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Grange Resources

Report for Southdown Mine Desalination Pipeline Route

Terrestrial Flora and Fauna Assessment

August 2011

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- *The assessment is based on the Project footprint provided by Grange Resources, as listed in the Project description and shown in Figure 1, Appendix A. Any changes to the project, outside the description provided above, are outside the scope of this assessment.*
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Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time.

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Executive Summary

GHD Pty Ltd (GHD) was commissioned by Grange Resources Ltd (Grange) to conduct a flora and fauna assessment, as part of the Public Environmental Review (PER), for a proposed desalination plant site and associated pipeline route for the Southdown Magnetite Project.

The aim of the assessment is to provide information on the flora and fauna present within the study areas, assess the potential impacts and provide management recommendations.

Methodology

The flora and fauna assessment included both desktop and field assessments, and consisted of a level 2 flora and a level 1 fauna field assessment.

Vegetation and Flora field assessment methodology involved a combination of sampling using quadrats and relevès located in representative vegetation types and meandering transects of the Study Area on foot to record plant species present (visible) at the time of the survey.

The survey methodology employed by GHD was consistent with the EPA's guidelines for flora surveys as outlined in Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection,* Position Statement No. 3 (EPA, 2002).

The Level 1 fauna assessment was conducted in accordance with EPA Guidance Statement No. 56 *Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004b). The assessment included a desktop investigation and opportunistic fauna field survey (vertebrate only) and a habitat assessment, undertaken in conjunction with the vegetation and flora survey. The field assessment involved visual and aural surveys for any fauna species utilising the Study Area in addition to searches of the Study Area for any fauna signs, such as tracks, scats, bones, diggings and feeding signs. The fauna assessment did not involve any fauna trapping.

Vegetation

A total of 12 vegetation types were identified within the Study Area, including a highly modified vegetation type. The vegetation types were described using Keighery's (1994) vegetation structural classes (adapted from Muir (1977) and Aplin (1979) in Government of Western Australia, 2000).

The vegetation types include Eucalypt Mallees, *Corymbia* and Eucalypt Open Woodlands and Forests, *Spyridium* Tall Open Shrublands, *Melaleuca* Low Open Forest, *Thryptomene* Closed Low Heath and cleared paddocks or agroforestry plantations.

All 12 vegetation types are present along the pipeline alignment, while the desalination plant is located within a cleared agricultural paddock.

The vegetation condition in the Study Area varied from *Pristine or Nearly So/Excellent* to *Completely Degraded*.

None of the vegetation types present are considered to be threatened ecological communities under either the *Environment Protection and Biodivisity Conservation Act 1999* (EPBC Act) or the *Wildlife Conservation Act 1950* (WC Act).

There are a number of Department of Environment and Conservation (DEC) priority ecological communities (PECs) mapped along the pipeline alignment. In most cases, the alignment is located within the buffer of the PECs, and these buffer zones contain vegetation that is not consistent with the PEC.

The pipeline alignment intersects two areas of the Priority 3 ecological community – Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast), within Mettler Road reserve (corner of Mettler Road and Cape Riche Road) and along the South Coast Highway. At both of these locations the pipeline alignment is located within the existing road reserve and existing access tracks to minimise the extent of disturbance.

Flora

Vegetation within the Study Area has high species diversity. A total of 339 taxa from 53 families was recorded during the survey. The diversity can be partly attributed to the linear nature of the Study Area, which crosses a range of vegetation types between inland areas and the coast.

Dominant families recorded include:

- Protecaeae 48 taxa;
- Fabaceae 46 taxa;
- Myrtaceae 45 taxa; and
- Ericaceae 19 taxa.

Conservation significant flora

No Declared Rare species as listed by the DEC or species of national conservation significance listed under the EPBC Act were recorded within the Study Area.

Four species of Priority flora species as listed by the DEC were recorded from the Study Area:

- *Monotoca aristata*, P2.
- *Chordifex leucoblepharus,* P2.
- *Goodenia filiformis,* P3.
- *Kunzea pauciflora,* P4.

A *Lasiopetalum* species that has a preliminarily identification as *Lasiopetalum* aff. *monticola* was collected during the assessment. The specimen does not completely meet the description of *L. monticola* (a P3 plant) and has been lodged at the herbarium for further identification.

Weeds

A total of 35 introduced (exotic) species was recorded during the survey. One of the weeds, *Asparagus asparagoides* (Bridal Creeper) is listed as P1 under the *Agriculture and Related Resources Protection Act 1976* and is also considered to be a Weed of National Significance (WONS).

Fauna

The Study Area is characterised by habitat types that are represented elsewhere in the local area. The road reserve vegetation within the Study Area consists primarily of Mixed Eucalypt woodland and outside the road reserve it is primarily cleared paddock or agroforestry with scattered patches of remnant vegetation.

The South Coast Coastal Macro-Corridor Project was a culmination of local, state and international developments in landscape and bioregional-scale nature conservation to help address the threats to biodiversity through habitat fragmentation.The proposed desalination plant site and approximately 7.5 kms of the pipeline alignment is located along the edge of a recognised weak point in this regional corridor. The weak point is between the northern and southern sections of Reserve 31240 at the western end of Cape Riche Road. At the narrowest point this gap is approximately 2 km wide. Most of the land within this area has been cleared for agricultural purposes. The proposed site for the Desalination plant is located centrally within this gap on cleared land and the proposed alignment for the pipe line lies adjacent to Cape Riche road.

The regional habitat or wildlife corridor values of the Study Area are reduced by the fragmented nature of the native vegetation, however, the well vegetated road reserves were observed to provide high local wildlife corridor value.

Desktop searches identified the potential presence of 126 bird, 11 reptile, 4 amphibian and 3 mammal species. During the field survey, 22 birds, 4 reptiles and 3 mammals were recorded.

Based on desktop queries, 14 conservation significant species potentially occur within the Study Area, these include 9 birds and 5 mammals. A likelihood of occurrence assessment was conducted. This was based on the species' range, habitat requirements and previous recordings in the area.

Many of the species were considered unlikely to occur based on the lack of suitable habitat including the fragmented nature of any habitat or lack of previous records from within the Study Area and its surrounds.

No fauna species listed under the EPBC Act or the WC Act were observed during the survey. One priority 5 fauna species, Quenda (*Isoodon obesulus fusciventer*), was observed during the site visit.

Two other species of bird, *Calyptorhynchus latirostris* (Carnaby's Cockatoo – Endangered EPBC Act, Schedule 1 WC Act) and *Falco peregrinus* (Peregrine Falcon – Schedule 4 WC Act), are likely to occur.

Short Range Endemic Species (SRE)

No invertebrate or SRE species were identified in the desktop searches including the burrowing crayfish (*Engaewa* spp.) which does not occur further east than the Kent River near Walpole Ecologia (2006 and 2008) undertook SRE assessments for the mine site, pipeline to Albany and the broader area, which identified three potential SRE species within the mine site area. Subsequent investigations show only one species is potentially restricted to the mine site.

The desalination plant and pipeline are largely located within existing highly disturbed areas, cleared paddocks, roads and access tracks, within habitat that is well represented elsewhere. Given the existing environment and limited extent of further disturbance, further SRE investigations for the pipeline are not considered necessary.

Potential Impacts

The Study Area has a long history of vegetation clearing and grazing, resulting in significant losses of native vegetation, suppression of natural regeneration and weed invasion. Despite the previous disturbance, there are areas of good quality vegetation within conservation reserves, road reserves and private farmland.

Potential Impacts from the Project include:

- Reduction in the extent of vegetation communities and associated habitats: the desalination plant and pipeline has been positioned to avoid or limit impacts to native vegetation, particularly conservation significant vegetation and important habitats. Up to 15.9 ha of native vegetation will require removal.
- This clearing includes 0.93 ha of the Priority 3 ecological community – Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast). Ecologia (2008a) assessed the extent of the Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast) within the East Sand Plain Sub-catchment, and identified the presence of 44 ha of this community in Good to Excellent condition. Taking a conservative approach (using the 44 ha extent), the 0.93 ha of the Swamp Yate PEC to be cleared for this Project is estimated to be approximately 2% of that present in the sub-catchment.
- Four Priority species and an unconfirmed *Lasiopetalum* species were identified from within the alignment. These were recorded in low densities in four quadrat sites. Given the limited extent of vegetation clearing associated with the Project and presence of similar habitat surrounding the alignment (including within the offset site) clearing for the Project is not expected to result in significant losses to priority species. An additional conservation significant flora targeted search will be undertaken in Spring 2011 to further assess and map conservation significant flora.
- Fragmentation and barrier effects: given the location along existing tracks and cleared areas and minimal length of time the trench will be open, further fragmentation or restrictions to fauna movement are not expected.
- Fauna injury and mortality: through entrapment and vehicle strike during the construction period.
- Dieback and weeds: potential to cause spread and introduction of weeds and dieback.

Mitigation

A general principle of environmental management is to, in order of preference:

- Avoid environmental impacts;
- Minimise impacts;
- Mitigate the impacts; and
- Where impacts cannot be avoided or minimised, compensate for the residual impacts using other mitigation measures such as offsets.

Potential impacts will be managed through Construction Environmental Management Plans/Project Environmental Management System (CEMP and PEMS).

Conclusion

Given the extent of native vegetation requiring clearing (15.9 ha) and presence of similar habitats within the broader area, the project is not expected to result in significant impacts to conservation significant species or communities, or to the biodiversity of the local or regional area. Furthermore, with appropriate management, the residual impacts of the Project on flora and fauna are considered to be relatively minor and localised.

1. Introduction

1.1 Background

Grange Resources Ltd (Grange) are developing the Southdown Magnetite Project, which involves the construction and operation of an open pit magnetite mine located approximately 90 kilometres east north east of Albany, near Wellstead. As part of this project, Grange is proposing to construct a desalination plant on freehold land, 4.5 km east of Cape Riche.

GHD Pty Ltd (GHD) was commissioned by Grange to conduct a flora and fauna assessment, as part of the Public Environmental Review (PER), for a proposed desalination plant site and associated pipeline route for the Southdown Magnetite Project.

1.2 Study Area

The Southdown Project is located in the south coast region of Western Australia, approximately 90 km east of Albany and 19 km from Wellstead. The treated water will be transported via pipeline between the desalination plant and the mine site.

The desalination plant is located on cleared grazing land approximately 4 km inland from Cape Riche. The proposed desalination plant site is adjacent to Cape Riche Road and was suggested as a suitable site by the local landowner.

The proposed coastal pump station is located on the Cape Riche Homestead property, situated along the southern banks of the Cheyne Bay and the Cape Riche coastline. Earlier consultation with the Cape Riche Homestead landowner has assisted in selecting the suitable site for the proposed below-ground pump station. The pump station site will be strategically positioned in consideration of the surrounding coastal topography, minimising visual impacts upon the nearby Cape Riche Caravan Park and Boat Harbour.

The Study Area is shown in Figure 1, Appendix A.

1.3 Scope of Works

The flora and fauna assessment included both desktop and field assessments, and consisted of a level 2 flora and a level 1 fauna assessment.

The aim of the assessment was to provide information on the flora and fauna present within the study areas, assess the potential impacts and provide management recommendations.

Specifically, the assessment involved:

- A desktop investigation to identify the existing environment, including previously described vegetation communities and flora and fauna species;
- Compiling an inventory of the vascular plant species present in the survey area;
- A review of, and search for, significant flora species;
- Compiling an inventory of dominant exotic plants, including declared noxious plants and environmental weed species;
- Assessing the condition of vegetation communities;

- An assessment of the likelihood of dieback or other pathogens occurring;
- An assessment of any wetlands located within the Study Area;
- Compiling an inventory of the vertebrate fauna species in the survey area through targeted searches and opportunistic recording of species; and
- Identification of any habitats of significance.

2. Methodology

2.1 Desktop Investigation

To provide information on the species previously recorded or likely to occur in the Study Area a number of desktop searches were undertaken, this included:

- A review of the Department of Environment and Conservation's (DEC) Rare and Threatened Flora database;
- A review of the DEC's Threatened Ecological Communities (TEC) database;
- A review of the Western Australian Museum (WAM) and DEC NatureMap database for threatened flora and fauna;
- A review of the DEC's Environmentally Sensitive Areas (ESAs) Mapping; and
- A review of the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters database for areas listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.2 Field Survey for Flora and Vegetation

GHD botanists, Meranda Toner and Christine Best, conducted a flora and vegetation assessment of the Study Area from 17 to 19 November 2010. The survey was undertaken to provide a description of the dominant vegetation types present, vegetation condition and flora species present at the time of the survey.

An additional survey of the proposed Offset Site was undertaken on 7 February 2011. Information collected during the offset site assessment has been used to assist in assessing the vegetation of the alignment.

Field assessment methodology involved a combination of sampling using quadrat, and relevès located in representative vegetation types and meandering transects of the Study Area on foot to record plant species present (visible) at the time of the survey.

The survey methodology employed by GHD was consistent with the EPA's guidelines for flora surveys as outlined in Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection,* Position Statement No. 3 (EPA, 2002).

2.2.1 Flora Identification

Species that were well known to the survey botanists were identified in the field, while species that were unknown were collected and assigned a unique number to facilitate tracking. All plant species collected during the field programme were dried and fumigated in accordance with the requirements of the Western Australian Herbarium. Plant species were identified by the use of local and regional flora keys and by comparison with the named species held at the Western Australian Herbarium. Plant taxonomists who are considered to be an authority on a particular plant group were consulted, when necessary. The conservation status of all recorded flora was compared against the current lists available on *FloraBase* and the EPBC Threatened species database provided by DSEWPaC.

2.2.2 Botanical Survey Limitations

Complete flora and vegetation surveys can require multiple surveys, at different times of year, and over a period of a number of years, to enable observation of all species present. Some flora species, such as annuals, are only available for collection at certain times of the year, and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. As mentioned previously, rainfall in the months preceding the survey has shown distinct differences to the long term averages. The Cape Riche/Wellstead area received substantially less rain in the September–October period and showed large fluctuation from the average prior to this. This variability in rainfall may have affected the health of individual plants making species that have a very low abundance in the area more difficult to locate. The other factors identified above may also make species with a very low abundance in the area more difficult to locate.

Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of future botanical surveys in this location may differ from the results of this survey.

The Study Area covers approximately 86 ha. Sampling was conducted using quadrats, relevès and targeted searches by intensively traversing areas likely to contain conservation significant species. The majority of species would have been identified using these techniques; however, it is possible that species with a low abundance, seasonal presence, or with a very restricted local range were not observed.

2.3 Fauna Field Investigation

The Level 1 fauna assessment was conducted in accordance with EPA Guidance Statement No. 56 *Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004b). The assessment included a desktop investigation and opportunistic fauna field survey (vertebrate only) and a habitat assessment, undertaken in conjunction with the vegetation and flora survey. The field assessment involved visual and aural surveys for any fauna species utilising the Study Area in addition to searches of the Study Area for any fauna signs, such as tracks, scats, bones, diggings and feeding signs. The fauna assessment did not involve any fauna trapping.

In addition, habitat types of the Study Area were identified. The habitat types present in the Study Area reflect both the landforms present and vegetation communities.

2.3.1 Limitations

The fauna assessment undertaken was a reconnaissance survey only and thus only sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings etc. Many cryptic and nocturnal species would not have been identified during a reconnaissance survey.

Extensive detailed fauna surveys, involving trapping surveys, are required to obtain a more comprehensive list of fauna species that may utilise the site.

The fauna assessment was aimed at identifying habitat types within the Study Area. In addition, terrestrial vertebrate fauna utilising the Study Area were identified; no sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.

This survey was carried out during only one season, and in one year. Complete faunal surveys often require multiple surveys, at different times of year, and over a period of a number of years, to enable full survey of all species present.

Pipeline realignments made after the field survey have been assessed based on aerial photography, supplemented by field work completed on 7 February 2011 for the proposed Grange Offset Site.

3. Existing Environment

3.1 Physical Context

The Study Area is located within the South Coast region of Western Australia. The closest Bureau of Meteorology weather station to the Study Area is located at Mettler. In Mettler, the highest mean minimum and maximum temperatures are experienced in January and February and range from 14°C to 25.1°C, while the lowest mean minimum and maximum temperatures are experienced in July and August and range from 6.1°C to 16.2°C. The historical average annual rainfall for Mettler is 605.1 mm, most of which occurs in the April to October period (Plate 1) (BoM, 2011).

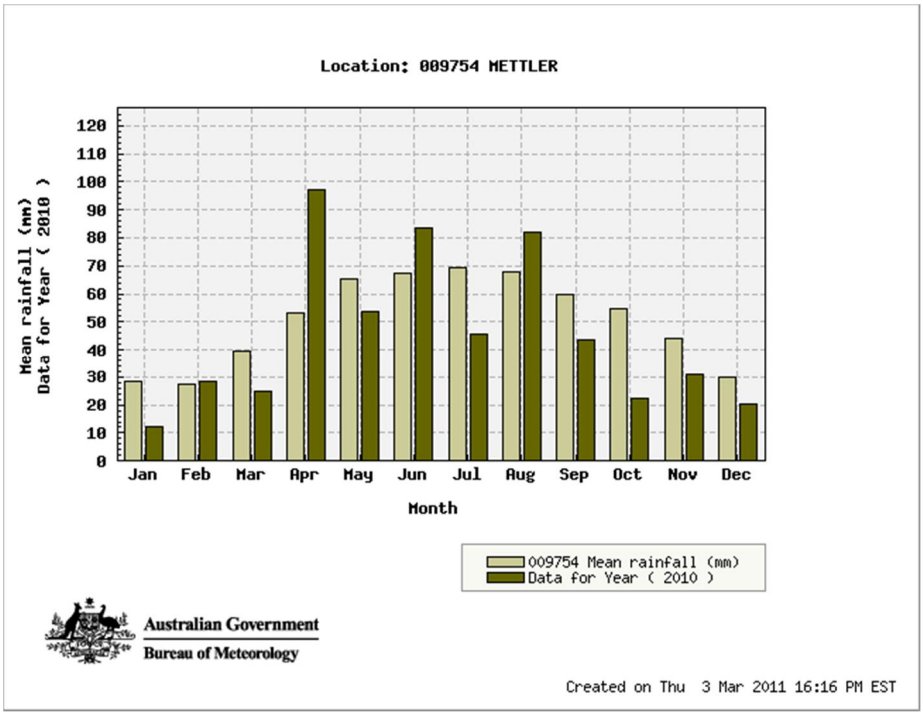

Plate 1 Average Annual Rainfall and Rainfall for 2010 for Mettler

The Study Area is located between Albany and Bremer Bay, dominated by the Stirling Ranges. The area ranges from 200 m AHD in the north-west to 50 m AHD in the south-east along the coast and is composed of sand plains and sediment. The region is also characterised by wetlands that lie between the sand plain and the coast, and contains seasonal lakes that form in depressions in the landscape and are directly linked to aquifer recharge (Rockwater, 2005a as cited in Ecologia, 2007).

The Study Area is located within the Biranup Complex of the Albany–Fraser province. This area is characterised by amphibolite to granulite facies Archaen and Proterozoic metamorphosed granites, gabbros and sediments. The Albany area is characterised by many different types of soils including seasonally waterlogged gravels and loams, sandy gravels and hill soils and waterlogged peaty acidic sands.

3.2 Vegetation and Fauna

The Study Area is situated within the Esperance Interim Biogeographic Regionalisation of Australia (IBRA) region, sub-region Fitzgerald. The Esperance bioregion is characterised by myrtaceous and proteaceous scrub and mallee heaths on sandplain, overlying Eocene sediments; rich in endemics. Herbfields and heaths (rich in endemics) occur on abrupt granite tors and quartzite ranges that rise from the plain. Eucalypt woodlands occur in gullies and alluvial foot-slopes.

Vegetation within Western Australia has been surveyed, mapped and described by Beard (1979). The Study Area is within the Cape Riche vegetation system of the Eyre District on the Pallinup Sandplain, This vegetation system is defined as being predominantly *Eucalyptus marginata* mallee-heath with occasional patches of Jarrah-Marri woodland in valleys, *E. decipiens* or *E. occidentalis* in small numerous depressions and a small area of *E. staeri* mallee-heath in the Hassell Beach to Bremer Bay Coastal Zone near the mouth of the Waychinicup River (Beard 1979). More specifically, the Study Area passes through two vegetaion units contained within the Beard vegetation system and these are:

- *Eucalyptus marginata* mallee heath; and
- *Eucalyptus marginata–Corymbia calophylla* woodland.

3.2.1 Threatened and Priority Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe 1997). TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered, and Vulnerable.

The DEC maintains a list of TECs for Western Australia; some of these TECs are also protected under the EPBC Act. DEC listed ecological communities are given special consideration in environmental impact assessments and have special status under the land clearing regulations of the *Environmental Protection Act 1986* (EP Act).

Possible TECs that do not meet survey criteria are added to the DEC Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

A search of the DEC's TEC data was undertaken for known occurrences of TECs and/or PECs within or near the Study Area. There are no known TECs near to the proposed route or desalination plant site. The EPBC Act Protected Matters Search Tool also did not identify any federally listed TECs adjacent or near to the Study Area.

The DEC database search identified several PECs along the pipeline route. There were no PECs recorded within the desalination plant site (Figure 1, Appendix A).

The PECs present in the Study Area consist of two types:

- The 'Priority 1' ecological community – Mosaic of Albany Blackbutt *(E. staeri)* mallee-heath found on lateritic ridges and Chittick *(Lambertia inermis* subsp. *inermis)* scrub-heath on seasonally–waterlogged laterite; and

- The ‘Priority 3’ ecological community – Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast).

3.2.2 Environmentally Sensitive Areas

The DEC’s online Native Vegetation Viewer was searched to determine the location of any Environmentally Sensitive Areas (ESAs) within the vicinity of the Study Area, as declared by a Notice under Section 51B of the EP Act.

There are no ESAs within or adjacent to the Study Area.

3.2.3 South Coast coastal macro-coridor linkage

The South Coast Coastal Macro-Corridor Project was a culmination of local, state and international developments in landscape and bioregional-scale nature conservation to help address the threats to biodiversity through habitat fragmentation. The South Coast Macro-corridor is a network of native vegetation that extends 700 km from Israelite Bay, east of Esperance and westwards through Albany along Western Australia’s southern coastline, with inland linkages along major river systems to protected areas and other uncleared bushland. High nature conservation values in the area arise from the existence of a number of large, intact protected areas such as the Stirling Range and Fitzgerald River National Parks. The area is within the South West botanical Province, a biodiversity hotspot of international significance and includes centres of floristic endemism, areas of high floristic diversity and important refuges for threatened fauna species. The Macro-corridor project aims to maintain landscape-scale biodiversity and meet the needs of the community.

The proposed desalination plant site and approximately 7.5kms of the pipeline alignment is located along the edge of a recognised weak point in this regional corridor. The weak point is between the northern and southern sections of Reserve 31240 at the western end of Cape Riche Road; at the narrowest point this gap is approximately 2 km wide. Most of the land within this area has been cleared for agricultural purposes. There are some sections of discontinuous vegetation that provide a vegetated linkage, including a creek line and part of Reserve 14943. The proposed site for the Desalination plant is located centrally within this gap on cleared land and the proposed alignment for the pipe line lies adjacent to Cape Riche road (Wilkins *et al*., 2006).

3.2.4 Conservation Significant Species

Species of significant flora and fauna are protected under both State and Commonwealth Acts. Any activities that are deemed to have a significant impact on species that are recognised by the *EPBC Act* and the *State Wildlife Conservation Act 1950* (WC Act) can trigger referral to DSEWPaC and/or the EPA.

The WC Act uses a set of Schedules but also classifies species using some of the IUCN categories. The EPBC Act protects migratory species that are listed under International Agreements and also protects marine species on Commonwealth lands and waters.

In Western Australia, the DEC also produces a supplementary list of Priority flora and fauna, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislatory protection, but their presence would normally be considered. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Relevant Federal and State conservation codes are provided in further detail in Appendix B.

The EPBC Act Protected Matters Search Tool is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DEC searches of threatened fauna provide more accurate information for the general area; however, some records of sightings or trappings can be dated and often misrepresent the current range of threatened species.

Desktop queries identified a number of potentially occurring conservation significant species within the Study Area (search within 15 km radius of the approximate centre of the proposed route). These include:

- Fifty three plants (Table 6); and
- Nine birds and five mammals (Table 8).

It should be noted that the EPBC protected matters search also identified additional threatened and migratory species that are largely exclusively marine and, as this report is assessing terrestrial components only, they have been excluded from the assessment. These include species such as turtles, sharks, whales, sea lions, albatross and petrels.

4. Survey Results

4.1 Vegetation

4.1.1 Vegetation Types

A total of 12 vegetation types were identified within the Study Area, including a highly modified vegetation type. The vegetation types were described using Keighery's (1994) vegetation structural classes (adapted from Muir (1977) and Aplin (1979) in Government of Western Australia, 2000). An asterisk indicates introduced (weed) plant species. The vegetation types are mapped in Figure 2, (Appendix A) and summarised below:

V1: Very Open Shrub Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus occidentalis* over Tall Open Shrubland of *Acacia subcaerulea* Open Shrubland of *Hakea trifurcata*, *Hakea denticulata* and *Beaufortia empetrifolia* over Low Open Shrubland of *Astartea aspera*, *Isopogon longifolius, Hovea trisperma*, *Petrophile squamata* subsp. *squamata*, *Comesperma virgatum* and *Chorizema glycinifolium* over Closed Sedgeland of *Anarthria laevis* and *Lepidosperma striatum*.

V2: Low Open Woodland of *Corymbia calophylla* and *Eucalyptus angulosa* over Tree Mallee to Low Open Woodland of *Eucalyptus staeri* over Tall Open Shrubland to Closed Tall Scrub of *Banksia attenuata*, *Banksia baxteri, Hakea laurina, Hakea ferruginea*, *Lambertia inermis*, *Lambertia* sp., *Adenanthos cuneatus, Allocasuarina scleroclada* and *Taxandria spathulata* over Open Shrubland to Open Heath of *Melaleuca striata*, *Leucopogon crassiflorus*, *Calothamnus quadrifidus, Beaufortia empetrifolia*, *Hibbertia cunninghamii* and *Agonis theiformis* over Low Shrubland to Open Low Heath of *Petrophile teretifolia*, *Melaleuca thymoides*, *Lysinema ciliatum, Banksia nutans*, *Hakea marginata*, *Hakea ceratophylla* and *Banksia repens* over mixed *pasture grasses over Very Open Herbland of *Lomandra* sp. and *pasture grasses and Very Open Sedgeland to Sedgeland of *Desmocladus fasciculatus*, *Caustis dioica*, *Anarthria scabra* and *Anarthria prolifera*.

V3: Very Open Tree Mallee of *Eucalyptus occidentalis* over Tall Open Shrubland of *Hakea laurina* and *Conothamnus aureus* over Shrubland of *Goodenia pterigosperma, Taxandria spathulata*, *Daviesia incrassata*, *Acacia subcaerulea* and *Coleanthera myrtoides* over Closed Low Heath of *Melaleuca rigidifolia*, *Melaleuca suberosa, Allocasuarina microstachya* and *Beaufortia micrantha* subsp. *micrantha* over Very Open Grassland of *Neurachne* sp. and mixed Very Open Herbland and Sedgeland of *Schoenus subfascicularis*, *Anarthria laevis*, *Desmocladus fasciculatus* and *Schoenus* sp.

V4: Tall Open Shrubland of *Spyridium globulosum* over Open Shrubland of *Acacia cyclops* over Open Low Heath of *Thryptomene saxicola*, *Gompholobium tomentosum*, *Kennedia microphylla* and *Kennedia prostrata* over mixed *pasture grasses and mixed Herbland dominated by *Patersonia occidentalis* and Sedgeland of *Desmocladus flexuosus*.

V5: Shrub Mallee of *Eucalyptus angulosa* over Tall Shrubland of *Spyridium globulosum* over Shrubland of **Lessertia frutescens*, *Leucopogon elegans* subsp. *elegans* and *Leucopogon obovatus* over Low Open Shrubland of *Kennedia coccinea* over Grassland of **Bromus* sp. and Very Open Sedgeland of *Desmocladus flexuosus*.

V6: Cleared Paddocks with occasional *Eucalyptus* sp. over *pasture weeds or Agroforestry plantations.

V7: Open Forest of *Corymbia calophylla* over Low Open Forest of *Eucalyptus occidentalis* over Open Tall Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus goniantha* over Tall Shrubland of *Melaleuca cuticularis*, *Agonis theiformis* and *Hakea varia* over Open Shrubland of *Spyridium globulosum*, *Jacksonia horrida* and *Bossiaea eriocarpa* over Open Heath of *Taxandria spathulata*, *Calothamnus quadrifidus*, *Petrophile media*, *Billardiera heterophylla*, **Psoralea pinnata* and *Acacia leioderma* over Low Open Shrubland of *Hibbertia cuneiformis* and *Thryptomene saxicola* over mixed *pasture grasses and Closed Sedgeland of *Hypolaena exsulca*, Baumea juncea, **Juncus bufonius* and *Juncus pallidus*.

V8: Low Open Forest of *Melaleuca cuticularis* over Open Shrubland of *Hibbertia cunninghamii* and *Xanthorrhoea platyphylla* over Low Shrubland of *Thryptomene saxicola* over Grassland of *pasture grasses and *Eragrostis* sp. and Herbland of *pasture grasses and Sedgeland of *Gahnia trifida*, *Juncus pallidus*, *Lepidosperma squamatum*, *Mesomelaena tetragona* and *Ficinia nodosa*.

V9: Very Open Shrub Mallee of *Eucalyptus pleurocarpa*, *Eucalyptus* sp. and *Eucalyptus decipiens* subsp. *adesmophloia* over Tall Open Scrub of *Lambertia* sp., *Melaleuca* sp., *Conothamnus aureus* and *Phymatocarpus maxwellii* over Shrubland of *Taxandria spathulata*, *Beaufortia schaueri* and *Acacia leioderma* over Low Shrubland of *Daviesia decurrens*, *Melaleuca rigidifolia*, *Banksia falcata* and *Banksia tenuis* over Open Sedgeland of *Schoenus subfascicularis*.

V10: Shrub Mallee of *Eucalyptus buprestium* and mixed *Eucalyptus* sp. over Tall Shrubland of *Lambertia* sp. over Open Heath of *Taxandria spathulata*, *Melaleuca striata* and *Beaufortia empetrifolia* over Low Shrubland of *Petrophile rigida*, *Allocasuarina humilis* and *Daviesia incrassata* subsp. *reversifolia* over Sedgeland of *Anarthria humilis*, *A. scabra* and *Desmocladus flexuosus*.

V11: Low Open woodland of *Melaleuca cuticularis* over Open Shrubland of *Leucopogon revolutus*, *Boronia alata* and *Westringia dampieri* over Low Open Shrubland of *Westringia* over Open Grassland of *pasture grasses and Open Herbland of *pasture grasses and Sedgeland of *Gahnia trifida, Lepidosperma squamatum* and *Ficinia nodosa*.

V12: Closed Low Heath of *Thryptomene saxicola* and *Pimelea ferruginea* over Open Grassland of *Eragrostis* sp., Poaceae sp. and *pasture grasses.

4.1.2 Threatened Ecological Communities

No TEC's as defined by the EPBC Act or the WC Act were recorded from within the Study Area.

4.1.3 Priority Ecological Communities

PECs have been previously mapped along the pipeline alignment, and are shown in DEC mapping. The DEC mapping provides the central location of the PEC, with a defined buffer distance, which is typically 500 m.

The PECs were initially identified by Ecologia during their assessment of the Southdown Minesite (Ecologia, 2007). Further regional analysis of the communities was undertaken by Ecologia in 2008 (Ecologia, 2008a). The DEC listed the PECs in January 2008.

During GHD's field assessment the sites mapped as PECs were visited, and a representative number of quadrats were placed within the sites. To assist in determining whether the PECs were present within the Study area, the quadrat data was assessed for its similarity with known PEC attributes using a statistical package (PATN). The analysis compares species presence/absence and groups similar data together.

The PATN analysis showed that the quadrat data was not statistically similar to the information provided on the PECs. PATN analysis is a useful tool in assessing similarity; however, as there is limited information available on the PECs and given the observed diversity in the groundlayer, the analysis may be biased.

Data presented in Ecologia (2007) and Ecologia (2008a) was compared to site data (Table 1) to assist in the determination of PECs present in the alignment.

In most cases, the alignment is located within the buffer of the PECs, and these buffer zones contain vegetation that is not consistent with the PEC. In addition, the PEC data supplied by Ecologia (2008a) has not been validated by the DEC in the field (Sarah Barrett, DEC, pers. comm.). Some areas recorded by Ecologia, which have been mapped as PECs, do not represent PEC vegetation, and may have been mapped through extrapolation, or with very limited assessment.

Two areas are consistent with the broader PEC description, one within Mettler Road reserve (corner of Mettler Road and Cape Riche Road) and the other along the South Coast Highway. At both of these locations the pipeline alignment will be located within the existing road reserve or within access tracks.

Table 1 Priority Ecological Community Assessment

Location	PEC Site No.	Ecologia (2008a) Site Data	GHD Assessment
The 'Priority 1' ecological community – Mosaic of Albany Blackbutt *(Eucalyptus staeri)* mallee-heath found on lateritic ridges and Chittick *(Lambertia inermis* subsp. *inermis)* scrub–heath on seasonally-waterlogged laterite.			
South Coast Highway and Gnowellen Road.	Site 5 Mine	Very open *Eucalyptus staeri* with mixed *Lambertia inermis* open scrub over very dense Heath on shallow white/ grey sand (with laterite close to the surface).	**Alignment does not intersect PEC.** Alignment is within the mapped buffer zone of this PEC. Buffer zone is 500 m radius surrounding the PEC. GHD Quadrat G 14 is representative of the vegetation in this area. The site is dominated by *E. buprestium* over Tall Shrubland of *Lambertia inermis*. The vegetation is not consistent with the PEC description.
Corner of Mettler and Cape Riche Road	Site 166 MLNR	Difficult to estimate the total extent of the vegetation community due to limited access through the interior of the reserve. Type 1a (Mosaic of Albany Blackbutt) vegetation occurs patchily along the northern boundary of the reserve, in pockets of approximately 5-10 ha, for a total area of approximately 20-40 ha.	**PEC Present in broader area but alignment does not intersect.** Areas of the PEC were noted in the Mettlers Lake Reserve. However, the section along the pipeline alignment was considered to represent the Swamp Yate damplands.
The 'Priority 3' ecological community – Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast).			
Gnowellen Road	Site 38 Mine	*Eucalyptus occidentalis* low forest.	**Alignment does not intersect PEC.** The alignment is within the mapped buffer of the PEC, within the road reserve. The wetland area that forms the PEC will be avoided.

Location	PEC Site No.	Ecologia (2008a) Site Data	GHD Assessment
South Coast Highway and Gnowellen Road	Site 13 Mine	*Eucalyptus occidentalis* open woodland over *Melaleuca cuticularis* open scrub over dense sedge (low lying drainage line).	**Alignment does not intersect PEC.** Alignment is within the mapped buffer zone (750 m) of this PEC. The vegetation present in the alignment is not representative of the PEC. GHD Quadrat G 14 is representative of the vegetation in this area.
Corner of Mettler and Cape Riche Road. Mettler Road reserve.	Wetland 44 Mine	*Eucalyptus occidentalis /Melaleuca cuticularis* woodland over *Kunzea recurva* scrub. Extensive basin, deeply inundated after last year's record rains.	**PEC Present** GHD quadrat G1 is representative of this PEC type: Very Open Shrub Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus occidentalis* over Tall Open Shrubland of *Acacia subcaerulea* Closed Sedgeland. The alignment has been positioned within the existing road reserve and along cleared access tracks in order to minimise the amount of PEC distrubed.
Open Paddock	Wetland 3 Mine	No information available.	**Alignment avoids PEC** Pipeline alignment located in cleared paddock, within the 500 m PEC buffer. The PEC will be avoided.
South Coast Highway	Wetland 53 Mine	No information available.	**PEC Present** A visual assessment along South Coast Highway was undertaken, the presence of a Swamp Yate dampland was noted along the highway. The alignment will be positioned within the existing road reserve, and clearing will be minimised.

4.1.4 Wetlands and Water Courses

Numerous minor, unnamed, ephemeral drainage lines are present within the Study Area. These are mainly small drainage or seepage creeks and most are likely to be highly dependent on rainfall. The largest of these is situated at the eastern end of Cape Riche Rd. This crossing is approximately 15 m wide with information from the Cape Riche Homestead indicating it is rain dependent; more often flowing after heavy rains and usually reaching a depth of less than 1 m.

An EPBC Act Protected Matters Search did not identify the presence of any Ramsar wetlands located along the alignment, or nearby. There are a number of seasonally inundated areas along the alignment, including a section of the Mettlers Lake Nature Reserve. These correspond to vegetation type V1.

There were no watercourse or wetlands within, or adjacent to, the proposed desalination plant site.

4.1.5 Vegetation Condition

The vegetation condition of the site was assessed using the vegetation condition rating scale developed by Keighery (1994) that recognises the intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping; and
- The potential for natural or assisted regeneration.

The scale, therefore, consists of six (6) rating levels as outlined below in Table 2.

Table 2 Bush Forever (Government of WA, 2000) vegetation condition rating scale.

Vegetation Condition Rating	Vegetation Condition	Description
1	*Pristine or Nearly So*	No obvious signs of disturbance.
2	*Excellent*	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	*Very Good*	Vegetation structure altered, obvious signs of disturbance.
4	*Good*	Vegetation structure significantly altered by very obvious signs of multiple disturbances retains basic vegetation structure or ability to regenerate it.
5	*Degraded*	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not in a state approaching good condition without intensive management.
6	*Completely Degraded*	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

The vegetation condition in the Study Area varied from *Pristine or Nearly So/Excellent* to *Completely Degraded*. The majority of the road reserve vegetation was considered be in *Very Good* to *Good* condition, the main exception to this was the area along Mettler Rd and the Mettler Rd/Cape Riche Rd intersection, which was considered to be in *Pristine or Nearly So* to *Excellent* condition. Most of the land beyond the road reserve is previously cleared agricultural land or agroforestry and was considered to be in a *Completely Degraded* condition (Figure 3, Appenidx A).

Levels of weed encroachment were varied across the Study Area and showed a strong correlation with the vegetation condition. Agricultural land or areas of high disturbance within the Study Area were dominated by weed and pastoral species, while less disturbed areas showed a much lower to non-existent level of weed encroachment.

4.2 Flora

Some vegetation types within the Study Area have high species diversity. A total of 339 taxa from 53 families was recorded during the survey. As the pipeline corridor traverses a range of vegetation types towards the coast, there is a range of flora species representing these types. Three collections could only be identified to family level (Poaceae, Restionaceae and Cyperaceae), 38 collections could only be identified to genera level and six collections could not be positively identified to species level due to lack of flowering parts or fruiting bodies. Many of these species are in the Poacaeae and Restionaceae genera, which are difficult to identify without flowering parts.

Dominant families recorded included:

- Protecaeae 48 taxa;
- Fabaceae 46 taxa;
- Myrtaceae 45 taxa; and
- Ericaceae 19 taxa.

A full list of flora species present in the Study Area is provided in Appendix C.

4.2.1 Significant Flora

No Declared Rare species as listed by the DEC or species of national conservation significance listed under the EPBC Act were identified within the Study Area. Three species of DRF are known to occur in the vicinity of the pipeline route. They are discussed below.

Banksia verticillata – Previously recorded in the Cape Riche area within a few hundred metres of the pipeline route. This species is easily visible when not in flower and was not recorded.

Myoporum cordifolium – Previously recorded in the vicinity of Gnowellen Road. This species flowers between July and November, but is relatively difficult to see in thick vegetation. Not recorded. The pipeline location is primarily in cleared farmland or firebreaks within its known vicinity and habitat type.

***Commersonia* sp. Mt Groper** – Previously recorded in the vicinity of the minesite and within 1 km of the pipeline route. This is a distinctive species present in winter wet areas. It was not recorded during the survey.

Of the 53 significant plant species (DRF or Priority) identified as potentially occurring within the study area, 21 of these were considered unlikely, 12 as possible and 20 as likely to occur (Table 6, Appendix C).

Four species of Priority flora species as listed by the DEC were recorded from the Study Area. The location of the priority flora recorded during this survey, and those previously recorded in the area (DEC Database records) is provided in Figure 4, Appendix A.

A targeted conservation significant flora survey will be undertaken in the 2011 Spring season. This survey will target previous known conservation significant flora sites (to establish population numbers) and other appropriate habitats (vegetation, soil type) within the Project footprint. In addition, as 17 of the

55 un-identifiable plants are in the same genera as known conservation significant species, these plants will be targeted in the Spring 2011 surveys to confirm whether or not they conservation significant species.

***Monotoca aristata*, P2**

Monotoca aristata is a medium shrub that grows to over 1 m in height and is restricted to the Esperance Region (Florabase). It occurs in sandy soils in mallee, scrub and heath. During the survey it was recorded in Low Open Woodland of *Corymbia calophylla* and *Eucalyptus angulosa* over Tree Mallee to Low Open Woodland of *Eucalyptus staeri* (vegetation type V2) on Mettler Road reserve (Quadrats two and three). The species was recorded in low densities at these two quadrats.

This species was also recorded within the mine site (Ecologia, 2007).

***Chordifex leucoblepharus* P2**

Chordifex leucoblepharus is a rhizomatous, perennial herb that grows to 0.4 m in height (Florabase). *C. leucoblepharus* was recorded at low densities within Mettler Road Reserve (Quadrat one).

***Goodenia filiformis*, P3**

Goodenia filiformis is a delicate perennial herb to about 20 cm in height with yellow flowers in the summer (Florabase). An individual of this species was identified in Tall Open Shrubland of *Spyridium globulosum* over Open Shrubland of *Acacia cyclops* (vegetation type V4) along the Cape Riche Road.

Ecologia (2007) recorded individuals on waterlogged laterite of the main ridge of the mine site.

***Kunzea pauciflora,* P4**

Kunzea pauciflora is an erect, compact shrub up to 1.5 m in height. It occurs on gravely sand or loamy soils over limestone, sandstone or spongolite (Florabase). A population of approximately 20 *K. pauciflora* plants was recorded in Very Open Shrub Mallee of *Eucalyptus pleurocarpa*, *Eucalyptus* sp. and *Eucalyptus decipiens* subsp. *adesmophloia* (vegetation type V9) along Cape Riche Road.

4.2.2 Other significant flora

The EPA's definition of conservation significant flora can be found in Guidance 51 (page 29-30) and includes reasons such as:

- large populations that represent a significant proportion of the local regional population of a species;
- plants representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- anomalies (new species, sub-species, varieties, hybrids);
- plants which represent local endemism or a restricted distribution; and/or
- plants which are poorly reserved.

A *Lasiopetalum* species collected during the assessment has a preliminarily identification as *Lasiopetalum* aff. *monticola*. The specimen does not completely meet the description of *L. monticola* (a P3 plant) and has been lodged at the herbarium for further identification.

None of the native plant species recorded were regarded to be range extensions.

Given the Project's proximity to reserves including Mettlers Lake Reserve, and National Parks such Waychinicup and Fitzgerald River as well as Grange's proposed offset areas, it is considered that the plant species are likely to be represented within these conservation areas.

4.2.3 Introduced Flora

A total of 35 introduced (exotic) species were recorded during the survey.

Some sections of the road verge have been partially cleared and these sections showed a higher proportion of weed species, while other less impacted areas of the road reserve showed minimal weed invasion. Weed and pasture species were the dominant species in the cleared paddock sections of the study area. A list of the weeds identified within the Study Area is presented in Table 5, Appendix C.

4.2.4 Declared Plants

Weeds that are, or may become, a problem to agriculture or the environment can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976*. The Department of Agriculture and Food Western Australia (DAFWA) and the Agriculture Protection Board maintains a list of Declared Plants for Western Australia. If a plant is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to control the species. One of the weeds identified within the Study Area, *Asparagus asparagoides* (Bridal Creeper) is listed as P1 for the whole of the State.

In 1998 the Australian Government created a framework to identify weeds considered to be of national significance. Factors used in the assessment include the weed's invasiveness, impact, potential for spread, and damage to socioeconomic and environmental values.

Asparagus asparagoides (identified within the Study Area) is also considered to be a Weeds of National Significance (WONS). The desktop searches identified two additional WONS as species likely to occur within the area. These were *Lycium ferocissimum* (African Boxthorn) and *Rubus fruticosus aggregate* (Blackberry), neither of these species were identified during the survey.

4.3 Fauna

4.3.1 Fauna Habitat Values

The Study Area is characterised by habitat types that are represented elsewhere in the local area. The road reserve within the Study Area is mainly Mixed Eucalypt woodland but outside the road reserve it is mainly cleared paddock or agroforestry with scattered patches of remnant vegetation. The regional habitat or wildlife corridor values of the study area are reduced by the fragmented nature of the native vegetation, however, the well vegetated road reserves were observed to provide a high local wildlife corridor value.

A total of five broad habitat types was identified within the Study Area. These generally correspond with the vegetation communities identified in Section 4.1.1.

The habitat types consist of:

Mixed Eucalypt woodlands: This broad vegetation type contains varied *Eucalyptus* spp. over mixed Myrtaceous and Proteaceous shrubs with a dense understory. This is one of two dominant habitats within the Study Area and includes the vegetation types V2, V7, G9 and G14.

Seasonally wet sedgeland: this vegetation type contains scattered Myrtaceous and Proteaceous trees and shrubs with a dense Restionaceae and Cyperaceae dominated understory. This habitat is consistent with vegetation type V1. The Mettler Lake Nature Reserve is an important water bird habitat, extensively used by nomadic and migratory species (Jaensch et al., 1988 in Ecologia, 2006).

Low heath: this vegetation type is characterised by scattered *Eucalyptus* or *Hakea* species over dense Myrtaceous dominated shrubs. This habitat is consistent with vegetation type V3.

Low coastal heath: this vegetation type is dominated by *Thryptomene saxicola* but also contains mixed shrubs and dense pockets of Restionaceae and Cyperaceae species. This habitat is consistent with vegetation type V4.

Cleared paddock: these areas have been cleared for agricultural use and are generally devoid of native vegetation, usually containing only scattered trees and introduced pasture grasses. This is the other dominant habitat within the Study Area.

4.3.2 Fauna Species

The terrestrial vertebrate fauna species that potentially occur within the area were identified through searches of various databases, including collections from the WA Museum and the DEC. The online *NatureMap* database was queried for the Study Area (search area with a 15 km radius from the approximate centre of the proposed route). The search identified previous records of 126 bird, 11 reptile, four amphibian and three mammal species within 15 km of the area. Copies of the database results are provided in Appendix D.

It should be noted that some of the records of the Museum are historical and some of the recorded species may now be locally extinct. Additionally, these records may include species that are vagrants or present in the general area but not present within the Study Area due to lack of suitable habitat.

During the field survey 22 birds, four reptiles and three mammals were recorded. A complete list of fauna species observed can be seen in Table 7, Appendix D.

4.3.3 Significant Fauna Species

Based on desktop queries, 14 conservation significant species potentially occur within the Study Area, these include nine birds and five mammals.

A likelihood of occurrence assessment was conducted. This was based on the species' range, habitat requirements and previous recordings in the area (Table 8, Appendix D). Of the 14 conservation significant species, one species is present, four may occur, two are likely and seven are unlikely to occur in the Study Area.

Many of the species were considered unlikely to occur based on the lack of suitable habitat including the fragmented nature of any habitat or lack of previous records from within the Study Area and its surrounds. One conservation significant fauna species, Quenda (*Isoodon obesulus fusciventer*), was observed during the site visit. Two other species of bird, *Calyptorhynchus latirostris* (Carnaby's Cockatoo) and *Falco peregrinus* (Peregrine Falcon), are likely to occur.

***Isoodon obesulus fusciventer* (Quenda) – P5 DEC**

The Quenda is an omnivorous marsupial that occurs in the south-west of Western Australia. This species prefers areas of dense or scrubby vegetation, particularly around swamps or along watercourses. It will

utilise more open areas such as woodlands, burnt vegetation and pasture if connected to more a suitable habitat or if there are predator control programs in place.

This species was observed during the survey.

***Calyptorhynchus latirostris* (Carnaby's Cockatoo) – Endangered EPBC Act and WC Act**

Carnabys cockatoo feed on Proteaceous species of plants from coastal heath and shrublands including: *Banksia*, *Hakea*, *Grevillea*, *Allocasuarina*, *Eucalypts* and *Pinus* plantations.

Strategen (2009) completed a Carnaby's Black Cockatoo assessment for the mine site. The assessment sought to evaluate the relative extent and significance of impacts to Carnaby's Black Cockatoo. The cockatoo was observed in low numbers and frequency at the mine site location.

Although no individuals or signs of cockatoo feeding were observed along the pipeline alignment there is suitable feeding habitat present. However, trees within the alignment are too small to support breeding hollows. Given the linear and fragmented nature of much of the alignment it is anticipated that the cockatoos may utilise the site as an additional foraging resource.

***Falco peregrinus* (Peregrine Falcon) – Schedule 4 – WC Act**

The Peregrine Falcon prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. This species requires abundant prey, secure nest sites and lack of human interference (Johnstone and Storr, 1998). This species occurs along the southern coast and is expected to be a vagrant visitor to the Study Area. The pipeline alignment and outfall contain rocky coastal areas, however, no nests were observed.

4.3.4 Introduced Fauna Species

Two introduced species, *Vulpes vulpes,* Red Fox and *Oryctolagus cuniculus,* Rabbit, were noted in the Study Area. These two species are commonly observed and are well documented in the south west of Western Australia.

4.4 Short Range Endemics (SREs)

Short range endemic (SRE) invertebrates are species with naturally restricted distributions. The isolation of invertebrates in specific habitats or bioregions leads to endemism at various spatial scales. The vast majority of invertebrates are capable of dispersing substantial distances at some phase of their life cycle. Some groups, however, are susceptible to short-range endemism, which describes endemic species with restricted ranges, which has been arbitrarily defined as less than 10,000 km^2 (100 km x 100 km) (Harvey, 2002). Taxa that have been more commonly found to contain short range endemic representatives include Onychophorans (velvet worms), Arachnids (mygalomorph spiders, pseudoscorpions, opiliones, scorpions, schizomids), Myriapods (millipedes and centipedes), Molluscs (land snails), and Insects (hemipterans, grasshoppers, butterflies).

Many processes contribute to taxa being susceptible to short-range endemism. Generally these factors are related to isolation of a species which can include the ability and opportunity to disperse, life history, physiology, habitat requirements, habitat availability. Taxa that exhibit short range endemism generally exhibit poor dispersal, low growth rates, low fecundity and reliance on habitat types that are discontinuous (Harvey, 2002). Taxa that reside within easily isolated habitats surrounded by physical barriers such as islands, mountains, aquifers, lakes and caves are also more susceptible to becoming short range endemic species often including additional taxa not otherwise generally forming SRE's.

Taxa that exhibit short range endemism are particularly vulnerable to disturbance, either natural or anthropogenic, as they are reliant upon specialised and often restricted habitats (often moist) (Framenau, *et al*., 2008). Short range endemic taxa are unable to disperse to refugia when their habitats are threatened or destroyed, thus making them a priority for conservation efforts.

No invertebarate or SRE species were identified in the desktop searches including the burrowing crayfish (*Engaewa* spp.) which does not occur further east than the Kent River near Walpole (Morgan *et al.* 2011)., Ecologia (2006) has, however, completed a SRE assessment for the Southdown Mine Site. The results from their assessment are summarised below.

SRE invertebrate surveys were undertaken in October 2005 and January 2006. These surveys comprised systematic and intensive targeted surveys for both aquatic and terrestrial SRE fauna.

Groups identified as potentially harbouring SRE species in the Albany area include Mygalomorph spiders, Pseudoscorpions, true scorpions, Isopods, freshwater crayfish, centipedes, millipedes and land snails.

Ecologia (2006) identified three species during their surveys that may be considered to be SREs:

- *Bothriembryon* species – land snail: One dead, potentially undescribed species was recorded from the proposed mine site. The specimen was collected in a Mallee Heath on the lower slope of a main ridge with deep white sands.
- *Yilgarnia currycomboides* – trapdoor spider: is known only from the type locality (Peak Charles, located approximately 300 km northeast of Wellstead). Although the genus is known to be widely distributed throughout Western Australia and additional species are recognised, they have not been named. The Wellstead specimen appears to agree (morphologically) with the male from Peak Charles. Ecologia (2006) note that using the precautionary principle it is not unreasonable to consider the species as potential SRE taxon until further investigations reveal otherwise. This species was recorded in wetlands, mid basement and low rises on skeletal sands.
- *Chenistonia "palludigena" ms* – trapdoor spider: has not previously been recorded from east of Albany, hence additional specimens (including a female) are required to more accurately define its distribution. This species was recorded in wetlands, mid basement and low rises on skeletal sands.

Ecologia (2008b) completed additional surveys for SRE species outside of the mine site impact area. The survey identified two *Bothriembryon n.sp "*Wellstead" one from the Wellstead Primary School and the other from the Mettlers Lake Nature Reserve. An additional seven *Chenistonia 'paludigena'* specimens were collected from five sites. No additional specimens of the *Yilgania currycomboides* were recorded.

The Western Australian Museum (WAM, 2008) completed an assessment of the terrestrial invertebrates of the south coast Natural Resource Management (NRM) Region. This assessment found that although SRE invertebrate species were found along the whole South Coast NRM region, the areas of highest concentration of species occurred in karri (*Eucalyptus diversicolor*) forest, isolated granite outcrops and mountain peaks.

The desalination plant and pipeline are largely located within existing highly disturbed areas, cleared paddocks, roads and access tracks. Generally, the habitat types in which Ecologica (2006 and 2008) recorded potential SRE species are avoided or clearing has been limited through selecting disturbed areas. The alignment does not intersect any of the areas identified in the WAM (2008) study as containing the highest species diversity for the South Coast NRM. The coastal granite areas present

along the alignment are currently grazed and as such disturbed, these coastal granites are also continuous along the coastal area and the section disturbed by the alignment is not considered to be a unique habitat type. Generally, the habitats disturbed by the alignment are well represented within the local area.

Given the existing environment and limited extent of further disturbance, further SRE assessments are not considered necessary.

4.5 Dieback

The Study Area is considered to be in an area susceptible to the pathogen, *Phytophthora cinnamomi,* commonly known as Dieback. Dieback is found throughout the southern extent of Western Australia in areas with susceptible plant species that receive rainfall in excess of 400 mm/year (Dieback Working Group, 2005).

Dieback infestations spread through bushland either naturally, through soil water movement, or artificially through vector movement of soil on vehicles, during fencing or firebreak track maintenance and occasionally via foot traffic.

5. Ecological Impacts and their Management

The Study Area has a long history of vegetation clearing and grazing, resulting in significant losses of native vegetation, suppression of natural regeneration and weed invasion. Despite the general disturbance, there are areas of native vegetation remaining in conservation reserves and road reserves as well as in farmland.

The desalination plant and pipeline has been positioned to avoid or limit impacts to native vegetation, particularly conservation significant vegetation and important habitats.

The potential direct and indirect Project impacts are discussed throughout this section, along with the proposed mitigation measures and residual impacts. Impacts on ecology are generally most substantial during the construction phase; however, operational impacts are also discussed where relevant.

Construction Impacts

The main direct impact during the construction phase is the loss of vegetation and fauna habitats to accommodate the project footprint. This loss also results in associated impacts such as fragmentation, fauna injury and mortality and disturbance effects such as light, noise, dust, vehicle movements and the introduction or spread of weed and pest species.

Operational Impacts

Direct impacts on ecology from ongoing operations could result from fauna injury and mortality through wildlife strike due to increased traffic within the general area due to the desalination plant operation.

Indirect impacts on fauna as a result of continual and long-term noise, general activity and lighting are not expected as the desalination plant is small and located within an existing area that is devoid of native vegetation.

Mitigation

A general principle of environmental management is to, in order of preference:

- Avoid environmental impacts.
- Minimise impacts.
- Mitigate the impacts.
- Where impacts cannot be avoided or minimised, compensate for the residual impacts using other mitigation measure such as offsets.

5.1 Potential Impacts

5.1.1 Reduction in the extent of vegetation communities and associated habitats

The Project footprint has been calculated to be approxiamtley 64.7 ha, including construction areas for the pipeline and desaltination plant. This area takes into account a construction corridor width of 20 m (desalination plant to mine) and 15 m (intake / discharge to desalination plant).

The Project is largely located within previously disturbed areas (approximately 76%), with up to 15.9 ha (24%) occurring in areas mapped as native vegetation. A total of 0.93 ha of the ‘Priority 3’ ecological

community – Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast) is within the Project footprint. This includes:

- 0.66 ha on the corner of Mettler Lake Road and Cape Rich Road; and
- 0.27 ha along South Coast Highway.

Ecologia (2008a) assessed the extent of the Swamp Yate *(Eucalyptus occidentalis)* woodlands in seasonally inundated clay basins (South Coast) within the East Sand Plain Sub-catchment, and identified the presence of 44 ha of this community in Good to Excellent condition. Ecologia (2008a) also state that the total area of this vegetation is likely to be significantly higher if the areas were mapped in detail.

Taking a conservative approach (using the 44 ha sub-catchment extent), the 0.93 ha of the Swamp Yate PEC to be cleared for this Project is estimated to be approximately 2% of that present in the sub-catchment.

The habitat types to be cleared are represented within Grange's proposed offset site, including areas mapped by the DEC and verified during the offset investigations (GHD, 2011) as the Swamp Yate PEC. The offset package includes sufficient offsets for the mine site, plus additional areas for clearing associated with this Project.

Given the small extent of native vegetation to be cleared, and the provision of an offset site, the clearing is not expected to result in a significant impact to biodiversity locally or regionally.

Four Priority species were identified during the field survey. These were recorded in low densities in a small number of quadrat sites. The *Lasiopetalum aff monticola* specimen was collected near quadrat 9 within road reserve along Cape Riche Road.

The four Priority species are present across a range of areas along the south coast and all are represented by a number of records in the Western Australian herbarium. The Table 3 below provides an indication of their known range.

Table 3 Priority Species Recorded within the Project Area and their Range

Priority Species	No. of Herbarium Records (plants*)	General Range
Monotoca aristata (P2)	19 (220+)*	Common locally. Mt Maxwell.
Chordiflex leucoblepharus (P2)	19 (unknown). A number of records state it as 'common' or 'very common'.	Cranbrook, Stirling Range, to Wellstead. Many in protected reserves.
Goodenia filiformis (P3)	19 (unknown). A number of records state it as 'common'.	Cowaramup (near Margaret River) to Wellstead
Kunzea pauciflora (P4)	20 (2170+). Records state it as 'abundant'.	Common in Cape Riche area, much of which is protected in reserves.

**** Plant numbers in herbarium records are often not stated. Where they are not stated only one plant has been counted, which could considerably underrepresent the number of plants present. In addition, a number of records state that the plant is 'common' or 'scattered'. These have also only been counted as one.***

Given the limited extent of vegetation clearing associated with the Project and presence of similar habitat surrounding the alignment (including within the offset site) clearing for the Project is not expected to result in significant losses to priority species.

5.1.2 Fragmentation and Barrier Effects

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, this creates a reduction in the continuity of native vegetation through disturbance or loss with the occurrence of a new habitat type in the area between the habitat fragments. The existing habitat has been fragmented by clearing for agriculture. Intact vegetation also contains access tracks and fence lines, which have been cleared.

The Project site is located wtihn an existing weakness in the South Coast coastal macro-corridor linkage between the separated portions of Reserve 31240. However, as the pipeline has been positioned along existing cleared tracks and the desalination plant is located within an existing cleared area the Project is not expected to result in further impacts to fauna movement in the long-term.

Barrier effects occur where particular species are unable or are unwilling to move between suitable areas of fragmented habitat. Species vulnerable to barrier effects include smaller ground-dwelling species and species with low mobility. Species least vulnerable to barrier effects tend to be those that are highly mobile (e.g. birds, bats and larger macropods), although even these can vary in their response to barriers.

The pipeline will be open trenched however, given the size of the pipeline the trench will only be open for a short period of time (a few days). As such, a barrier to fauna movement will be temporary and localised.

5.1.3 Fauna Injury and Mortality

Construction Phase

Fauna injury or death has the greatest potential to occur during the clearing and grubbing phase of construction. Animals that are particularly at risk include those that shelter in hollows, beneath rocks, logs and bark and ground animals that tend to hide rather than flee at approaching danger. Increased vehicular movements associated with construction activities have the potential to increase the incidence of wildlife strike and road kill. However, given vehicle movements are expected to be relatively slow, the risk is expected to be relatively low.

Entrapment of wildlife in excavations is another potential cause of fauna injury or death. Species that are more likely to be trapped are highly mobile species and ground dwelling species that are too small to escape from excavations.

Species most likely to be impacted by direct mortality during the construction phase are generally regionally abundant.

Mortality – Operational Phase

Direct mortality of livestock and native wildlife can occur during the operational phase of the Project through vehicle strikes.

5.1.4 Habitat Degradation - Light, Noise, Vibration and Dust

Light, noise and vibration disturbance can disrupt normal wildlife behaviours (i.e. foraging, feeding, breeding and nesting). The impact of operational lighting/noise associated with the Project on flora and fauna is considered negligible as minimal operational lighting will be required.

As the Project will be constructed over a short time period, the effect of habitat degradation is expected to be minimal. Also, as the alignment is largely adjacent to existing roads and highways, species present are expected to be tolerant of background disturbances.

5.1.5 Dieback and weeds

The Study Area is susceptible to dieback, which can be introduced or spread through the movement of materials particularly during the construction phase.

An increase in bare ground and open areas will favour weedy species, which can suppress the regeneration of native species and reduce the available habitat for native species.

Vehicles, machinery and materials also have the potential to introduce new weeds and disease into the area, and/or facilitate the spread of disease/weeds.

5.2 Mitigation Measures

Potential impacts should be managed through Construction Environmental Management Plans/Project Environmental Management System (CEMP and PEMS), that include but are not limited to the management measures presented in Table 4.

Given the extent of native vegetation requiring clearing (15.9 ha) and presence of similar habitats within the broader area, the project is not expected to result in significant impacts to conservation significant species or communities, or to the biodiversity of the local or regional area. Furthermore, with appropriate management, the residual impacts of the Project on flora and fauna are considered to be relatively minor and localised.

Table 4 Management measures

Aspect	Potential Impact	Mitigation Measure
Vegetation and Flora		
Vegetation Clearing, Construction and Operation	Loss in local and regional representation of flora and fauna communities.	Vegetation and flora management will be addressed in a CEMP, which will include measures to: • Minimise clearing through site selection and design and construction options. • Clearing extents or areas to avoid will be clearly marked on site plans and in the field. • Priority flora will be avoided and protected wherever possible. • Management measures should be implemented to ensure clearing does not cause appreciable land degradation, including preventing erosion from the cleared areas. Management measures should be implemented to prevent impacts on adjacent flora and fauna from pollution, such as litter and oil spills.

Rehabilitation		
All Phases	Improve rehabilitation success	Rehabilitation will be undertaken where possible. During the construction phase topsoil and chipped vegetation will be removed and stored for later use. Rehabilitation of disturbed areas with local species, in particular within the reserves, where possible.
Dieback and Weeds		
Construction and Operation	Spread of dieback and new weed species from infected areas external to the Study Area. Increase in edge effects/proliferation of weed species present at the site.	The CEMP and OEMP will include dieback and weed hygiene management measures such as: • Ensuring, by visual inspection and cleaning, that vehicles, plant, equipment and footwear are clean when entering the site. • Ensuring that any imported material to be used in construction will be certified weed and dieback free. • Ongoing visual inspection and management of weed species. • Dieback mapping prior to construction commencing, and dieback monitoring. • Due to the presence of waterlogged areas and creeklines in the southern part of the alignment, if possible, construction in these areas should be undertaken during the summer months. This will assist in preventing the spread/introduction of dieback and also limit the disturbance associated with erosion and sedimentation. Dieback measures will also be incorporated into rehabilitation activities such as stockpile management for progressive rehabilitation and mulching.
Fauna		
Clearing of Vegetation	Clearing will result in the loss of habitat for terrestrial fauna.	Destruction of fauna habitat should be minimised during clearing. Dead, standing or fallen timber should be retained as habitat, wherever possible. Where micro-habitats, such as logs and other debris, must be disturbed for construction, these should be retained and used in rehabilitation.
Construction and Operation.	Death or injury to fauna.	If any trenches are to remain open after daily site works have completed, ensure fauna ramps (e.g. log ramps or wooden planks) are put in place to provide a potential means of escape for trapped fauna. Work areas are to be checked for fauna that may have become trapped within the worksite. This will occur immediately prior to work commencing and also within two

		hours post-sunrise and pre-sunset. On-site speed limits will be enforced to restrict the incidence of wildlife road kill.
Residual Impacts		
All Phases	Residual Impacts – vegetation clearing and loss of fauna habitat.	Grange is negotiating an offsets package for the minesite. The proposed offset site is located to the north of Mettler Road. This offset site contains similar vegetation types to those being cleared, and provides suitable habitat for conservation significant species in the area (including Carnaby's Cockatoo). The offsets package takes into account all project aspects, including the desalination pipeline and plant.

5.3 Legal Requirements

5.3.1 Federal Referral

Referral to the DSEWPaC is required if projects result in a significant impact to Matters of National Environmental Significance (MNES). This investigation has identified the potential presence of Carnaby's Cockatoo (*Calyptorhynchus latirostris*) feeding habtiat. However, given the narrow width of the alignment, its proposed position along road reserves and existing fence lines and the provision of offsets it is not expected that habitat loss associated with the pipeline will result in a significant impact to the conservation significant fauna in the area. The habitats identified within the Study Area are well represented in the area, and the clearing is not expected to result in a reduction in the available feeding/breeding habitat that would cause species decline. Referral to DSEWPaC is not considered to be required for this project.

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Appendix A

Figures

640,000 647,500 655,000 662,500

6,180,000 6,172,500 6,165,000

GNOWELLEN RD
SANDALWOOD RD
SOUTH COAST HWY
SHEARER RD
METTLER RD
CAPE RICHE RD
BASIL RD
TURNOR RD

Mettler Lake
Nature Reserve

Hassell
National Park

Basil Road
Nature Reserve

R 31240
R 14943
R 14943

Cheyne Island
Nature Reserve

1:75,000 (at A3)

0 375 750 1,500 2,250 3,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Seawater Transfer Pipeline and Buried Power Line
- Treated Water Transfer Pipeline and Power Line
- Brine Discharge Pipeline
- Priority Ecological Community Location
- Priority Ecological Community Areas
- South Coast Significant Wetlands
- Desalination Plant
- Outfall Station
- Pump Station
- Proposed Pit Boundary
- Cadastre
- Other Reserves

DEC Managed Lands

- National Park
- Nature Reserve

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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number	61-26005
Revision	2
Date	6 JUL 2011

Location and Environmental Constraints Map

Figure 1

G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig1_Rev2.mxd

Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Proposed Pit Boundary - 2010; Harley Global: Seawater Pipeline, Outfall Pipeline, Treated Water Transfer Pipeline - 20110706; GHD: Desalination Plant, Outfall Station, Pump Station - 20110527; DEC: Threatened Ecological Communities - 20101108, South Coast Significant Wetlands, DEC Managed Lands - 20110301 Created by: tgoad

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640,000 643,000 646,000 649,000

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GNOWELLEN RD

SOUTH COAST HWY

SHEARER RD

METTLER RD

SANDALWOOD RD

CAPE RICHE RD

G1 G2 G3 G13 G14

Locality Map

SOUTH COAST HWY

1 2 3 4 5

SOUTHERN OCEAN

1:30,000 (at A3)

0 150 300 600 900 1,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Flora Quadrat
- Seawater Transfer Pipeline and Buried Power Line
- Treated Water Transfer Pipeline and Power Line
- Brine Discharge Pipeline
- Desalination Plant
- Outfall Station
- Pump Station
- Proposed Pit Boundary
- Cadastre
- Plantation

Vegetation Type

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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number	61-26005
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MapSheet 1 of 5

Vegetation Types and Quadrat Locations

Figure 2a

G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig2a_Rev2.mxd

Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Types - 20110704, Plantation - 20110510, Quadrat Locations - 20110420, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Brine Discharge, Treated Water Transfer Pipeline - 20110704 Created by: tgoad

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CAPE RICHE RD

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

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LEGEND

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- Seawater Transfer Pipeline and Buried Power Line
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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number	61-26005
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Date	6 JUL 2011

MapSheet 2 of 5

Vegetation Types and Quadrat Locations

Figure 2a

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Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Types - 20110704, Plantation - 20110510, Quadrat Locations - 20110420, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Brine Discharge, Treated Water Transfer Pipeline - 20110704 Created by: tgoad

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CAPE RICHE RD

BASIL RD

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Locality Map

SOUTH COAST HWY

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SOUTHERN OCEAN

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

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LEGEND

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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number	61-26005
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Date	6 JUL 2011

MapSheet 3 of 5

Vegetation Types and Quadrat Locations

Figure 2a

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Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Types - 20110704, Plantation - 20110510, Quadrat Locations - 20110420, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Brine Discharge, Treated Water Transfer Pipeline - 20110704 Created by: tgoad

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CAPE RICHE RD

Locality Map

SOUTH COAST HWY

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SOUTHERN OCEAN

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

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Grange Resources
Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number 61-26005
Revision 2
Date 6 JUL 2011

MapSheet 4 of 5

Vegetation Types and Quadrat Locations

Figure 2a

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Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Types - 20110704, Plantation - 20110510, Quadrat Locations - 20110420, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Brine Discharge, Treated Water Transfer Pipeline - 20110704 Created by: tgoad

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Locality Map

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Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

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LEGEND

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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number 61-26005
Revision 2
Date 6 JUL 2011

MapSheet 5 of 5

Vegetation Types and Quadrat Locations

Figure 2a

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Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Types - 20110704, Plantation - 20110510, Quadrat Locations - 20110420, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Brine Discharge, Treated Water Transfer Pipeline - 20110704 Created by: tgoad

Vegetation Type

V1	Very Open Shrub Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus occidentalis* over Tall Open Shrubland of *Acacia subcaerulea* Open Shrubland of *Hakea trifurcata, Hakea denticulata* and *Beaufortia empetrifolia* over Low Open Shrubland of *Astartea aspera, Isopogon longifolius, Hovea trisperma, Petrophile squamata* subsp. *squamata, Comesperma virgatum* and *Chorizema glycinifolium* over Closed Sedgeland of *Anarthria laevis* and *Lepidosperma striatum.*
V2	Low Open Woodland of *Corymbia calophylla* and *Eucalyptus angulosa* over Tree Mallee to Low Open Woodland of *Eucalyptus staeri* over Tall Open Shrubland to Closed Tall Scrub of *Banksia attenuata, Banksia baxteri, Hakea laurina, Hakea ferruginea, Lambertia inermis, Lambertia* sp., *Adenanthos cuneatus, Allocasuarina scleroclada* and *Taxandria spathulata* over Open Shrubland to Open Heath of *Melaleuca striata, Leucopogon crassiflorus, Calothamnus quadrifidus, Beaufortia empetrifolia, Hibbertia cunninghamii* and *Agonis theiformis* over Low Shrubland to Open Low Heath of *Petrophile teretifolia, Melaleuca thymoides, Lysinema ciliatum, Banksia nutans, Hakea marginata, Hakea ceratophylla* and *Banksia repens* over mixed *pasture grasses over Very Open Herbland of *Lomandra* sp. and *pasture grasses and Very Open Sedgeland to Sedgeland of *Desmocladus fasciculatus, Caustis dioica, Anarthria scabra* and *Anarthria prolifera.*
V3	Very Open Tree Mallee of *Eucalyptus occidentalis* over Tall Open Shrubland of *Hakea laurina* and *Conothamnus aureus* over Shrubland of *Goodenia pterigosperma, Taxandria spathulata, Daviesia incrassata, Acacia subcaerulea* and *Coleanthera myrtoides* over Closed Low Heath of *Melaleuca rigidifolia, Melaleuca suberosa, Allocasuarina microstachya* and *Beaufortia micrantha* subsp. *micrantha* over Very Open Grassland of *Neurachne* sp. and mixed Very Open Herbland and Sedgeland of *Schoenus subfascicularis, Anarthria laevis, Desmocladus fasciculatus* and *Schoenus* sp.
V4	Tall Open Shrubland of *Spyridium globulosum* over Open Shrubland of *Acacia cyclops* over Open Low Heath of *Thryptomene saxicola, Gompholobium tomentosum, Kennedia microphylla* and *Kennedia prostrata* over mixed *pasture grasses and mixed Herbland dominated by *Patersonia occidentalis* and Sedgeland of *Desmocladus flexuosus.*
V5	Shrub Mallee of *Eucalyptus angulosa* over Tall Shrubland of *Spyridium globulosum* over Shrubland of **Lessertia frutescens, Leucopogon elegans* subsp. *elegans* and *Leucopogon obovatus* over Low Open Shrubland of *Kennedia coccinea* over Grassland of **Bromus* sp. and Very Open Sedgeland of *Desmocladus flexuosus.*
V6	Cleared Paddocks with occasional *Eucalyptus* sp. over *pasture weeds or Agroforestry plantations.
V7	Open Forest of *Corymbia calophylla* over Low Open Forest of *Eucalyptus occidentalis* over Open Tall Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus goniantha* over Tall Shrubland of *Melaleuca cuticularis, Agonis theiformis* and *Hakea varia* over Open Shrubland of *Spyridium globulosum, Jacksonia horrida* and *Bossiaea eriocarpa* over Open Heath of *Taxandria spathulata, Calothamnus quadrifidus, Petrophile media, Billardiera heterophylla, *Psoralea pinnata* and *Acacia leioderma* over Low Open Shrubland of *Hibbertia cuneiformis* and *Thryptomene saxicola* over mixed *pasture grasses and Closed Sedgeland of *Hypolaena exsulca, Baumea juncea, *Juncus bufonius* and *Juncus pallidus.*
V8	Low Open Forest of *Melaleuca cuticularis* over Open Shrubland of *Hibbertia cunninghamii* and *Xanthorrhoea platyphylla* over Low Shrubland of *Thryptomene saxicola* over Grassland of *pasture grasses and *Eragrostis* sp. and Herbland of *pasture grasses and Sedgeland of *Gahnia trifida, Juncus pallidus, Lepidosperma squamatum, Mesomelaena tetragona* and *Ficinia nodosa.*
V9	Very Open Shrub Mallee of *Eucalyptus pleurocarpa, Eucalyptus* sp. and *Eucalyptus decipiens* subsp. *adesmophloia* over Tall Open Scrub of *Lambertia* sp., *Melaleuca* sp., *Conothamnus aureus* and *Phymatocarpus maxwellii* over Shrubland of *Taxandria spathulata, Beaufortia schaueri* and *Acacia leioderma* over Low Shrubland of *Daviesia decurrens, Melaleuca rigidifolia, Banksia falcata* and *Banksia tenuis* over Open Sedgeland of *Schoenus subfascicularis.*
V10	Shrub Mallee of *Eucalyptus buprestium* and mixed *Eucalyptus* sp. over Tall Shrubland of *Lambertia* sp. over Open Heath of *Taxandria spathulata, Melaleuca striata* and *Beaufortia empetrifolia* over Low Shrubland of *Petrophile rigida, Allocasuarina humilis* and *Daviesia incrassata* subsp. *reversifolia* over Sedgeland of *Anarthria humilis, A. scabra* and *Desmocladus flexuosus.*
V11	Low Open woodland of *Melaleuca cuticularis* over Open Shrubland of *Leucopogon revolutus, Boronia alata* and *Westringia dampieri* over Low Open Shrubland of *Westringia* over Open Grassland of *pasture grasses and Open Herbland of *pasture grasses and Sedgeland of *Gahnia trifida, Lepidosperma squamatum* and *Ficinia nodosa.*
V12	Closed Low Heath of *Thryptomene saxicola* and *Pimelea ferruginea* over Open Grassland of *Eragrostis* sp., Poaceae sp. and *pasture grasses.

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Grange Resources
Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number	61-26005
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Date	12 MAY 2011

Vegetation Types and Quadrat Locations

Figure 2b

G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig2b_Rev0.mxd

Data source: GHD: Vegetation Types - 20110510 Created by: tgoad

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

1:30,000 (at A3)

0 150 300 600 900 1,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Seawater Pipeline
- Outfall Pipeline
- Pit Boundary
- Cadastre
- Desalination Plant
- Outfall Station
- Pump Station

Vegetation Condition

- 1
- 1-2
- 2
- 2-3
- 3
- 3-4
- 4
- 4-5
- 5
- 5-6
- 6

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Grange Resources
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Potential Pipeline Route

Job Number 61-26005
Revision 1
Date 30 MAY 2011

MapSheet 1 of 2

Vegetation Condition

Figure 3

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G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig3_Rev1.mxd

Data source: Landgate: Cadastre - 20101018, Road Names- 20110421; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Condition - 20110527, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Outfall Pipeline - 20110527 Created by: tgoad

1:30,000 (at A3)

0 150 300 600 900 1,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

- Seawater Pipeline
- Outfall Pipeline
- Pit Boundary
- Cadastre
- Desalination Plant
- Outfall Station
- Pump Station

Vegetation Condition

1	3	5
1-2	3-4	5-6
2	4	6
2-3	4-5	

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Cape Riche Seawater Desalination Plant :
Potential Pipeline Route

Job Number 61-26005
Revision 1
Date 30 MAY 2011

MapSheet 2 of 2

Vegetation Condition

Figure 3

G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig3_Rev1.mxd

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: Cadastre - 20101018, Road Names- 20110421; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Vegetation Condition - 20110527, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Outfall Pipeline - 20110527 Created by: tgoad

640,000 647,500 655,000 662,500

6,180,000

6,172,500

6,165,000

GNOWELLEN RD
SOUTH COAST HWY
SHEARER RD
METTLER RD
CAPE RICHE RD
SANDALWOOD RD
BASIL RD
TURNOR RD

1:75,000 (at A3)

0 375 750 1,500 2,250 3,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Declared Rare & Priority Species

- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa

GHD Surveyed Priority Flora

- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa

- Road
- Seawater Transfer Pipeline and Buried Power Line
- Treated Water Transfer Pipeline and Power Line
- Brine Discharge Pipeline

- Desalination Plant
- Outfall Station
- Pump Station
- Pit Boundary
- Cadastre

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Grange Resources
Cape Riche Seawater Desalination Plant : Potential Pipeline Route

Conservation Significant Flora

Job Number	61-26005
Revision	1
Date	30 MAY 2011

Figure 4

G:\61\26005\GIS\Maps\MXD\612600505_G025_Fig4_Rev1.mxd

Data source: Landgate: Cadastre - 20101018, Roads - 20110411; Grange Resources: Mosaic, Pit Boundary - 2010; GHD: Priority Flora - 20110228, Desalination Plant, Outfall Station, Pump Station - 20110527; Harley Global: Seawater Pipeline, Outfall Pipeline - 20110527; DEC: DRF, WAHerb - 20101109 Created by: tgoad

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Appendix B

Conservations Codes

EPBC Act Fauna Conservation Categories

Listed threatened species and ecological communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild,
- critically endangered,
- endangered, or
- vulnerable.

Critically endangered and endangered species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.*

Vulnerable species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or

- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- interferes
- substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Listed migratory species

The EPBC Act protects lands and migratory species that are listed under International Agreements.

- Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a Range State under the Convention;
- The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- The Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA).
- other international agreements approved by the Commonwealth Environment Minister.

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species.

The criteria below are relevant to migratory species that are not threatened.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

- habitat utilized by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilized by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated).

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.*

Table 5a Conservation categories and definitions for EPBC Act listed flora and fauna species.

Conservation Category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Table 5b Conservation codes and descriptions for DEC Declared Rare and Priority flora species.

Conservation Code	Description
R: Declared Rare Flora – Extant Taxa	Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

Conservation Code	Description
P1: Priority One – Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two – Poorly Known Taxa	Taxa which are known from one or a few (generally<5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three – Poorly Known Taxa	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
P4: Priority Four – Taxa in need of monitoring	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.

Table 5c Western Australian *Wildlife Conservation Act 1950* Conservation Codes for fauna.

Conservation Code	Description
Schedule 1	"…fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection."
Schedule 2	"…fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection."
Schedule 3	"…birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection."
Schedule 4	"…fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3]"

Table 5d DEC Priority fauna codes.

(Species not listed under the *Wildlife Conservation Act 1950*, but for which there is some concern).

Conservation Code	Description
Priority 1	Taxa with few, poorly known populations on threatened lands.
Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
Priority 3	Taxa which are known from few specimens or sight records, some of which are on lands not under immediate threat of habitat destruction or degradation.
Priority 4	Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
Priority 5	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Appendix C

Flora

Southdown Mine Desalination Pipeline Route - Flora Species List

Quadrat data

Likelihood of Occurrence of Significant Flora species previously recorded within 15 km of the study area (DEC, WAHERB, EPBC and NatureMap)

Table 6 Southdown Mine Desalination Pipeline Route - Flora Species List

Family	Genus	Species	Status
Aizoaceae	*Carpobrotus*	*sp.*	
Aizoaceae	*Tetragonia*	*decumbens*	*
Amaranthaceae	*Ptilotus*	*drummondii*	
Anarthriaceae	*Anarthria*	*laevis*	
Anarthriaceae	*Anarthria*	*prolifera*	
Anarthriaceae	*Anarthria*	*scabra*	
Anarthriaceae	*Anarthria*	*sp.*	
Anarthriaceae	*Anarthria*	*humilis*	
Apiaceae	*Centella*	*asiatica*	
Araliaceae	*Trachymene*	*pilosa*	
Asparagaceae	*Asparagus*	*asparagoides*	* DP, WONS
Asparagaceae	*Chamaexeros*	*serra*	
Asparagaceae	*Laxmannia*	*paleacea*	
Asparagaceae	*Lomandra*	*hastilis*	
Asparagaceae	*Lomandra*	*rupestris*	
Asparagaceae	*Lomandra*	*sp.*	
Asteraceae	*Amblysperma*	*spathulatum*	
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Brachyscome*	*sp.*	
Asteraceae	*Gnephosis*	*tenuissima*	
Asteraceae	*Helichrysum*	*leucopsideum*	
Asteraceae	*Hypochaeris*	*sp.*	
Asteraceae	*Olearia*	*axillaris*	
Asteraceae	*Siloxerus*	*filifolius*	
Asteraceae	*Sonchus*	*asper*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Asteraceae	*Ursinia*	*anthemoides*	*
Brassicaceae	*Brassica*	*sp.*	*
Campanulaceae	*Lobelia*	*anceps*	
Campanulaceae	*Lobelia*	*gibbosa*	
Campanulaceae	*Wahlenbergia*	*multicaulis*	
Caryophyllaceae	*Cerastium*	*glomeratum*	*

Family	Genus	Species	Status
Caryophyllaceae	*Petrorhagia*	*dubia*	*
Casuarinaceae	*Allocasuarina*	*humilis*	
Casuarinaceae	*Allocasuarina*	*microstachya*	
Casuarinaceae	*Allocasuarina*	*scleroclada*	
Casuarinaceae	*Allocasuarina*	*sp.*	
Casuarinaceae	*Allocasuarina*	*thuyoides*	
Casuarinaceae	*Allocasuarina*	*trichodon*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Celastraceae	*Stackhousia*	*monogyna*	
Chenopodiaceae	*Enchylaena*	*tomentosa*	
Chenopodiaceae	*Rhagodia*	*baccata subsp. baccata*	
Colchicaceae	*Burchardia*	*congesta*	
Convolvulaceae	*Convolvulus*	*angustissimus*	
Cyperaceae	*Baumea*	*juncea*	
Cyperaceae	*Caustis*	*dioica*	
Cyperaceae		*sp.*	
Cyperaceae	*Cyperus*	*tenellus*	*
Cyperaceae	*Ficinia*	*nodosa*	
Cyperaceae	*Gahnia*	*trifida*	
Cyperaceae	*Lepidosperma*	*?pubisquameum* complex	
Cyperaceae	*Lepidosperma*	*squamatum*	
Cyperaceae	*Lepidosperma*	*striatum*	
Cyperaceae	*Mesomelaena*	*stygia*	
Cyperaceae	*Mesomelaena*	*tetragona*	
Cyperaceae	*Schoenus*	*sp.*	
Cyperaceae	*Schoenus*	*?sublateralis*	
Cyperaceae	*Schoenus*	*obtusifolius*	
Cyperaceae	*Schoenus*	*subfascicularis*	
Cyperaceae	*Schoenus*	*sublateralis*	
Cyperaceae	*Tricostularia*	*neesii var neesii*	
Dasypogonaceae	*Calectasia*	*grandiflora*	
Dasypogonaceae	*Dasypogon*	*bromeliifolius*	
Dasypogonaceae	*Kingia*	*australis*	
Dilleniaceae	*Hibbertia*	*cuneiformis*	
Dilleniaceae	*Hibbertia*	*cunninghamii*	

Family	Genus	Species	Status
Dilleniaceae	*Hibbertia*	*lineata*	
Dilleniaceae	*Hibbertia*	*sp.*	
Dilleniaceae	*Hibbertia*	*arcuata*	
Dilleniaceae	*Hibbertia*	*gracilipes*	
Droseraceae	*Drosera*	*platypoda*	
Ericaceae	*Andersonia*	*parvifolia*	
Ericaceae	*Andersonia*	*simplex*	
Ericaceae	*Andersonia*	*sp.*	
Ericaceae	*Astroloma*	*baxteri*	
Ericaceae	*Astroloma*	*compactum*	
Ericaceae	*Astroloma*	*pallidum*	
Ericaceae	*Coleanthera*	*myrtoides*	
Ericaceae	*Leucopogon*	*crassiflorus*	
Ericaceae	*Leucopogon*	*elegans subsp. elegans*	
Ericaceae	*Leucopogon*	*gibbosus*	
Ericaceae	*Leucopogon*	*obovatus*	
Ericaceae	*Leucopogon*	*parviflorus*	
Ericaceae	*Leucopogon*	*revolutus*	
Ericaceae	*Leucopogon*	*tamariscinus*	
Ericaceae	*Leucopogon*	*aff assimilis*	
Ericaceae	*Leucopogon*	*propinquus*	
Ericaceae	*Leucopogon*	sp. Coujinup (M.A. Burgman 1085)	
Ericaceae	*Lysinema*	*ciliatum*	
Ericaceae	*Monotoca*	*aristata*	P2
Fabaceae	*Acacia*	*cowleana*	
Fabaceae	*Acacia*	*cupularis*	
Fabaceae	*Acacia*	*cyclops*	
Fabaceae	*Acacia*	*delphina*	
Fabaceae	*Acacia*	*gonophylla*	
Fabaceae	*Acacia*	*leioderma*	
Fabaceae	*Acacia*	*subcaerulea*	
Fabaceae	*Acacia*	*biflora*	
Fabaceae	*Acacia*	*leioderma*	
Fabaceae	*Acacia*	*pulchella var. goadbyi*	
Fabaceae	*Acacia*	*sp.*	

Family	Genus	Species	Status
Fabaceae	*Bossiaea*	*eriocarpa*	
Fabaceae	*Bossiaea*	*praetermissa*	
Fabaceae	*Bossiaea*	*preissii*	
Fabaceae	*Chorizema*	*glycinifolium*	
Fabaceae	*Daviesia*	*decurrens*	
Fabaceae	*Daviesia*	*incrassata*	
Fabaceae	*Daviesia*	*incrassata subsp. reversifolia*	
Fabaceae	*Daviesia*	*marginata*	
Fabaceae	*Eutaxia*	*inuncta*	
Fabaceae	*Gastrolobium*	*bilobum*	
Fabaceae	*Gastrolobium*	*retusum*	
Fabaceae	*Gastrolobium*	*bracteolosum*	
Fabaceae	*Gastrolobium*	*reticulatum*	
Fabaceae	*Gompholobium*	*capitatum*	
Fabaceae	*Gompholobium*	*polymorphum*	
Fabaceae	*Gompholobium*	*scabrum*	
Fabaceae	*Gompholobium*	*tomentosum*	
Fabaceae	*Gompholobium*	*venustum*	
Fabaceae	*Gompholobium*	*confertum*	
Fabaceae	*Gompholobium*	*knightianum*	
Fabaceae	*Hovea*	*trisperma*	
Fabaceae	*Jacksonia*	*horrida*	
Fabaceae	*Jacksonia*	*capitata*	
Fabaceae	*Kennedia*	*coccinea*	
Fabaceae	*Kennedia*	*microphylla*	
Fabaceae	*Kennedia*	*prostrata*	
Fabaceae	*Lessertia*	*frutescens*	*
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Melilotus*	*siculus*	*
Fabaceae	*Psoralea*	*pinnata*	*
Fabaceae	*Sphaerolobium*	*sp.*	
Fabaceae	*Templetonia*	*neglecta*	
Fabaceae	*Templetonia*	*retusa*	
Fabaceae	*Trifolium*	*campestre*	*
Fabaceae	*Trifolium*	*sp.*	

Family	Genus	Species	Status
Geraniaceae	*Erodium*	*sp.*	*
Geraniaceae	*Geranium*	*sp.*	
Geraniaceae	*Pelargonium*	*australe*	
Geraniaceae	*Pelargonium*	*littorale*	
Goodeniaceae	*Dampiera*	*juncea*	
Goodeniaceae	*Dampiera*	*pedunculata*	
Goodeniaceae	*Goodenia*	*incana*	
Goodeniaceae	*Lechenaultia*	*formosa*	
Goodeniaceae	*Lechenaultia*	*sp.*	
Goodeniaceae	*Lechenaultia*	*tubiflora*	
Goodeniaceae	*Velleia*	*sp.*	
Goodeniaceae	*Velleia*	*trinervis*	
Goodeniaceae	*Goodenia*	*filiformis*	P3
Goodeniaceae	*Goodenia*	*pterigosperma*	
Haemodoraceae	*Conostylis*	*pusilla*	
Haemodoraceae	*Conostylis*	*serrulata*	
Haemodoraceae	*Conostylis*	*vaginata*	
Haemodoraceae	*Haemodorum*	*discolor*	
Hemerocallidaceae	*Agrostocrinum*	*hirsutum*	
Hemerocallidaceae	*Caesia*	*micrantha*	
Hemerocallidaceae	*Dianella*	*revoluta*	
Hemerocallidaceae	*Dianella*	*sp.*	
Hemerocallidaceae	*Tricoryne*	*elatior*	
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Patersonia*	*maxwellii*	
Iridaceae	*Patersonia*	*occidentalis*	
Iridaceae	*Patersonia*	*sp.*	
Iridaceae	*Romulea*	*rosea*	*
Juncaceae	*Juncus*	*pallidus*	
Juncaceae	*Juncus*	*subsecundus*	
Juncaceae	*Juncus*	*bufonius*	*
Juncaceae	*Juncus*	*sp. (insufficient material)*	
Lamiaceae	*Westringia*	*dampieri*	
Lauraceae	*Cassytha*	*racemosa*	
Lauraceae	*Cassytha*	*sp.*	

Family	Genus	Species	Status
Loranthaceae	*Nuytsia*	*floribunda*	
Malvaceae	*Lasiopetalum*	*?aff monticola*	Awaiting formal identification
Malvaceae	*Thomasia*	*foliosa*	
Myrtaceae	*Agonis*	*theiformis*	
Myrtaceae	*Astartea*	*aspera*	
Myrtaceae	*Beaufortia*	*empetrifolia*	
Myrtaceae	*Beaufortia*	*micrantha subsp. micrantha*	
Myrtaceae	*Beaufortia*	*schaueri*	
Myrtaceae	*Beaufortia*	*anisandra*	
Myrtaceae	*Calothamnus*	*gracilis*	
Myrtaceae	*Calothamnus*	*quadrifidus*	
Myrtaceae	*Conothamnus*	*aureus*	
Myrtaceae	*Corymbia*	*calophylla*	
Myrtaceae	*Darwinia*	*citriodora*	
Myrtaceae	*Darwinia*	*vestita*	
Myrtaceae	*Eucalyptus*	*angulosa*	
Myrtaceae	*Eucalyptus*	*?decipiens*	
Myrtaceae	*Eucalyptus*	*?occidentalis*	
Myrtaceae	*Eucalyptus*	*?uncinata*	
Myrtaceae	*Eucalyptus*	*buprestium*	
Myrtaceae	*Eucalyptus*	*decipiens subsp. adesmophbia*	
Myrtaceae	*Eucalyptus*	*goniantha*	
Myrtaceae	*Eucalyptus*	*incrassata*	
Myrtaceae	*Eucalyptus*	*lehmannii*	
Myrtaceae	*Eucalyptus*	*occidentalis*	
Myrtaceae	*Eucalyptus*	*pleurocarpa*	
Myrtaceae	*Eucalyptus*	*sp.*	
Myrtaceae	*Eucalyptus*	*staeri*	
Myrtaceae	*Kunzea*	*pauciflora*	P4
Myrtaceae	*Leptospermum*	*sp.*	
Myrtaceae	*Leptospermum*	*squamatum*	
Myrtaceae	*Melaleuca*	*cuticularis*	
Myrtaceae	*Melaleuca*	*densa*	
Myrtaceae	*Melaleuca*	*minutifolia*	

Family	Genus	Species	Status
Myrtaceae	*Melaleuca*	*pentagona*	
Myrtaceae	*Melaleuca*	*rigidifolia*	
Myrtaceae	*Melaleuca*	*sp.*	
Myrtaceae	*Melaleuca*	*striata*	
Myrtaceae	*Melaleuca*	*suberosa*	
Myrtaceae	*Melaleuca*	*thymoides*	
Myrtaceae	*Melaleuca*	*rhaphiophylla*	
Myrtaceae	*Phymatocarpus*	*maxwellii*	
Myrtaceae	*Taxandria*	*spathulata*	
Myrtaceae	*Thryptomene*	*saxicola*	
Myrtaceae	*Verticordia*	*habrantha*	
Myrtaceae	*Verticordia*	*sieberi var. lomata*	
Myrtaceae	*Verticordia*	*sp.*	
Myrtaceae	*Verticordia*	*grandiflora*	
Olacaceae	*Olax*	*phyllanthi*	
Orchidaceae	*Cyrtostylis*	*huegelii*	
Orchidaceae	*Caladenia*	*sp.*	
Orchidaceae	*Disa*	*bracteata*	*
Orchidaceae	*Diuris*	*longifolia*	
Orchidaceae	*Diuris*	*sp.*	
Orchidaceae	*Microtis*	*sp.*	
Orchidaceae	*Thelymitra*	*sp.*	
Orobanchaceae	*Bartsia*	*trixago*	*
Phyllanthaceae	*Phyllanthus*	*calycinus*	
Pittosporaceae	*Billardiera*	*heterophylla*	
Pittosporaceae	*Marianthus*	*erubescens*	
Plumbaginaceae	*Limonium*	*sinuatum*	*
Poaceae	*Aira*	*caryophyllea*	*
Poaceae	*Amphipogon*	*turbinatus*	
Poaceae	*Austrodanthonia*	*caespitosa*	
Poaceae	*Austrostipa*	*sp.*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Avena*	*sp.*	
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*

Family	Genus	Species	Status
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Bromus*	*sp.*	
Poaceae	*Cyperochloa*	*hirsuta*	
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	*sp.*	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Neurachne*	*alopecuroidea*	
Poaceae	*Pennisetum*	*clandestinum*	*
Poaceae		*sp.*	
Polygalaceae	*Comesperma*	*virgatum*	
Polygalaceae	*Comesperma*	*calymega*	
Polygonaceae	*Muehlenbeckia*	*adpressa*	
Portulacaceae	*Calandrinia*	*eremaea var. ellipticum*	
Primulaceae	*Lysimachia*	*arvensis*	*
Proteaceae	*Adenanthos*	*apiculatus*	
Proteaceae	*Adenanthos*	*cuneatus*	
Proteaceae	*Banksia*	*arctotidis*	
Proteaceae	*Banksia*	*attenuata*	
Proteaceae	*Banksia*	*baxteri*	
Proteaceae	*Banksia*	*falcata*	
Proteaceae	*Banksia*	*gardneri*	
Proteaceae	*Banksia*	*grandis*	
Proteaceae	*Banksia*	*nivea*	
Proteaceae	*Banksia*	*nutans*	
Proteaceae	*Banksia*	*obovata*	
Proteaceae	*Banksia*	*plumosa*	
Proteaceae	*Banksia*	*repens*	
Proteaceae	*Banksia*	*sessilis*	
Proteaceae	*Banksia*	*tenuis*	
Proteaceae	*Banksia*	*pteridifolia*	
Proteaceae	*Banksia*	*sphaerocarpa var. sphaerocarpa*	
Proteaceae	*Conospermum*	*sp.*	
Proteaceae	*Conospermum*	*teretifolium*	

Family	Genus	Species	Status
Proteaceae	*Franklandia*	*fucifolia*	
Proteaceae	*Grevillea*	*fasciculata*	
Proteaceae	*Hakea*	*ceratophylla*	
Proteaceae	*Hakea*	*denticulata*	
Proteaceae	*Hakea*	*lorea*	
Proteaceae	*Hakea*	*trifurcata*	
Proteaceae	*Hakea*	*corymbosa*	
Proteaceae	*Hakea*	*cucullata*	
Proteaceae	*Hakea*	*ferruginea*	
Proteaceae	*Hakea*	*lissocarpha*	
Proteaceae	*Hakea*	*marginata*	
Proteaceae	*Hakea*	*sulcata*	
Proteaceae	*Hakea*	*varia*	
Proteaceae	*Isopogon*	*formosus*	
Proteaceae	*Isopogon*	*longifolius*	
Proteaceae	*Isopogon*	*buxifolius*	
Proteaceae	*Isopogon*	*polycephalus*	
Proteaceae	*Lambertia*	*inermis*	
Proteaceae	*Lambertia*	*inermis*	
Proteaceae	*Petrophile*	*divaricata*	
Proteaceae	*Petrophile*	*media*	
Proteaceae	*Petrophile*	*phylicoides*	
Proteaceae	*Petrophile*	*rigida*	
Proteaceae	*Petrophile*	*sp. (insufficient material)*	
Proteaceae	*Petrophile*	*squamata subsp. squamata*	
Proteaceae	*Petrophile*	*teretifolia*	
Proteaceae	*Stirlingia*	*teretifolia*	
Proteaceae	*Synaphea*	*petiolaris subsp. triloba*	
Proteaceae	*Synaphea*	*polymorpha*	
Pteridaceae	*Cheilanthes*	*sp.*	
Ranunculaceae	*Clematis*	*pubescens*	
Restionaceae	*Chordifex*	*sphacelatus*	
Restionaceae	*Chordifex*	*laxus*	
Restionaceae	*Chordifex*	*leucoblepharus*	P2
Restionaceae	*Desmocladus*	*fasciculatus*	

Family	Genus	Species	Status
Restionaceae	*Desmocladus*	*flexuosus*	
Restionaceae	*Harperia*	*confertospicata*	
Restionaceae	*Harperia*	*sp.*	
Restionaceae	*Hypolaena*	*exsulca*	
Restionaceae	*Restionaceae*	*sp.*	
Rhamnaceae	*Spyridium*	*globulosum*	
Rhamnaceae	*Stenanthemum*	*emarginatum*	
Rubiaceae	*Opercularia*	*vaginata*	
Rutaceae	*Boronia*	*alata*	
Rutaceae	*Boronia*	*spathulata*	
Rutaceae	*Boronia*	*albiflora*	
Santalaceae	*Exocarpos*	*sparteus*	
Stylidiaceae	*Levenhookia*	*stipitata*	
Stylidiaceae	*Stylidiaceae*	*sp.*	
Stylidiaceae	*Stylidium*	*corymbosum var. corymbosum*	
Stylidiaceae	*Stylidium*	*preissii*	
Stylidiaceae	*Stylidium*	*repens*	
Stylidiaceae	*Stylidium*	*crassifolium*	
Stylidiaceae	*Stylidium*	*hirsutum*	
Stylidiaceae	*Stylidium*	*luteum*	
Thymelaeaceae	*Pimelea*	*angustifolia*	
Thymelaeaceae	*Pimelea*	*ferruginea*	
Thymelaeaceae	*Pimelea*	*tinctoria*	
Thymelaeaceae	*Pimelea*	*argentea*	
Thymelaeaceae	*Pimelea*	*imbricata var. piligera*	
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	

***** Denotes introduced (weed) species.

P Denotes Priority listed species.

GRANGE – DESALINATION PROJECT: VEGETATION QUADRAT DATA

Site: G1 **Date:** 17/11/10

Location: Cr Cape Riche and Mettler Rd, Wellstead

Described by: MT **Dimensions:** Q 10 m x 10 m

MGA zone: 50 648784 mE 6175291 mN

Habitat: Swamp sedgeland

Soil: Dark brown clayey loamy sand

Vegetation: Very Open Shrub Mallee of *Eucalyptus decipiens* subsp. *adesmophloia* and *Eucalyptus occidentalis* over Tall Open Shrubland of *Acacia subcaerulea* Open Shrubland of *Hakea trifurcata*, *Hakea denticulata* and *Beaufortia empetrifolia* over Low Open Shrubland of *Astartea aspera*, *Isopogon longifolius, Hovea trisperma*, *Petrophile squamata* subsp. *squamata*, *Comesperma virgatum* and *Chorizema glycinifolium* over Closed Sedgeland of *Anarthria laevis* and *Lepidosperma striatum*.

Veg. condition: Pristine

Fire age: > 10 years

Notes: Seasonally wet

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*laevis*	
Celastraceae	*Stackhousia*	*monogyna*	
Cyperaceae	*Lepidosperma*	*striatum*	
Cyperaceae	*Tricostularia*	*neesii* var. *neesii*	
Fabaceae	*Acacia*	*subcaerulea*	
Fabaceae	*Chorizema*	*glycinifolium*	
Fabaceae	*Eutaxia*	*inuncta*	
Fabaceae	*Gastrolobium*	*bracteolosum*	

Fabaceae	*Hovea*	*trisperma*	
Fabaceae	*Melilotus*	*siculus*	*
Goodeniaceae	*Goodenia*	*pterigosperma*	
Myrtaceae	*Astartea*	*aspera*	
Myrtaceae	*Beaufortia*	*empetrifolia*	
Myrtaceae	*Eucalyptus*	*decipiens* subsp. *adesmophbia*	
Myrtaceae	*Eucalyptus*	*occidentalis*	
Poaceae	*Cyperochloa*	*hirsuta*	
Poaceae	Poaceae	sp.	
Polygalaceae	*Comesperma*	*virgatum*	
Proteaceae	*Hakea*	*denticulata*	
Proteaceae	*Hakea*	*trifurcata*	
Proteaceae	*Isopogon*	*longifolius*	
Proteaceae	*Petrophile*	*squamata* subsp. *squamata*	
Restionaceae	*Chordifex*	*laxus*	
Restionaceae	*Chordifex*	*leucoblepharus*	P2
Restionaceae	*Desmocladus*	*flexuosus*	
Restionaceae	*Harperia*	sp.	
Stylidiaceae	*Stylidium*	*corymbosum* var. *corymbosum*	

Site: G2 **Date:** 17/11/10

Location: Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** Q 10 m x 10 m

MGA zone: 50 648937 mE 6174991 mN

Habitat:

Soil: Light grey sand

Vegetation: Tree Mallee of *Eucalyptus staeri* over Tall Open Scrub of *Lambertia inermis*, *Adenanthos cuneatus*, *Banksia baxteri* and *Taxandria spathulata* over Open Heath of *Melaleuca striata*, *Leucopogon crassiflorus* and *Calothamnus quadrifidus* over Low Shrubland of *Petrophile teretifolia* and *Banksia repens* over mixed Open Sedgeland dominated by Cyperaceae species.

Veg. condition: Excellent

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*laevis*	
Anarthriaceae	*Anarthria*	*prolifera*	
Cyperaceae	*Lepidosperma*	?pubisquameum complex	
Cyperaceae	*Lepidosperma*	*squamatum*	
Cyperaceae	*Mesomelaena*	*stygia*	
Cyperaceae	*Schoenus*	sp.	
Dasypogonaceae	*Dasypogon*	*bromeliifolius*	
Dilleniaceae	*Hibbertia*	*lineata*	
Ericaceae	*Astroloma*	*baxteri*	
Ericaceae	*Leucopogon*	*crassiflorus*	

Ericaceae	*Leucopogon*	*elegans* subsp. *elegans*	
Ericaceae	*Lysinema*	*ciliatum*	
Ericaceae	*Monotoca*	*aristata*	P2
Fabaceae	*Bossiaea*	*praetermissa*	
Fabaceae	*Daviesia*	*incrassata*	
Fabaceae	*Eutaxia*	*inuncta*	
Fabaceae	*Gompholobium*	*venustum*	
Haemodoraceae	*Conostylis*	*vaginata*	
Iridaceae	*Patersonia*	sp.	
Myrtaceae	*Agonis*	*theiformis*	
Myrtaceae	*Beaufortia*	*empetrifolia*	
Myrtaceae	*Calothamnus*	*quadrifidus*	
Myrtaceae	*Eucalyptus*	*staeri*	
Myrtaceae	*Leptospermum*	*squamatum*	
Myrtaceae	*Melaleuca*	*striata*	
Myrtaceae	*Melaleuca*	*thymoides*	
Myrtaceae	*Taxandria*	*spathulata*	
Polygalaceae	*Comesperma*	*calymega*	
Proteaceae	*Adenanthos*	*apiculatus*	
Proteaceae	*Adenanthos*	*cuneatus*	
Proteaceae	*Banksia*	*baxteri*	
Proteaceae	*Banksia*	*repens*	
Proteaceae	*Conospermum*	sp.	
Proteaceae	*Hakea*	*lorea*	
Proteaceae	*Hakea*	*corymbosa*	
Proteaceae	*Lambertia*	*inermis*	
Proteaceae	*Petrophile*	*teretifolia*	
Proteaceae	*Synaphea*	*polymorpha*	
Restionaceae	*Harperia*	*confertospicata*	
Restionaceae	Restionaceae	sp.	
Stylidiaceae	*Stylidium*	*preissii*	

Site: G3 **Date:** 17/11/10

Location: Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 649087 mE 6174784 mN

Habitat:

Soil: Dark grey sand

Vegetation: Low Open Woodland of *Eucalyptus staeri* over Tall Open Scrub of *Banksia baxteri* and *Hakea laurina* over Open Heath of *Taxandria spathulata* and *Beaufortia empetrifolia* over mixed Open Low Heath dominated by Fabaceae and Proteaceae species over Sedgeland of *Anarthria scabra*.

Veg. condition: Pristine

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*prolifera*	
Anarthriaceae	*Anarthria*	*scabra*	
Asparagaceae	*Lomandra*	*hastilis*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Casuarinaceae	*Allocasuarina*	*trichodon*	
Cyperaceae	*Lepidosperma*	?pubisquameum complex	
Cyperaceae	*Schoenus*	sp.	
Cyperaceae	*Schoenus*	*subfascicularis*	
Cyperaceae	*Schoenus*	*sublateralis*	
Dasypogonaceae	*Dasypogon*	*bromeliifolius*	
Ericaceae	*Andersonia*	*simplex*	

Ericaceae	*Astroloma*	*baxteri*	
Ericaceae	*Leucopogon*	*crassiflorus*	
Ericaceae	*Leucopogon*	*elegans* subsp. *elegans*	
Ericaceae	*Lysinema*	*ciliatum*	
Ericaceae	*Monotoca*	*aristata*	P2
Fabaceae	*Acacia*	*cowleana*	
Fabaceae	*Acacia*	*delphina*	
Fabaceae	*Daviesia*	*incrassata*	
Fabaceae	*Eutaxia*	*inuncta*	
Fabaceae	*Gompholobium*	*capitatum*	
Fabaceae	*Gompholobium*	*scabrum*	
Fabaceae	*Gompholobium*	*venustum*	
Fabaceae	*Jacksonia*	*capitata*	
Goodeniaceae	*Dampiera*	*juncea*	
Goodeniaceae	*Dampiera*	*pedunculata*	
Haemodoraceae	*Conostylis*	*pusilla*	
Haemodoraceae	*Conostylis*	*vaginata*	
Myrtaceae	*Agonis*	*theiformis*	
Myrtaceae	*Beaufortia*	*anisandra*	
Myrtaceae	*Beaufortia*	*empetrifolia*	
Myrtaceae	*Calothamnus*	*gracilis*	
Myrtaceae	*Darwinia*	*vestita*	
Myrtaceae	*Eucalyptus*	*incrassata*	
Myrtaceae	*Eucalyptus*	*staeri*	
Myrtaceae	*Melaleuca*	*striata*	
Myrtaceae	*Taxandria*	*spathulata*	
Proteaceae	*Adenanthos*	*cuneatus*	
Proteaceae	*Banksia*	*attenuata*	
Proteaceae	*Banksia*	*baxteri*	
Proteaceae	*Banksia*	*falcata*	
Proteaceae	*Banksia*	*gardneri*	
Proteaceae	*Banksia*	*grandis*	
Proteaceae	*Banksia*	*nutans*	
Proteaceae	*Hakea*	*ceratophylla*	
Proteaceae	*Hakea*	*corymbosa*	
Proteaceae	*Hakea*	*lorea*	
Proteaceae	*Isopogon*	*formosus*	
Proteaceae	*Isopogon*	*polycephalus*	
Proteaceae	*Petrophile*	*teretifolia*	
Proteaceae	*Synaphea*	*polymorpha*	
Restionaceae	*Chordifex*	*sphacelatus*	
Restionaceae	*Desmocladus*	*fasciculatus*	
Rutaceae	*Boronia*	*spathulata*	
Stylidiaceae	*Stylidium*	*preissii*	
Stylidiaceae	*Stylidium*	*luteum*	
Thymelaeaceae	*Pimelea*	*tinctoria*	
Xanthorrhoeaceae	*Xanthorrhoea*	sp.	

Site: G4 **Date:** 17/11/10

Location: Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 658663 mE 6169262 mN

Habitat:

Soil: Very fine light grey sand

Vegetation: Very Open Tree Mallee of *Eucalyptus occidentalis* over Tall Open Shrubland of *Hakea laurina* and *Conothamnus aureus* over Shrubland of *Taxandria spathulata*, *Daviesia incrassata* and *Acacia subcaerulea* over Open Low Heath of *Melaleuca suberosa* and *Allocasuarina microstachya* over mixed Very Open Herbland and mixed Sedgeland dominated by Cyperaceae species.

Veg. condition: Excellent – Very Good

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*scabra*	
Araliaceae	*Trachymene*	*pilosa*	
Asparagaceae	*Chamaexeros*	*serra*	
Asteraceae	*Amblysperma*	*spathulatum*	
Asteraceae	*Gnephosis*	*tenuissima*	
Asteraceae	*Siloxerus*	*filifolius*	
Campanulaceae	*Lobelia*	*gibbosa*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Casuarinaceae	*Allocasuarina*	*microstachya*	
Cyperaceae	*Cyperus*	*tenellus*	*
Cyperaceae	*Mesomelaena*	*stygia*	

Cyperaceae	*Schoenus*	sp.	
Cyperaceae	*Schoenus*	*obtusifolius*	
Cyperaceae	*Schoenus*	*subfascicularis*	
Cyperaceae	*Schoenus*	?*sublateralis*	
Cyperaceae	*Tricostularia*	*neesii* var. *neesii*	
Dasypogonaceae	*Calectasia*	*grandiflora*	
Dilleniaceae	*Hibbertia*	*lineata*	
Droseraceae	*Drosera*	*platypoda*	
Ericaceae	*Andersonia*	*parvifolia*	
Ericaceae	*Astroloma*	*compactum*	
Ericaceae	*Leucopogon*	*tamariscinus*	
Ericaceae	*Leucopogon*	aff. *assimilis*	
Ericaceae	*Leucopogon*	sp. Coujinup (M.A. Burgman 1085)	
Ericaceae	*Lysinema*	*ciliatum*	
Fabaceae	*Acacia*	*gonophylla*	
Fabaceae	*Acacia*	*subcaerulea*	
Fabaceae	*Acacia*	*pulchella* var. *goadbyi*	
Fabaceae	*Bossiaea*	*preissii*	
Fabaceae	*Daviesia*	*decurrens*	
Fabaceae	*Daviesia*	*incrassata*	
Fabaceae	*Eutaxia*	*inuncta*	
Fabaceae	*Gompholobium*	*tomentosum*	
Fabaceae	*Templetonia*	*neglecta*	
Goodeniaceae	*Lechenaultia*	sp.	
Goodeniaceae	*Velleia*	*trinervis*	
Goodeniaceae	*Goodenia*	*filiformis*	P3
Goodeniaceae	*Goodenia*	*pterigosperma*	
Haemodoraceae	*Conostylis*	*pusilla*	
Hemerocallidaceae	*Caesia*	*micrantha*	
Myrtaceae	*Astartea*	*aspera*	
Myrtaceae	*Beaufortia*	*micrantha* subsp. *micrantha*	
Myrtaceae	*Beaufortia*	*schaueri*	
Myrtaceae	*Conothamnus*	*aureus*	
Myrtaceae	*Darwinia*	*vestita*	
Myrtaceae	*Eucalyptus*	?*decipiens*	
Myrtaceae	*Eucalyptus*	*decipiens* subsp. *adesmophbia*	
Myrtaceae	*Eucalyptus*	*goniantha*	
Myrtaceae	*Eucalyptus*	*occidentalis*	
Myrtaceae	*Eucalyptus*	?*uncinata*	
Myrtaceae	*Melaleuca*	*cuticularis*	
Myrtaceae	*Melaleuca*	*pentagona*	
Myrtaceae	*Melaleuca*	*rigidifolia*	
Myrtaceae	*Melaleuca*	*suberosa*	
Myrtaceae	*Melaleuca*	*thymoides*	
Myrtaceae	*Taxandria*	*spathulata*	
Myrtaceae	*Verticordia*	*habrantha*	
Myrtaceae	*Verticordia*	*sieberi* var. *lomata*	
Olacaceae	*Olax*	*phyllanthi*	
Orchidaceae	*Disa*	*bracteata*	*
Orchidaceae	*Diuris*	sp.	
Orchidaceae	*Microtis*	sp.	
Orchidaceae	*Thelymitra*	sp.	

Orobanchaceae	*Bartsia*	*trixago*	*
Pittosporaceae	*Billardiera*	*heterophylla*	
Poaceae	*Amphipogon*	*turbinatus*	
Poaceae	*Austrodanthonia*	*caespitosa*	
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Neurachne*	sp.	
Proteaceae	*Banksia*	*arctotidis*	
Proteaceae	*Banksia*	*nivea*	
Proteaceae	*Banksia*	*tenuis*	
Proteaceae	*Grevillea*	*fasciculata*	
Proteaceae	*Hakea*	*lorea*	
Proteaceae	*Hakea*	*marginata*	
Proteaceae	*Hakea*	*varia*	
Proteaceae	*Isopogon*	*buxifolius*	
Proteaceae	*Petrophile*	*rigida*	
Proteaceae	*Petrophile*	*squamata* subsp. *squamata*	
Proteaceae	*Synaphea*	*petiolaris* subsp. *triloba*	
Restionaceae	*Desmocladus*	*fasciculatus*	
Restionaceae	*Harperia*	*confertospicata*	
Restionaceae	*Harperia*	sp.	
Rhamnaceae	*Stenanthemum*	*emarginatum*	
Rubiaceae	*Opercularia*	*vaginata*	
Santalaceae	*Exocarpos*	*sparteus*	
Stylidiaceae	*Levenhookia*	*stipitata*	
Stylidiaceae	*Stylidium*	*repens*	
Stylidiaceae	*Stylidium*	*crassifolium*	
Stylidiaceae	*Stylidium*	*hirsutum*	
Thymelaeaceae	*Pimelea*	*imbricata* var. *piligera*	
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	

Site: G5 **Date:** 17/11/10

Location: Cape Riche Homestead Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 661208 mE 6169483 mN

Habitat:

Soil: Dark brown sand

Vegetation: Tall Open Shrubland of *Spyridium globulosum* over Open Shrubland of *Acacia cyclops* over Open Low Heath of *Thryptomene saxicola*, *Gompholobium tomentosum*, *Kennedia microphylla* and *Kennedia prostrata* over mixed *pasture grasses and mixed Herbland dominated by *Patersonia occidentalis* and Sedgeland of *Desmocladus flexuosus*.

Veg. condition: Degraded - grazing

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Aizoaceae	*Carpobrotus*	sp.	
Amaranthaceae	*Ptilotus*	*drummondii*	
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Brachyscome*	sp.	
Asteraceae	*Hypochaeris*	sp.	
Asteraceae	*Olearia*	*axillaris*	
Asteraceae	*Sonchus*	*asper*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Ursinia*	*anthemoides*	*
Brassicaceae	*Brassica*	sp.	*

Campanulaceae	*Wahlenbergia*	*multicaulis*	
Caryophyllaceae	*Cerastium*	*glomeratum*	*
Caryophyllaceae	*Petrorhagia*	*dubia*	*
Chenopodiaceae	*Rhagodia*	*baccata* subsp. *baccata*	
Dilleniaceae	*Hibbertia*	*cuneiformis*	
Ericaceae	*Leucopogon*	*obovatus*	
Ericaceae	*Leucopogon*	*propinquus*	
Fabaceae	*Acacia*	*cyclops*	
Fabaceae	*Daviesia*	*incrassata* subsp. *reversifolia*	
Fabaceae	*Gompholobium*	*tomentosum*	
Fabaceae	*Kennedia*	*microphylla*	
Fabaceae	*Kennedia*	*prostrata*	
Fabaceae	*Templetonia*	*neglecta*	
Fabaceae	*Trifolium*	sp.	
Geraniaceae	*Geranium*	sp.	
Iridaceae	*Patersonia*	*occidentalis*	
Iridaceae	*Romulea*	*rosea*	*
Juncaceae	*Juncus*	*subsecundus*	
Lamiaceae	*Westringia*	*dampieri*	
Myrtaceae	*Thryptomene*	*saxicola*	
Orchidaceae	*Caladenia*	sp.	
Orchidaceae	*Diuris*	*longifolia*	
Orchidaceae	*Microtis*	sp.	
Phyllanthaceae	*Phyllanthus*	*calycinus*	
Plumbaginaceae	*Limonium*	*sinuatum*	*
Poaceae	*Aira*	*caryophyllea*	*
Poaceae	*Austrodanthonia*	*caespitosa*	
Poaceae	*Austrostipa*	sp.	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Avena*	sp.	
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	Poaceae	sp.	
Polygalaceae	*Comesperma*	*virgatum*	
Polygonaceae	*Muehlenbeckia*	*adpressa*	
Portulacaceae	*Calandrinia*	*eremaea* var. *ellipticum*	
Primulaceae	*Lysimachia*	*arvensis*	*
Proteaceae	*Banksia*	*sessilis*	
Proteaceae	*Hakea*	*lissocarpha*	
Pteridaceae	*Cheilanthes*	sp.	
Ranunculaceae	*Clematis*	*pubescens*	
Restionaceae	*Desmocladus*	*flexuosus*	
Rhamnaceae	*Spyridium*	*globulosum*	
Thymelaeaceae	*Pimelea*	*argentea*	
Thymelaeaceae	*Pimelea*	*ferruginea*	

Site:	G6			**Date:**	17/11/10
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	Relevè
MGA zone:	50	661087 mE	6169414 mN		
Habitat:					
Soil:	Dark grey sand				
Vegetation:	Shrub Mallee of *Eucalyptus angulosa* over Tall Shrubland of *Spyridium globulosum* over Shrubland of **Lessertia frutescens*, *Leucopogon elegans* subsp. *elegans* and *Leucopogon obovatus* over Low Open Shrubland of *Kennedia coccinea* over Grassland of **Bromus* sp. and Very Open Sedgeland of *Desmocladus flexuosus*.				
Veg. condition:	Good – Degraded - grazing				
Fire age:	> 10 years				
Notes:	Good drainage				

Family	Genus	Species	Status
Aizoaceae	*Tetragonia*	*decumbens*	*
Asteraceae	*Helichrysum*	*leucopsideum*	
Ericaceae	*Leucopogon*	*elegans* subsp. *elegans*	
Ericaceae	*Leucopogon*	*obovatus*	
Ericaceae	*Leucopogon*	*parviflorus*	
Fabaceae	*Acacia*	*cupularis*	
Fabaceae	*Kennedia*	*coccinea*	
Fabaceae	*Lessertia*	*frutescens*	*
Fabaceae	*Psoralea*	*pinnata*	*
Myrtaceae	*Eucalyptus*	*angulosa*	
Pittosporaceae	*Marianthus*	*erubescens*	

Poaceae	*Bromus*	sp.
Polygalaceae	*Comesperma*	*virgatum*
Restionaceae	*Desmocladus*	*flexuosus*
Rhamnaceae	*Spyridium*	*globulosum*

Site: G7 **Date:** 17/11/10

Location: Cape Riche Homestead Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 mE mN

Habitat:

Soil: Light grey sand

Vegetation: Open Forest of *Corymbia calophylla* over Open Tree Mallee of *Eucalyptus decipiens* subsp. *adesmophloia*, *Eucalyptus ?occidentalis* and *Eucalyptus goniantha* over Open Shrubland of *Spyridium globulosum*, *Jacksonia horrida* and *Bossiaea eriocarpa* over Low Open Shrubland of *Hibbertia cunninghamii* and *Thryptomene saxicola* over mixed *pasture grasses and Sedgeland of *Hypolaena exsulca*, **Juncus bufonius* and *Juncus pallidus*.

Veg. condition: Degraded - grazing

Fire age: > 10 years

Notes: Moderate drainage line

Family	Genus	Species	Status
Asparagaceae	*Asparagus*	*asparagoides*	*
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Chenopodiaceae	*Rhagodia*	*baccata* subsp. *baccata*	
Cyperaceae	*Cyperaceae*	sp.	
Cyperaceae	*Lepidosperma*	?pubisquameum complex	
Dilleniaceae	*Hibbertia*	*cuneiformis*	
Ericaceae	*Leucopogon*	*propinquus*	
Fabaceae	*Bossiaea*	*eriocarpa*	

Fabaceae	*Jacksonia*	*horrida*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Geraniaceae	*Pelargonium*	*littorale*	
Hemerocallidaceae	*Dianella*	*revoluta*	
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Juncaceae	*Juncus*	*bufonius*	*
Juncaceae	*Juncus*	*pallidus*	
Myrtaceae	*Corymbia*	*calophylla*	
Myrtaceae	*Eucalyptus*	*decipiens* subsp. *adesmophbia*	
Myrtaceae	*Eucalyptus*	*goniantha*	
Myrtaceae	*Eucalyptus*	*?occidentalis*	
Myrtaceae	*Thryptomene*	*saxicola*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Restionaceae	*Desmocladus*	*flexuosus*	
Restionaceae	*Hypolaena*	*exsulca*	
Rhamnaceae	*Spyridium*	*globulosum*	

Site:	G8			**Date:**	18/11/10
Location:	Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	658395 mE	6169237 mN		
Habitat:					
Soil:	Light grey sand				
Vegetation:	Open Shrubland of *Goodenia pterigosperma* and *Coleanthera myrtoides* over Closed Low Heath of *Melaleuca rigidifolia*, *Melaleuca suberosa* and *Beaufortia micrantha* subsp. *micrantha* over Very Open Grassland of *Neurachne* sp. and Sedgeland of *Schoenus subfascicularis*, *Anarthria laevis*, *Desmocladus fasciculatus* and *Schoenus* sp..				
Veg. condition:	Excellent				
Fire age:	> 10 years				
Notes:	Good drainage				

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*laevis*	
Asparagaceae	*Chamaexeros*	*serra*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Casuarinaceae	*Allocasuarina*	*thuyoides*	
Cyperaceae	*Lepidosperma*	?pubisquameum complex	
Cyperaceae	*Schoenus*	sp.	
Cyperaceae	*Schoenus*	*obtusifolius*	
Cyperaceae	*Schoenus*	*subfascicularis*	
Cyperaceae	*Schoenus*	*sublateralis*	
Cyperaceae	*Tricostularia*	*neesii* var. *neesii*	
Dasypogonaceae	*Calectasia*	*grandiflora*	

Dilleniaceae	*Hibbertia*	*lineata*	
Ericaceae	*Andersonia*	*simplex*	
Ericaceae	*Andersonia*	sp.	
Ericaceae	*Coleanthera*	*myrtoides*	
Ericaceae	*Leucopogon*	*elegans* subsp. *elegans*	
Ericaceae	*Leucopogon*	*tamariscinus*	
Ericaceae	*Lysinema*	*ciliatum*	
Fabaceae	*Acacia*	*subcaerulea*	
Fabaceae	*Daviesia*	*incrassata* subsp. *reversifolia*	
Fabaceae	*Templetonia*	*retusa*	
Goodeniaceae	*Goodenia*	*pterigosperma*	
Goodeniaceae	*Velleia*	sp.	
Haemodoraceae	*Conostylis*	*pusilla*	
Hemerocallidaceae	*Tricoryne*	*elatior*	
Iridaceae	*Patersonia*	*occidentalis*	
Myrtaceae	*Astartea*	*aspera*	
Myrtaceae	*Beaufortia*	*micrantha* subsp. *micrantha*	
Myrtaceae	*Darwinia*	*vestita*	
Myrtaceae	*Melaleuca*	*rigidifolia*	
Myrtaceae	*Melaleuca*	*suberosa*	
Myrtaceae	*Taxandria*	*spathulata*	
Myrtaceae	*Verticordia*	*habrantha*	
Myrtaceae	*Verticordia*	*sieberi* var. *lomata*	
Orchidaceae	*Caladenia*	sp.	
Orchidaceae	*Cyrtostylis*	*huegelii*	
Orchidaceae	*Microtis*	sp.	
Plumbaginaceae	*Limonium*	*sinuatum*	*
Poaceae	*Austrodanthonia*	*caespitosa*	
Poaceae	*Neurachne*	sp.	
Proteaceae	*Banksia*	*arctotidis*	
Proteaceae	*Banksia*	*nivea*	
Proteaceae	*Grevillea*	*fasciculata*	
Proteaceae	*Petrophile*	*rigida*	
Proteaceae	*Petrophile*	*squamata* subsp. *squamata*	
Proteaceae	*Petrophile*	*teretifolia*	
Proteaceae	*Synaphea*	*petiolaris* subsp. *triloba*	
Restionaceae	*Desmocladus*	*fasciculatus*	
Restionaceae	*Desmocladus*	*flexuosus*	
Rubiaceae	*Opercularia*	*vaginata*	
Rutaceae	*Boronia*	*spathulata*	
Stylidiaceae	*Stylidium*	*crassifolium*	
Stylidiaceae	*Stylidium*	*hirsutum*	
Stylidiaceae	*Stylidium*	*preissii*	
Thymelaeaceae	*Pimelea*	*imbricata* var. *piligera*	
Thymelaeaceae	*Pimelea*	*tinctoria*	
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	

Site: G9 **Date:** 18/11/10

Location: Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 657484 mE 6169271 mN

Habitat:

Soil: Light grey sand

Vegetation: Very Open Shrub Mallee of *Eucalyptus pleurocarpa*, *Eucalyptus* sp. and *Eucalyptus decipiens* subsp. *adesmophloia* over Tall Open Scrub of *Lambertia* sp., *Melaleuca* sp., *Conothamnus aureus* and *Phymatocarpus maxwellii* over Shrubland of *Taxandria spathulata*, *Beaufortia schaueri* and *Acacia leioderma* over Low Shrubland of *Daviesia decurrens*, *Melaleuca rigidifolia*, *Banksia falcata* and *Banksia tenuis* over Open Sedgeland of *Schoenus subfascicularis*.

Veg. condition: Good

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Casuarinaceae	*Allocasuarina*	sp.	
Cyperaceae	*Schoenus*	*subfascicularis*	
Fabaceae	*Acacia*	*leioderma*	
Fabaceae	*Daviesia*	*decurrens*	
Fabaceae	*Gompholobium*	*polymorphum*	
Loranthaceae	*Nuytsia*	*floribunda*	
Myrtaceae	*Astartea*	*aspera*	
Myrtaceae	*Beaufortia*	*schaueri*	
Myrtaceae	*Conothamnus*	*aureus*	
Myrtaceae	*Eucalyptus*	*decipiens* subsp. *adesmophbia*	

Myrtaceae	*Eucalyptus*	*pleurocarpa*
Myrtaceae	*Eucalyptus*	sp.
Myrtaceae	*Melaleuca*	*rigidifolia*
Myrtaceae	*Melaleuca*	sp.
Myrtaceae	*Phymatocarpus*	*maxwellii*
Myrtaceae	*Taxandria*	*spathulata*
Proteaceae	*Banksia*	*falcata*
Proteaceae	*Banksia*	*tenuis*
Proteaceae	*Lambertia*	sp.
Santalaceae	*Exocarpos*	sp.

Site:	G10	**Date:**	18/11/10
Location:	Cape Riche Rd, Wellstead		
Described by:	MT	**Dimensions:**	10 m x 10 m
MGA zone:	50 656032 mE 6169268 mN		
Habitat:			
Soil:	Light grey sand		
Vegetation:	Low Open Woodland of *Corymbia calophylla* and *Eucalyptus angulosa* over Tall Open Shrubland of *Allocasuarina scleroclada* over Open Shrubland of *Hibbertia cunninghamii*, *Adenanthos cuneatus* and *Melaleuca striata* over Very Open Herbland of *Lomandra* sp. and *pasture grasses.		
Veg. condition:	Good – prior ?clearing disturbance		
Fire age:	> 10 years		
Notes:	Good drainage		

Family	Genus	Species	Status
Asparagaceae	*Lomandra*	sp.	
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Casuarinaceae	*Allocasuarina*	*scleroclada*	
Dilleniaceae	*Hibbertia*	*cunninghamii*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Myrtaceae	*Corymbia*	*calophylla*	

Myrtaceae	*Eucalyptus*	*angulosa*	
Myrtaceae	*Melaleuca*	*striata*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Proteaceae	*Adenanthos*	*cuneatus*	

Site:	G11			**Date:**	18/11/10
Location:	Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	656464 mE	6169387 mN		
Habitat:					
Soil:	Orange – brown sandy clay				
Vegetation:	Low Open Forest of *Eucalyptus occidentalis* over Tall Shrubland of *Melaleuca cuticularis*, *Agonis theiformis* and *Hakea varia* over Open Heath of *Taxandria spathulata*, *Calothamnus quadrifidus*, *Petrophile media*, *Billardiera heterophylla*, **Psoralea pinnata* and *Acacia leioderma* over Closed Sedgeland of *Juncus pallidus* and *Baumea juncea*.				
Veg. condition:	Very Good				
Fire age:	> 10 years				
Notes:	Seasonaly wet				

Family	Genus	Species	Status
Campanulaceae	*Lobelia*	*anceps*	
Casuarinaceae	*Allocasuarina*	sp.	
Cyperaceae	*Baumea*	*juncea*	
Fabaceae	*Acacia*	*leioderma*	
Fabaceae	*Acacia*	sp.	
Fabaceae	*Psoralea*	*pinnata*	*
Juncaceae	*Juncus*	*pallidus*	
Myrtaceae	*Agonis*	*theiformis*	
Myrtaceae	*Calothamnus*	*quadrifidus*	
Myrtaceae	*Eucalyptus*	*occidentalis*	
Myrtaceae	*Melaleuca*	*cuticularis*	

Myrtaceae	*Melaleuca*	*minutifolia*	
Myrtaceae	*Taxandria*	*spathulata*	
Myrtaceae	*Verticordia*	sp.	
Orchidaceae	*Microtis*	sp.	
Pittosporaceae	*Billardiera*	*heterophylla*	
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Polygalaceae	*Comesperma*	*virgatum*	
Proteaceae	*Hakea*	*varia*	
Proteaceae	*Petrophile*	*media*	
Rutaceae	*Boronia*	*albiflora*	

Site:	G12			**Date:**	18/11/10
Location:	Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	655442 mE	6168679 mN		
Habitat:					
Soil:	Dark grey sand				
Vegetation:	Low Open Woodland of *Corymbia calophylla* over Closed Tall Scrub of *Banksia attenuata*, *Hakea laurina* and *Banksia baxteri* over Open Heath of *Melaleuca striata*, *Taxandria spathulata* and *Beaufortia empetrifolia* over Low Shrubland of *Petrophile teretifolia*, *Melaleuca thymoides* and *Lysinema ciliatum* over Very Open Sedgeland of *Caustis dioica*, *Anarthria scabra* and *Anarthria prolifera*.				
Veg. condition:	Excellent – Very Good				
Fire age:	> 10 years				
Notes:	Good drainage				

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*prolifera*	
Anarthriaceae	*Anarthria*	*scabra*	
Cyperaceae	*Caustis*	*dioica*	
Cyperaceae	*Schoenus*	sp.	
Dasypogonaceae	*Dasypogon*	*bromeliifolius*	
Ericaceae	*Lysinema*	*ciliatum*	
Goodeniaceae	*Goodenia*	*incana*	
Myrtaceae	*Agonis*	*theiformis*	
Myrtaceae	*Beaufortia*	*empetrifolia*	
Myrtaceae	*Corymbia*	*calophylla*	
Myrtaceae	*Melaleuca*	*striata*	

Myrtaceae	*Melaleuca*	*thymoides*
Myrtaceae	*Taxandria*	*spathulata*
Proteaceae	*Adenanthos*	*cuneatus*
Proteaceae	*Banksia*	*attenuata*
Proteaceae	*Banksia*	*baxteri*
Proteaceae	*Conospermum*	*teretifolium*
Proteaceae	*Hakea*	*lorea*
Proteaceae	*Petrophile*	*teretifolia*

Site:	G13			**Date:**	18/11/10
Location:	Mettler Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	647538 mE	6174445 mN		
Habitat:					
Soil:	Dark grey sandy loam				
Vegetation:	Open Shrub Mallee of *Eucalyptus staeri* over Closed Tall Scrub of *Hakea ferruginea*, *Hakea laurina* and *Lambertia* sp. over Open Heath of *Melaleuca striata*, *Taxandria spathulata* and *Agonis theiformis* over Open Low Heath of *Banksia nutans*, *Hakea marginata* and *Hakea ceratophylla* over Sedgeland of *Caustis dioica*, *Anarthria prolifera* and *Desmocladus fasciculatus*.			
Veg. condition:	Excellent				
Fire age:	> 10 years				
Notes:	Good drainage				

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*prolifera*	
Asparagaceae	*Laxmannia*	*paleacea*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Casuarinaceae	*Allocasuarina*	*microstachya*	
Cyperaceae	*Caustis*	*dioica*	
Cyperaceae	*Mesomelaena*	*stygia*	
Cyperaceae	*Schoenus*	*subfascicularis*	
Cyperaceae	*Schoenus*	*sublateralis*	
Dilleniaceae	*Hibbertia*	*lineata*	
Ericaceae	*Leucopogon*	*crassiflorus*	
Ericaceae	*Leucopogon*	*tamariscinus*	

Ericaceae	*Lysinema*	*ciliatum*
Fabaceae	*Acacia*	*cupularis*
Fabaceae	*Daviesia*	*incrassata* subsp. *reversifolia*
Fabaceae	*Gastrolobium*	*bracteolosum*
Fabaceae	*Gastrolobium*	*retusum*
Fabaceae	*Gompholobium*	*venustum*
Fabaceae	*Hovea*	*trisperma*
Fabaceae	*Sphaerolobium*	sp.
Fabaceae	*Templetonia*	*retusa*
Goodeniaceae	*Dampiera*	*juncea*
Goodeniaceae	*Goodenia*	*incana*
Haemodoraceae	*Conostylis*	*pusilla*
Iridaceae	*Patersonia*	sp.
Juncaceae	*Juncus*	sp. (insufficient material)
Myrtaceae	*Agonis*	*theiformis*
Myrtaceae	*Eucalyptus*	*staeri*
Myrtaceae	*Melaleuca*	*striata*
Myrtaceae	*Taxandria*	*spathulata*
Orchidaceae	*Thelymitra*	sp.
Proteaceae	*Adenanthos*	*cuneatus*
Proteaceae	*Banksia*	*arctotidis*
Proteaceae	*Banksia*	*falcata*
Proteaceae	*Banksia*	*gardneri*
Proteaceae	*Banksia*	*grandis*
Proteaceae	*Banksia*	*nutans*
Proteaceae	*Banksia*	*sphaerocarpa* var. *sphaerocarpa*
Proteaceae	*Banksia*	*tenuis*
Proteaceae	*Hakea*	*ceratophylla*
Proteaceae	*Hakea*	*denticulata*
Proteaceae	*Hakea*	*ferruginea*
Proteaceae	*Hakea*	*lorea*
Proteaceae	*Hakea*	*marginata*
Proteaceae	*Lambertia*	sp.
Proteaceae	*Petrophile*	*rigida*
Proteaceae	*Petrophile*	*teretifolia*
Restionaceae	*Chordifex*	*laxus*
Restionaceae	*Desmocladus*	*fasciculatus*
Rutaceae	*Boronia*	*spathulata*
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*

Site:	G14	**Date:**	19/11/10
Location:	Shearer Rd, Wellstead		
Described by:	MT	**Dimensions:**	10 m x 10 m
MGA zone:	50 642708 mE 6177199 mN		
Habitat:			
Soil:	Light grey sand		
Vegetation:	Shrub Mallee of *Eucalyptus buprestium* over Tall Shrubland of *Lambertia* sp. over Open Heath of *Taxandria spathulata*, *Melaleuca striata* and *Beaufortia empetrifolia* over Low Shrubland of *Petrophile rigida*, *Allocasuarina humilis* and *Daviesia incrassata* subsp. *reversifolia* over Sedgeland of *Anarthria humilis*, *A. scabra* and *Desmocladus flexuosus*.		
Veg. condition:	Excellent		
Fire age:	> 10 years		
Notes:	Good drainage		

Family	Genus	Species	Status
Anarthriaceae	*Anarthria*	*humilis*	
Anarthriaceae	*Anarthria*	*prolifera*	
Anarthriaceae	*Anarthria*	*scabra*	
Casuarinaceae	*Allocasuarina*	*humilis*	
Colchicaceae	*Burchardia*	*congesta*	
Cyperaceae	*Lepidosperma*	*squamatum*	
Cyperaceae	*Mesomelaena*	*stygia*	
Cyperaceae	*Schoenus*	*sublateralis*	
Cyperaceae	*Tricostularia*	*neesii* var. *neesii*	
Dilleniaceae	*Hibbertia*	*arcuata*	

Fabaceae	*Acacia*	*biflora*
Fabaceae	*Daviesia*	*incrassata* subsp. *reversifolia*
Fabaceae	*Eutaxia*	*inuncta*
Fabaceae	*Gastrolobium*	*bracteolosum*
Fabaceae	*Gompholobium*	*capitatum*
Fabaceae	*Gompholobium*	*venustum*
Fabaceae	*Jacksonia*	*capitata*
Fabaceae	*Kennedia*	*coccinea*
Goodeniaceae	*Dampiera*	*juncea*
Goodeniaceae	*Lechenaultia*	*formosa*
Haemodoraceae	*Conostylis*	*pusilla*
Iridaceae	*Patersonia*	*maxwellii*
Lauraceae	*Cassytha*	sp.
Myrtaceae	*Beaufortia*	*empetrifolia*
Myrtaceae	*Conothamnus*	*aureus*
Myrtaceae	*Eucalyptus*	*buprestium*
Myrtaceae	*Eucalyptus*	sp.
Myrtaceae	*Melaleuca*	*striata*
Myrtaceae	*Melaleuca*	*suberosa*
Myrtaceae	*Taxandria*	*spathulata*
Myrtaceae	*Verticordia*	*habrantha*
Polygalaceae	*Comesperma*	*virgatum*
Proteaceae	*Banksia*	*falcata*
Proteaceae	*Banksia*	*gardneri*
Proteaceae	*Banksia*	*nutans*
Proteaceae	*Banksia*	*plumosa*
Proteaceae	*Hakea*	*cucullata*
Proteaceae	*Hakea*	*denticulata*
Proteaceae	*Hakea*	*ferruginea*
Proteaceae	*Hakea*	*lorea*
Proteaceae	*Lambertia*	sp.
Proteaceae	*Petrophile*	*rigida*
Proteaceae	*Petrophile*	*teretifolia*
Proteaceae	*Stirlingia*	*teretifolia*
Proteaceae	*Synaphea*	*polymorpha*
Restionaceae	*Desmocladus*	*flexuosus*
Rutaceae	*Boronia*	*spathulata*
Thymelaeaceae	*Pimelea*	*tinctoria*
Xanthorrhoeaceae	*Xanthorrhoea*	sp.

Site:	A1			**Date:**	16/02/2011
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	661291 mE	6167919 mN		
Habitat:					
Soil:	Dark brown clayey loam				
Vegetation:	Closed Low Heath of *Thryptomene saxicola* and *Pimelea ferruginea* over Open Grassland of *Eragrostis* sp. and *pasture grasses and Open Herbland of *pasture grasses.				
Veg. condition:	Good - Degraded				
Fire age:	> 10 years				
Notes:	Good drainage				

Family	Genus	Species	Status
Asparagaceae	*Asparagus*	*asparagoides*	*
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Chenopodiaceae	*Enchylaena*	*tomentosa*	
Convolvulaceae	*Convolvulus*	*angustissimus*	
Cyperaceae	*Ficinia*	*nodosa*	
Dilleniaceae	*Hibbertia*	*cunninghamii*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Geraniaceae	*Erodium*	sp.	*

Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Malvaceae	*Thomasia*	*foliosa*	
Myrtaceae	*Darwinia*	*citriodora*	
Myrtaceae	*Thryptomene*	*saxicola*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Thymelaeaceae	*Pimelea*	*argentea*	
Thymelaeaceae	*Pimelea*	*ferruginea*	

Site: A2 **Date:** 16/02/2011

Location: Cape Riche Homestead Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 661453 mE 6167816 mN

Habitat:

Soil: Dark brown clayey loam

Vegetation: Low Open Forrest of *Melaleuca cuticularis* over Shrubland of *Leucopogon revolutus*, *Boronia alata* and *Westringia dampieri* over Low Shrubland of *Westringia dampieri* over Very Open Grassland of *pasture grasses and Sedgeland of *Isolepis nodosa* and *Lepidosperma squamatum*.

Veg. condition: Very Good - Good

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Campanulaceae	*Lobelia*	*anceps*	
Campanulaceae	*Wahlenbergia*	*multicaulis*	
Cyperaceae	*Ficinia*	*nodosa*	
Cyperaceae	*Gahnia*	*trifida*	
Cyperaceae	*Lepidosperma*	*squamatum*	
Dilleniaceae	*Hibbertia*	*cunninghamii*	
Ericaceae	*Leucopogon*	*revolutus*	

Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Lamiaceae	*Westringia*	*dampieri*	
Lauraceae	*Cassytha*	sp.	
Malvaceae	*Thomasia*	*foliosa*	
Myrtaceae	*Melaleuca*	*cuticularis*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Stylidiaceae	*Stylidiaceae*	sp.	
Thymelaeaceae	*Pimelea*	*ferruginea*	
Thymelaeaceae	*Pimelea*	*argentea*	

Site:	A3			**Date:**	16/02/2011
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	Relevè
MGA zone:	50	661429 mE	6167785 mN		
Habitat:					
Soil:	Dark brown clayey loam				
Vegetation:	Open Grassland of *pasture grasses and Open Herbland of *pasture grasses and Sedgeland of *Gahnia trifida* and *Ficinia nodosa*.				
Veg. condition:	Very Good - Good				
Fire age:	> 10 years				
Notes:	Seasonaly wet				

Family	Genus	Species	Status
Asparagaceae	*Asparagus*	*asparagoides*	*
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Campanulaceae	*Lobelia*	*anceps*	
Campanulaceae	*Wahlenbergia*	*multicaulis*	
Cyperaceae	*Ficinia*	*nodosa*	
Cyperaceae	*Gahnia*	*trifida*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Hemerocallidaceae	*Dianella*	*revoluta*	
Hemerocallidaceae	*Dianella*	sp.	

Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Lamiaceae	*Westringia*	*dampieri*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*

Site:	A4			**Date:**	16/02/2011
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	Relevè
MGA zone:	50	661352 mE	6167829 mN		
Habitat:					
Soil:	Dark brown clayey loam				
Vegetation:	Open Grassland of *Eragrostis* sp. and *pasture grasses and Very Open Herbland of *Lobelia anceps* and *pasture grasses and Closed Sedgeland of *Gahnia trifida* and *Ficinia nodosa*.				
Veg. condition:	Very Good - Good				
Fire age:	> 10 years				
Notes:	Seasonaly wet				

Family	Genus	Species	Status
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Campanulaceae	*Lobelia*	*anceps*	
Chenopodiaceae	*Enchylaena*	*tomentosa*	
Convolvulaceae	*Convolvulus*	*angustissimus*	
Cyperaceae	*Ficinia*	*nodosa*	
Cyperaceae	*Gahnia*	*trifida*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Hemerocallidaceae	*Dianella*	sp.	

Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Poaceae	sp.		

Site: A5 **Date:** 16/02/2011

Location: Cape Riche Homestead Cape Riche Rd, Wellstead

Described by: MT **Dimensions:** 10 m x 10 m

MGA zone: 50 661205 mE 6167873 mN

Habitat:

Soil: Orange brown loamy sand

Vegetation: Closed Low Heath of *Thryptomene saxicola* and *Pimelea ferruginea* over Open Grassland of *Eragrostis* sp. and Poaceae sp..

Veg. condition: Good - Degraded - grazing

Fire age: > 10 years

Notes: Good drainage

Family	Genus	Species	Status
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Dilleniaceae	*Hibbertia*	*gracilipes*	
Dilleniaceae	*Hibbertia*	sp.	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Myrtaceae	*Thryptomene*	*saxicola*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*

Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Restionaceae	*Desmocladus*	*flexuosus*	
Thymelaeaceae	*Pimelea*	*ferruginea*	

Site:	A6			**Date:**	16/02/2011
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	660079 mE	6168432 mN		
Habitat:					
Soil:	Light grey clayey loamy sand				
Vegetation:	Low Open Forest of *Melaleuca cuticularis* over Low Open Shrubland of *Thryptomene saxicola* over Open Grassland of *Eragrostis* sp. and Sedgeland of *Gahnia trifida*, *Juncus pallidus* and *Lepidosperma squamatum*.				
Veg. condition:	Good				
Fire age:	> 10 years				
Notes:	Likely to be seasonaly wet				

Family	Genus	Species	Status
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Cyperaceae	*Gahnia*	*trifida*	
Cyperaceae	*Lepidosperma*	*squamatum*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*
Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Juncaceae	*Juncus*	*pallidus*	
Myrtaceae	*Melaleuca*	*cuticularis*	

Myrtaceae	*Thryptomene*	*saxicola*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Eragrostis*	sp.	
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Proteaceae	*Hakea*	*lissocarpha*	

Site:	A7			**Date:**	16/02/2011
Location:	Cape Riche Homestead Cape Riche Rd, Wellstead				
Described by:	MT			**Dimensions:**	10 m x 10 m
MGA zone:	50	660035 mE	6168460 mN		
Habitat:					
Soil:	Light grey clayey loamy sand				
Vegetation:	Open Shrubland of *Hibbertia cunninghamii* and *Xanthorrhoea platyphylla* over Low Shrubland of *Thryptomene saxicola* over Grassland of *pasture grasses and Herbland of *pasture grasses and Sedgeland of *Mesomelaena tetragona* and *Ficinia nodosa*.				
Veg. condition:	Good				
Fire age:	> 10 years				
Notes:	Very small patch of vegetaion				

Family	Genus	Species	Status
Asteraceae	*Arctotheca*	*calendula*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Asteraceae	*Taraxacum*	*officinale*	*
Cyperaceae	*Ficinia*	*nodosa*	
Cyperaceae	*Mesomelaena*	*stygia*	
Cyperaceae	*Mesomelaena*	*tetragona*	
Dilleniaceae	*Hibbertia*	*cunninghamii*	
Fabaceae	*Acacia*	*cyclops*	
Fabaceae	*Jacksonia*	*horrida*	
Fabaceae	*Lotus*	*subbiflorus*	*
Fabaceae	*Trifolium*	*campestre*	*

Iridaceae	*Gladiolus*	*undulatus*	*
Iridaceae	*Romulea*	*rosea*	*
Loranthaceae	*Nuytsia*	*floribunda*	
Myrtaceae	*Eucalyptus*	*angulosa*	
Myrtaceae	*Thryptomene*	*saxicola*	
Poaceae	*Avena*	*sativa*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Briza*	*minor*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Ehrharta*	*calycina*	*
Poaceae	*Ehrharta*	*longiflora*	*
Poaceae	*Hordeum*	*leporinum*	*
Poaceae	*Lolium*	*rigidum*	*
Poaceae	*Pennisetum*	*clandestinum*	*
Restionaceae	*Desmocladus*	*flexuosus*	
Xanthorrhoeaceae	*Xanthorrhoea*	*platyphylla*	

Table 7 Likelihood of occurrence of significant flora species previously recorded within 15 km of the Study Area (DEC, WAHERB, EPBC and NatureMap)

Species	Status	Habitat	Description	Likelihood of Occurrence	Source
Acacia dictyoneura	P4	Loamy soils. River banks, gentle slopes.	Shrub, 0.5–2 m high. Fl. yellow, Aug–Nov. Distribution: SW: ESP, MAL.	Unlikely	DEC
Acacia empelioclada	P4	White sand, gravelly sand, laterite. Rocky hillsides, low rises, moist drainage areas.	Spindly erect shrub, 0.5–2 m high. Fl. yellow, cream, Jul–Oct.	Possible	DEC
Acrotriche parviflora	P4	Rocky grey loam, white-grey sandy or sandy clay loam, red loam over spongolite, brown sandy loam or clay. Sandstone, upland flats and slopes, hillcrests, near creeklines, adjacent to salt lakes, base of breakaways.	Erect, spreading or compact shrub, to 1.2 m high. Fl. green, white, Aug–Oct.	Possible	DEC
Andersonia carinata	P2	White sand, gravelly lateritic soils. Plains.	Erect slender shrub, 0.1–0.45(–0.8) m high. Fl. pink, whitele, Aug–Oct. Distribution: SW: AW, ESP, MAL.	Possible	DEC
Anigozanthos bicolor subsp. *minor*	R	Sand. Well-watered sites.	Rhizomatous, perennial, herb, 0.05–0.2 m high. Fl. green, red, Aug–Oct.	Likely	EPBC
Banksia calophylla	P3	Rocky sandy clay, white sand with gravel.	Prostrate, spreading, lignotuberous shrub, to 0.3(–0.5) m high. Fl. yellow, brown, Oct–Jan. Distribution: SW: ESP, JF.	Likely	DEC
Banksia verticillata	R	Sandy loam, on or beside granite outcrops.	Non-lignotuberous shrub or tree (rarely), 1.3–6 m high. Fl. yellow, orange, Jan–Apr. Distribution: SW: ESP, JF, WAR.	Likely	DEC
Banksia pseudoplumosa	R	Gravelly soils.	Non-lignotuberous shrub, to 1.8 m high. Fl. Nov–Dec.	Possible	EPBC
Calectasia obtusa	P3	Sand, clay loam, gravel, laterite. Flats.	Erect, low herb, 0.25–0.4 m high, to 0.2; with aerial roots. Fl. blue, Aug–Sep. Distribution: SW: AW, ESP, JF, MAL.	Possible	DEC
Calothamnus robustus	P3	Rocky quartzite or granitic soils. Low hills.	Erect, compact shrub, 0.5–1.5 m high. Fl. red, Feb/Jul–Nov. Distribution: SW: ESP.	Unlikely	DEC
Calytrix pulchella	P3	Grey or white sand over laterite. Ridges, flats.	Shrub, 0.3–0.7(–1) m high. Fl. pink, Aug–Nov. Distribution: SW: AW, ESP, JF, MAL.	Likely	DEC

Species	Status	Habitat	Description	Likelihood of Occurrence	Source
Centrolepis caespitosa	P4	White sand, clay. Salt flats, wet areas.	na	Unlikely	EPBC
Chamelaucium sp. Cape Riche (C.A. Gardner 2153)	P2	Grey, gravel, clay sand on hillside over clay and spongelite.	na	Likely	DEC
Chordifex leucoblepharus	P2	Sand, dry heath.	Rhizomatous, perennial, herb, ca 0.4 m high. Fl. brown, Nov–Dec. Distribution: SW: ESP.	Likely	DEC
Comesperma lanceolatum	P2	White sand, sand dunes, quartzite ridges.	na	Unlikely	Nature Map
Commersonia sp. Mt Groper (R. Cranfield & D. Kabay 9157)	R	White-grey sandy loam, dark brown peaty sand, seasonally waterlogged wetlands.	Erect shrub, to 0.4 m high. Fl. cream, white, Sept/Dec. Distribution: SW: ESP.	Likely	DEC
Conostylis misera	R	Rhizomatous, tufted perennial, grass-like or herb, 0.05–0.18 m high. Fl. yellow, Oct–Nov.	White or grey sand, sandy loam. Winter-wet flats.	Likely	EPBC
Darwinia collina	R	Erect shrub, 0.3–1.2 m high. Fl. yellow, Sep–Nov. Peaty sand.	Rocky quartzite slopes.	Unlikely	EPBC
Daviesia obovata	R	Erect, slender shrub, 0.7–1.5 m high. Fl. yellow, black, Sep–Oct.	Stony loam, sandy loam. Hillslopes, outcrops.	Unlikely	EPBC
Drosera fimbriata	P4	Erect tuberous, perennial, herb, 0.05–0.15 m high. Fl. white, Sep–Oct.	White sand, granite.	Unlikely	EPBC
Eucalyptus buprestium x staeri	P4	Sand or loam with lateritic gravel, sandy loam. Steep slopes.	Mallee or tree, 1.5–4 m high. Fl. Apr. Sand or loam with lateritic gravel, sandy loam. Steep slopes. Distribution: SW: ESP.	Possible	DEC
Eucalyptus calcicola subsp. *Unita*	P4	Grey sand or loam over limestone. Coastal dunes.	Mallee, to 8 m high, bark smooth throughout, dull grey over light grey-tan, peeling in strips; leaves glossy, light green. Fl. white. Grey sand or loam over limestone. Coastal dunes. Distribution: SW: ESP, WAR.	Possible	DEC
Eucalyptus goniantha subsp. *goniantha* (Jerdacuttup Mallee)	P4	Sand, sandy clay, often over weathered granite & laterite. Coastal areas	na	Likely	Nature Map
Eucalyptus preissiana x staeri	P4	Grey peaty or gravelly sand.	Slender mallee, to 6 m high. Fl. yellow. Grey peaty or gravelly sand. Distribution: SW: ESP, JF.	Likely	DEC

Species	Status	Habitat	Description	Likelihood of Occurrence	Source
Eucalyptus x kalganensis	P4	Sand/sandy clay over laterite/limestone.	Spreading mallee, 1.5–7 m high, bark smooth, grey. Fl. cream, white, yellow, Sep–Oct. Sand/sandy clay over laterite/limestone. Distribution: SW: ESP, JF.	Likely	DEC
Eucalyptus melanophitra	P4	Laterite, skeletal soils. Stony breakaways	na	Unlikely	Nature Map
Eucalyptus newbeyi (Beaufort Inlet Mallee)	P3	Sandy clay, loam. Steep spongolite valley sides & cliffs forming river banks	na	Unlikely	Nature Map
Gonocarpus trichostachyus	P3	Sandy soils.	Erect to spreading perennial, herb, 0.05–0.17 m high. Fl. red, purple, Sep–Oct. Sandy soils. Distribution: SW: ESP, JF.	Possible	DEC
Goodenia filiformis	P3	Sandy soils, winter-wet depressions	Erect to ascending, slender perennial, herb, 0.1–0.25 m high, leaves linear-terete, entire, c. 1 mm wide; sepals ovate, 1.5-2 mm long; indusium c. 0.7 mm long. Fl. yellow, Nov–Jan. Sandy soils. Winter-wet depressions. Distribution: ER: CAR; SW: ESP, JF, SWA, WAR.	Likely	DEC
Grevillea tetragonoloba	P2	Sand or loam, sometimes with gravel, on laterite, granite or quartzite.	Erect to spreading shrub, 0.6–2.6 m high. Fl. red, brown, Jun–Nov. Sand or loam, sometimes with gravel, on laterite, granite or quartzite. Distribution: SW: ESP, MAL.	Likely	DEC
Hakea lasiocarpha	P3	Sandy loam soils, organic litter over sand, clay or gravel. Hill tops, valleys.	Erect shrub, to 6 m high. Fl. white, May–Jul. Sandy loam soils, organic litter over sand, clay or gravel. Hill tops, valleys. Distribution: SW: ESP, JF.	Unlikely	DEC
Hibbertia argentea	P3	Clayey sand, rocky loam. Granite hills, rocky slopes.	Erect shrub, 0.3–1.2 m high. Fl. yellow, Sep–Dec. Clayey sand, rocky loam. Granite hills, rocky slopes. Distribution: SW: ESP, JF.	Unlikely	DEC
Hypocalymma elongatum	P3	Sand, sandy loam.	na	Likely	Nature Map
Kennedia glabrata	R	Prostrate shrub, 0.05–0.5 m high, to 5 m wide. Fl. red, Aug–Nov.	Soil pockets, sandy soils. Granite oucrops.	Unlikely	EPBC
Kunzea micrantha subsp. *Hirtiflora*	P2	In temporary marshes, often partly submerged.	Spindly shrub, 0.6–1 m high. Fl. pink, white, purple, Sep. In temporary marshes, often partly submerged. Distribution: SW: JF.	Possible	DEC

Species	Status	Habitat	Description	Likelihood of Occurrence	Source
Kunzea pauciflora	P4	Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes.	Erect, compact shrub, (0.35–)0.5–1.2(–1.5) m high. Fl. pink, Aug–Nov. Gravelly sandy or loamy soils over limestone, sandstone or spongolite. Hillsides, coastal slopes. Distribution: SW: ESP.	Likely	DEC
Leucopogon elegans subsp. *psorophyllus*	P3	Deep sandy soils to shallow duplex soils approaching spongelite ridges.	na	Likely	DEC
Melaleuca araucarioides	P4	Sandy or loamy soils, often rocky.	Bushy shrub, 0.7–1.5 m high. Fl. cream, yellow, Jul/Oct. Sandy or loamy soils, often rocky. Distribution: SW: ESP, MAL.	Unlikely	DEC
Monotoca aristata	P2	Stony quartzitic sandy soils. Hillslopes.	Erect, dioecious shrub, 0.1–0.5 m high. Stony quartzitic sandy soils. Hillslopes. Distribution: SW: ESP.	Likely	DEC
Myoporum cordifolium	R	Sandy loam or clay loam. Flat plains.	Spindly, erect shrub, 0.3–0.8 m high. Fl. white, pink, Jul–Nov. Sandy loam or clay loam. Flat plains. Distribution: SW: ESP, MAL.	Possible	DEC
Persoonia micranthera	R	Decumbent to prostrate shrub, 0.1–0.4 m high. Fl. yellow, Aug.	Sandy, stony soils. Summit of plateau.	Unlikely	EPBC
Petrophile longifolia	P3	Deep sandy soils to shallow duplex soils approaching spongelite ridges.	Prostrate, non-lignotuberous shrub, 0.15–0.5 m high. Fl. yellow, cream, white, pink, Jul–Dec/Mar. Distribution: SW: AW, ESP, JF.	Unlikely	DEC
Scaevola macrophylla	R	Rocky, gravel loam soil.	Erect herb (woody at base), to 0.4 m high. Fl. blue. Distribution: SW: ESP.	Unlikely	DEC, EPBC
Sphaerolobium validum	P3	White-grey sand, red-brown clayey sand, laterite gravel and quartz pebbles. Gently undulating areas, flats, roadsides.	Erect shrub, to 0.9 m high. Fl. yellow, red, Sep. White-grey sand, red-brown clayey sand, laterite gravel and quartz pebbles. Gently undulating areas, flats, roadsides. Distribution: SW: ESP, MAL.	Possible	DEC
Spyridium oligocephalum	P3	Sandy soils, sandplains.	Shrub, (0.3–)0.6–1.5 m high. Fl. white, cream, Mar/Jul–Oct. Sandy soils. Sandplains. Distribution: SW: ESP, JF.	Possible	DEC
Stylidium daphne	P2	Grey to white sand or brown sandy clay loam over laterite. Gentle slopes or winter wet depressions.	Rosetted perennial, herb, 0.15–0.45 m high, Leaves tufted, linear to narrowly oblanceolate, 1-4.5 cm long, 0.5-2 (-3) mm wide, apex subacute, margin entire, hoary. Scape mostly glabrous, inflorescence axis sparingly glandular. Inflorescence racemose. Fl. yellow, Dec. Grey to white sand or brown sandy clay loam over laterite. Gentle slopes or winter wet depressions. Mallee or Melaleuca shrubland. Distribution: SW: ESP, JF.	Likely	DEC

Species	Status	Habitat	Description	Likelihood of Occurrence	Source
Tetratheca affinis subsp. Cape Riche (T.D. Macfarlane TDM 1832)	P1	Flat plain, light brown clay loam with spongelite.	na	Unlikely	DEC
Thelymitra psammophila	R	Tuberous, perennial, herb, 0.15–0.25 m high. Fl. yellow, Sep–Oct.	Sandy clay, loam.	Unlikely	EPBC
Thomasia solanacea	P4	Alluvium, sand over limestone, rocky loam. Coastal areas.	na	Unlikely	Nature Map
Thysanotus gageoides	P3	Sand, clay, granite, sandstone, laterite.	na	Unlikely	Nature Map
Trymalium litorale	P1	Coastal granite.	Shrub. Fl. Jul–Sep. Coastal granite. Distribution: SW: ESP.	Likely	DEC
Verticordia harveyi	P4	White sand. Low hills.	Slender, spindly shrub, 0.2–1.5 m high. Fl. white, pink, purple, Jan–Apr. White sand. Low hills. Distribution: SW: ESP, JF.	Unlikely	DEC
Verticordia helichrysantha	R	Sandy soils over spongolite. Coastal plains & cliffs.	Sprawling shrub, 0.1–0.3(–0.6) m high. Fl. green, yellow, May–Nov. Sandy soils over spongolite. Coastal plains & cliffs. Distribution: SW: ESP.	Likely	DEC

Appendix D

Fauna

Desktop Searches – NatureMap Fauna and EPBC Protected Matters Search

Southdown Mine Desalination Pipeline Route - Fauna Species List

Likelihood of occurrence of Significant Fauna species previously recorded within 15 km of the Study Area (EPBC and NatureMap)

Desktop searches

NatureMap Species Report

Created By Guest user on 25/01/2011

Kingdom Animalia
Method 'By Circle'
Centre 118°38' 53" E,34°35' 33" S
Buffer 12km
Group By Family

Family	Species	Records
Acanthizidae	6	71
Accipitridae	6	20
Aegothelidae	1	1
Anatidae	7	36
Anhingidae	1	1
Ardeidae	4	22
Artamidae	2	7
Campephagidae	2	12
Charadriidae	5	15
Columbidae	3	33
Corvidae	1	38
Cracticidae	3	79
Cuculidae	3	8
Dicruridae	4	69
Elapidae	2	6
Estrilidae	1	9
Falconidae	3	9
Gekkonidae	1	11
Haematopodidae	1	5
Halcyonidae	2	8
Hirundinidae	2	33
Hylidae	1	12
Laridae	4	19
Limnodynastidae	2	3
Macropodidae	1	1
Maluridae	4	29
Megapodiidae	1	1
Meliphagidae	12	195
Motacillidae	1	3
Muridae	1	1
Myobatrachidae	1	3
Neosittidae	1	2
Pachycephalidae	3	20
Pardalotidae	2	17
Pelecanidae	1	4
Petroicidae	4	7
Phalacrocoracidae	3	9
Phasianidae	1	2
Physeteridae	1	1
Podicipedidae	2	5
Procellariidae	1	1
Psittacidae	11	57
Rallidae	4	5
Recurvirostridae	1	2
Scincidae	8	47
Scolopacidae	4	8
Spheniscidae	1	2
Strigidae	1	1
Sulidae	1	2
Sylviidae	1	1
Tarsipedidae	1	1
Threskiornithidae	3	6
Vespertilionidae	1	1
Zosteropidae	1	35
TOTAL	**145**	**996**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthizidae					
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill (Inland Thornbill))*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	34000	*Calamanthus campestris subsp. montanellus (Rufous Fieldwren (western wheatbelt))*		P4	
5.	25530	*Gerygone fusca (Western Gerygone)*			
6.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
Accipitridae					
7.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
8.	24285	*Aquila audax (Wedge-tailed Eagle)*			
9.	24288	*Circus approximans (Swamp Harrier)*			
10.	-1600	*Elanus axillaris*			
11.	-1601	*Hieraaetus morphnoides*			
12.	-1616	*Lophoictinia isura*			
Aegothelidae					
13.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
Anatidae					
14.	24310	*Anas castanea (Chestnut Teal)*			
15.	24312	*Anas gracilis (Grey Teal)*			
16.	24316	*Anas superciliosa (Pacific Black Duck)*			
17.	24319	*Biziura lobata (Musk Duck)*			
18.	24321	*Chenonetta jubata (Australian Wood Duck (Wood Duck))*			
19.	24322	*Cygnus atratus (Black Swan)*			
20.	24331	*Tadorna tadornoides (Australian Shelduck (Mountain Duck))*			
Anhingidae					
21.	-1591	*Anhinga novaehollandiae*			
Ardeidae					
22.	-1578	*Ardea modesta*			
23.	24341	*Ardea pacifica (White-necked Heron)*			
24.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
25.	-1577	*Egretta novaehollandiae*			
Artamidae					
26.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
27.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
Campephagidae					
28.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
29.	-1641	*Lalage sueurii*			
Charadriidae					
30.	24376	*Charadrius rubricollis (Hooded Plover)*		P4	
31.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
32.	-1573	*Elseyornis melanops*			
33.	-1621	*Thinornis rubricollis*			
34.	25577	*Vanellus miles (Masked Lapwing)*			
Columbidae					
35.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
36.	24409	*Phaps chalcoptera (Common Bronzewing)*			
37.	25587	*Phaps elegans (Brush Bronzewing)*			
Corvidae					
38.	25592	*Corvus coronoides (Australian Raven)*			
Cracticidae					
39.	25595	*Cracticus tibicen (Australian Magpie)*			
40.	25596	*Cracticus torquatus (Grey Butcherbird)*			
41.	25597	*Strepera versicolor (Grey Currawong)*			
Cuculidae					
42.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
43.	-1624	*Chalcites basalis*			
44.	-1581	*Chalcites lucidus*			
Dicruridae					
45.	24443	*Grallina cyanoleuca (Magpie-lark)*			
46.	25610	*Myiagra inquieta (Restless Flycatcher)*			
47.	-1654	*Rhipidura albiscapa*			
48.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
Elapidae					
49.	25250	*Elapognathus coronatus (Crowned Snake)*			
50.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
Estrilidae					
51.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
Falconidae					
52.	25621	*Falco berigora (Brown Falcon)*			
53.	25622	*Falco cenchroides (Australian Kestrel)*			
54.	25624	*Falco peregrinus (Peregrine Falcon)*		S	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Gekkonidae					
55.	24980	*Christinus marmoratus (Marbled Gecko)*			
Haematopodidae					
56.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
Halcyonidae					
57.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
58.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
Hirundinidae					
59.	24491	*Hirundo neoxena (Welcome Swallow)*			
60.	-1640	*Petrochelidon nigricans*			
Hylidae					
61.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
Laridae					
62.	-1637	*Chroicocephalus novaehollandiae*			
63.	-1642	*Hydroprogne caspia*			
64.	25638	*Larus pacificus (Pacific Gull)*			
65.	-1622	*Thalasseus bergii*			
Limnodynastidae					
66.	25410	*Heleioporus eyrei (Moaning Frog)*			
67.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
Macropodidae					
68.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
Maluridae					
69.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
70.	24551	*Malurus pulcherrimus (Blue-breasted Fairy-wren)*			
71.	25654	*Malurus splendens (Splendid Fairy-wren)*			
72.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
Megapodiidae					
73.	24557	*Leipoa ocellata (Malleefowl)*		T	
Meliphagidae					
74.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
75.	24561	*Anthochaera carunculata (Red Wattlebird)*			
76.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
77.	24567	*Epthianura albifrons (White-fronted Chat)*			
78.	-1596	*Glyciphila melanops*			
79.	24573	*Lichenostomus cratitius (Purple-gaped Honeyeater)*			
80.	24577	*Lichenostomus ornatus (Yellow-plumed Honeyeater)*			
81.	25661	*Lichmera indistincta (Brown Honeyeater)*			
82.	24583	*Manorina flavigula (Yellow-throated Miner)*			
83.	-1649	*Melithreptus lunatus*			
84.	-1643	*Phylidonyris niger*			
85.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
Motacillidae					
86.	-1612	*Anthus novaeseelandiae*			
Muridae					
87.	24243	*Rattus fuscipes (Western Bush Rat)*			
Myobatrachidae					
88.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
Neosittidae					
89.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
Pachycephalidae					
90.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
91.	25679	*Pachycephala pectoralis (Golden Whistler)*			
92.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Pardalotidae					
93.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
94.	25682	*Pardalotus striatus (Striated Pardalote)*			
Pelecanidae					
95.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
Petroicidae					
96.	24650	*Drymodes brunneopygia (Southern Scrub-robin)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
97.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
98.	-1629	*Eopsaltria griseogularis*			
99.	-1650	*Petroica boodang*			
Phalacrocoracidae					
100.	-1636	*Microcarbo melanoleucos*			
101.	25697	*Phalacrocorax carbo (Great Cormorant)*			
102.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
Phasianidae					
103.	24671	*Coturnix pectoralis (Stubble Quail)*			
Physeteridae					
104.	24073	*Physeter macrocephalus (Sperm Whale)*		P4	
Podicipedidae					
105.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
106.	25705	*Tachybaptus novaehollandiae (Australasian Grebe (Black-throated Grebe))*			
Procellariidae					
107.	25710	*Pterodroma macroptera (Great-winged Petrel)*			
Psittacidae					
108.	-1633	*Barnardius zonarius*			
109.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo)*		T	
110.	-3794	*Calyptorhynchus sp*			
111.	-1569	*Eolophus roseicapillus*			
112.	24735	*Glossopsitta porphyrocephala (Purple-crowned Lorikeet)*			
113.	24738	*Neophema elegans (Elegant Parrot)*			
114.	24739	*Neophema petrophila (Rock Parrot)*			
115.	24744	*Pezoporus wallicus subsp. flaviventrus*		T	
116.	25722	*Polytelis anthopeplus (Regent Parrot)*			
117.	30854	*Polytelis anthopeplus subsp. westralis*			
118.	-1580	*Purpureicephalus spurius*			
Rallidae					
119.	25727	*Fulica atra (Eurasian Coot)*			
120.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
121.	24771	*Porzana tabuensis (Spotless Crake)*			
122.	-1617	*Tribonyx ventralis*			
Recurvirostridae					
123.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
Scincidae					
124.	25011	*Acritoscincus trilineatum*			
125.	25031	*Ctenotus catenifer*			
126.	25049	*Ctenotus labillardieri*			
127.	25096	*Egernia kingii (King's Skink)*			
128.	25099	*Egernia multiscutata*			
129.	25103	*Egernia pulchra subsp. pulchra*			
130.	25117	*Hemiergis peronii subsp. peronii*			
131.	25192	*Morethia obscura*			
Scolopacidae					
132.	-1576	*Actitis hypoleucos*			
133.	24788	*Calidris ruficollis (Red-necked Stint)*			
134.	-1684	*Genus sp.*			
135.	24808	*Tringa nebularia (Common Greenshank)*			
Spheniscidae					
136.	25746	*Eudyptula minor (Little Penguin)*			
Strigidae					
137.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
Sulidae					
138.	-1595	*Morus serrator*			
Sylviidae					
139.	24833	*Cincloramphus cruralis (Brown Songlark)*			
Tarsipedidae					
140.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
Threskiornithidae					
141.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
142.	24844	*Threskiornis molucca (Australian White Ibis)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
143.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			

Vespertilionidae

144.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			

Zosteropidae

145.	25765	*Zosterops lateralis (Grey-breasted White-eye (Silvereye))*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

EPBC Act Protected Matters Report: Coordinates

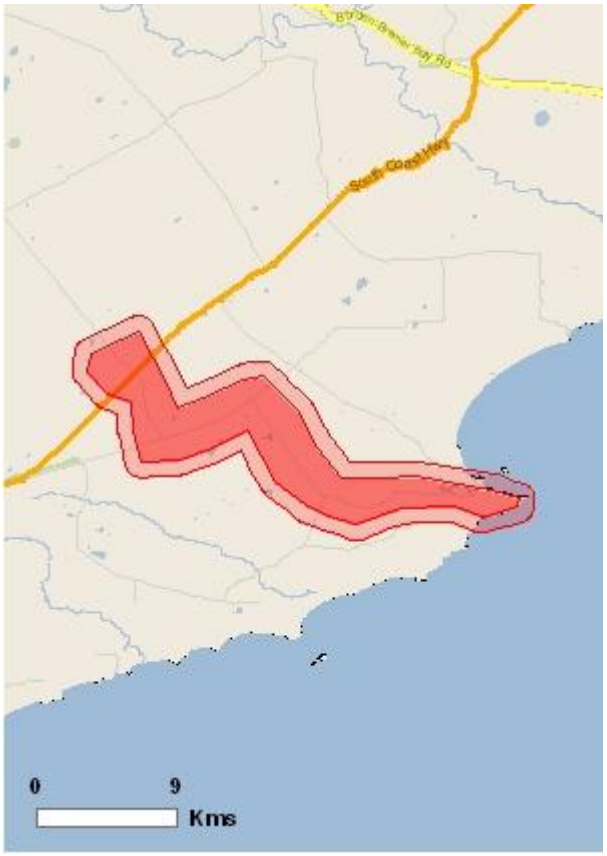
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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.

You may wish to print this report for reference before moving to other pages or websites.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 09/03/11 13:36:07



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1Km

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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	None
Threatened Species:	32
Migratory Species:	23

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. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	35

Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

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

Place on the RNE:	4
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	6
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Species **[Resource Information]**

Name	Status	Type of Presence
BIRDS		
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Dasyornis longirostris Western Bristlebird [515]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pezoporus wallicus flaviventris Western Ground Parrot [26024]	Endangered	Species or species habitat likely to occur within area
Psophodes nigrogularis nigrogularis Western Whipbird (western heath) [64449]	Endangered	Species or species habitat likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
MAMMALS		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area

Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion [22]	Vulnerable	Species or species habitat likely to occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat likely to occur within area
Phascogale calura Red-tailed Phascogale [316]	Endangered	Species or species habitat may occur within area
PLANTS		
Anigozanthos bicolor subsp. minor Little Kangaroo Paw, Two-coloured Kangaroo Paw [21241]	Endangered	Species or species habitat likely to occur within area
Banksia pseudoplumosa a shrub [82760]	Endangered	Species or species habitat likely to occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Conostylis misera Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area
Darwinia collina Yellow Mountain Bell [17296]	Endangered	Species or species habitat may occur within area
Daviesia obovata Paddle-leaf Daviesia [17311]	Endangered	Species or species habitat may occur within area
Drosera fimbriata Manypeaks Sundew [18749]	Vulnerable	Species or species habitat likely to occur within area
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Persoonia micranthera Small-flowered Snottygobble [64939]	Endangered	Species or species habitat may occur within area
Scaevola macrophylla Large-flowered Scaevola [11806]	Critically Endangered	Species or species habitat known to occur within area
Thelymitra psammophila Sandplain Sun-orchid [4908]	Vulnerable	Species or species habitat likely to occur within area
Verticordia helichrysantha Coast Featherflower [8204]	Vulnerable	Species or species habitat likely to occur within area
REPTILES		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area

Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
SHARKS		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species [Resource Information]

Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]		Species or species habitat may occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy Albatross [64697]		Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus		

Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca		
Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
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
Pezoporus wallicus flaviventris		
Western Ground Parrot [26024]	Endangered	Species or species habitat likely to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species **[Resource Information]**

Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Diomedea gibsoni		
Gibson's Albatross [64466]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy Albatross [64697]		Species or species habitat may occur within area
Fish		
Acentronura australe		
Southern Pygmy Pipehorse		Species or species habitat may occur within area

[66185]

Campichthys galei	
Gale's Pipefish [66191]	Species or species habitat may occur within area
Heraldia nocturna	
Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]	Species or species habitat may occur within area
Hippocampus breviceps	
Short-head Seahorse, Short-snouted Seahorse [66235]	Species or species habitat may occur within area
Histiogamphelus cristatus	
Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]	Species or species habitat may occur within area
Leptoichthys fistularius	
Brushtail Pipefish [66248]	Species or species habitat may occur within area
Lissocampus caudalis	
Australian Smooth Pipefish, Smooth Pipefish [66249]	Species or species habitat may occur within area
Lissocampus runa	
Javelin Pipefish [66251]	Species or species habitat may occur within area
Maroubra perserrata	
Sawtooth Pipefish [66252]	Species or species habitat may occur within area
Nannocampus subosseus	
Bonyhead Pipefish, Bony-headed Pipefish [66264]	Species or species habitat may occur within area
Notiocampus ruber	
Red Pipefish [66265]	Species or species habitat may occur within area
Phycodurus eques	
Leafy Seadragon [66267]	Species or species habitat may occur within area
Phyllopteryx taeniolatus	
Common Seadragon, Weedy Seadragon [66268]	Species or species habitat may occur within area
Pugnaso curtirostris	
Pugnose Pipefish, Pug-nosed Pipefish [66269]	Species or species habitat may occur within area
Solegnathus lettiensis	
Gunther's Pipehorse, Indonesian Pipefish [66273]	Species or species habitat may occur within area
Stigmatopora argus	
Spotted Pipefish, Gulf Pipefish [66276]	Species or species habitat may occur within area
Stigmatopora nigra	
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]	Species or species habitat may occur within area
Urocampus carinirostris	
Hairy Pipefish [66282]	Species or species habitat may occur within area
Vanacampus margaritifer	
Mother-of-pearl Pipefish [66283]	Species or species habitat may occur within area
Vanacampus phillipi	
Port Phillip Pipefish [66284]	Species or species habitat may occur within area

Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri New Zealand Fur-seal [20]		Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion [22]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Whales and Other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		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	Status
Natural	
Beaufort Inlet Area WA	Indicative Place
Hassell National Park and Adjacent Reserves WA	Indicative Place
Mettler Lake Nature Reserve WA	Indicative Place
The South Coast Reserves WA	Indicative Place

State and Territory Reserves [Resource Information]

Mettler Lake, WA

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
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		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 may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat may occur within area

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.

Coordinates

118.75341
-34.61956,118.75341
-34.61956,118.73734
-34.61361,118.70701
-34.6148,118.68083
-34.62432,118.66596
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-34.61421,118.75341
-34.62016,118.7546
-34.61956,118.75341 -34.61956

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
-Other groups and individuals

Environment Australia 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.

Last updated: Thursday, 16-Sep-2010 09:13:25 EST

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Table 8 Southdown Mine Desalination Pipeline Route - Fauna Species List

Family	Species	Common Name	Status
Birds			
Accipitridae	*?Circus approximans*	Swamp Harrier	
	Aquila audax	Wedge-tailed Eagle	
Apodidae	*Apus pacificus*	Fork-tailed Swift	
Artamidae	*Cracticus tibicen*	Australian Magpie	
	Cracticus torquatus	Grey Butcherbird	
	Strepera versicolor	Grey Currawong	
Cacatuidae	*Eolophus roseicapillus*	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Columbidae	*Phaps chalcoptera*	Common Bronzewing	
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	
Laniidae	*Corvus coronoides*	Australian Raven	
Maluridae	*Malurus splendens*	Splendid Fairy-wren	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
	Manorina flavigula	Yellow-throated Miner	
	Melithreptus lunatus	White-naped Honeyeater	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit	
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	
Psittacidae	*Barnardius zonarius*	Australian Ringneck	
	Purpureicephalus spurius	Red-capped Parrot	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	
Mammals			
Canidae	*Vulpes vulpes*	Red Fox	Naturalised Exotic
Leporidae	*Oryctolagus cuniculus*	Rabbit	Naturalised Exotic
Peramelidae	*Isoodon obesulus* subsp. *fusciventer*	Southern Brown Bandicoot, Quenda	Priority 5
Reptiles			
Elapidae	*Notechis scutatus*	Tiger Snake	
Scincidae	*?Tiliqua occipitalis*	Western Bluetongue	
	Tiliqua rugosa	Bobtail	

Family	Species	Common Name	Status
Varanidae	*Varanus rosenbergi*	Heath Monitor	

Table 9 Likelihood of occurrence of significant fauna species previously recorded within 15 km of the Study Area (EPBC and NatureMap)

Species	Status	Description	Likelihood of Occurrence
Birds			
Calamanthus campestris subsp. *montanellus* (Rufous Fieldwren (western wheatbelt))	P4	This Rufous Fieldwren occurs north to Shark Bay and east to Toolinna Rockhole. The species inhabits heaths and other low shrublands (up to 1.5 m high) on sandplains and lateritic ridges. It is also present in shrub steppe on limestone plains and around saltlakes. The Rufous Fieldwren consumes insects, grubs, small snails and seeds and forages in low vegetation and on the ground.	**May Occur** This species has previously been recorded within 15 km of the Study Area. There is a single record from 1979. There is suitable habitat and it may occur along the alignment.
Botaurus poiciloptilus (Australasian Bittern)	EN – WC Act, E – EPBC Act	The Australasian Bittern occurs mainly in densely vegetated freshwater wetlands and, rarely, in estuaries or tidal of temperate southeast & southwest Australia, favouring foraging in tall, dense vegetation in shallow permanent or seasonal fresh water. Habitats dominated by Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus and Gahnia growing over muddy or peaty soils are preferred and the species appears capable of moving between habitats as suitability changes.	**Unlikely** Species is unlikely to occur within the area, however some areas adjacent to the Study Area may provide suitable habitat for this species.
Charadrius rubricollis (Hooded Plover)	P4	The Hooded Plover is found on the southern coasts and saltlakes north to Port Gregory, Three Springs, Mt Gibson, Lake Brown, Lake Barlee, Lake Cowan and Eyre. The species inhabits the margins and shallows of saltlakes, sandy and seaweedy beaches and estuaries, as well as dams and nests in a scrape in the sand on ocean beaches or in nearby coastal dunes or in the soil at the edge of saltlakes.	**May Occur** Species or species habitat may occur within the area, however only a very small section of the Study Area is coastal or suitable for this species.
Falco peregrinus (Peregrine Falcon)	S4	The Peregrine Falcon prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. This species requires abundant prey, secure nest sites and lack of human interference.	**Likely** Species or species habitat may occur within the area, number of records along the coast near Wellstead.
Leipoa ocellata (Malleefowl)	VU – WC Act, V – EPBC Act	The Mallefowl occurs in the semi-arid to arid zones of Australia, south and west of the line from Cape Farquhar to the Eyre Bird Observatory. The species exists on sandy or loamy soils that receive 200 to 450mm of rainfall each year in shrublands and low woodlands dominated by Mallee vegetation, they may also occur in coastal heathlands as well as crop fields and around roads. The nest is a large mound of sand or soil and organic matter.	**Unlikely** Species or species habitat may occur within the area, however no mounds were identified during the survey.

Species	Status	Description	Likelihood of Occurrence
Calyptorhynchus latirostris (Carnaby's Cockatoo)	EN – WC Act, E – EPBC Act	Carnaby's Cockatoo, also known as the Short-billed Black-Cockatoo, is distributed across the south-west of Western Australia in uncleared or remnant areas of *Eucalyptus* Woodland and Shrubland or kwongan heath. Breeding usually occurs in the Wheatbelt region of Western Australia, with flocks moving to the higher rainfall coastal areas to forage after the breeding season. These Cockatoos feed on the seeds of a variety of native plants, including *Allocasuarina*, *Banksia*, *Dryandra*, *Eucalyptus*, *Grevillea* and *Hakea*, and some introduced plants. They will also feed on the nectar from flowers of a number of species, and on insect larvae.	**Likely** Known to occur at the Grange minesite – feeding habitat present in the Study Area. No breeding habitat present.
Pezoporus wallicus subsp. *flaviventrus* (Western Ground Parrot)	CR – WC Act, E – EPBC Act	The Western Ground Parrot is a cryptic, ground-dwelling parrot with a range restricted to five subpopulations in the north section of Fitzgerald River National Park and one population in Cape Arid National Park. The species inhabits temperate regions of Western Australia with rainfall of 400-500 mm per year in low, dense sedgelands, temperate shrub heaths and temperate graminoid heaths of medium to high species richness except sedgelands that are frequently dominated by a single species.	**Unlikely** Given the species very restricted range and extensive previous survey for this species, it is unlikely this species occurs within the area.
Dasyornis longirostris (Western Bristlebird)	Vu – WC Act, V – EPBC Act	The Western Bristlebird is a medium-sized brown, ground-dwelling songbird with short wings and a long tail. The species is restricted to a floristically diverse low dense coastal heathland 0.5–1.5 m tall in the coastal strip of southern Western Australia from Two Peoples Bay to near East Mount Barren in the eastern end of Fitzgerald River National Park, with a large gap further west of the National Park. The breeding season runs from July to October.	**May Occur** The near coastal area of the alignment has been grazed and is disturbed. There are limited records of this species in the Study Area, with clusters of sightings restricted to Fitzgerald River and Albany.
Psophodes nigrogularis nigrogularis (Western Whipbird (western heath))	EN – WC Act, E – EPBC Act	The Western Whipbird (western heath) is a small, greyish brown or pale brownish olive bird, distributed in the south of the south west of WA, mainly in eastern semiarid and subhumid zones, from Gnowangerup, the upper Fitzgerald River and Ravenshorpe Range south to King George Sound (formerly), Two Peoples Bay and Hopetoun and patchily further north (near Lake Grace and near Nyabing, Pingerup near Gnowangerup and Tambellup). In the east, the Western Whipbird is found mainly in mallee and banksia scrubs or heathlands 1-2 m high. In west mainly heathlands and coastal and waterside thickets.	**Unlikely** There are no records of this species within the Wellstead area.
Mammals			
Macropus irma (Western Brush Wallaby)	P4	The Western Brush Wallaby, a medium sized macropod, is a grazer found primarily in open forest and woodland. This species was once very common in the south-west of Western Australia but has undergone a reduction in range and a significant decline in abundance in its current habitat. The decline in populations of this species has resulted from extensive clearing within its original distribution and from predation of juvenile Western Brush Wallabies by foxes (CALM, 2005d).	**May Occur** Species or suitable habitat may occur within the area

Species	Status	Description	Likelihood of Occurrence
Dasyurus geoffroii (Chuditch, Western Quoll)	Vu – WC Act, V – EPBC Act	The Chuditch is the largest carnivorous marsupial in Western Australia. This species occupies a wide range of habitats including woodlands, riparian vegetation, beaches and deserts. The Chuditch formerly ranged over nearly 70 % of Australia but now retains only a patchy distribution through the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-western WA. This reduction in range and decline in population numbers have been caused by habitat alteration, impacts from the introduction of foxes and cats, hunting and poisoning.	**Unlikely** Species is unlikely to occur within the area as no Jarrah forest or mixed Karri/Marri/Jarrah forest were identified within the Study Area and are unlikely to occur in nearby area.
Parantechinus apicalis (Dibbler)	EN – WC Act, E – EPBC Act	The Dibbler was formerly widely distributed throughout south-western Australia but is now restricted to the Western Australian coastline near Jurien on three small offshore islands and a small number of widely scattered populations across Fitzgerald River National Park, Arpenteur Nature Reserve (Cheynes Beach), Waychinicup National Park, Torndirrup National Park and vacant Crown land near Ravensthorpe. It is likely that they can occupy a diverse range of habitats but seem to prefer vegetation with a dense canopy greater than 1 m high which has been unburnt for at least 10 years or more, growing in sandy substrates and occasionally lateritic soils.	**Unlikely** Species or suitable species habitat may occur within the area. However, the alignment is mostly located in linear fragments that would not provide core habitat. Also previous record in the Study Area is from 1970's on an offshore island.
Phascogale calura (Red-tailed Phascogale)	EN – WC Act, E – EPBC Act	The Red-tailed Phascogale is restricted to native remnants throughout the wheatbelt of Western Australia from Beverley to Fitzgerald River National Park. The species is found in *Allocasuarina huegeliana* woodlands. It requires vegetation that has been unburnt for greater than 20 years, providing sufficient canopy and leaf cover for nesting and foraging. Hollows in logs are required for nesting, while for protection during fire it requires hollows above the height of flames.	**Unlikely** No *Allocasuarina* woodlands were identified during the survey.
Isoodon obesulus fusciventer (Quenda)	P5	The Quenda is an omnivorous marsupial that occurs in the south-west of Western Australia. This species prefers areas of dense or scrubby vegetation, particularly around swamps or along watercourses. It will utilise more open areas such as woodlands, burnt vegetaion and pasture if connected to more a suitable habitat or if there is predator control programs in place.	**Present** A sighting confirmed the species does occur within the area.

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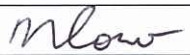
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	C Best	M Toner		A Napier		28/06/11
1	C Best	M Toner		A Napier		30/08/11