscosa ssp. angustissima	Narrow-leaf Hop-bush				Not B
Drosera macrantha ssp. planchonii	Climbing Sundew				Not B
Echium plantagineum	Salvation Jane	*			Not B
Enneapogon sp.	Bottle-washers/Nineawn				Not B
Eragrostis cilianensis	Stink Grass	*			Not B
Eremophila behriana	Rough Emubush				Not B
Eremophila crassifolia	Thick-leaf Emubush				Not B
Eucalyptus brachycalyx	Gilja				Not B
Eucalyptus calcareana	Nundroo Mallee				Not B
Eucalyptus calycogona ssp.	Square-fruit Mallee				Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Eucalyptus cretata -- Eucalyptus dumosa complex					Not B
Eucalyptus dumosa	White Mallee				Not B
Eucalyptus gracilis	Yorrell				Not B
Eucalyptus pileata	Capped Mallee				Not B
Eucalyptus porosa	Mallee Box				Not B
Euphorbia sp. (NC)	Spurge				Not B
Eutaxia diffusa	Large-leaf Eutaxia				Not B
Eutaxia microphylla	Common Eutaxia				Not B
Exocarpos aphyllus	Leafless Cherry				Not B
Exocarpos sparteus	Slender Cherry				Not B
Galenia pubescens var. pubescens	Coastal Galenia	*			Not B
Geijera linearifolia	Sheep Bush				Not B
Glischrocaryon flavescens	Yellow Pennants				Not B
Goodenia varia	Sticky Goodenia				Not B
Goodenia willisiana	Silver Goodenia				Not B
Grevillea huegelii	Comb Grevillea				Not B
Grevillea ilicifolia ssp. ilicifolia	Holly-leaf Grevillea				Not B
Grevillea pterosperma	Dune Grevillea				Not B
Hakea cycloptera	Elm-seed Hakea				Not B
Hakea leucoptera ssp. leucoptera	Silver Needlewood				Not B
Hakea mitchellii	Heath Needlebush				Not B
Halgania andromedifolia	Scented Blue-flower				Not B
Helichrysum leucopsideum	Satin Everlasting				Not B
Hibbertia virgata	Twiggy Guinea-flower				Not B
Homoranthus wilhelmii	Wilhelm's Homoranthus				Not B
Hybanthus floribundus ssp. floribundus	Shrub Violet				Not B
Lasiopetalum X tepperi	Tepper's Velvet-bush				Not B
Lepidosperma viscidum	Sticky Sword-sedge				Not B
Leptospermum coriaceum	Dune Tea-tree				Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Logania ovata	Oval-leaf Logania				Not B
Lomandra collina	Sand Mat-rush				Not B
Lomandra effusa	Scented Mat-rush				Not B
Lomandra leucocephala ssp. robusta	Woolly Mat-rush				Not B
Lycium ferocissimum	African Boxthorn	*			Not B
Maireana brevifolia	Short-leaf Bluebush				Not B
Maireana erioclada	Rosy Bluebush				Not B
Maireana pentatropis	Erect Mallee Bluebush				Not B
Marrubium vulgare	Horehound	*			Not B
Medicago polymorpha var. polymorpha	Burr-medic	*			Not B
Melaleuca acuminata ssp. acuminata	Mallee Honey-myrtle				Not B
Melaleuca uncinata	Broombush				Not B
Mesembryanthemum aitonis	Angled Iceplant	*			Not B
Mesembryanthemum crystallinum	Common Iceplant	*			Not B
Mesembryanthemum nodiflorum	Slender Iceplant	*			Not B
Minuria leptophylla	Minnie Daisy				Not B
Muehlenbeckia adpressa	Climbing Lignum				Not B
Oenothera stricta ssp. stricta	Common Evening Primrose	*			Not B
Olearia ciliata var. ciliata	Fringed Daisy-bush				Not B
Olearia decurrens	Winged Daisy-bush				Not B
Olearia rudis	Azure Daisy-bush				Not B
Oxalis perennans	Native Sorrel				Not B
Phebalium bullatum	Silvery Phebalium				Not B
Philotheca pungens	Prickly Wax-flower				Not B
Pimelea octophylla	Woolly Riceflower				Not B
Pimelea stricta	Erect Riceflower				Not B
Piptatherum miliaceum	Rice Millet	*			Not B
Platysace heterophylla var. heterophylla	Slender Platysace				Not B
Polygonum aviculare	Wireweed	*			Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Pomaderris paniculosa ssp. paralia	Coast Pomaderris				Not B
Prostanthera serpyllifolia ssp. serpyllifolia	Thyme Mintbush				Not B
Pterostylis mutica	Midget Greenhood				Not B
Ptilotus seminudus	Rabbit-tails				Not B
Pultenaea tenuifolia	Narrow-leaf Bush-pea				Not B
Reseda lutea	Cut-leaf Mignonette	*			Not B
Rhagodia crassifolia	Fleshy Saltbush				Not B
Rhodanthe pygmaea	Pigmy Daisy				Not B
Rytidosperma setaceum	Small-flower Wallaby-grass				Not B
Salsola australis	Buckbush				Not B
Salvia verbenaca var. vernalis	Wild Sage	*			Not B
Santalum murrayanum	Bitter Quandong				Not B
Scabiosa atropurpurea	Pincushion	*			Not B
Scaevola spinescens	Spiny Fanflower				Not B
Schinus molle	Pepper-tree	*			Not B
Senna artemisioides ssp.	Desert Senna				Not B
Setaria constricta	Knotty-butt Paspalidium				Not B
Silene tridentata		*			Not B
Sonchus oleraceus	Common Sow-thistle	*			Not B
Spergularia diandra	Lesser Sand-spurrey	*			Not B
Spyridium bifidum var.	Forked Spyridium				Not B
Spyridium eriocephalum var. eriocephalum	Heath Spyridium				Not B
Spyridium subochreatum	Velvet Spyridium				Not B
Stenanthemum leucophractum	White Cryptandra				Not B
Stenanthemum notiale ssp. notiale	Trident Spyridium				Not B
Thysanotus patersonii	Twining Fringe-lily				Not B
Triodia scariosa	Spinifex				Not B
Triticum aestivum	Wheat	*			Not B
Velleia connata	Cup Velleia				Not B

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Vittadinia dissecta var. hirta	Dissected New Holland Daisy				Not B
Vittadinia gracilis	Woolly New Holland Daisy				Not B
Vittadinia sp.	New Holland Daisy				Not B
Wahlenbergia stricta ssp. stricta	Tall Bluebell				Not B
Acacia calamifolia/euthycarpa	Wallowa				All
Acacia continua	Thorn Wattle				All
Acacia cyclops	Western Coastal Wattle				All
Acacia enterocarpa	Jumping-jack Wattle		EN	E	All
Acacia farinosa	Mealy Wattle				All
Acacia halliana	Hall's Wattle				All
Acacia microcarpa	Manna Wattle				All
Acacia montana	Mallee Wattle			R	All
Acacia paradoxa	Kangaroo Thorn				All
Acacia pycnantha	Golden Wattle				All
Acacia sclerophylla var. sclerophylla	Hard-leaf Wattle				All
Acacia spinescens	Spiny Wattle				All
Acacia triquetra	Mallee Wreath Wattle				All
Acianthus pusillus	Mosquito Orchid				All
Acrotriche cordata	Blunt-leaf Ground-berry				All
Acrotriche patula	Prickly Ground-berry				All
Aeonium haworthii		*			All
Agave americana	Century Plant	*			All
Alectryon oleifolius ssp. canescens	Bullock Bush				All
Allocasuarina muelleriana ssp. muelleriana	Common Oak-bush				All
Aloe maculata	Broad-leaf Aloe	*			All
Alyogyne huegelii	Native Hibiscus				All
Alyssum linifolium	Flax-leaf Alyssum	*			All
Alyxia buxifolia	Sea Box				All
Amyema melaleucae	Tea-tree Mistletoe				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Anagallis arvensis	Pimpernel	*			All
Anogramma leptophylla	Annual Fern			R	All
Anthocercis anisantha ssp. collina	Gawler Ranges Ray-flower				All
Arctotheca calendula	Cape Weed	*			All
Argyranthemum frutescens ssp. foeniculaceum	Teneriffe Daisy	*			All
Aristida behriana	Brush Wire-grass				All
Asteridea athrixioides f. athrixioides	Wirewort				All
Astroloma humifusum	Cranberry Heath				All
Atriplex paludosa ssp. cordata	Marsh Saltbush				All
Atriplex pumilio	Mat Saltbush				All
Atriplex vesicaria	Bladder Saltbush				All
Austrostipa acrociliata	Graceful Spear-grass				All
Austrostipa echinata	Spiny Spear-grass			R	All
Austrostipa elegantissima	Feather Spear-grass				All
Austrostipa eremophila	Rusty Spear-grass				All
Austrostipa exilis	Heath Spear-grass				All
Austrostipa hemipogon	Half-beard Spear-grass				All
Austrostipa mollis	Soft Spear-grass				All
Austrostipa nitida	Balcarra Spear-grass				All
Austrostipa puberula	Fine-hairy Spear-grass				All
Austrostipa scabra ssp.	Rough Spear-grass				All
Austrostipa scabra ssp. falcata	Slender Spear-grass				All
Austrostipa tenuifolia	-			R	All
Austrostipa trichophylla	-				All
Blennospora drummondii	Dwarf Button-flower				All
Bothriochloa macra	Red-leg Grass			R	All
Bovista verrucosa	Puff Ball Fungus				All
Brachiaria notochthona	Hairy-edged Arm-grass				All
Bromus rubens	Red Brome	*			All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Bulbine semibarbata	Small Leek-lily				All
Bursaria spinosa ssp. spinosa	Sweet Bursaria				All
Caladenia bicalliata ssp. bicalliata	Western Daddy-long-legs			R	All
Caladenia septuosa	Eyre Peninsula Spider-orchid				All
Calendula arvensis	Field Marigold	*			All
Callistemon rugulosus	Scarlet Bottlebrush				All
Callitris canescens	Scrubby Cypress Pine				All
Calotis erinacea	Tangled Burr-daisy				All
Carpobrotus rossii	Native Pigface				All
Carpobrotus rossii (NC)	Native Pigface				All
Cassinia complanata	Sticky Cassinia				All
Cassinia laevis	Curry Bush				All
Cheilanthes austrotenuifolia	Annual Rock-fern				All
Chenopodiaceae sp.	Goosefoot Family				All
Chenopodium desertorum ssp. rectum	Erect Goosefoot				All
Chrysocephalum apiculatum	Common Everlasting				All
Comesperma volubile	Love Creeper				All
Convolvulus crispifolius	Silver Bindweed				All
Cotyledon orbiculata var. orbiculata	Pig's Ear	*			All
Crassula closiana	Stalked Crassula				All
Crassula decumbens var. decumbens	Spreading Crassula				All
Crassula exserta	Large-fruit Crassula			R	All
Cryptandra sp. Floriferous (W.R.Barker 4131)	Pretty Cryptandra				All
Cucumis myriocarpus	Paddy Melon	*			All
Cyphanthera myosotidea	Small-leaf Ray-flower				All
Dampiera lanceolata var. lanceolata	Grooved Dampiera				All
Daucus glochidiatus	Native Carrot				All
Dianella brevicaulis	Short-stem Flax-lily				All
Dianella revoluta var. divaricata	Broad-leaf Flax-lily				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Dicrastylis verticillata	Whorled Sand-sage				All
Diplotaxis tenuifolia	Lincoln Weed	*			All
Disphyma crassifolium ssp. clavellatum	Round-leaf Pigface				All
Dodonaea baueri	Crinkled Hop-bush				All
Dodonaea stenozyga	Desert Hop-bush				All
Ehrharta longiflora	Annual Veldt Grass	*			All
Ehrharta sp.	Veldt Grass	*			All
Emex australis	Three-corner Jack	*			All
Eragrostis barrelieri	Pitted Love-grass	*			All
Eragrostis minor	Small Stink-grass	*			All
Eremophila barbata	Blue Range Emubush			R	All
Eremophila deserti	Turkey-bush				All
Eremophila subfloccosa ssp. lanata	Woolly Emubush				All
Eucalyptus angulosa	Coast Ridge-fruited Mallee				All
Eucalyptus camaldulensis ssp.	River Red Gum				All
Eucalyptus diversifolia ssp. diversifolia	Coastal White Mallee				All
Eucalyptus odorata (NC)	Peppermint Box				All
Eucalyptus peninsularis -- Eucalyptus socialis ssp.	Merrit Intergrade				All
Eucalyptus petiolaris	Eyre Peninsula Blue Gum				All
Eucalyptus phenax ssp. phenax	White Mallee				All
Eucalyptus rugosa	Coastal White Mallee				All
Eucalyptus yalatensis	Yalata Mallee				All
Euchiton sphaericus	Annual Cudweed				All
Euphorbia paralias	Sea Spurge	*			All
Euphorbia terracina	False Caper	*			All
Euphrasia collina ssp. tetragona	Coast Eyebright				All
Exocarpos cupressiformis	Native Cherry				All
Ficinia nodosa	Knobby Club-rush				All
Gahnia lanigera	Black Grass Saw-sedge				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Galium migrans (NC)	Loose Bedstraw				All
Gazania linearis	Gazania	*			All
Gazania rigens	Gazania	*			All
Genoplesium sp.	Midge Orchid				All
Glycine rubiginosa	Twining Glycine				All
Gnaphalium indutum ssp. indutum	Tiny Cudweed				All
Gonocarpus mezianus	Broad-leaf Raspwort				All
Goodenia pusilliflora	Small-flower Goodenia				All
Grevillea aspera	Rough Grevillea				All
Grevillea ilicifolia complex	Holly-leaf Grevillea				All
Gyrostemon australasicus	Buckbush Wheel-fruit				All
Haeckeria cassiniiformis	Dogwood Haeckeria			R	All
Hakea rugosa	Dwarf Hakea				All
Haloragis acutangula f.	Smooth Raspwort				All
Helianthus annuus	Sunflower	*			All
Helichrysum luteoalbum	Jersey Cudweed				All
Heliotropium europaeum	Common Heliotrope				All
Hibbertia riparia	Bristly Guinea-flower				All
Hornungia procumbens	Oval Purse	*			All
Hyalosperma demissum	Dwarf Sunray				All
Hydrocotyle callicarpa	Tiny Pennywort				All
Hydrocotyle medicaginoides	Medic Pennywort				All
Hydrocotyle pilifera var. glabrata	Buttercup Pennywort				All
Hydrocotyle rugulosa	Mallee Pennywort				All
Hypochaeris radicata	Rough Cat's Ear	*			All
Isoetopsis graminifolia	Grass Cushion				All
Isotoma petraea	Rock Isotome				All
Kennedia prostrata	Scarlet Runner				All
Lasiopetalum discolor	Coast Velvet-bush				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Lawrencia berthae	Showy Lawrencia			R	All
Lawrencia glomerata	Clustered Lawrencia				All
Lawrencia spicata	Salt Lawrencia				All
Lawrencia squamata	Thorny Lawrencia				All
Lepidium africanum	Common Peppercress	*			All
Lepidium sp.	Peppercress				All
Lepidosperma concavum	Spreading Sword-sedge				All
Lepidosperma congestum	Clustered Sword Sedge				All
Limonium hyblaeum		*			All
Limonium sinuatum	Notch-leaf Sea-lavender	*			All
Lobelia cleistogamoides	Lobelia			R	All
Logania linifolia	Flax-leaf Logania				All
Lomandra juncea	Desert Mat-rush				All
Maireana enchylaenoides	Wingless Fissure-plant				All
Maireana radiata	Radiate Bluebush				All
Maireana rohrlachii	Rohrlach's Bluebush			R	All
Maireana trichoptera	Hairy-fruit Bluebush				All
Medicago minima var. minima	Little Medic	*			All
Medicago truncatula	Barrel Medic	*			All
Melaleuca armillaris ssp. akineta	Needle-leaf Honey-myrtle			R	All
Melaleuca eleuterostachya	Hummock Honey-myrtle				All
Melaleuca halmaturorum	Swamp Paper-bark				All
Melaleuca lanceolata	Dryland Tea-tree				All
Melaleuca oxyphylla	Pointed-leaf Honey-myrtle			R	All
Melaleuca pauperiflora ssp. mutica	Boree				All
Microcybe multiflora ssp. baccharoides	Scale-leaf Microcybe				All
Microcybe pauciflora ssp. pauciflora	Yellow Microcybe				All
Millotia myosotidifolia	Broad-leaf Millotia				All
Myoporum brevipes	Warty Boobialla				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Myoporum insulare	Common Boobialla				All
Myoporum parvifolium	Creeping Boobialla			R	All
Neurachne alopecuroidea	Fox-tail Mulga-grass				All
Nitraria billardierei	Nitre-bush				All
Olearia axillaris	Coast Daisy-bush				All
Olearia floribunda	Heath Daisy-bush				All
Olearia ramulosa	Twiggy Daisy-bush				All
Opercularia turpis	Twiggy Stinkweed				All
Opuntia ficus-indica	Indian Fig	*			All
Opuntia puberula	Prickly Pear	*			All
Ozothamnus retusus	Notched Bush-everlasting				All
Panicum hillmanii	Witch-grass	*			All
Parapholis incurva	Curly Ryegrass	*			All
Paspalum dilatatum	Paspalum	*			All
Pelargonium peltatum	Ivy-leaf Pelargonium	*			All
Persicaria prostrata	Creeping Knotweed				All
Petrorhagia dubia	Velvet Pink	*			All
Phyllangium divergens	Wiry Mitrewort				All
Pimelea flava ssp. dichotoma	Diosma Riceflower				All
Pimelea microcephala ssp. microcephala	Shrubby Riceflower				All
Pimelea serpyllifolia ssp. serpyllifolia	Thyme Riceflower				All
Pimelea williamsonii	Williamson's Riceflower			R	All
Plantago coronopus ssp.	Bucks-horn Plantain	*			All
Plantago sp. B (R.Bates 44765)	Little Plantain				All
Plicaria alveolata	Fungus species				All
Poa drummondiana	Knotted Poa			R	All
Poa poiformis var. poiformis	Coast Tussock-grass				All
Podolepis rugata var. rugata	Pleated Copper-wire Daisy				All
Podolepis tepperi	Delicate Copper-wire Daisy				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Polygonum plebeium	Small Knotweed				All
Pomaderris obcordata	Wedge-leaf Pomaderris				All
Pomaderris paniculosa ssp. paniculosa	Mallee Pomaderris				All
Prasophyllum fecundum	Self-pollinating Leek-orchid			R	All
Prasophyllum occultans	Hidden Leek-orchid			R	All
Prostanthera serpyllifolia ssp. microphylla (purplish-green flowers)	Small-leaf Mintbush				All
Prostanthera serpyllifolia ssp. serpyllifolia (purplish-green flowers)	Thyme Mintbush				All
Ptilotus spathulatus	Pussy-tails				All
Pultenaea acerosa	Bristly Bush-pea				All
Pultenaea canaliculata	Soft Bush-pea				All
Retama raetam	White Weeping Broom	*			All
Rhagodia candolleana ssp. candolleana	Sea-berry Saltbush				All
Rhagodia parabolica	Mealy Saltbush				All
Rhodanthe laevis	Smooth Daisy				All
Rostraria cristata	Annual Cat's-tail	*			All
Ruppia tuberosa	Widgeon Grass				All
Salvia verbenaca var. verbenaca	Wild Sage	*			All
Sarcozona praecox	Sarcozona				All
Scaevola aemula	Fairy Fanflower				All
Scaevola myrtifolia	Myrtle Fanflower			R	All
Schismus barbatus	Arabian Grass	*			All
Scleranthus pungens	Prickly Knawel				All
Senecio glossanthus	Annual Groundsel				All
Senecio quadridentatus	Cotton Groundsel				All
Senecio spanomerus	Groundsel species				All
Senna artemisioides ssp. petiolaris					All
Senna artemisioides ssp. X coriacea	Broad-leaf Desert Senna				All
Silene nocturna	Mediterranean Catchfly	*			All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Sisymbrium irio	London Mustard	*			All
Solanum capsiciforme	Capsicum Kangaroo-apple				All
Solanum coactiliferum	Tomato-bush				All
Solanum nigrum	Black Nightshade	*			All
Solanum simile	Kangaroo Apple				All
Spergularia marina	Salt Sand-spurrey				All
Spyridium phylicoides	Narrow-leaf Spyridium				All
Spyridium stenophyllum ssp. renovatum	Forked Spyridium				All
Stackhousia aspericocca ssp. Cylindrical inflorescence (W.R.Barker 1418)	Bushy Candles				All
Stackhousia aspericocca ssp. One-sided inflorescence (W.R.Barker 697)	One-sided Candles				All
Stellaria media	Chickweed	*			All
Stenopetalum lineare	Narrow Thread-petal				All
Stenopetalum sphaerocarpum	Round-fruit Thread-petal				All
Stypandra glauca	Nodding Grass-lily			V	All
Swainsona pyrophila	Yellow Swainson-pea		VU	R	All
Tamarix aphylla	Athel Pine	*			All
Tecticornia pergranulata ssp. pergranulata	Black-seed Samphire				All
Templetonia retusa	Cockies Tongue				All
Tetragonia implexicoma	Bower Spinach				All
Teucrium sessiliflorum	Mallee Germander				All
Thelymitra luteocilium	Yellow-tuft Sun Orchid				All
Thelymitra nuda	Scented Sun Orchid				All
Thelymitra pauciflora	Slender Sun-orchid				All
Threlkeldia diffusa	Coast Bonefruit				All
Trachymene cyanopetala	Purple Trachymene				All
Trachymene ornata var. ornata (NC)	Sponge-fruit Trachymene				All
Tragus australianus	Small Burr-grass				All
Triglochin centrocarpum	Dwarf Arrowgrass				All

Species Name[1]	Common Name	Introduced	EPBC Status	NPW Status	Corridor[2]
Triodia bunicola	Flinders Ranges Spinifex				All
Triodia compacta	Spinifex				All
Triodia lanata	Woolly Spinifex				All
Tulostoma reticulatum	Fungus Species				All
Vittadinia australasica var. australasica	Sticky New Holland Daisy				All
Vittadinia cervicularis var. cervicularis	Waisted New Holland Daisy				All
Vittadinia cuneata var. cuneata	Fuzzy New Holland Daisy				All
Wahlenbergia gracilenta	Annual Bluebell				All
Wahlenbergia preissii	Bluebell species				All
Wurmbea decumbens	Trailing Nancy			R	All
Wurmbea dioica ssp. brevifolia	Early Nancy				All
Zygophyllum apiculatum	Pointed Twinleaf				All
Zygophyllum aurantiacum ssp. aurantiacum	Shrubby Twinleaf				All
Zygophyllum glaucum	Pale Twinleaf				All

[1]NC = Not Current, taxonomic term, often species has been split further into a number of subspecies;
[2]All = records from main corridor, plus borefield and transmission line within 5 km buffer; Not B =records are within main corridor buffer not within borefield, Not TL = records are within main corridor buffer not within transmission line spur study area.

Appendix C: Assessment Type with Easting and Northings (GDA 94, Z53) and Preliminary SEB Condition Rating

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
3	Groundtruthed	4:1	6312037	592612	0.090179	Hambidge
5	Inferred Binocular	4:1	6221718	621709	0.754126	Waretta
7	Groundtruthed	6:1	6311936	577601	0.410571	Koongawa
10	Groundtruthed	8:1	6311953	577176	0.881345	Koongawa
13	Groundtruthed	6:1	6311937	587694	0.414998	Hambidge
17	Groundtruthed	4:1	6248711	622098	1.675843	Wharminda
19	Groundtruthed	6:1	6294354	604128	1.034771	Hambidge
19a	Inferred Binocular	6:1	6293666	604491	0.884918	Hambidge
22	Groundtruthed	6:1	6311871	585803	1.901688	Hambidge
24	Inferred Binocular	6:1	6311947	588164	0.022372	Hambidge
31	Groundtruthed	8:1	6311796	580630	1.729564	Koongawa
32	Inferred Binocular	4:1	6248513	621758	0.391446	Wharminda
36	Inferred Binocular	4:1	6248285	621791	0.339397	Wharminda
40	Groundtruthed	4:1	6312492	595003	2.434257	Hambidge
41	Inferred Binocular	unclassified	6306191	600112	0.288204	Hambidge
43	Inferred Binocular	4:1	6247940	621488	0.404917	Wharminda
45	Groundtruthed	8:1	6311804	584857	5.497951	Hambidge
48	Groundtruthed	6:1	6312008	588635	0.921949	Hambidge
50	Inferred Binocular	4:1	6307494	599336	3.010167	Hambidge
60	Inferred Binocular	4:1	6312268	576156	0.359275	Koongawa
64	Groundtruthed	4:1	6311751	579281	1.286883	Koongawa
65	Groundtruthed	4:1	6311702	580281	1.077853	Koongawa
66	Groundtruthed	4:1	6312077	580671	0.511546	Koongawa

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
68	Groundtruthed	4:1	6311735	581676	0.476452	Koongawa
71	Groundtruthed	4:1	6311857	582693	1.541662	Hambidge
75	Groundtruthed	6:1	6312578	594741	0.429118	Hambidge
76	Groundtruthed	6:1	6312603	594656	0.381653	Hambidge
85	Groundtruthed	6:1	6309720	598081	6.110128	Hambidge
87	Inferred Binocular	4:1	6292818	604060	0.354863	Hambidge
89	Groundtruthed	4:1	6290688	604619	1.539265	Hambidge
90	Inferred Binocular	4:1	6290890	603957	0.17113	Hambidge
91	Inferred Binocular	4:1	6290745	603685	0.105965	Hambidge
92	Inferred Binocular	4:1	6290173	603875	0.185801	Hambidge
93b	Inferred Binocular	4:1	6268419	617636	0.273536	Hambidge
94	Groundtruthed	2:1	6269332	616945	0.521265	Hambidge
95	Groundtruthed	6:1	6263330	620415	1.148374	Hambidge
100	Groundtruthed	8:1	6253380	621860	5.517458	Wharminda
103b	Groundtruthed	6:1	6274614	617027	0.837198	Hambidge
121	Inferred	unclassified	6314848	575740	0.481315	Koongawa
122	Inferred	unclassified	6314329	575936	0.594427	Koongawa
123	Inferred	unclassified	6313918	575825	0.70114	Koongawa
124	Inferred	unclassified	6313388	576140	0.455798	Koongawa
125	Inferred	unclassified	6313327	575802	0.986182	Koongawa
126	Inferred	unclassified	6312690	575986	0.685889	Koongawa
127	Inferred	unclassified	6312467	575633	0.714409	Koongawa
128	Inferred	unclassified	6312141	575915	0.865186	Koongawa
129	Inferred Binocular	2:1	6311743	592078	0.037471	Hambidge
130	Groundtruthed	4:1	6311724	581300	0.375683	Koongawa
131	Groundtruthed	4:1	6311721	583148	0.708286	Hambidge
132	Groundtruthed	4:1	6311721	578791	1.490109	Koongawa

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
133	Groundtruthed	2:1	6311689	593197	0.180854	Hambidge
134	Groundtruthed	4:1	6311685	579784	0.550949	Koongawa
135	Groundtruthed	4:1	6311680	587042	0.480084	Hambidge
136	Groundtruthed	2:1	6311673	582205	0.082505	Koongawa
137	Groundtruthed	4:1	6311647	592692	0.727843	Hambidge
138	Inferred	unclassified	6311469	595948	0.271299	Hambidge
139	Inferred	unclassified	6310802	596922	1.167573	Hambidge
141	Inferred	unclassified	6309302	598550	1.686317	Hambidge
144	Inferred	unclassified	6307657	599433	1.851457	Hambidge
153	Groundtruthed	6:1	6298505	601311	5.795778	Hambidge
154	Inferred Binocular	unclassified	6298192	601809	4.604585	Hambidge
155	Groundtruthed	6:1	6294813	604146	4.206765	Hambidge
156	Inferred	unclassified	6293285	604413	0.605723	Hambidge
157	Inferred	unclassified	6292962	604150	0.470968	Hambidge
158	Inferred	unclassified	6292968	604455	1.004719	Hambidge
160	Inferred	unclassified	6290532	604298	0.29065	Hambidge
161	Inferred	unclassified	6290312	604123	0.16501	Hambidge
162	Inferred	unclassified	6290282	604338	0.002749	Hambidge
163	Inferred	unclassified	6289695	604377	0.193705	Hambidge
164	Groundtruthed	4:1	6287666	604829	0.784975	Hambidge
165	Inferred Binocular	4:1	6286508	604786	0.596516	Hambidge
167	Groundtruthed	4:1	6285190	604940	1.300272	Hambidge
175a	Groundtruthed	6:1	6277006	611497	1.120279	Hambidge
175b	Groundtruthed	4:1	6277074	611269	0.061519	Hambidge
176	Inferred	unclassified	6276422	611591	1.239817	Hambidge
177	Groundtruthed	6:1	6274314	612273	0.206887	Hambidge
178	Inferred Binocular	2:1	6273433	612515	0.621477	Hambidge

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
182b	Groundtruthed	6:1	6266439	618382	0.935725	Hambidge
182c	Groundtruthed	6:1	6264696	619474	0.341635	Hambidge
183	Groundtruthed	8:1	6263865	619928	0.309466	Hambidge
191	Inferred Binocular	unclassified	6233386	621651	0.157962	Wharminda
192	Inferred Binocular	4:1	6233152	621551	0.507461	Wharminda
193	Inferred	unclassified	6231020	620869	1.627497	Wharminda
194	Groundtruthed	2:1	6230670	619624	0.215883	Wharminda
195	Inferred Binocular	2:1	6229676	618911	0.402543	Butler
199	Inferred	unclassified	6225889	619123	0.947285	Butler
201	Inferred	unclassified	6223240	621394	0.068999	Butler
202	Inferred Binocular	4:1	6222995	619760	0.493674	Butler
258	Inferred	unclassified	6278429	610999	4.268845	Hambidge
259	Inferred	unclassified	6278813	611015	2.046709	Hambidge
260	Inferred	unclassified	6279905	610428	1.889274	Hambidge
261	Inferred	unclassified	6262123	621270	0.565683	Wharminda
262	Inferred	unclassified	6260970	622150	0.231042	Wharminda
263	Inferred	unclassified	6252696	622245	1.34484	Wharminda
267	Inferred	unclassified	6278991	611197	0.0004	Hambidge
269	Inferred	unclassified	6280673	609754	2.795311	Hambidge
270	Inferred	unclassified	6281260	608972	1.303381	Hambidge
273	Inferred	unclassified	6282415	607718	2.116199	Hambidge
362	Inferred	unclassified	6257197	622406	0.520953	Wharminda
377	Inferred	unclassified	6315693	573382	1.070384	Koongawa
378	Inferred	unclassified	6315607	573925	0.768761	Koongawa
379	Inferred	unclassified	6315539	574451	0.227053	Koongawa
380	Inferred	unclassified	6315531	574984	0.438749	Koongawa
381	Inferred	unclassified	6315575	575343	0.884628	Koongawa

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
383	Groundtruthed	2:1	6311604	590737	0.02734	Hambidge
385	Inferred	unclassified	6304866	600230	0.456705	Hambidge
386	Inferred	unclassified	6303515	600653	2.4296	Hambidge
387	Inferred	unclassified	6302743	600464	1.225664	Hambidge
388	Inferred	unclassified	6302688	600191	1.130828	Hambidge
389	Inferred	unclassified	6300913	600557	0.941228	Hambidge
391	Inferred	unclassified	6299730	600806	0.151787	Hambidge
392	Inferred	unclassified	6284206	606064	1.09981	Hambidge
393	Inferred	unclassified	6281778	608643	0.836512	Hambidge
394	Inferred	unclassified	6245905	621894	0.229565	Wharminda
395	Inferred	unclassified	6234192	622293	0.380411	Wharminda
396	Inferred	unclassified	6228566	618846	0.049702	Butler
397	Inferred	unclassified	6226559	618963	2.273123	Butler
399	Inferred	unclassified	6224930	619979	0.602926	Butler
400	Inferred	unclassified	6276547	612408	0.425668	Hambidge
401	Inferred	unclassified	6276230	612702	0.141231	Hambidge
402	Inferred	unclassified	6274365	616274	1.170585	Hambidge
403	Inferred	unclassified	6274030	617059	0.244893	Hambidge
404	Inferred	unclassified	6274120	617227	0.931155	Hambidge
406	Inferred	unclassified	6273068	619359	0.428932	Hambidge
407	Inferred	unclassified	6272939	620235	1.028207	Hambidge
408	Inferred	unclassified	6272245	620991	0.560778	Hambidge
411	Inferred	unclassified	6272129	622654	0.174239	Cleve
418	Inferred	unclassified	6271679	627354	0.621143	Cleve
419	Inferred	unclassified	6271664	628409	0.734658	Cleve
423	Inferred	unclassified	6271788	629131	0.282214	Cleve
427	Inferred	unclassified	6282924	594400	0.108201	Hambidge

Vegetation Patch ID No.	Assessment Type[1]	Preliminary SEB[2]	Northing	Easting	Hectares[3]	IBRA Association
428	Inferred	unclassified	6283339	595436	0.124311	Hambidge
429	Inferred	unclassified	6283626	596029	0.065123	Hambidge
430	Inferred	unclassified	6283725	597245	0.33242	Hambidge
431	Inferred	unclassified	6283714	598682	0.114906	Hambidge
432	Inferred	unclassified	6283926	599522	0.079383	Hambidge
433	Inferred	unclassified	6285047	601026	0.148502	Hambidge
434	Inferred	unclassified	6285543	601386	0.193963	Hambidge
435	Inferred	unclassified	6283591	597668	0.070924	Hambidge
436	Inferred	unclassified	6285547	601549	0.064647	Hambidge
437	Inferred	unclassified	6285531	601509	0.047561	Hambidge
438	Inferred	unclassified	6285316	601882	0.067367	Hambidge
439	Inferred	unclassified	6285545	602073	0.075319	Hambidge
440	Inferred	unclassified	6285687	602148	0.187378	Hambidge
441	Inferred	unclassified	6285828	602814	0.296599	Hambidge
442	Inferred	unclassified	6285374	603927	0.268682	Hambidge
443	Inferred	unclassified	6285099	606089	1.593913	Hambidge

[1]Method of assessment: groundtruthed in field during 2011 and 2012 surveys; inferred from field assessment (with Binoculars in field / and or based on spatial relation to similar patches that had been groundtruthed).; inferred based on DEWNR 2004 Dominant_S categorisation

[2] As groundtruthed in 2011-2012 rapid spring / summer assessments; based on DLWBC 2005 SEB condition ratings

[3]Hectares of vegetation within the study area, not total patch size.

Appendix D: Study Area Photos

Photos of groundtruthed and / or inferred via binocular vegetation patches that occur along the infrastructure corridor

Patch #	Patch Details		
3	Vey Open Mallee over *Melaleuca uncinata* with very sparse *Triodia* and *Sisymbrium* sp. Left photo 223 (2011 survey) Right photo 3274 (2012 survey, facing North)		
17	Open Mallee Shrubland of *E. incrassata +/- Melaleuca uncinata, M. lanceolata* Left photo 3184 (from representative patch 360) Right photo 155 (from representative patch 360, waypoint 098)		
19	Mallee *E. socialis, E. leptophylla, E. brachycalyx*. Left photo 3311 (facing east) Right photo 3310 (facing north)		
19	Quarry / *Melaleuca uncinata* shrubland Left photo 3314 (facing northwest) Right photo 3312 (facing southwest)		

Patch #	Patch Details		
19a	Mallee *E. socialis, E. leptophylla, E. brachycalyx*. Left photo 3316 (facing north) Right photo 3317 (facing east) Other photos: 3318S, 3317E, 3319W		
31	Open Mallee *Eucalyptus brachycalyx, E. oleosa ssp., +/- E. incrassata, E. socialis* Condition 6:1 or 8:1. Left photo 3226 (facing east) Right photo 3237 (facing nearby Hambidge WPA from boundary fence) Other photos: 3235N, 3238W		
60	Low Open Mallee over small *Triodia sp*. Surrounded by sheep grazing (Dune Crest Mallee) Photo 202 facing north taken from northern access track of Hambidge WPA.		
64	*Melaleuca* shrubland with emergent *E. incrassata, E. leptopylla* mallee Left photo 3223 (facing north) Right photo 3224 (facing east) Other photos: 3225S, 3226W		

Patch #	Patch Details		
65	*E. brachycalyx, E. incrassata, E. socialis + E. leptophylla* Open Mallee Left photo 3231 (facing north) Right photo 3224 (facing west) Other photos: 3233S at Hambidge, 3232E		
68	Open Low Mixed Mallee *E. brachycalyx, E. incrassata, E. socialis, E. leptophylla* Left photo 3247 (facing north) Right photo 3250 (facing west) Other photos: 3249S at Hambidge, 3248E 3250W		
85	Mixed mallee *E. calcareana, E. leptophylla over Melaleuca uncinata* Left photo 227 (85b) Right photo 228 (85a paddock patch, greater edge effects)		
7, 13, 66	Open Mallee to Low Mallee of *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla*. Located north of northern boundary /fire track of Hambidge WPA Left photo 208 (patch 7, facing north). Right photo 215 (patch 66, facing north east).		

Patch #	Patch Details		
89	Mallee *E. leptophylla, E. incrassata* Left photo 244 (facing west) Right photo 246 (facing south) Other photo 245 (close up of *M. uncinata*)		
90	Mixed Mallee with *Melaleuca* dominated shrubland Left photo 247 (2011 survey, facing south) Photo taken from patch of vegetation closest to the road, intersected patch is further south within paddock		
95	Mallee of *E. socialis, E. rugosa, E. incrassata* over *M. lanceolata* Left photo 163 Right photo 164 looking down existing rail track south		
100	Mallee *E. brachycalyx, E. leptophylla* over *M. uncinata*. Condition 8:1 Left photo 158 (within patch, potential habitat for threatened bird species. Right photo 157 –Hakea spp.		

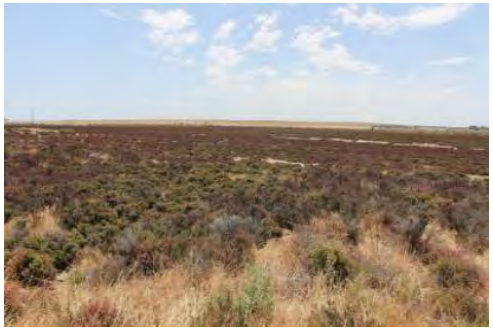
Patch #	Patch Details		
71, 40	Very Open Mallee to Mallee *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla, + E. calcareana, +/- Callitris* Left photo 226 (facing north to east from roadside) Right photo 216 (*Callitris* spp.)		
32, 36, 43	Open Mallee *E. incrassata* Photos of patch 32, representative of patch 36 and patch 43: Left photo (Patch *32)* 3399 *(*facing wsw) Right photo (Patch 32) 3396 *(*facing wsw) Other photos: 3398, 3397, all wsw direction (bino assessment)		
10, 22, 45, 48	Open Mallee to Mallee *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla.* Located north of northern boundary track of Hambidge WPA Left photo 218 (patch 45, facing north, note onion weed in foreground) Right photo 204 (patch 10, facing north)		
129	Very open mallee with *M. uncinata* tall shrubland Located north of northern boundary /fire track of Hambidge WPA Left photo 3267 (zoom in, facing north Right photo 3268 (facing north)		

Patch #	Patch Details		
130	Open Low Mallee *E. incrassata* Left photo 3243 (facing north, at fence boundary) Right photo 3244 (facing east, at fence boundary) Other photos: 3245S at park, 3246W		
131	Highly disturbed paddock with scattered shrubs, emergent Eucalypts Left photo 3252 (facing northwest, at fence boundary) Right photo 3253 (facing northeast, at fence boundary)		
132	Open Mallee *E. brachycalyx, E. incrassata, E. socialis /- E. leptophylla* Left photo 3219 (facing north, from within edge of patch) Right photo 3221 (facing south towards Hambidge) Other photos: 3220E, 3222W		
133	Very Open Malee *E. brachycalyx, E. incrassata, E. socialis /- E. leptophylla* Left photo 3279 (facing east) Right photo 3278 (facing north) Other photos: 3280S, 3281W		

Patch #	Patch Details		
134	Very Open Low Mallee *E. incrassata* Located north of northern boundary /fire track of Hambidge WPA Left photo 3227 (facing north from fenceline) Right photo 3230 (facing west from fenceline) Other photos: 3229S,3228E		
135	Very Open Mallee *E. leptophylla* Located north of northern boundary /fire track of Hambidge WPA Left photo 3260 (facing north) Right photo 3258 (facing west from fenceline) Other photo: 3259 (east)		
136	Very Open Mallee *E. brachycalyx, E. incrassata, E. socialis, E. leptophylla* Photo 3251 (facing north from fenceline of Hambidge WPA northern fire track)		
137	Open Mallee *E. incrassata* Located north of northern boundary /fire track of Hambidge WPA Left photo 3270 (facing north) Right photo 3273 (facing west along fire track) Other photos: 3272S, 3271E		

Patch #	Patch Details		
153, 154	Mixed Mallee *E. incrassata, E. leptophylla* over *Melaleuca* shrubland (patch 153) Paddock patch (154) is dunecrest mallee. Left photo 3302 (facing north from main road, patch 153, similar vegetation to inferred paddock patch 154) Right photo 3303 (facing east, patch 153 as per above)		
155	Mallee *E. brachycalyx, E. incrassata, E. oleosa, E. socialis* Left photo 3309 (facing west) Right photo 3306 (facing north) Other photos: 3308S, 3309W		
164	Mallee *E. calcareana, E. leptophylla* Left photo 3320 (facing north) Right photo 3321 (facing east) Other photos: 3322S, 3323W		
167	Very Open Mallee *E. oleosa* Left photo.3324 (facing north) Right photo 3325 (facing east) Other photos: 3326S, 3327W		

Patch #	Patch Details		
175a	Mallee Woodland *E. incrassata, E. leptophylla*. Called "roadside" in field. Left photo 3347 (facing north) Right photo (facing west) Other photos: 3349S, 3348E,		
175b	Mallee Woodland *E. incrassata, E. leptophylla,* "paddock" vegetation. Left photo 3353 (facing north) Right photo 3352 (facing south west) Other photo: 3351S		
177	Mallee Woodland *E. incrassata, E. leptophylla* Taken from NE of intersection close to patch: Left photo 3354 (facing north northeast) Right photo 3355 (facing eastsoutheast) Other photo: 3356W		
178	Revegetation, various species Left photo 3357 (facing east) Right photo 3358 (facing south east)		

Patch #	Patch Details		
182b	Mallee *E. incrassata, E. leptophylla, E. oleosa* Understorey of native grasses and Chenopods. Diversity varies along patch. Left photo 3371 (facing north) Right photo 3372 (facing east)		
182c	Mallee *E. incrassata, E. leptophylla, E. oleosa* Left photo 3375 (facing south) Right photo3374 (facing southeast) Other photos: 3373N, 3376W		
183	Open mallee woodland *E. peninsularis* + *E. incrassata* + *E. phenax*. Triangular patch avoided by alignment. Condition 8:1 (low weeds, higher diversity) Left photo 3379 (facing south towards large triangle patch at intersection that is avoided). Right photo 3380 (facing west) Other photos: 3377N, 3378E,		
191	*Tecticornia pergranulata* low open shrubland (representative photos taken nearby – waypoint 387). Left photo 3176 (facing north) Right photo 3179 (facing west) Other photos: 3177E, 3178S, 3175 (weed)		

Patch #	Patch Details		
192	Low Samphire/Chenopod flat fringed with *Melaleuca uncinata / lanceolata* shrubland and Nitre Bush Left photo 3406 (facing north) Right photo 3407 (facing north) Other photos: 3405, 3408 all facing north		
194	Open Mallee Woodland *E. incrassata, E. oleosa* Left photo 3170 (facing west, note Boxthorn weed). Right photo 3174 (facing north)		
383	Very sparse Lomandra shrubland Left photo 3265 (facing north west) Right photo 3266 (facing west, track on the left is Hambidge WPA northern access track)		

Other photo = other photos were taken, but are not shown here.

Appendix E: Rapid Vegetation Patch Assessment

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
GROUNDTRUTHED					
3	Very Open Mallee with *M. uncinata* shrubland over very sparse *Triodia*	*Melaleuca uncinata*	*Sisymbrium orientale** and very sparse *Triodia spp.*	Hambidge	5
7	Open Mallee *Eucalyptus brachycalyx, E. incrassata, E. socialis + E. leptophylla*	*Melaleuca uncinata* ± *M. lanceolata,* ± *Callitris*	*Triodia* spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia spp.,* ± *Podolepis capillaris*	Koongawa	5.1
10	Mallee *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla*	*M. uncinata* ± *M. lanceolata,* ± *Callitris*	Triodia spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia spp.,* ± *P. capillaris*	Koongawa	5.1
13	Mallee *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla*	*M. uncinata* ± *M. lanceolata,* ± *Callitris*	*Triodia* spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia spp.,* ± *P. capillaris*	Hambidge	5.1
17	Open Mallee Shrubland *E. incrassata*	*M. uncinata, M. lanceolata, Pittosporum angustifolium, Nitraria billardierei*	*Rhagodia candolleana* ssp. *candolleana., Carpobrotus rossii, Austrodanthonia spp., Lepidosperma*	Wharminda	5.1
19	Mallee *E. socialis, E. leptophylla, E. brachycalyx*	*M. uncinata, M. lanceolata*	*Triodia, Austrostipa* spp., *Austrodanthonia* spp., *Lepidosperma viscidum*	Hambidge	5.2
22	Open Mallee *E. brachycalyx, E. incrassata, E. socialis + E. leptophylla*	*M. uncinata* ± *M. lanceolata,* ± *Callitris*	Triodia spp. ; + *Lepidosperma* sp., *Austrostipa spp.,* *Austrodanthonia spp.,* ± *P. capillaris*	Hambidge	5.1
31	Open Mallee *E. brachycalyx*, *E. oleosa*	*M. uncinata* closed shrubland + *Callitris*	*Enchylaena tomentosa, Triodia irritans*	Koongawa	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
	ssp.	*verrucosa* + *Santalum acuminatum*			
40	Open Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*, + *Eucalyptus calcareana*	*M. uncinata* + *C. verrucosa*	*Triodia sp.*	Hambidge	5.1
45	Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata* ± *M. lanceolata*, ± *Callitris*	*Triodia* spp. + *Lepidosperma* sp., *Austrostipa spp., Austrodanthonia spp.*, ± *P. capillaris*	Hambidge	5.1
48	Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata* ± *M. lanceolata*, ± *Callitris*	*Triodia* spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia* spp., ± *P. capillaris*	Hambidge	5.1
64	*Melaleuca* Tall Shrubland with emergent *E. incrassata, E. leptopylla*	*Melaleuca sp.* and *Callitris*	*R. candolleana, Helichrysum leucopsidium*	Koongawa	5.1
65	Open Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*Melaleuca uncinata*	*Dianella revoluta, Vittadinia, C. rossii, H. leucopsidium, Austrodanthonia caespitosa, R. candolleana* ssp. *candolleana.,*	Koongawa	5.1
66	Open Mixed Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata* ± *M. lanceolata*, ± *Callitris*	*Triodia* spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia* spp., ± *P. capillaris*	Koongawa	5.1
68	Open Low Mixed Mallee *E. brachycalyx, E. incrassata, E. socialis, E. leptophylla*	*M. uncinata* shrubland + *C. verrucosa*	*T. irritans*	Koongawa	5.1
71	Open Mixed Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla* + *E. calcareana*	*M. uncinata* ± *C. verrucosa*	*Triodia* to sparse *Triodia*	Hambidge	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
75	Mallee *E. calcareana*, with mixed shrubland	*Acacia merrallii, M. lanceolata, Grevillea* sp.	*E. tomentosa*	Hambidge	5.2
76	Mallee *E. calcareana*, with mixed shrubland	*A. merrallii, M. Lanceolata, Grevillea sp.*	*E. tomentosa*	Hambidge	5.2
85	Mixed mallee with *Melaleuca* dominated shrubland and grassy understorey, *E. calcareana, E. leptophylla*	*M. uncinata*	*E. tomentosa, Austrostipa sp.* diversity in understorey, leaf litter. Impacts from road dust, cropping, *Sisymbrium** and Indian head mustard*. Patch was divided into a and b. Part a is in alignment more edge effects (SEB 4:1), part b is adjacent corridor (SEB 6:1).	Hambidge	5
89	Mallee *E. leptophylla, E. incrassata* with mixed shrubland	*M. uncinata* ± *M. lanceolata* ± *Callitris*	*E. tomentosa, Maireana brevifolia, - Triodia*	Hambidge	5.1
94b	Revegetation (Very Open Mallee shrubland & Blue gum woodlot) *E. socialis, E. leucoxylon*	*M. uncinata*	*Vittadinia*	Hambidge	NA
94a (poor qual)	Very Open Low Mallee *E. incrassata, E. leptophylla, E. oleosa*	*M. uncinata, + M. lanceolata*	*E. tomentosa, M. brevifolia*	Hambidge	5
95	Mallee *E. socialis, E. phenax subsp. phenax, E. incrassata*	*M. lanceolata, Acacia wilhelmiana*	*E. tomentosa, C. rossii, Sclerolaena uniflora, Threlkeldia diffusa*	Hambidge	5.2
100	Mallee *E. phenax subsp. phenax, E.*	*M. uncinata, Allocasuarina (small*	*L. viscidum, Dodonaea baueri*	Wharminda	5.2

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
	leptophylla	*sandy), Cassytha melantha*			
103b	Open Mallee *E. leptophylla, E. incrassata, E. socialis, E. calycogona*	*M. uncinata*	*Triodia sp., Austrodanthonia sp., Avena sp., Lactuca, Asphodelus, Carrichtera annua.*	Hambidge	5.2
130	Open Low Mallee *E. incrassata*	*Melaleuca* shrubland + *Santalum acuminatum*	*T. irritans, A. caespitosa, Baeckea crassifolia*	Koongawa	5.1
131	absent (disturbed), scattered paddock trees (*E. incrassata, E. leptophylla*)	*M. uncinata*	Exotic grasses	Hambidge	5.1
132	Open Mallee *E. brachycalyx*, *E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata*	*T. irritans, E. tomentosa, Chrysocephalum apiculatum, L. viscidum, Vittadinia* sp.	Koongawa	5
133	Very Open Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata*	Sparse *T. irritans, Sisymbrium* sp.	Hambidge	5
134	Very Open Low Mallee *E. incrassata*	*M. uncinata*	*D. revoluta, Triodia, Vittadinia, C. rossii, H. leucopsidium, A. caespitosa, R. candolleana* ssp. *candolleana*	Koongawa	5.2
135	Very Open Mallee *E. leptophylla*	Melaleuca spp.	*Triodia irritans, Lomandra effusa*	Hambidge	5
136	Very Open Mallee *E. brachycalyx, E. incrassata, E. socialis, E. leptophylla*		*R. candolleana* ssp. *candolleana., Sisymbrium orientale**	Koongawa	5
137	Open Mallee *E. incrassata*	*M. uncinata* shrubland	*T. irritans*	Hambidge	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
153	Mixed Mallee, *E. calcareana, E. incrassata, E. oleosa, E. socialis*	*M. Uncinata, M. Lanceolata*	*Rhagodia sp., Triodia sp. and E. tomentosa*	Hambidge	5
155	Mallee *E. brachycalyx, E. incrassata, E. oleosa, E. socialis*	*M. uncinata* shrubland + *M. lanceolata*	*T. irritans, E. tomentosa, L. viscidum*	Hambidge	5.1
164	Mallee *E. calcareana*, *E. leptophylla*	*M. uncinata*	*E tomentosa, M brevifolia*	Hambidge	5.2
167	Very Open Mallee *E. oleosa*	*M. uncinata*	*E tomentosa, M brevifolia*	Hambidge	5
175a	Mallee *E. incrassata*, *E. leptophylla*	*M. uncinata* shrubland + *M. lanceolata, + Exocarpus aphyllus*	*E tomentosa, M brevifolia*	Hambidge	5.2
175b	Mallee *E. incrassata*, *E. leptophylla*	*M. uncinata* shrubland + *M. lanceolata*	*E. tomentosa, M. brevifolia*	Hambidge	5.2
177	Mallee *E. incrassata*, *E. leptophylla*	*M. uncinata* shrubland + *M. lanceolata*	*E. tomentosa, D. revoluta, L viscidum, M. brevifolia*	Hambidge	5.2
182b	Mixed mallee of *E. incrassata, E. leptophylla, E. calcareana, E. socialis*	*M. uncinata, + M. lanceolata*	*E. tomentosa, M. brevifolia, Threlkeldia diffusa, Austrodanthonia, Avena*, Sisymbrium*, Mesembryanthemum **	Hambidge	5.1
182c	Mallee *E. incrassata, E. leptophylla, E. oleosa*	*M uncinata, + M. lanceolata*	*E. tomentosa, M. brevifolia*	Hambidge	5.1
183	Open Mallee *Eucalyptus peninsularis + E. incrassata + Eucalyptus phenax*	*M. lanceolata, P. angustifolium, Grevillea huegellii*	*M. brevifolia, , T. diffusa, T. irritans*	Hambidge	5.2
194	Open mallee woodland *E. incrassata, E.*	*M. uncinata + Lycium ferocissimum**	*E. tomentosa, Mesembryanthemum crystallinum*,*	Wharminda	5

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
	oleosa		*Galenia pubescens* var. *pubescens**		
383	Sparse *Lomandra* shrubland		*Lomandra* sp.	Hambidge	5
INFERRED (Binocular assessment and proximity)					
5[1]	Mallee *E. gracilis* over *Melaleuca* shrubland	*Melaleuca lanceolata* ± *P. angustifolium*	*E. tomentosa*	Waretta	11.1
19a	Mallee *E. socialis, E. leptophylla, E. brachycalyx*	*M. uncinata, M. lanceolata*	*Triodia, Austrostipa* spp., *Austrodanthonia* spp., *L. viscidum*	Hambidge	5.2
24	Mallee *E. brachycalyx, E. incrassata, E. socialis* + *E. leptophylla*	*M. uncinata* ± *M. lanceolata,* ± *Callitris sp.*	*Triodia* spp. ; + *Lepidosperma* sp., *Austrostipa* spp., *Austrodanthonia spp.,* ± *P. capillaris*	Hambidge	5.1
32	Open Mallee shrubland, *E. incrassata*	*M. uncinata, M. lanceolata, Santalum acuminatum, N. billardierei*	*R. candolleana ssp. candolleana., C. rossii, , Austrodanthonia* spp., *Lepidosperma* sp.	Wharminda	5.1
36	Open Mallee shrubland, *E. incrassata*	*M. uncinata, M. lanceolata, Santalum acuminatum, N. billardierei,*	*R. candolleana* ssp. *candolleana, C. rossii, Austrodanthonia spp., Lepidosperma* sp.	Wharminda	5.1
41	*E. incrassata*+/-*E. leptophylla* mid mallee woodland			Hambidge	5
43	Open Mallee Shrubland *E. incrassata*	*M. uncinata, M. lanceolata, Santalum acuminatum, N. billardierei*	*R. candolleana ssp. candolleana., C. rossii, , Austrodanthonia* spp., *Lepidosperma* sp.	Wharminda	5.1
50	Mixed Mallee with Melaleuca dominated shrubland and grassy	*Melaleuca sp.*		Hambidge	5

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
	understorey				
60	Low Open Mallee Woodland	*M. uncinata*	*Triodia sp.*	Koongawa	5
87	Mallee *E. socialis, E. leptophylla, E. brachycalyx*	*M. uncinata, M. lanceolata*	*Triodia, Austrostipa* spp., *Austrodanthonia* spp., *L. viscidum*	Hambidge	5.2
90	Mixed Mallee with *Melaleuca* dominated shrubland, *E leptophylla*, *E. incrassata*, + *Callitris*	*M. uncinata*	*E. tomentosa, Sonchus*, Avena**, no *Triodia.* Grazing and cropping impacts.	Hambidge	5.1
91	Mixed Mallee with *Melaleuca* dominated shrubland, *E leptophylla*, *E. incrassata*, + *Callitris*	*M. uncinata*	*No Triodia*	Hambidge	5.1
92	Mixed Mallee with *Melaleuca* dominated shrubland, *E leptophylla*, *E. incrassata*, + *Callitris*	*M. uncinata*	*No Triodia*	Hambidge	5.1
93b	Low Open Mallee *E. incrassata, E. leptophylla, E. oleosa*	*M. uncinata, + M. lanceolata*	*E. tomentosa, M. brevifolia*	Hambidge	5
129	Very Open Mallee with *M. uncinata* tall shrubland	*M. uncinata*	Likely similar understorey to patch 73, 74, 137, including *Sisymbrium, Avena, Asphodelus*	Hambidge	5
154	Mixed Mallee, *E. calcareana, E. incrassata, E. oleosa, E. socialis*	*M. Uncinata, M. Lanceolata*		Hambidge	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
165	Very Open Mallee *E. oleosa*	*M. uncinata*		Hambidge	5
178	Revegetation, various species	*M. uncinata*		Hambidge	n/a
191	*Tecticornia pergranulata* Low Open Shrubland		*Tecticornia pergranulata*	Wharminda	13
192	Low Samphire / Chenopod flat fringed with *Melaleuca* shrubland and *N. billardieria*	*M. uncinata* shrubland + *M. lanceolata* + *N. billardieria*	*Tecticornia* sp., *Maireana* sp.	Wharminda	13
195	Very Open Low Mallee Woodland *E. incrassata*	*M. uncinata*	Highly disturbed	Butler	5
202	Open Mallee *E. brachycalyx*	*M. uncinata +Acacia entercorpa potential (given proximity to 98[a])*	*Maireana brevifolia*	Butler	11
INFERRED (aerial and proximity only)[1]					
121 - 128	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Koongawa	5.1
138	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland		Appears same as 75, 76	Hambidge	11.1 or 5.2
139	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee			Hambidge	11.1 or 5.2

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
	Woodland				
141	*Eucalyptus brachycalyx, E. oleosa* ssp. Very Low Mallee Woodland			Hambidge	5
144	*Eucalyptus incrassata, E. socialis* ssp. Very Low Mallee Woodland			Hambidge	5.1
156 - 158, 160 - 163, 176	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland	160 likely same 89, 90, 91, 92	160 likely same 89, 90, 91, 92	Hambidge	5.1
193	*Gramineae sp.,Lomandra sp., Lepidosperma viscidum, Gahnia lanigera* Tussock Grassland			Wharminda	13
199	*Maireana oppositifolia,Atriplex paludosa ssp. cordata, Lycium australe* Open Shrubland			Butler	11
201	*Eucalyptus oleosa ssp*. Very Low Mallee Woodland			Butler	
258-260	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
261-262	*Eucalyptus peninsularis+/-E. incrassata+/-E. phenax ssp.+/-E. calcareana +/-E. calycogona* ssp. Very Low Mallee Woodland			Hambidge	5
263	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Wharminda	5 or 8
267, 269, 270, 273	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5
362	*Eucalyptus calcareana+/- E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Wharminda	5, 8 or 11
377-381, 385-388	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Koongawa	
389	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Hambidge	5, 8 or 11
391	*Melaleuca uncinata* Tall Open Shrubland			Hambidge	5

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
392	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5
393	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Wharminda	5.2
394	*Melaleuca uncinata* Tall Open Shrubland			Wharminda	5
395	*Eucalyptus socialis ssp.+/-E. leptophylla+/-E. phenax* ssp. Very Low Mallee Woodland			Butler	11 or 5.2
396	*Eucalyptus diversifolia ssp. diversifolia+/-E. incrassata+/-E. leptophylla+/-E. peninsularis* Very Low Mallee Woodland			Butler	11.2
397	*Eucalyptus incrassata+/- E. calcareana +/-E. gracilis* Very Low Mallee Woodland			Butler	11 or 5
399	*Eucalyptus incrassata+/- E. calcareana +/-E. gracilis* Very Low Mallee Woodland			Hambidge	11or 5
400-401	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5
402	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Hambidge	5.2 or 11

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
403-404	*Eucalyptus incrassata+/-E. leptophylla* mid mallee woodland			Hambidge	5
406	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Hambidge	5.2 or 11
407-408	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5
411	*Eucalyptus phenax ssp., E. oleosa* ssp. Very Low Mallee Woodland			Cleve	5.2
418	*Eucalyptus calcareana+/-E. socialis ssp.+/-E. yalatensis* Very Low Mallee Woodland			Cleve	5.2 or 11
419	*Eucalyptus oleosa* ssp. Very Low Mallee Woodland			Cleve	5
423	*Eucalyptus oleosa* ssp. Very Low Mallee Woodland			Cleve	5
427	*Eucalyptus incrassata, E. socialis* ssp. Very Low Mallee Woodland			Hambidge	5.1
428	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5.1

Patch No.	Broad Habitat Type & Dominant Overstorey Species	Key Shrubs	Key Understorey	IBRA Region	EP Type[2]
429-430	*Eucalyptus incrassata, E. socialis* ssp. Very Low Mallee Woodland			Hambidge	5.1
431-433	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5.1
434	*Eucalyptus phenax ssp., E. leptophylla* Very Low Mallee Woodland			Hambidge	5.2
435	*Eucalyptus incrassata, E. socialis* ssp. Very Low Mallee Woodland			Hambidge	5.1
436	*Eucalyptus incrassata +/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5.1
437	*Eucalyptus phenax ssp., E. leptophylla* Very Low Mallee Woodland			Hambidge	5.2
438-440	*Eucalyptus incrassata+/-E. leptophylla* Very Low Mallee Woodland			Hambidge	5.1, 5.2
441-443	*Eucalyptus phenax ssp., E. oleosa* ssp. Very Low Mallee Woodland			Hambidge	5.2

[1]Based on DEWNR florisitic vegetation, mid mallee woodland has been supplemented with Very Low Mallee Woodland to align with Heard and Channon 1997;
[2]EP Vegetation Community Type as per Milne *et al*. 2008; community types vary with depth and type of soil and intergrade throughout the region
[3] IBRA vegetation association region

Appendix F: Higher Resolution Vegetation Condition Assessment Maps

F1 southern end of corridor to F7 northern end of corridor

Figure F-1 Native Vegetation Patches and Preliminary Condition Scores

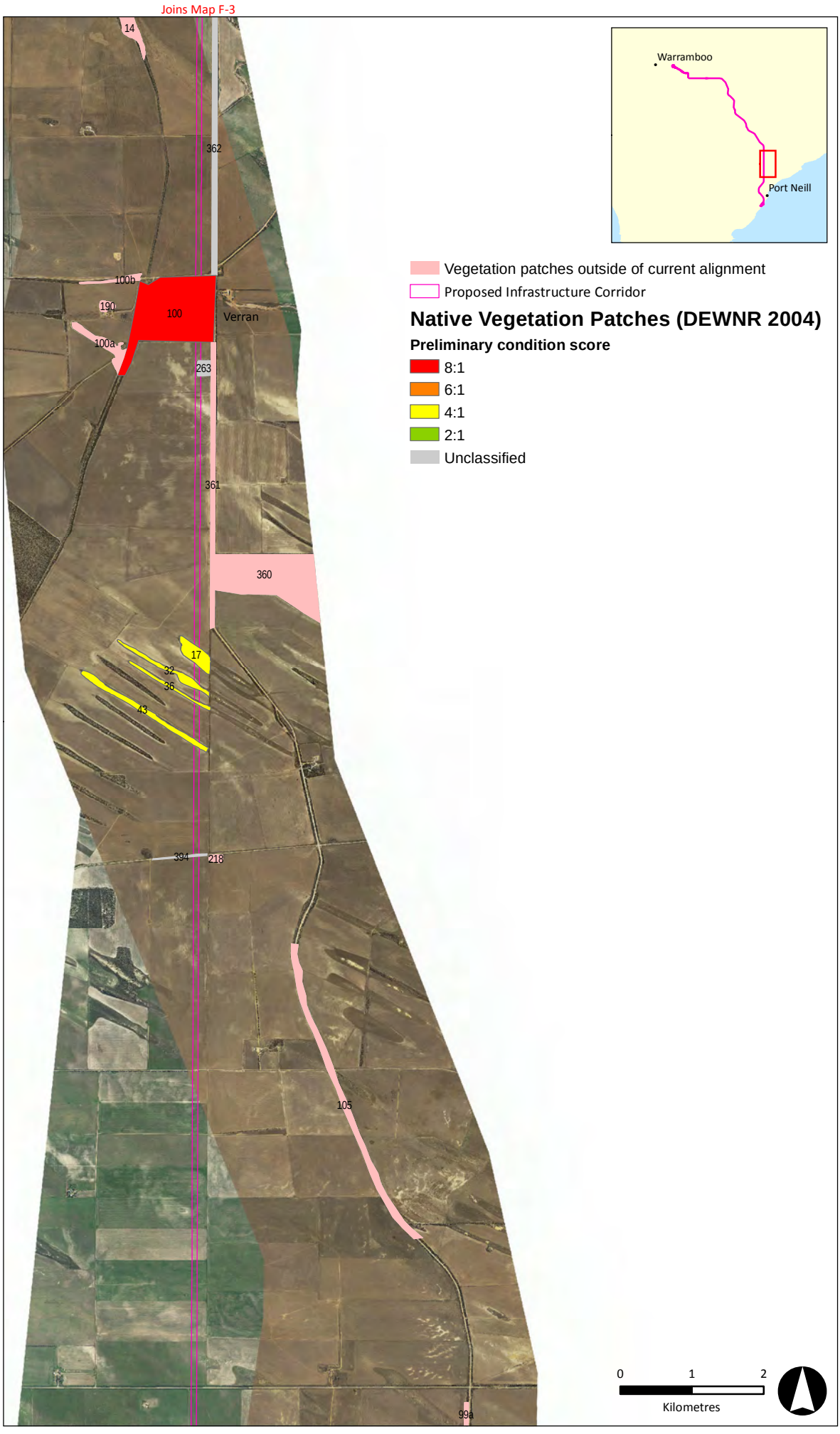


Figure F-2 Native Vegetation Patches and Preliminary Condition Scores

Monday, 23 June 2014 10:33:27 AM Immoore
I:\VESA\Projects\VE23730\Technical\Spatial_Data\ArcGIS\Infrastructure Corridor Ecology\ReportMaps\Figure F-2 Native Vegetation Patches and Preliminary Condition Scores.mxd

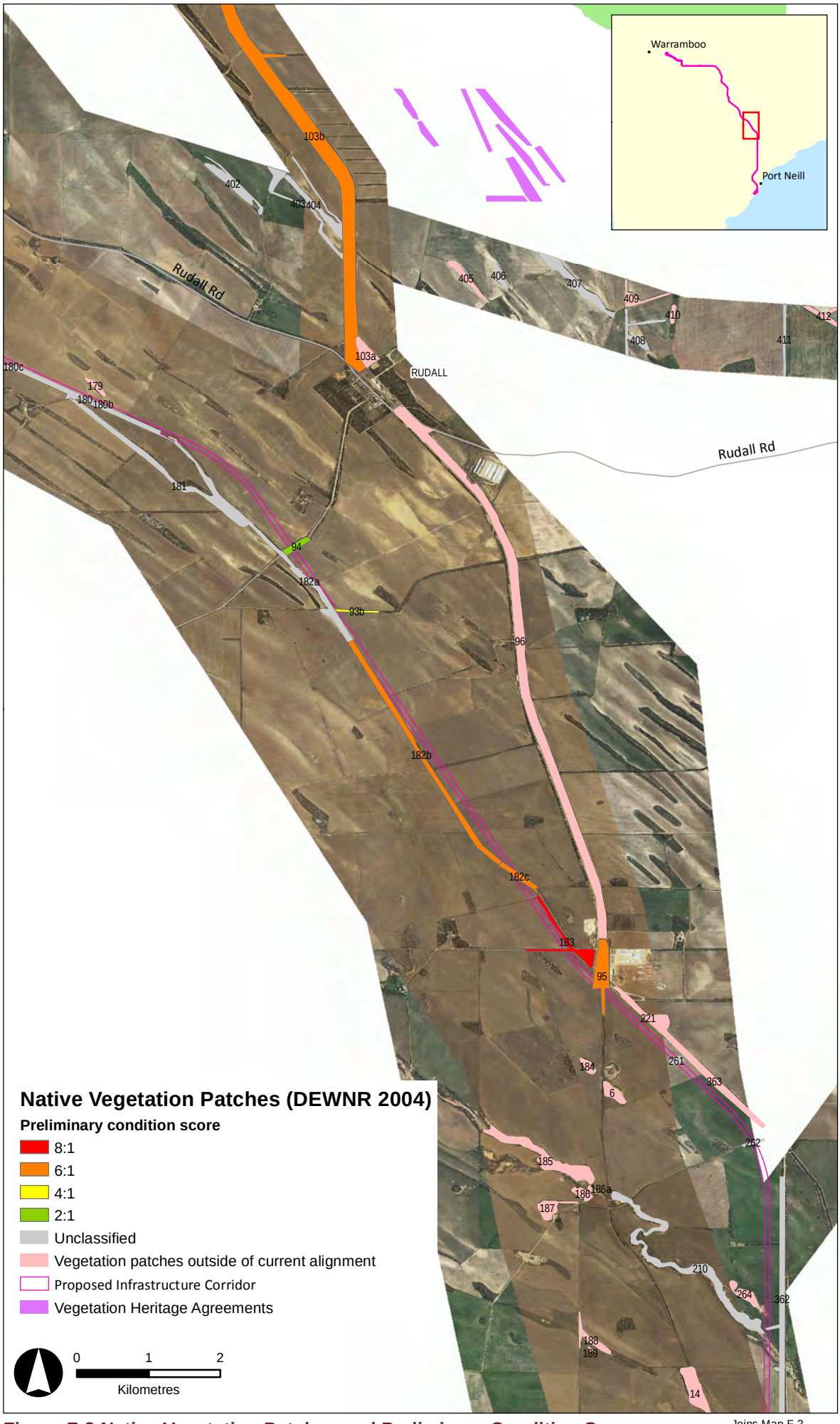


Figure F-3 Native Vegetation Patches and Preliminary Condition Scores

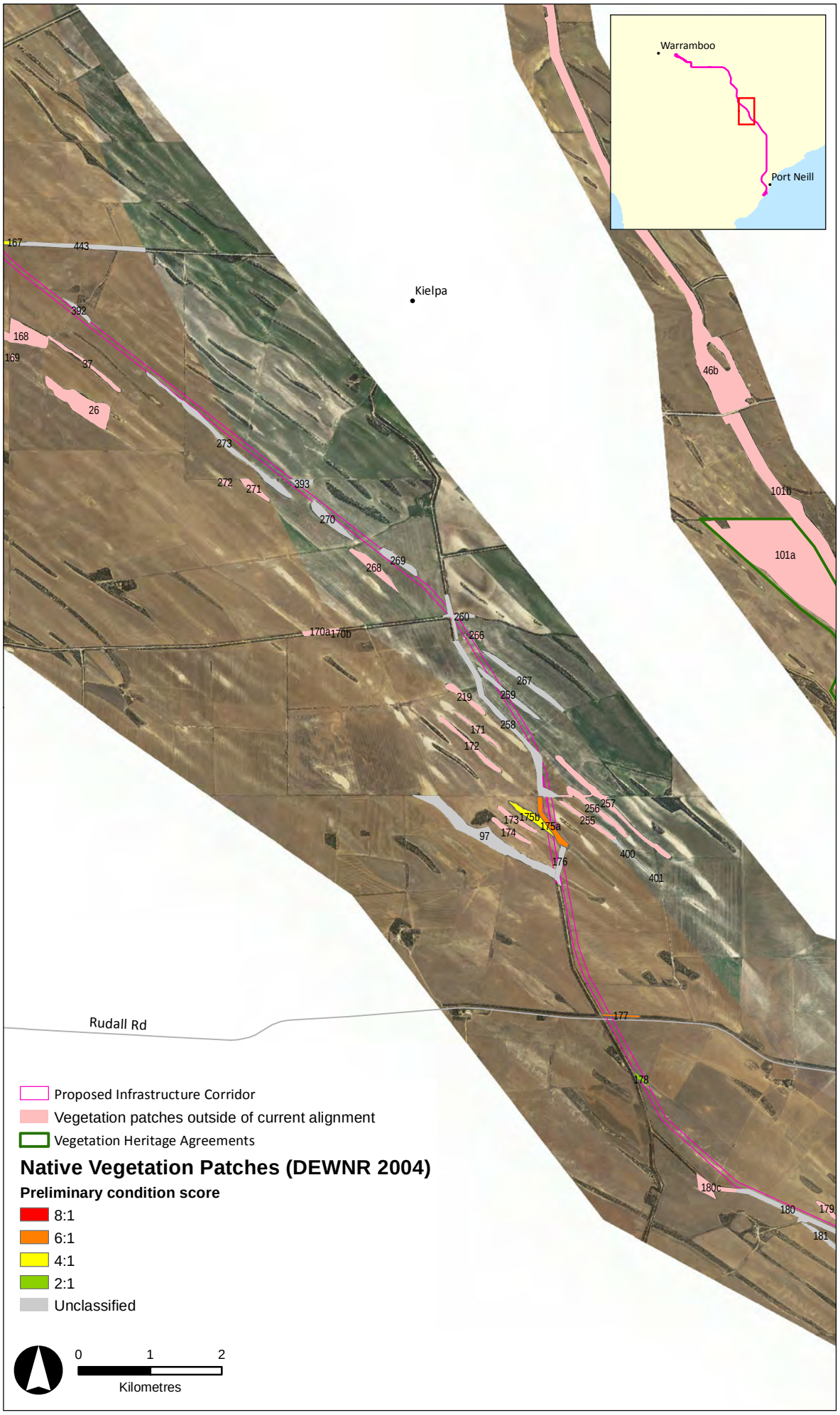
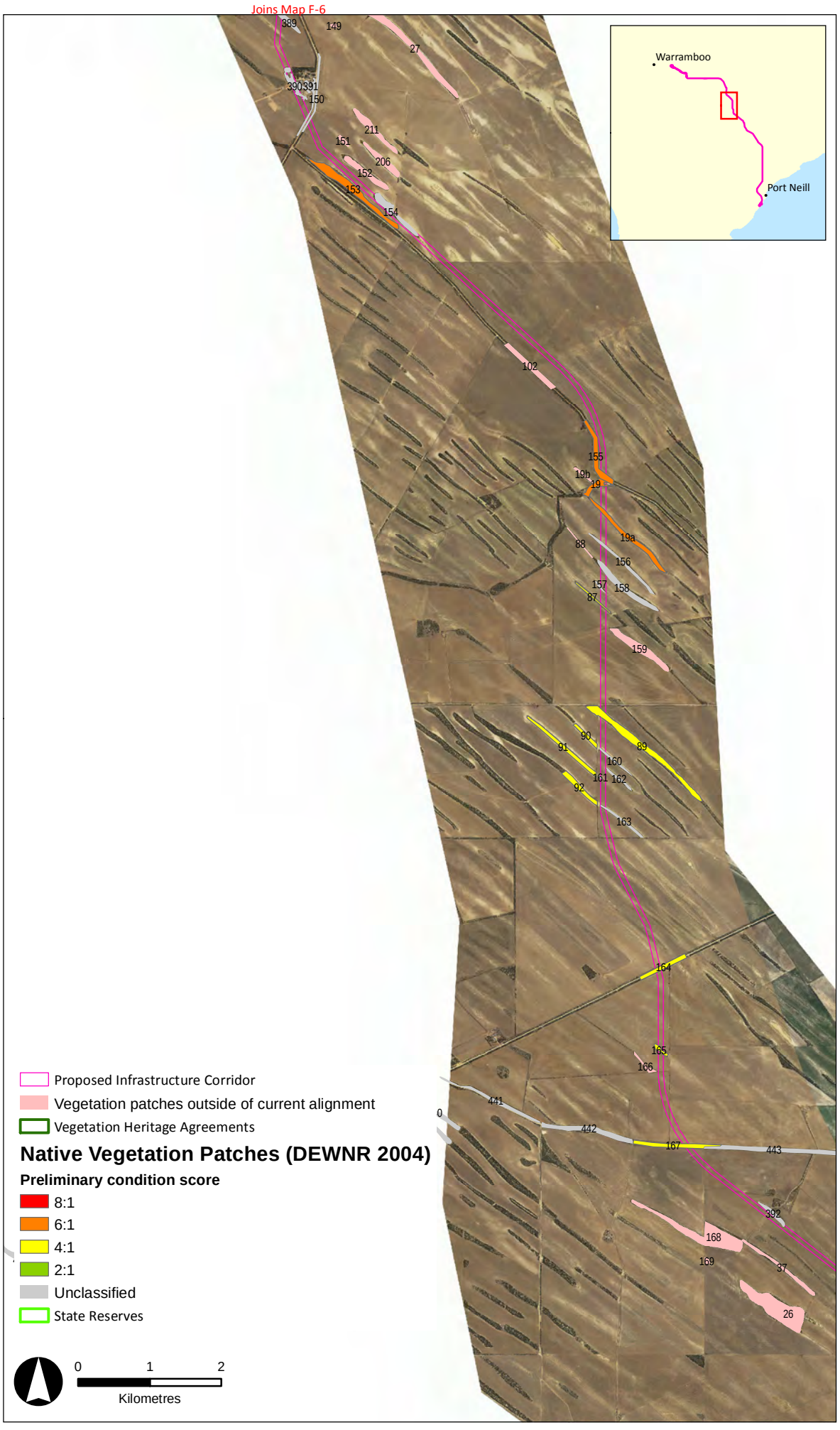


Figure F-4 Native Vegetation Patches and Preliminary Condition Scores



23/06/2014 10:31:38 AM Immoore
I:\VESAIProjects\VE23730\Technical\Spatial_Data\ArcGIS\Infrastructure Corridor Ecology\ReportMaps\Figure F-5a Native Vegetation Patches and Preliminary Condition Scores.mxd

Figure F-5 Native Vegetation Patches and Preliminary Condition Scores

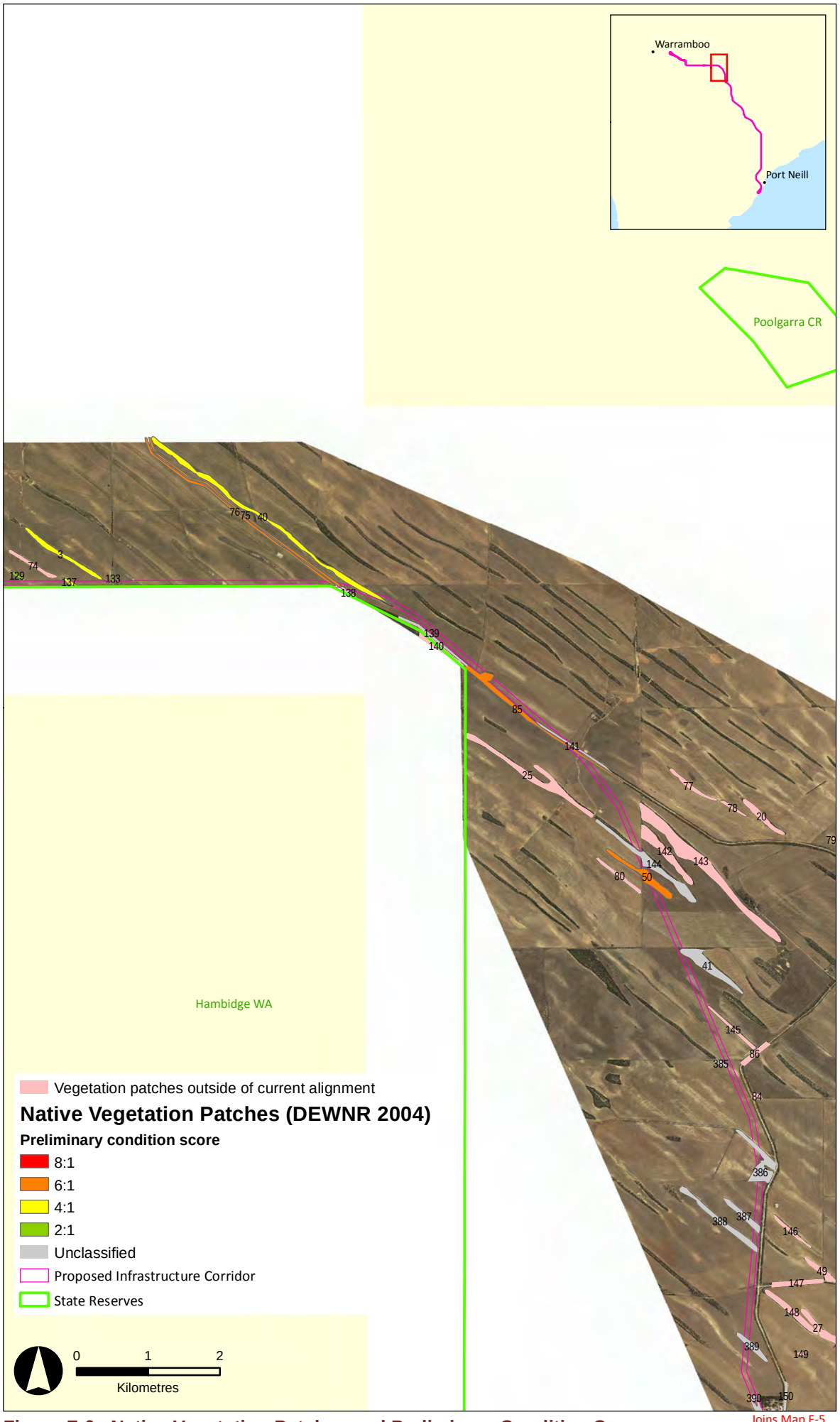


Figure F-6a Native Vegetation Patches and Preliminary Condition Scores

Figure F-7 Native Vegetation Patches and Preliminary Condition Scores