ENVIRONMENTAL DESKTOP STUDY

(SUMMARY)

ATTACHMENT B

Project:	**UIL Energy 2D Seismic survey, Onshore, Perth Basin, WA**

Document Information

Operation area	Onshore, Shire of Dandaragan and Shire of Coorow, WA	**Document No**	UIL Desktop Study
Revision	4.0	**Last revision date**	October 2015

Register of Amendments

Rev	Description	Date	Prepared by
1.0	Initial Draft	July 2013	L. Volkova
2.0	Updates and Amendments	2013-2015	L. Volkova
3.0	Final Summary Report for release to DotE	August 2015	L.Volkova
4.0	Updates	October 2015	L.Volkova

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Background

This report summarises the results of the desktop study undertaken by UIL Energy during 2013-2015 for proposed 2D seismic survey (the Project). The desktop study is detailed environmental desktop assessment that also includes comments from two UIL Energy reconnaissance surveys undertaken in April 2013 and November 2014.

The objective of the desktop study is to describe the existing environment and to identify environmental values, potential environmental constraints and assess these values and sensitivities to assist UIL Energy with the design of the proposed 2D seismic survey layout. The location of the study area is shown in *Figure 1: Desktop study area*. Identified environmental values /sensitivities and outcomes of UIL's preliminary risk assessment were taken into account to finalise preliminary layout of proposed 2D seismic survey. Conceptual design of the Project is shown in *Figure 2: Conceptual design of the Project*.

To verify the desktop study results, finalise the 2D seismic survey layout and provide baseline information on the existing environmental values/sensitivities an on-ground ecological survey was carried out in November 2015.

Figure 1: Desktop study area

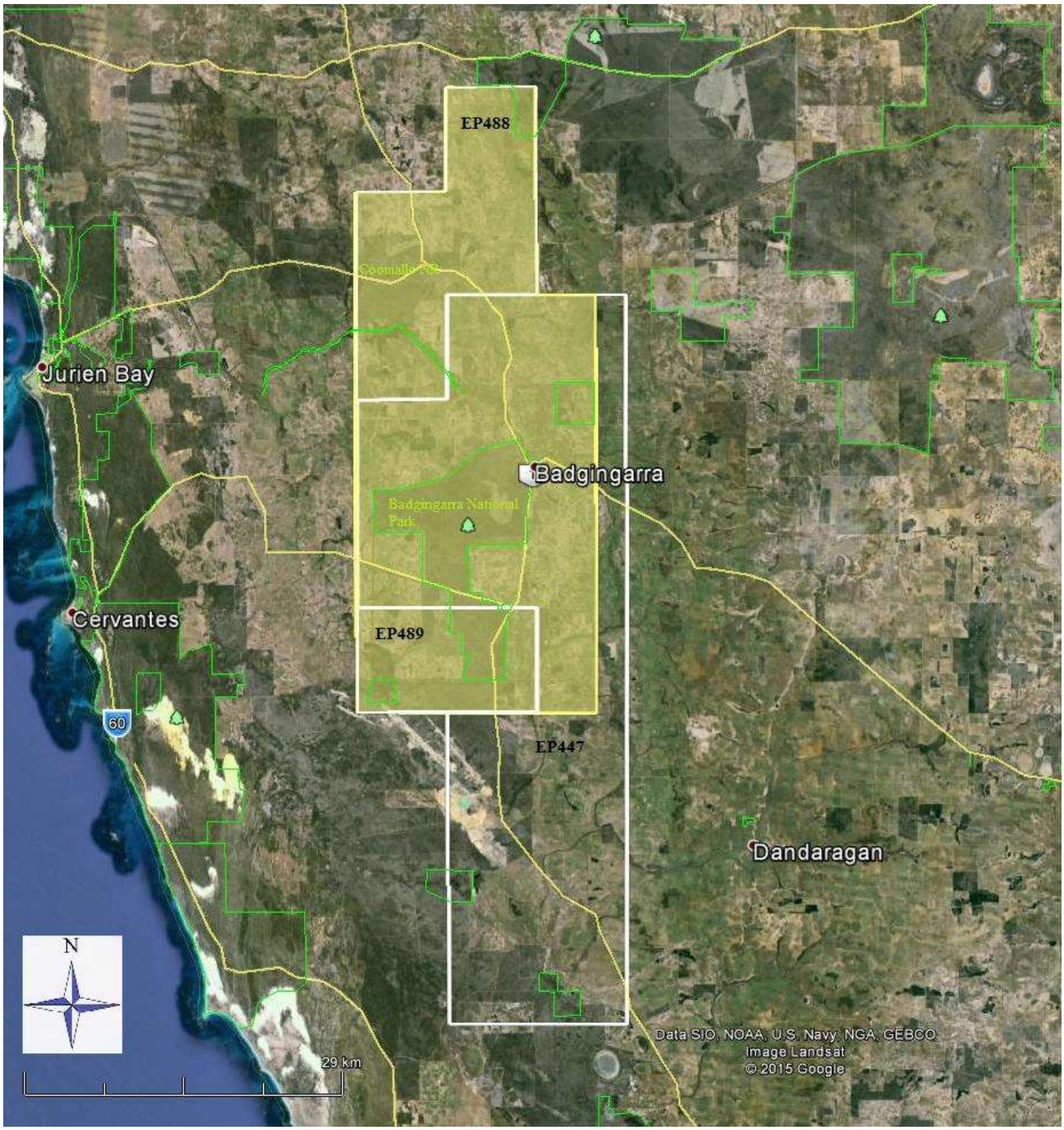
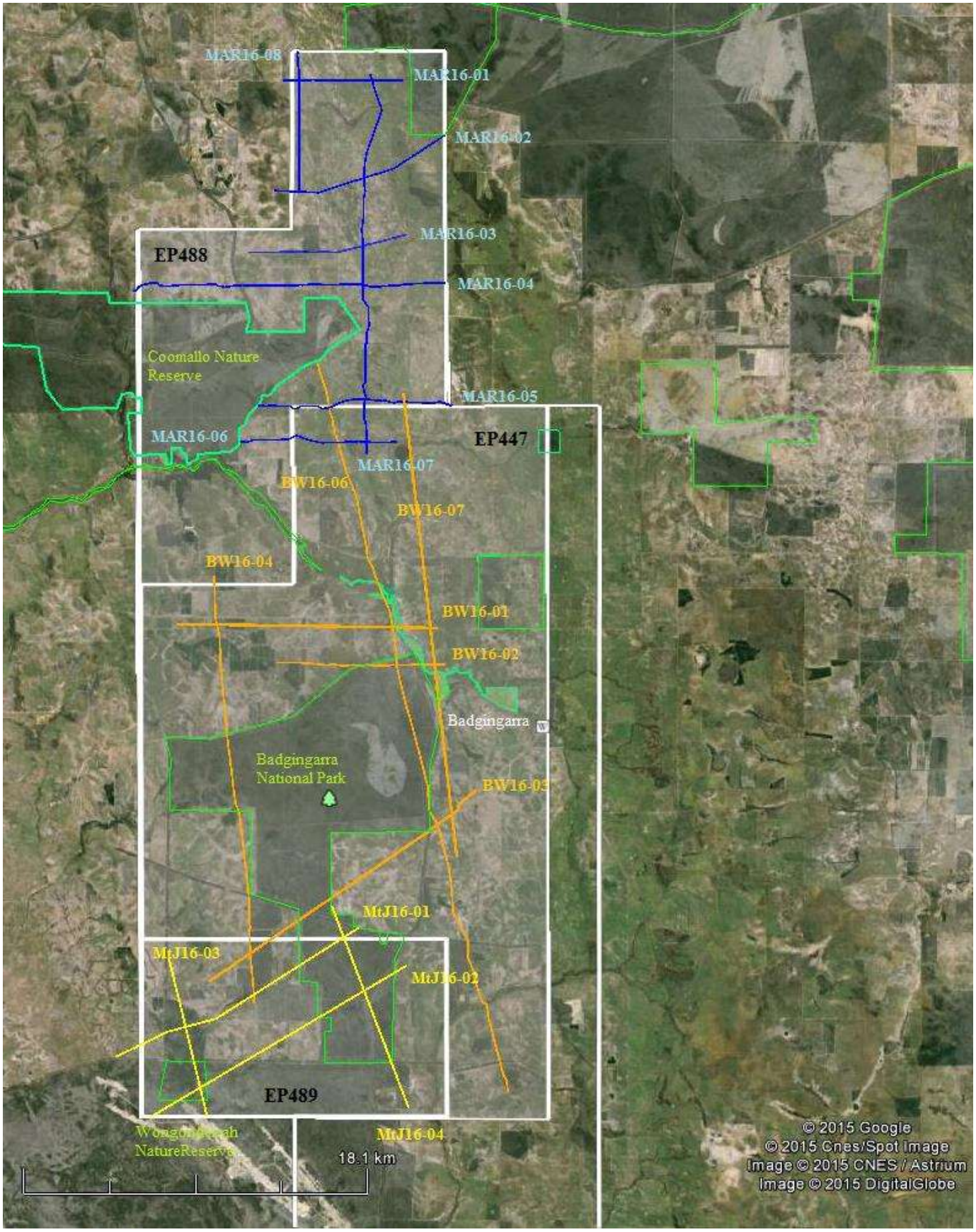


Figure 2: Conceptual design of the Project



Scope of works

An environmental desktop assessment was carried out in accordance with the principal components of WA EPA Environmental Assessment Guidelines (EAG) for a level 1 flora and fauna assessment and involved the following key tasks:

- Review of relevant legislative requirements and relevant regulations and guidelines;
- Review of available databases relating to the study area, including:
    - Commonwealth EPBC Act Protected Matters Search Tool, Department of Environment (DoE);
    - DoE Biodiversity Species Profile and Threats Database (SPAT);
    - Department of Park and Wildlife (DPaW) NatureMap Species database and interactive map;
    - DPaW Flora Database NatureMap;
    - Wetland Database;
    - Birds Australia Birdata Database;
    - Department of Mines and Petroleum, interactive map GeoVIEW;
    - WA Department of Parks and Wildlife (DPAW) Flora, Fauna and Communities database
    - National Vegetation Information System (NVIS) Mapping Tool V. 4.1.
- Review of relevant publicly available information including published ecological assessment reports, management plans, environmental studies undertaken for existing and proposed resource projects in the region, relevant environmental impact assessments and research papers.

1. EXISTING ENVIRONMENT

1.1 CLIMATE AND LAND USE

The Project is located in the Shire of Dandaragan within the Wheatbelt Region of Western Australia. The Project area has a Mediterranean climate with cool, wet winters and warm, dry summers. The long term (1956-1992) average annual rainfall is about 570 millimetres (WRC, 1999). Most of the rain falls during the winter months between April and September. The average annual evaporation is about 200mm and rainfall exceeds evaporation only the winter months.

During summer from October to April, the advent of hot, dry northerly winds frequently results in severe fire weather conditions. Wind speed and direction is the major factor influencing the spread of wildfires in this area. A typical daily weather pattern during the fire season starts with light to moderate offshore winds in early morning. Moderate to strong south to south-westerly sea breezes take over in the late morning or early afternoon. The sea breeze is commonly over 30kph. These usually decrease in the evening returning to the east or south-east.

The surrounding land use is predominantly pastoral (73%) comprised of cropping and grazing land with wheat, cattle and sheep are typical products and large areas have been cleared for this purpose. Other land uses for the region are unallocated crown land (2%), conservation lands (23%), land allocated for wind farms and mining leases, road reserves and pipeline easements (2%).

1.2 FIRE REGIME

During summer from October to April, the advent of hot, dry northerly winds frequently results in severe fire weather conditions. Wind speed and direction is the major factor influencing the spread of wildfires in this area. A typical daily weather pattern during the fire season starts with light to moderate offshore winds in early morning. Moderate to strong south to south-westerly sea breezes take over in the late morning or early afternoon. The sea breeze is commonly over 30kph. These usually decrease in the evening returning to the east or south-east.

1.3 SOIL AND LANDFORMS

The Project covers the *Swan Coastal Plain* and the *Geraldton Sandplains* regions of the Irwin Botanical District (Beard, 1979). The topography is described as a flat plain with low ridges alternating with numerous interdunal swamps and lakes (Beard, 1979).

The *Swan Coastal Plain* is low-laying area covered by Quaternary coastal sediments and bounded to the west by the Gingin Scarp. The Swan Coastal Plain consists of a series of distinct platforms, roughly parallel to the coast. The Bassendean Dunes represent a belt of coastal dunes and associated shoreline deposit in a low-lying area between the Spearwood Dune System and the Gingin Scarp.

The Swan Coastal Plain presents by Perth sub-region (SWA02) which covers south-eastern corner of the Project area. In this part the Project area consists predominantly of low dune ridges with inter-dunal swales

subject to seasonal waterlogging. The major types of soil that may be distinguished within the Project include deep sand, sand overlying laterite, sand overlying clayey subsoil, sand overlying laterite and mottled clay subsoils and deep sand more than 1m in depth (WRC 1997).

The *Geraldton Sandplains* presents by *Lesueur Sandplain* sub-region (GES02) on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. The *Lesueur Sandplain* (GES02) comprises Jurassic siltstones and sandstones (often heavily lateritised) of central Perth Basin. Alluvials are associated with drainage systems. There are extensive yellow sandplains in south-eastern parts. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains and coastal sands (DEC, 2002).

1.4 SURFACE AND GROUNDWATER

The Project covers the Arrowsmith Groundwater Area in the northern part of the Perth Basin and Jurien Groundwater Area in the southern part of the Perth Basin and is subject to the requirements of the RIWI Act regarding groundwater abstractions. No extraction of groundwater is proposed for the Project.

The area is drained by watercourses originated in the Dandaragan Plateau, Arrowsmith groundwater region, namely the Coomallo Creek, Hill River, Mullering Brook, Mt Jetty Creek and un-named ephemeral creeks. All of these watercourses with the exception of the Hill River terminate in swamps and lakes in interdunal depressions in the western half of the Swan Coastal Plain. When the lakes are full, water overflows into the cave systems (WRC, 1997). The Coomallo Creek has a number of distinct, upper tributaries that rise in the Comallo Nature Reserve and farmland to the north-east. The flow in these drainage lines is seasonal. The majority of vegetation is low heath varying in composition in response to soil types. Small patches of woodlands on sands or clays are also present, usually in lower parts of the landscape (CALM, 1995).

The groundwater resources of the groundwater areas are the unconfined superficial and surficial aquifers, fractured rocks and the semi-confined to confined aquifers of Leederville–Parmelia, Yarragadee, Cattamarra, Eneabba, Lesueur, and Otorowiri formations.

Badgingarra's drinking water is supplied from the Yarragadee Aquifer. The Badgingarra Water Reserve is located immediately east of Badgingarra. Badgingarra's drinking water source is not considered highly vulnerable to surface contamination in the broader recharge area around the bore field. This is because the source is largely protected from surface contamination by the considerable depth to the groundwater and the presence of multiple layers of rock that sit above the groundwater. The main risks to Badgingarra water quality would arise from inappropriate land uses or activities in the immediate vicinity of the bore field (BWSPP, 1999). Proposed amendments to Badgingarra drinking water source protection plan include extending the boundary of the Badgingarra Water Reserve to a 500m radius and assigning it priority 1 (P1) (DoW, 2015).

None of the proposed seismic alignments are within proposed 500m boundary of the Badgingarra water Reserve. No activities are proposed that will interact with surface or ground waters.

2. ENVIRONMENTAL ASSESSMENT

2.1 CONSERVATION AREAS

There are nine areas of declared conservation land overlap the Project, namely the Alexander-Morrison National Park, Coomallo Nature Reserve and Unnamed WA29901 located within Coomallo Nature Reserve, Hill River Nature Reserve, Twyata Nature Reserve, the Badgingarra National Park and Unnamed WA41986 Badgingarra National Park Proposed extension south to the Badgingarra National Park, Unnamed WA29719 Nature Reserve and Wongonderrah Nature Reserve. The Coomallo Nature Reserve is a large area located in the central region of EP488. It is traversed by two pipelines, the Brand Highway and the Jurien Road. The Badgingarra National Park is a large area located in the central to eastern region of the Project with the Parmelia Pipeline, Brand Highway and Wongonderrah Road traversing through the National Park.

The Project does not overlap or ingress into the Alexander-Morrison National Park, Coomallo Nature Reserve, Unnamed WA29901 located within Coomallo Nature Reserve, Hill River Nature Reserve, Unnamed WA29719 Nature Reserve and Unnamed WA41986 Badgingarra National Park Proposed extension.

The Project overlaps the Badgingarra National Park, Twyata Nature Reserve and Wongonderrah Nature Reserve in the central and in the southern region of the Project.

2.2 REMNANT VEGETATION AND ASSOCIATIONS

The Project is present by two sub-bioregions: Swan Coastal Plains (SWA02) and Lesueur Sandplain (GES02), the Interim Biogeographic Regionalisation of Australia (IBRA), Version 7, 2012 (DoE, 2015). The bioregions

are composed mainly of Proteaceous scrub-heaths, rich in endemics. The vegetation within this region is typically described as kwongan which is any community of sclerophyll shrubland in South-Western Australia (Mattiske, 2012).

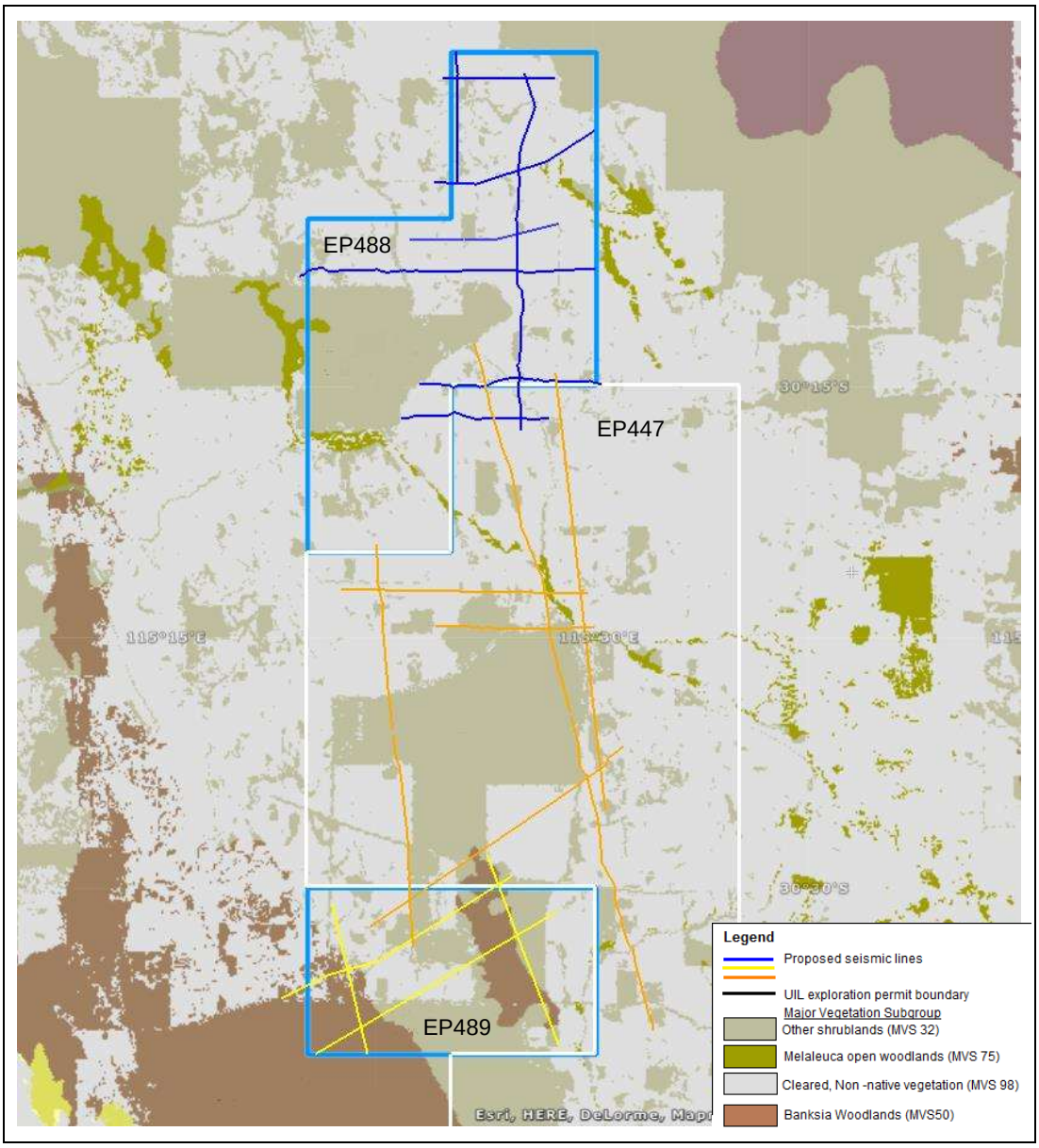
The Lesueur Sandplain (GES02) sub-region is composed a high percentage of rare and endemic plants mainly located within the Coomallo Nature Reserve, Hill River Reserve and Twyata Nature Reserve, Alexander Morrison National Park and the Badgingarra National Park and unnamed Conservation Reserve. The vegetation in *Swan Coastal Plain* (SWA02) sub-bioregion consists mainly of banksia, low woodland of various types which areas of wetland heath, mixed low heath, and restricted occurrences of *Hakea obligua* scrub heath and *Eucalyptus* low woodland. A high percentage of protected and endemic plants occur within the Wongonderrah Nature Reserve located in the south east corner of the Project.

The Project area contains the following Major Vegetation Subgroup (MVS), (NVIS, 2014):

- MVS No.32 "Other Shrublands" mostly situated within the Badgingarra National Park, Coomallo Nature Reserve and Alexander-Morrison National Park.
- MVS No.75 "Melaleuca open woodlands" predominantly associated with the Hill River nature Reserve and Twyata Nature Reserve and also covers small patches in north-eastern part of the Project.
- MVS No.98 "Cleared, non-native vegetation land" covers more than 70% of the Project area.

Major vegetation subgroups associated within the project area are depicted on *Figure 2.2-1: Native vegetation type and extent.*

Figure 2.2-1: Native vegetation type and extent



The Project area is represented by following Beard's vegetation associations:

No	Vegetation Association Description
4	Medium woodland; marri & wandoo
7	Medium woodland; York gum (Eucalyptus loxophleba) & wandoo
125	Bare areas; salt lakes
129	Bare areas; dune sand
352	Medium woodland; York gum
377	Mosaic: Shrublands; scrub-heath on limestone in the northern Swan Region / Sparse low woodland; illyarrie
694	Shrublands; scrub-heath on yellow sandplain banksia-xylomelum alliance in the Geraldton Sandplain & Avon-Wheatbelt Regions
946	Medium woodland; wandoo
949	Low woodland; banksia
952	Shrublands; dryandra heath
998	Medium woodland; tuart
999	Medium woodland; marri
1009	Medium woodland; marri & river gum
1015	Mosaic: Mixed scrub-heath / Shrublands; dryandra thicket
1026	Mosaic: Shrublands; Acacia rostellifera, A. cyclops (in the south) & Melaleuca cardiophylla (in the north) thicket / Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath
1028	Medium woodland; river gum
1029	Shrublands; scrub-heath dryandra-calothamnus assocication with Banksia prionotes on limestone in the northern Swan Region
1030	Low woodland; Banksia attenuata & B. menziesii
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath
1032	Mosaic: Medium woodland; marri,wandoo, powderbark / Shrublands; dryandra heath
1034	Medium woodland; marri, wandoo & powderbark
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath
1036	Low woodland; Banksia prionotes
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii

Source: Department of Parks and Wildlife, Statewide Vegetation Statistics 2013, accessed via SLIP portal June 2014 (DPaW 2014)

Vegetation associations 1026, 1029, 1030, 1031, and 1036 are the dominant vegetation types in the project area. Most of dominant vegetation types are located within conservation reserves or national parks. There is approximately 39.5 per cent of pre-European vegetation that remains *(DPaW, 2014).*

Mattiske (2012) described four most common vegetation communities identified in eastern region of the Project as:

- Heath consisting of a dense, rich assemblage of low shrubs, most very sclerophyllous and pungent, with scattered *Xanthorrhoea* as emergent taller plants and scattered small herbaceous plants as a ground layer featuring *Cyperaceae* and *Restionaceae;*
- Scrub-Heath where *Xanthorrhoea* are virtually absent and are replaced by an open stratum of tall shrubs reaching some 2m in height, principally *Proteaceae*;
- Banksia Low Woodland consisting of emergent stunted trees, often barely 3m tall overlying a rich assemblage of low shrubs. Principal species are *Banksia attenuata*, *Banksia menziesii*, *Banksia prionotes*, *Eucalyptus todtiana* and *Nuytsia floribunda* among the tress with associated shrubs;
- Eucalypt Woodland occupies a strip of woodland that lines rivers and some tributaries on alluvial soil or heavier soil developed in situ after stripping of the sand and laterite. The woodland is of variable height, width and consistency. *Corymbia calophylla*, *Eucalyptus wandoo*, *Eucalyptus loxophleba*, *Eucalyptus accedens* and *Eucalyptus rudis* may all be present (Mattiske, 2012).

The National Objectives and Targets for biodiversity conservation include a target that prevents the clearance of ecological communities with an extent below 30 per cent of that present pre-European settlement (Commonwealth of Australia, 2001).

The seismic activities are proposed on land that is subject to historical grazing and cropping. The vegetation conditions could be described to range between "degraded" to "good" and "excellent", based on ranking scale of Keighery, 1994, (UIL Energy reconnaissance surveys 2013 and 2014).

Main land-uses are: cultivation (dry land agriculture), conservation lands, grazing of native pastures, and unallocated crown land. The area outside the conservation lands has been developed for agriculture and grazing and supports only remnants of the original vegetation comprises of *.Juncus acutus*, *Regelia ciliata*, *Xanthorrhoea preissii*, *Gahnia trifida*, *Acacia cyclops*, *Baumea juncea* and *Lepidosperma longitudinale* at varying densities (Rockwater, 2008).

2.3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE UNDER THE EPBC ACT

2.3.1 Threatened Ecological communities

A search of the EPBC Act Protected Matters database indicates that there is no Commonwealth Threatened Ecological Communities (TEC) occurring within the Project area.

2.3.2 Listed threatened flora species

A search of the EPBC Act Protected Matters Search Tool indicated that there is one National Heritage Place within the Project area namely the Coomallo Nature Reserve. This place is a part of the Beekeepers-Lesueur-Coomallo Area and Nambung National Park which covers the western extent of EP488. Environmental values of this area comprise a high level of threatened and vulnerable flora and fauna species and fauna habitat.

The proposed seismic survey is unlikely to affect the National Heritage Place as there are no activities proposed within or in close proximity to this National heritage Place. Further, as the Project is one stage, one component (seismic acquisition) and is a short-term activity, offsite emissions and discharges are not proposed during the survey and therefore would not directly or indirectly affect "downstream" or "upstream" areas of the National Heritage Place. No clearing is proposed on or within the National Heritage Place.

No Wetlands of International Importance (declared RAMSAR Wetlands) are located within or near the Project area.

A search of the EPBC Act Protected Matters database indicates that there no Commonwealth Threatened Ecological Communities (TEC) within the Project area. The Project will not result in direct or indirect impacts to Threatened Ecological Communities.

A search of the EPBC Act Protected Matters database indicates thirty-eight (39) threatened flora species are known, likely or may potentially occur within the Project area and 5km buffer, (DOE, 2015), refer to *Table 2.3.1-1* below. For more details refer to *Attachment 1 – EP488, EP447, EP489 EPBC Act Protected Matters Reports* (DOE, 2014-2015). Three (3) critically endangered, twenty-seven (27) endangered and nine (9) vulnerable flora species are known, likely or may occur within the Development Envelope area and 5km buffer. There are ten areas where populations of threatened flora species are likely to occur: the Alexander-Morrison National Park, Coomallo Nature Reserve and Unnamed WA29901 located within Coomallo Nature Reserve, Hill River Nature Reserve, Twyata Nature Reserve, the Badgingarra National Park and Unnamed WA41986 Badgingarra National Park Proposed extension south to the Badgingarra National Park, Unnamed WA29719 Nature Reserve and Wongonderrah Nature Reserve and remnant native vegetation where scattered individuals may also be present.

While the desktop assessment identified flora species that are known or likely to occur within the Project area, a detailed on-ground flora and vegetation survey will be undertaken to identify threatened flora species, conditions of suitable habitat and map their locations within the proposed disturbance.

Table 2.3.1-1: the EPBC Act listed flora species potentially occurring within the Project area.

Flora Species scientific name	Common name	EPBC Act status	EP488*	EP489	EP447
Acacia cochlocarpa subsp. cochlocarpa	Spiral-fruited Wattle	Endangered	May occur	-	May occur
Acacia splendens	Splendid Wattle, Dandaragan Wattle	Endangered	-	Likely to occur	Likely to occur
Acacia forrestiana	Forest's Wattle	Vulnerable	-	-	Likely to occur
Andersonia gracilis	Slender Andersonia	Endangered	Likely to occur	Known to occur	Likely to occur
Anigozanthos viridis subsp. terraspectans	Dwarf Green Kangaroo Paw	Vulnerable	-	Known to occur	May occur
Banksia serratuloides subsp. perissa	Northern Serrate Dryandra	Critically endangered	Known to occur	May occur	Known to occur
Caladenia huegelii	King Spider-orchid	Endangered	May occur	May occur	May occur
Centrolepis caespitosa	N/A	Endangered	May occur	May occur	May occur
Conospermum densiflorum	One-headed Smokebush	Endangered	-	-	Likely to occur

Flora Species scientific name	Common name	EPBC Act status	EP488*	EP489	EP447
subsp. unicephalatum					
Chorizema humile	Prostrate Flame Pea	Endangered	May occur	-	-
Darwinia foetida	Muchea Bell	Critically Endangered	-	Likely to occur	-
Drakaea elastica	Glossy-leafed Hammer-orchid	Endangered	-	May occur	May occur
Eleocharis keigheryi	Keighery's Eleocharis	Vulnerable	-	Likely to occur	Likely to occur
Eremophila scaberula	Rough Emu Bush	Endangered	-	-	May occur
Epiblema grandiflorum var. cyaneum	Baby Blue Orchid	Endangered	-	May occur	-
Eucalyptus absita	Badgingarra Box	Endangered	Known to occur	Known to occur	Known to occur
Eucalyptus balanites	Cadda Road Mallee	Endangered	Likely to occur	Likely to occur	Known to occur
Eucalyptus crispata	Yandanooka Mallee	Vulnerable	Likely to occur	-	Known to occur
Eucalyptus dolorosa	Dandaragan Mallee	Endangered	May occur	Likely to occur	Likely to occur
Eucalyptus impensa	Eneabba Mallee	Endangered	Likely to occur	Likely to occur	Likely to occur
Eucalyptus johnsoniana	Johnson's Mallee	Vulnerable	Likely to occur	-	-
Eucalyptus lateritica	Laterite Mallee	Vulnerable	Likely to occur	-	Likely to occur
Eucalyptus leprophloia	Scaly Butt Mallee	Endangered	Known to occur	Likely to occur	Known to occur
Eucalyptus pruiniramis	Midlands Gum	Endangered	Likely to occur	-	Likely to occur
Eucalyptus suberea	Cork Mallee,	Vulnerable	Likely to occur	-	Likely to occur
Grevillea batrachioides	Mt Lesueur Grevillea	Endangered	May occur	Likely to occur	Likely to occur
Grevillea curviloba subsp. incurva	Narrow curved-leaf Grevillea	Endangered	May occur	-	May occur
Grevillea humifusa	Spreading Grevillea	Endangered	May occur	-	May occur
Hakea megalosperma	Lesueur Hakea	Vulnerable	Likely to occur	Likely to occur	Likely to occur
Hemiandra gardneri	Red Snakebush	Endangered	Likely to occur	May occur	Likely to occur
Hemiandra rutilans	Sargents Snakebush	Endangered	Likely to occur	-	-
Leucopogon obtectus	Hidden Beard-heath	Endangered	Likely to occur	May occur	May occur
Macarthuria keigheryi	Keighery's Macarthuria	Endangered	-	Likely to occur	-
Paracaleana dixonii	Sandplain Duck Orchid	Endangered	Known to occur	May occur	Likely to occur
Patersonia spirifolia	Spiral-leaved Patersonia	Endangered	Likely to occur	Likely to occur	Likely to occur
Ptychosema pusillum	Dwarf Pea	Vulnerable	-	-	Likely to occur
Spirogardnera rubescens	Spiral Bush	Endangered	Likely to occur	-	Likely to occur
Tetratheca nephelioides	N/A	Critically endangered	Likely to occur	-	-
Thelymitra stellata	Star Sun-orchid	Endangered	Known to occur	May occur	Likely to occur

** note: no clearing is proposed within EP488*

The description of potential occurrence of identified threatened flora species is summarised in Table 2.3.1-2 below:

Table 2.3.1-2: Description of potential occurrence

Flora species	Description	Likelihood of occurrence
Acacia cochlocarpa subsp. cochlocarpa	Known from a narrow 700m length of road reserve and private property near Watheroo in the Moora Shire. Populations are associated with brown sand, or clayey sand with laterite. Plants occur as two close populations in disturbed open low scrub on road reserve and on private property. The subspecies grows in association with *Hakea scoparia*, *Allocasuarina campestris*, and a number of other *Acacia* species (DEC, 2009a)	Unlikely, Outside of known distribution
Acacia forrestiana	The species grows in two localities - near Dandaragan and near Jurien Bay, north of Perth over a range of about 80 km. Many populations are conserved in Lesueur National Park. The species inhabits gullies and slopes of lateritic hills, often growing in rocky or lateritic clay loams, or gravelly soils over sandstone. The vegetation is heath or low woodland of *Eucalyptus wandoo* and *E. calophylla*. Scrub includes *Hakea lissocarpha* and *Grevillea, Acacia, Isopogon, Calothamnus* and *Melaleuca* species (SPAT, 2015).	Likely, falls within predicted species distribution
Acacia splendens	At two of the three populations that occur over a range of about 60km in the Dandaragan to Mogumber area. Population 1 is the largest, and occurs on road reserve and adjoining private property. Population 2 also occurs on private property, and consists of less than twenty plants. These two populations cover a range of less than 20km. Population 3 is recorded by a herbarium specimen collected in 1985 from a nature reserve (CALM 2004a)	Likely, falls within predicted species distribution
Andersonia gracilis	Known from the Badgingarra, Dandaragan and Kenwick areas from seasonally damp, black sandy clay flats, on or near margins of swamps, often on duplex soils. Associated vegetation includes low open heath vegetation with *Calothamnus hirsutus*, *Verticordia densiflora*, *Kunzea recurva*, *Banksia telmatiaea* and sedges (DEC 2006a).	Likely, falls within predicted species distribution
Anigozanthos viridis subsp.	Known from six populations occurring in an area west of Cataby, occurring in winter-wet depressions on grey sandy clay loam, or grey sand, in low post-fire regenerating heath.	Likely, falls within predicted

Flora species	Description	Likelihood of occurrence
terraspectans	Associated species include *Banksia leptophylla*, *Melaleuca* spp., *Verticordia densiflora*, and *Conostylis* spp. and sedges (DSEWPaC 2008a).	species distribution
Banksia serratuloides subsp. perissa	Known from three populations, over 16 sites, north of Badgingarra from Alexander Morrison National Park South to Badgingarra and Boothendarra Hill. Sites are mainly on road verges with others on conservation estates and private property. Grows in lateritic gravel and brown loam on ridge tops and slopes or in red-brown sand on lower areas. This subspecies favours areas of low dense heath but can also be found in low open woodland (DoE 2008e).	Likely, falls within predicted species distribution
Caladenia huegelii	Known to occur in small disjunctive remnants of natural vegetation on the Swan Coastal Plain. 22% occurred within Nature Reserves, 12% occurred on a declared conservation reserve, 50% occurred over two adjoining private properties within Ken Hurst Park, Roe Hwy Reserve and Jandakot Airport. (DEC 2009b)	Unlikely, Outside of known distribution
Centrolepis caespitosa	Eight populations are known over a large geographical range from the South Coast near Denmark, north to the Swan Coastal Plain and east to Meckering. Due to its inconspicuous nature, the taxon is difficult to locate and the possibility of finding more populations is highly unlikely unless the species is specifically targeted for survey (DEC 2004g).	Unlikely, Outside of known distribution
Chorizema humile	Known from E and NE of Coorow and E and NE of Bibdi Bindi, found in red loam, brown sandy clay with decomposing granite or in clay soils, on plains in scrub or open tree mallee. Associated species include *Allocasuarina campestris*, *Hypocalymma angustifolium* and several *Acacia species*. (DEC 2009c)	Unlikely, Outside of known distribution
Darwinia foetida	Known from three populations in swampy, seasonally wet habitat in the Muchea area. The area of occupancy is estimated to be 0.03km^2 (DSEWPaC 2012d). The species is known from three populations: one occurs within a nature reserve; one within a water reserve; and one is spread over two privately owned properties (DEC 2008)	Unlikely, Outside of known distribution
Drakaea elastica	Known only from the Swan Coastal Plain over a range of approximately 350km between Cataby in the north and Busselton in the south. The species grows on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps, typically in banksia (*Banksia menziesii, B. attenuata and B. ilicifolia*) woodland or spearwood (*Kunzea glabrescens*) thicket vegetation. (DEC 2009d)	Likely, falls within predicted species distribution
Eleocharis keigheryi	Known from north of Eneabba to south-east of Qualeup. Scattered occurrences are known in the areas of Eneabba, Dandaragan, Bindoon, Toodyay, Beverley, Capel and Boyup Brook. Five populations occur on Nature Reserve, one in National Park, three on road verges, two on private property, two on shire reserve, two on rail reserve and one on airport land (DoE 2008f)	Unlikely, Outside of known distribution
Epiblema grandiflorum var. cyaneum	Currently known from one population in a single swamp in the Perth Metropolitan area (Stack *et al*. 2000).	Unlikely, Outside of known distribution
Eucalyptus absita	Known from a narrow 15km range near Badgingarra. Populations occur between 24km and 27km west of a fault line that runs north-north west to south-south east and between elevations of 210m and 290m above sea level. They seem to be associated with minor drainage lines flowing downhill from upper catchment areas. These populations occur on white sands with some lateritic gravel and on clayey sand on sandy flats where they are lower in the landscape. The most northerly population occurs on the floodplain of the Hill River on dark grey sandy loam. (DEC 2008c)	Likely, falls within predicted species distribution
Eucalyptus balanites	Population 1 in Badgingarra National Park contains 25 clumps or plants. Population 2 occurs in bushland in the City of Armadale and consists of a single plant. Eucalyptus balanites is found on light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (Population 1). (DEC 2004b)	Likely, falls within predicted species distribution
Eucalyptus crispata	Known from 10 populations in the Yandanooka to Eneabba area and extends down past Boothendarra in the Moora district. Five populations occur on land which is privately owned, three on conservation estate, one on a road verge, and one on unallocated Crown land. Most populations are considered to be in a healthy condition (DoE, 2008m).	Likely, falls within predicted species distribution
Eucalyptus dolorosa	Known from a single population west (WSW) of Dandaragan (private property). It is confined to lateritic breakaway slopes and a summit in mallee heath over low scrub, amongst massive ironstone blocks (Brown et al. 1998). DEC 2004c	Unlikely within the project layout. Outside of known distribution
Eucalyptus impensa	Restricted to six populations that occur south east of Eneabba over a range of about 3km. Five populations occur on a Nature Reserve, and the sixth is on private property. It inhabits very open shrub mallee over low heath, on grey gravelly sand on undulating plains and low breakaway slopes. Associated species include *Eucalyptus pleurocarpa, E. todtiana and E. macrocarpa subsp. elecantha, with Hakea, Banksia and Dryandra* species (DEC 2004d)	Unlikely, Outside of known distribution
Eucalyptus johnsoniana	Known from 34 populations between Eneabba and Badgingarra. Of these populations, 19 are on reserves, 14 are on road verges, four are on private land, six are on mining leases and four are on Crown land. The total population size is estimated to be 360 plants. The extent of occurrence is approximately 330km2. (DoE 2008c)	Likely, falls within predicted species distribution

Flora species	Description	Likelihood of occurrence
Eucalyptus lateritica	Known from 13 small (less than 20 individuals), isolated populations occurring over a range of approx.30km in the Gairdner Range, Mount Lesueur and the Coomallo Hill area. The largest populations are on non-reserved private farmland. This species inhabits white or grey sandy soils of lateritic, gravelly slopes and breakaways in upland regions DoE 2008d	Likely, falls within predicted species distribution
Eucalyptus leprophloia	Known over a range of approximately 90km from north of Badgingarra to the Mt Adams area. These populations identified within private farmland, Unallocated crown land, Nature reserve North of Dandaragan and education reserve NE of Jurien Bay. Known from a range of habitats including the slopes of hills in brown loam over laterite as an emergent mallee; in white sand on gentle valley slopes in low E. accedens woodland over heath; on grey sand and laterite with E. todtiana; in grey sandy clay loam on the slopes of a drainage line between two breakaways; and in grey sand and lateritic gravel with Corymbia calophylla and E. wandoo over open low scrub (DEC 2004e)	Likely, falls within predicted species distribution
Eucalyptus pruiniramis	Known from nine populations between Mogumber and Arrino, north of Three Springs. Four populations occur on road verges, four on private property, and one in a national park. Midlands Gum grows in open, low mallee woodlands emerging from heath or scrub in yellow sand or brown, sandy loam and lateritic gravel or quartz (DoE 2008j)	Unlikely, Outside of known distribution
Eucalyptus suberea	Known from 18 populations from areas in Mt Lesueur to Coomallo Creek in the midwest region. Twelve populations occur on conservation estates, five on private property and one is on land used for educational purposes (DoE 2008k).	Likely, falls within predicted species distribution
Grevillea batrachioides	Known from a single population within Lesueur National Park. Despite many searches of what appear to be suitable habitat, no populations have been found. The species grows on flat sandstone outcrops in brown sandy loam on north-west facing slopes. It inhabits low dense heath with open woodland of mallee and emergent *Banksia tricuspis* (DoE 2008l).	Falls within predicted species distribution
Grevillea curviloba subsp. incurva	Confined to an area between Muchea and Badgingarra and grows in open heath in winter-wet areas on sand over limestone, or over ironstone at sites with a high water table. (DEC 2000a)	Falls within predicted species distribution
Grevillea humifusa	Known from a single population in Eneabba area. A major portion of this population is located on private property, in a pasture paddock. The remainder of the population occurs on adjacent Shire road reserves. The species occurs on an undulating plain of gravelly loam that supports very disturbed open low *Eucalyptus loxophleba* and *E. wandoo* woodland over species including *Kennedia prostrata*, *Jacksonia sp*. and *Dianella revolute* (DEC 2003)	Unlikely, Outside of known distribution
Hakea megalosperma	Known from Mt Lesueur, eastward for 35km, and two disjunctive populations, one near Eneabba in the north and the other near Dandaragan in the south (DSEWPaC 2008b). Occurs in low heath on grey sand and lateritic gravel, on hilltops, ridges, amongst boulders, and occasionally with *Eucalyptus todtiana* in white, yellow or grey sand. Associated species include *Banksia candolleana, B. micrantha, Lambertia multiflora, Hakea obliqua, Adenanthos cygnorum, Allocasuarina humilis*, and *Stirlingia* sp.	Falls within predicted species distribution
Hemiandra gardneri	Known from five populations over a range of approximately 15km between Watheroo and Gunyidi, one population approximately 40km to the northwest of this area and another approximately 90km to the west. Found in deep yellow to yellow-white sand on sandplains and hills (Stack & Broun 2004c).	Falls within predicted species distribution
Hemiandra rutilans	Known from two areas only - the type collection at Sand Springs south-west of York (exact location unknown) and, until its death in 1994, a single plant in remnant vegetation on private property near Dowerin, estimated to be 65 to 85 kilometres from the original collection. The Dowerin location comprised low *Banksia prionotes woodland* with *Eremaea pauciflora*, *Nuytsia floribunda and Verticordia densiflora*. The soil type is deep grey sand. (DEC 2008f)	Unlikely, outside of known distribution
Leucopogon obtectus	Known from northwest and southeast of Eneabba over a range of approximately 30 km. Generally found in small, scattered groups in low, open heath on the crests and upper slopes of sand dunes, or occasionally in interdunal swales in grey-white or pale yellow sand (DEC 2006b).	Falls within predicted species distribution
Macarthuria keigheryi	Known from six populations over a range of approximately 160km, five of which are in the Perth Metropolitan area, and one isolated population (last surveyed in 1996) in the Cooljarloo area, west of Dandaragan. The species is found in low-lying winter-wet damp, grey-white sands and *Banksia/Eucalyptus* woodland at the Dandaragan population (DEC 2009).	Falls within predicted species distribution
Paracaleana dixonii	Known from eight populations from Arrowsmith, Eneabba and south to the Jurien Bay area. Five of these eight populations occur on nature reserves that have active mining leases and an adjacent railway reserve, two others occur in national parks and the other is on private property (DoE 2008g)	Falls within predicted species distribution
Patersonia spirifolia	Known over a range of less than 10km, south west of Badgingarra, a total of 5 populations. The largest of these is on a road reserve near a National Park. The population in National Park was burnt in 2002; the others are on road reserves in reasonably good condition. It is found on lateritic ridges and slopes or sand over laterite in low heath with *Allocasuarina humilis, Gastrolobium spinulosum, Daviesia species, Xanthorrhoea preissii* and *Patersonia occidentalis* (DEC 2004f)	Falls within predicted species distribution
Spirogardnera	Known from two disjunctive areas: in the Moora District the species is known from four	Falls within

Flora species	Description	Likelihood of occurrence
rubescens	populations in an area over 12km to the north of Badgingarra, there are three populations in Wannamal. All known populations are located in National Parks and Shire Road Reserves. (DoE 2008h)	predicted species distribution
Tetratheca nephelioides	Known from seven populations approximately 13km south of Eneabba. Five populations occur within the South Eneabba Nature Reserve. Two of these populations occur mainly on and adjacent to a firebreak. The remaining two populations occur partially within this reserve and partially on a road verge (DoE 2013)	Unlikely, Outside of known distribution
Thelymitra stellata	Lateritic soil, growing amongst low heath and scrub in jarrah (*Eucalyptus marginata*) woodland, on ridges, slopes, and breakaways. Known with the majority of records from two areas: the Geraldton Sandplains (between Arrowsmith River, Coomallo Nature Reserve and Lesueur National Park) and the Jarrah Forest (SPAT 2014)	Falls within predicted species distribution

2.3.3 Listed threatened fauna

A search of the EPBC Act MNES database indicates five (5) fauna species listed as Threatened under the EPBC Act that likely or may potentially occur within the Project area and the 5km buffer. Table 2.3.2-1 provides results of the search for each exploration permit, (please note: no clearing is proposed within EP488). For more details refer to *Attachment 1*.

Table 2.3.2-1: Threatened fauna species potentially occurring within the Project area.

Fauna species scientific name	Common name	EPBC Act status	EP488	EP489	EP447
Birds					
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	Endangered	Breeding likely to occur	Breeding likely to occur	Breeding likely to occur
Leipoa ocellata	Malleefowl	Vulnerable	Likely to occur	Likely to occur	Likely to occur
Mammals					
Dasyurus geoffroii	Western Quoll	Vulnerable	-	Likely to occur	Likely to occur
Reptiles					
Egernia stokesii aethiops	Houtman Abrolhos Spiny-tailed Skink	Vulnerable	Likely to occur	-	May occur
Egernia stokesii badia	Western Spiny-tailed Skink	Endangered	Likely to occur	-	May occur

Of the MNES, Carnarby's Black Cockatoo and the Western Spiny-tailed Skink species are the only endangered fauna species that likely or may occur within the Project area. The following paragraphs describe each of these species in more details.

Carnaby's Black Cockatoo species is endemic to the south-west of Western Australia. Carnaby's Black-Cockatoo mainly occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*E. wandoo*), and in shrubland or kwongan heathland dominated by *Hakea, Dryandra, Banksia* and *Grevillea* species. It is a seasonal visitor to plantations of exotic pines (*Pinus* spp.), and sometimes occurs in forests containing Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) or Karri (*E. diversicolor*) (SPAT, 2014a).

The species is highly mobile and displays a seasonal migratory pattern that is linked to breeding. Breeding takes place between late July and December and most breeding occurs in the inland parts of its distribution. During the non-breeding season (January to July) the majority of the birds move to the higher rainfall coastal regions of their range including the Midwest coast, Swan Coastal Plain and south coast (DPaW, Recovery Plan 2013).

Birds Australia Birdata search identified one **Important Bird Area** (Coomallo IBA) declared within the Project area. The IBA is located within the Coomallo Nature Reserve, east of the Brand Hwy. The Coomallo IBA supports up to 40 breeding pairs of the endangered Carnaby's Black Cockatoo which nest in woodland remnants and isolated paddock trees and feed in native shrublands. (SPAT, 2014a).

At Coomallo Creek, birds abandon breeding sites shortly after breeding and congregate in foraging flocks which then disperse into surrounding areas. These flocks wander locally during the non-breeding season (January to July). They concentrate around water courses during dry conditions in the early part of the season, and then forage more widely once the rains begin in April. Foraging flocks remain within 50km of breeding

sites. Populations located south of Coomallo Creek move towards the coast during the non-breeding season (SPAT, 2014a).

Maintaining the availability of foraging habitat is especially important in the breeding range, as sufficient foraging habitat within a 6–12km radius of breeding sites is necessary to successfully raise chicks. Vegetation/soil associations (VSA) could be described for this area as Banksia Low Woodland on stabilised sand dunes. The woodland typically consists of *Banksia menziesii* and *Banksia attenuate*. Banksia trees are key food sources for Carnaby's Black Cockatoo (Tronox, EPBC Act Referral 2012).

During reconnaissance survey undertaken by UIL Energy in April 2013, Carnaby's Black Cockatoos were observed on Yarramullah Road within a pine trees plantation. It was identified that the western part of the EP489 contains potential foraging habitat for Carnaby's Black Cockatoo. EP489 is unlikely to be used as a breeding ground due to the absence of large trees suitable for nesting; however, the species is likely to be a regular foraging visitor. No Carnaby's Black Cockatoos were observed during reconnaissance survey undertaken by UIL Energy in November 2014.

Western Spiny-tailed Skink (*E.* stokesii *badia)* is listed as endangered under the EPBC Act. In the WA Wheatbelt, *E. s. badia* occurred in woodlands of York Gum (*Eucalyptus loxophleba*), Gimlet (*E. salubris*) and Salmon Gum (*E. salmonophloia*) that are distributed on heavier (clayey) soils predominantly within the Avon Wheatbelt IBRA bio-region. All known localities are mostly distributed east of the Brand Highway. Hollow logs are used as refuge sites in woodland habitat. Their diet and breeding period is not known but births were observed between December and March (SPAT 2014h). The species or species habitat are likely to occur within the Project area where clearing of vegetation is not proposed. In this part of the Project the seismic survey will utilise existing firebreaks, fence lines, tracks and traverse farming land. Therefore, it was considered that potential impacts on species and their habitat are unlikely to be significant.

Houtman Abrolhos Spiny-tailed Skink (*Egernia stokesii aethiops*) is listed as vulnerable under the EPBC Act, however it is a synonym for the Western Spiny-tailed Skink and no longer used in WA Museum Checklist 2015 (OEPA advice, 2015).

The Malleefowl is mostly located to the south and west of a line extending from Cape Farquhar, which lies north of Carnarvon, to the Eyre Bird Observatory in the south-east of Western Australia. The extent of occurrence is known to be decreasing. Preferred habitat of shrublands and low woodlands dominated by mallee vegetation in semi-arid and arid zones of temperate Australia. Breeding period begins in September and continues until mid to late summer. Breeding typically occurs in areas of light soils with abundant leaf litter. Threats to Malleefowl primarily consist of clearance and fragmentation of mallee vegetation habitat for forestry and grazing, predation by European red fox and feral cats, and degradation of existing habitat by tramp ants, feral rabbits and feral goats (SPAT, 2014g). The species and species habitat are likely to occur within the Project area.

The majority of **Western Quolls (***Chuditch)* are recorded from the contiguous forest of south-west Western Australia. Occasional records for this species are obtained from the wheatbelt and goldfields regions where only fragments of suitable habitat remain (DEC 2007a). Chuditch currently inhabit most kinds of wooded habitat within its current range including eucalypt forest (especially Jarrah, Eucalyptus marginata), dry woodland and mallee shrublands. Chuditch are primarily active at night. The diet of Chuditch is predominantly large invertebrates and is supplemented by small mammals, birds and lizards. Births occur between May and September and peak between June and July (SPAT 2014i). The species and species habitat are likely to occur within the Project area.

2.3.4 Listed migratory species

An EPBC Act Protected Matters Search identified seven (7) migratory and marine species that are likely to occur within the Project area. They are Fork-tailed Swift, Great Egret, Cattle Egret, White-bellied Sea-Eagle, Rainbow Bee-eater, Osprey and Hooded Plover. These species are protected under international agreements. A Level 1 fauna assessment will be conducted in September 2015 taking into account an observation of listed migratory and marine species.

Under the significant impacts assessment criteria, an action is likely to have significant impact on migratory and marine species if there is a real chance or possibility that it will:

- significantly modify (including by fragmentation, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for migratory species;

- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

There are no significant threats to the identified migratory and marine species in Australia. Potential threats include habitat destruction and predation by feral animals, drainage, clearing of wetlands, loss of foraging habitat through alteration of water flows, exotic species such as feral cats and cane toads, shooting, and deterioration of inland water resources. None of these threats relate to the Project. Due to the range of distribution and unrelated threats to the Project the potential impacts from the Project are considered to be negligible.

2.4 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

A search of the WA DPAW's Threatened and Priority Ecological Community (TEC and PEC) Database (undertaken on 03.08.2015) does not identify any TEC or PEC located within the project area. The DPAW advised (DPAW ref no: 05-0815EC) that there are no known occurrences of threatened or priority ecological communities recorded within the project area; there are five ecological communities listed in the vicinity of the project area namely Lesueur-Coomallo M2, Lesueur-Coomallo A1.2, Lesueur-Coomallo D1, Gp200-170, Lesueur-Coomallo DFGH. However, none of these communities are impacted or overlap by the Project layout.

2.5 DECLARED RARE (DRF) AND PRIORITY SPECIES UNDER THE WC ACT 1950

2.5.1 Declared flora species

A search of the DPAW threatened flora database (NatureMap) identified the Project Development envelope as having a total of 116 protected flora species including 19 threatened or declared rare flora (DRF) species, nine (9) flora species are recorded as Priority 1, twenty (20) flora species as Priority 2, forty six (46) flora species as Priority 3 and twenty two (22) flora species as Priority 4. Table 7 summarises the Wildlife Conservation Act (WA) declared rare and priority flora species recorded within the Project.

Table 2.4.1-1: DRF and priority flora species declared under the WC Act 1950

No	DRF and priority flora species scientific name	EP 488 Priority status	EP489 Priority status	EP447 Priority status
1	*Acacia splendens T*			*T*
2	*Acacia wilsonii*	T		*T*
3	*Andersonia gracilis T*		*T*	
4	*Anigozanthos viridis subsp. terraspectans (Dwarf Green Kangaroo Paw) T*		*T*	
5	*Banksia catoglypta* T	*T*		
6	*Banksia serratuloides subsp. perissa* T	*T*		*T*
7	*Eucalyptus absita (Badgingarra Box) T*		*T*	*T*
8	*Eucalyptus crispata (Yandanooka Mallee) T*			*T*
9	*Eucalyptus johnsoniana (Johnson's Mallee)* T	*T*		
10	*Eucalyptus lateritica (Laterite Mallee)* T	*T*		
11	*Eucalyptus leprophloia (Scaly Butt Mallee)* T	*T*		*T*
12	*Eucalyptus suberea (Mount Lesueur Mallee)* T	*T*		*T*
13	*Eucalyptus x balanites (Cadda Road Mallee)* T			*T*
14	*Hakea megalosperma (Lesueur Hakea)* T	*T*		
15	*Paracaleana dixonii* T	*T*		
16	*Patersonia spirifolia T*			*T*
17	*Ptychosema pussillum (Dwarf Pea) T*			*T*
18	*Spirogardnera rubescens (Spiral Bush)* T	*T*		*T*
19	*Thelymitra stellata (Star Orchid)* T	*T*		
20	*Calectasia palustris* P1		1	1
21	*Chordifex reseminans P1*			1
22	*Drosera allantostigma P1*			1

No	DRF and priority flora species scientific name	EP 488 Priority status	EP489 Priority status	EP447 Priority status
23	*Eucalyptus absita x loxophleba P1*			1
24	*Hypocalymma sp. Dandaragan (C.A. Gardner 9014) P1*			1
25	*Rhetinocarpha suffruticosa (Shrubby Myriocephalus) P1*			1
26	*Lyginia excelsa* P1		1	
27	*Schoenus pennisetis* P1		1	
28	*Stylidium tinkeri* P1		1	
29	*Acacia retrorsa*			2
30	*Anigozanthos humilis subsp. Badgingarra (S.D. Hopper 7114) P2*		2	2
31	*Arnocrinum gracillimum* P2	2	2	2
32	*Boronia ramosa subsp. lesueurana* P2	2		
33	*Catacolea enodis P2*		2	2
34	*Comesperma rhadinocarpum (Slender-fruited Comesperma) P2*		2	2
35	*Goodenia xanthotricha (Yellow-haired Goodenia)* P2	2		2
36	*Isopogon panduratus subsp. palustris P2*		2	
37	*Hypocalymma sp. Cataby (G.J. Keighery 5151)P2*			2
38	*Jacksonia rubra* P2	2		2
39	*Lasiopetalum lineare P3*		2	
40	*Leucopogon sp. Badgingarra (R. Davis 421) P2*		2	2
41	*Leucopogon plumuliflorus P3*			2
42	*Persoonia filiformis* P2	2		
43	*Onychosepalum microcarpum P2*			2
44	*Stylidium aceratum P2*			2
45	*Stylidium hymenocraspedum P2*		2	2
46	*Synaphea endothrix* P2	2		2
47	*Synaphea lesueurensis* P2	2		
48	*Thysanotus sp. Badgingarra (E.A. Griffin 2511) P2*			2
49	*Acacia cummingiana*			3
50	*Acacia epacantha* P3	3	3	3
51	*Acacia flabellifolia*			3
52	*Acacia plicata*			3
53	*Allocasuarina grevilleoides*			3
54	*Allocasuarina ramosissima*			3
55	*Baeckea sp. Perth Region (R.J. Cranfield 444) P3*		3	3
56	*Banksia kippistiana var. paenepeccata*			3
57	*Banksia nobilis subsp. fragrans* P3	3		3
58	*Banksia splendida subsp. macrocarpa* P3	3		3
59	*Banksia subulata (Awled Honeypot)* P3	3		3
60	*Beaufortia bicolor P3*		3	3
61	*Beaufortia eriocephala (Woolly Bottlebrush)*			3
62	*Beyeria gardneri*			3
63	*Calytrix ecalycata subsp. brevis*			3
64	*Conospermum scaposum*			3
65	*Desmocladus biformis*			3
66	*Drosera marchantii subsp. prophylla* P3	3	3	3
67	*Gompholobium gairdnerianum*			3

No	DRF and priority flora species scientific name	EP 488 Priority status	EP489 Priority status	EP447 Priority status
68	*Grevillea leptopoda*			3
69	*Grevillea thyrsoides subsp. thyrsoides*			3
70	*Grevillea uniformis*			3
71	*Guichenotia alba P3*		3	3
72	*Haemodorum loratum* P3	3		
73	*Hakea longiflora* P3	3		*3*
74	*Hensmania stoniella* P3	3		*3*
75	*Hypocalymma serrulatum P3*		3	*3*
76	*Hypocalymma gardneri*			*3*
77	*Hypocalymma tetrapterum*			*3*
78	*Jacksonia anthoclada P3*		3	*3*
79	*Jacksonia carduacea P3*		3	
80	*Lepidobolus quadratus* P3	3		*3*
81	*Melaleuca clavifolia P3*		3	
82	*Onychosepalum nodatum P3*	3	3	
83	*Phlebocarya pilosissima subsp. pilosissima* P3	3	3	3
84	*Patersonia argyrea*			3
85	*Persoonia rudis*			3
86	*Stackhousia sp. Red-blotched corolla (A. Markey 911)*			3
87	*Stylidium nonscandens P3*	3		
88	*Stylidium torticarpum P3*	3		3
89	*Tetratheca angulata*			
90	*Thysanotus vernalis*			
91	*Thysanotus anceps* P3	3		
92	*Verticordia fragrans* P3	3		3
93	*Verticordia insignis subsp. eomagis* P3	3		3
94	*Verticordia rutilastra* P3	3		3
95	*Banksia elegans (Elegant Banksia)* P4	4		
96	*Banksia chamaephyton (Fishbone Banksia)*			4
97	*Banksia platycarpa P4*		4	
98	*Calytrix chrysantha* P4	4		
99	*Chordifex chaunocoleus*			4
100	*Conostephium magnum*			4
101	*Conostephium magnum P4*	4	4	
102	*Desmocladus elongatus P4*	4		4
103	*Eucalyptus exilis (Boyagin Mallee) P4*	4		
104	*Eucalyptus macrocarpa subsp. elachantha (Small-leaved Mottlecah) P4*	4	4	4
105	*Eucalyptus pendens (Badgingarra Mallee) P4*	4	4	4
106	*Grevillea rudis P4*	4		4
107	*Grevillea saccata (Pouched Grevillea) P4*	4	4	4
108	*Hakea neurophylla P4*	4		4
109	*Hibbertia helianthemoides P4*		4	4
110	*Hypolaena robusta*			4
111	*Stylidium inversiflorum*			4
112	*Stylidium aeonioides P4*	4	4	4

No	DRF and priority flora species scientific name	EP 488 Priority status	EP489 Priority status	EP447 Priority status
113	*Tripterococcus paniculatus*			4
114	*Thelymitra apiculata P4*	4		4
115	*Thysanotus glaucus P4*	4		
116	*Xanthosia tomentosa (Lesueur Southern Cross) P4*	4		4

2.5.2 Declared terrestrial fauna

A search of the DPaW threatened fauna database identified the following protected fauna species:

- two fauna species declared under the WC Act as rare or likely to become extinct, being:
  - Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*);
  - Western Spiny-tailed Skink (*Egernia stokesii subsp. Badia*).
- two fauna species declared as protected under international agreement, being:
  - Rainbow Bee-eater *(Merops ornatus);*
  - Fork-tailed Swift (*Apus pacificus*).
- three specifically protected fauna:
  - Carpet python *(Morelia spilota subsp. Imbricate);*
  - Woma *(Aspidites ramsayi);*
  - Peregrine Falcon (*Falco peregrinus*).
- one Priority 4 fauna species:
  - Western Brush Wallaby *(Macropus Irma)*

Table 2.4.2-1 below summarises declared rare and priority fauna species protected under the Wildlife Conservation Act 1950.

Table 2.4.2-1 Declared fauna species

No	Declared rare and priority fauna species	EP 488	EP489	EP447
1	*Carnaby's Black Cockatoo (Calyptorhynchus latirostris)*	T	T	T
2	*Egernia stokesii subsp. badia (Western Spiny-tailed Skink)*	T		
3	*Merops ornatus (Rainbow Bee-eater)*			IA
4	*Falco peregrinus (Peregrine Falcon)*	S		
5	*Morelia spilota subsp. Imbricate (Carpet python)*		S	
6	*Aspidites ramsayi (Woma)*			S
7	*Macropus Irma (Western Brush Wallaby)*		P4	P4

T – rare or likely to become extinct; IA – protected under international agreement; S – other specifically protected fauna; P4 – Priority 4

Birds Australia Birdata search identified the Coomallo Important Bird Area is located mostly within the Coomallo Nature Reserve, east of Brand Hwy. The Coomallo IBA supports up to 40 breeding pairs of the endangered Carnaby's Black Cockatoo which nest in woodland remnants and isolated paddock trees and feed in native shrublands. No clearing activities are proposed within 500m of the Coomallo IBA.

It was identified that the southern region of the Project contains potential foraging habitat for Carnaby's Black Cockatoo. It is unlikely to be used as a breeding ground due to the absence of large trees suitable for nesting; however, the species is likely to be regular foraging visitors.

2.6 WEEDS AND PLANT DISEASES

A total of 8 introduced (exotic) taxa were recorded as the weeds of national significance (WoNS). The high percentage of weed species is present due to agriculture being the dominate land use within the area. Most of the weed species are agricultural pastoral species such as Buffel-grass, Olive, Monterey Pine, Athel Pine etc. The EPBC Act MNES Database search indicates 12 feral animals are present within the desktop study area.

Four weeds are considered to have significant threat to biodiversity under the EPBC Act namely Boneseed (*Chrysanthemoides monilifera* ssp. *monilifera*), Bridal Creeper (*Asparagus asparagoides*), Broom (*Genista* spp. *Genista monspessulana), and* Blackberry (*Rubus fruticosus* species).

The roadside survey (RCC, 2009) has recorded populations of seven significant weeds along the roads of Shire Dandaragan: Paterson's Curse (*Echium plantagineum*); Cape Tulip (*Moraea flaccida and Moraea miniata)*; Victorian Tea Tree (*Leptospermum laevigatum*); Bridal Creeper (*Asparagus asparagoides*); Boneseed (*Chrusanthemoides monilifera* ssp. *Monilifera*); Spiny Rush (*Juncus acutus*); and *Gladiolus* sp. Of the nominated weeds species, the Patterson's Curse is the most prevalent, recorded within the Project area along main roadsides. The next most common weed is Spring Rush, was recorded in the northern-west part of EP489, (RCC, 2009). These weeds are considered to have a high ecological impact rating due to rapid rate of dispersal and increasing trend in distribution (DEC, 2009).

The weeds of concern on cleared land for agricultural use are Double Gee (*Emex australis*), Skeleton Weed (*Chondrilla juncea*), African Love Grass (*Eragrostis curvula*) and Prickly Paddy Melons (*Cucumis myriocarpus*). These weeds were identified during previous UIL Energy Badgingarra 2D Seismic campaign on EP447. Double Gee, Skeleton Weed and Prickly Paddy Melons are classified as low ecological impact species with rapid rate of dispersal and extensive distribution (DEC, 2009).

Dieback pathogens

South region of the Project area has a potential for Dieback disease with part of the Badgingarra National Park and proposed extension is declared as Dieback disease area. These *Phytophthorae* pathogens are capable of causing serious damage to the banksia woodlands and scrub heath associations that dominate south part of the project area. Dieback is readily spread through the use of infected soil, sand and gravel during construction or disturbance activities. Dieback is also spread along vehicle tracks particularly between areas of infection to dieback-free areas, through the use of vehicles and other machinery that has not been properly cleaned.

Basic dieback hygiene measures are a simple and effective method of preventing the spread of dieback. The *Management of Phytophthora Dieback in Extractive Industries Best Practice Guideline* (the Dieback Working Group) will be adopted for the seismic survey.

2.7 CULTURAL HERITAGE

A search of the Aboriginal Heritage Inquiry System was conducted during 2013 and 2015 to identify potential registered aboriginal heritage sites. One registered Aboriginal Heritage site was identified within the boundaries of the Project located to the east of the Brand Hwy namely Mullering Brook (ID 4640). The Mullering Brook has mythological significance to Yued People. However, the project layout is designed to avoid Mullering Brook crossing.

For more details refer to *Attachment 3 – Aboriginal Heritage Inquiry System Reports EP488, EP447, EP489*.

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