AUSTRALIA BUNDLE SITE

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Desktop Assessment of Short Range Endemic Invertebrates for the Learmonth Bundle Project, Learmonth, Western Australia

Report by Invertebrate Solutions for Subsea7 Australia Contracting Ltd on behalf of 360 Environmental Pty Ltd

September 2017

Dr Timothy Moulds
Director and Principal Ecologist
Invertebrate Solutions
PO Box 14
Victoria Park, WA 6979
Australia
tim@invertebratesolutions.com
www.invertebratesolutions.com

Invertebrate Solutions. (2017). Desktop assessment of short range endemic invertebrates for the Learmonth Bundle Project, Learmonth, Western Australia. Unpublished report to 360 Environmental, September 2017.

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Prepared for: SubSea7 Contracting Ltd, on behalf of 360 Environmental Pty Ltd

Frontispiece: *Acacia sclerosperma* subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland (Photo 360 Environmental)

Contents

Executive Summary

Subsea7 is currently undertaking investigations for the proposed Learmonth Bundle project (the Project). The proposed site is located approximately 2 km south-east of the Learmonth Airport, Western Australia. Due to the potential for impacts to the surface environment, including vegetation clearing and the potential for subsequent impacts to short range endemic (SRE) invertebrates, 360 Environmental Pty Ltd (360 Environmental) has requested Invertebrate Solutions to undertake a desktop review of SRE invertebrates and a preliminary impact risk assessment for the proposed development.

The desktop assessment for SRE invertebrates recorded nine confirmed SRE species (all land snails) and seven Potential SRE species (data deficient) within the broader Study area. The majority of these species are restricted to the central Cape Range itself and do not occur within the Project Area, located on the coastal plain. Two species of Camaenid land snails, *Plectorhagaha* sp. 1 and *Quistrachia* sp. 1 that are Confirmed SRE species may potentially occur on the coastal plain in the vicinity of the Project Area, however, the absence of outcropping limestone substantially reduces the likelihood of their occurrence specifically within the Project Area. These species are considered to have a low likelihood of occurring within the Project Area due to an absence of suitable habitat.

The potential for impacts to SRE fauna, if present, are currently considered low from the proposed development, although the final impact will be dependent upon the specifics of the final development.

The following recommendations are made with regard to the potential development of the Project:

- No further investigation of SRE invertebrates is required based on the currently available information regarding both the likelihood of occurrence and potential impacts from the Project.
- The surface clearing footprint and positioning of infrastructure should be tailored to minimise clearing.
- Hydrocarbons storage areas should be fully bunded.

1. Introduction

Subsea7 Australia Contracting Ltd (Subsea7) is currently undertaking investigations for the proposed Learmonth Bundle project (the Project). The proposed site is located approximately 2 km south-east of the Learmonth Airport, Western Australia.

Due to the potential for impacts to the surface environment, including vegetation clearing and changes to surface hydrology and the potential for subsequent impacts to short range endemic fauna (SRE) in the Project area, 360 Environmental Pty Ltd (360 Environmental) has requested Invertebrate Solutions to undertake a desktop review of SRE invertebrate fauna and preliminary impact risk assessment for the proposed development.

1.1. Purpose of this report

360 Environmental has requested Invertebrate Solutions to undertake the following scope of works for the Learmonth Bundle Project area, Cape Range, Western Australia:

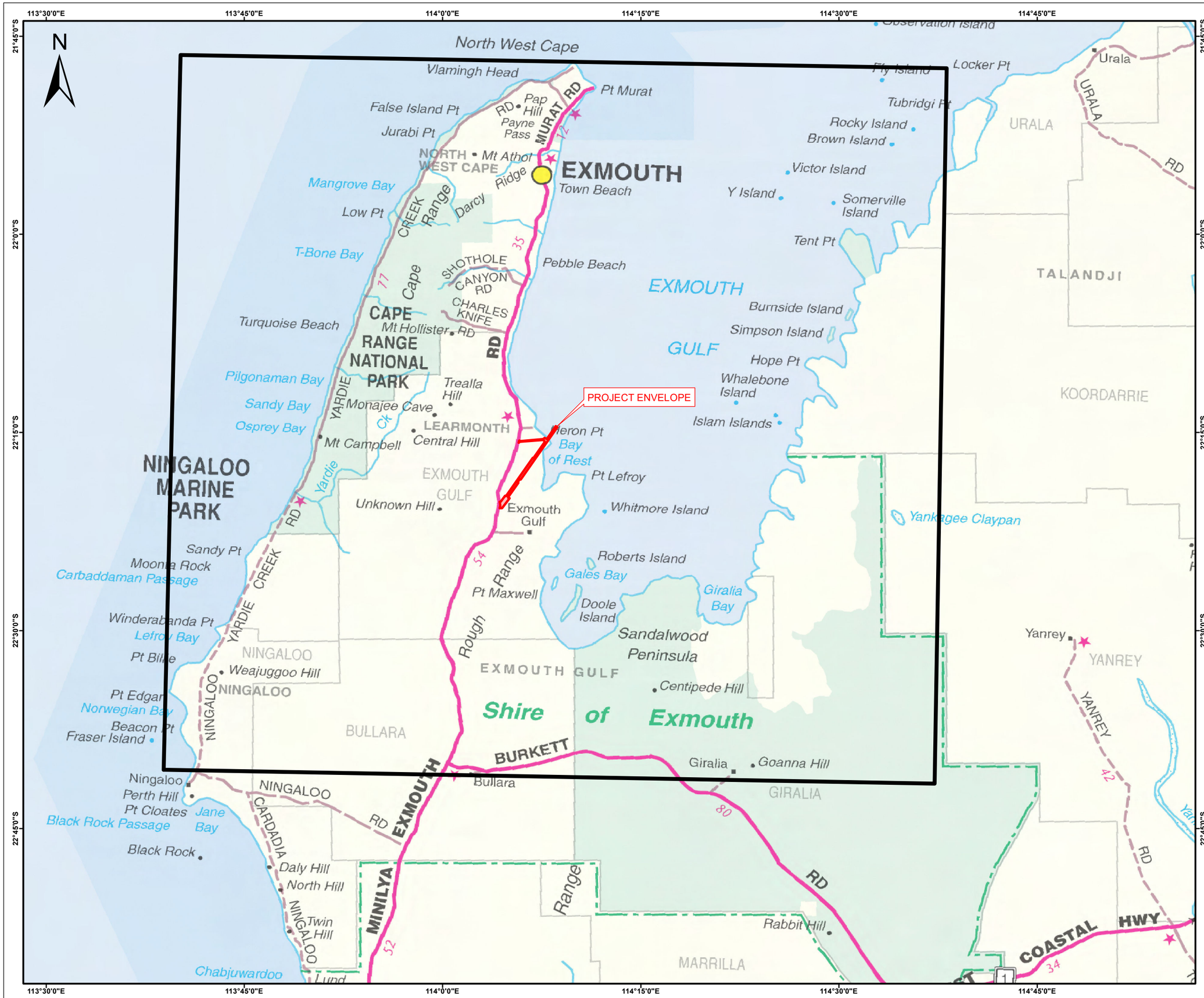
- Undertake a desktop review for SRE invertebrate presence.
- Undertake a risk assessment for impacts to SRE invertebrates from the proposed development.
- Provide recommendations to minimise potential impacts and any suggested requirements for further work to comply with relevant legislation.
- Provide a written report containing the above items.

1.2. Study Area

The desktop Study area includes a 100 km sided rectangle centred on the Learmonth Bundle Project area. The Project area is defined by a 500 m wide corridor on either side of a transect running from the shoreline at -22.2592058°S 114.1302957°E and the inland termination at -22.3325504°S 114.0737961°E. The desktop Study area boundary and the Project area is shown in Figure 1.

1.3. Documents examined

The Detailed Flora and Vegetation Assessment (360 Environmental 2017) was examined in the compilation of this report, along with other referenced scientific papers used to provide general background. This report has been prepared with regard to the Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA2016).



Legend

- Project Envelope
- Study Area

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- TRAVELLERS ATLAS 2006 9th EDITION

Powered By SLIP ENABLER

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au

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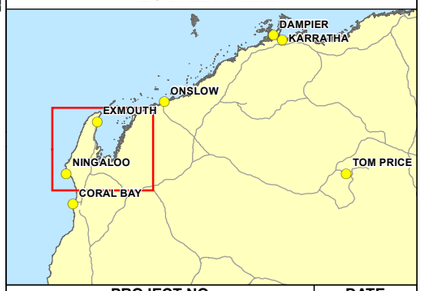
LOCALITY MAP



PROJECT NO	DATE
2061 PHASE 004	18/09/2017

HORIZONTAL DATUM AND PROJECTION
GCS GDA 1994

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	SS	SS	0

Learmonth Bundle Site

SRE Desktop Assessment

Figure 1
Site Location

C:\GIS\Jobs\360\2061 Phase 004 - Learmonth Habitat Mapping\Figures\2061 Phase 004_F01 Site Location_170918.mxd

1.4. Introduction to SRE fauna

Short range endemic (SRE) invertebrates are species with 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, arbitrarily defined in Western Australia as less than 10,000 km^2 (100 km x 100 km) (Harvey, 2002). Taxa that have been more commonly found to contain SRE representatives include:

- Onychophorans (velvet worms);
- Crustaceans (Isopoda);
- Arachnids (mygalomorph spiders, pseudoscorpions, opiliones, scorpions, schizomids);
- Myriapods (millipedes and centipedes);
- Molluscs (land snails); and
- Insects (hemipterans, grasshoppers, butterflies).

SRE invertebrate fauna taxa are generally found in sheltered, relatively mesic environments such as isolated habitats (e.g. boulder piles, isolated hills, dense patches of vegetation, gullies) and can include microhabitats within these environments such as deep leaf litter accumulation, large logs, under bark, cave areas and springs and permanent water bodies.

Many processes contribute to taxa being susceptible to short range endemism. Generally, these factors are related to the isolation of a species which can include the ability and opportunity to disperse, life history, physiology, habitat requirements, and 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 SRE species often including additional taxa not otherwise generally forming SREs.

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.

The allocation of short range endemism status can be difficult due to the often incomplete taxonomic framework of many invertebrate groups and the often frequent need for substantial revision to enable accurate identification. Short Range Endemic status is assigned using the categories described in Table 1, based upon the available information from the WAM database and discussion with appropriate taxonomic authorities for various invertebrate groups. Insufficient information exists for many invertebrate species due to specimens being juvenile, the wrong sex to allow identification, damaged, or inadequate taxonomic frameworks, precluding the assignment of SRE status.

Table 1 Short Range Endemic Status of Species

SRE Status	Definition
Confirmed	A confirmed SRE species. A known distribution of < 10,000 km^2 (after Harvey 2002). Taxonomy of the group is well known. The group is well represented in collections, or via comprehensive sampling.
Likely	Likely to be a SRE species based upon knowledge of the family/genus, where other closely related species show evidence of short range endemism. Where habitats containing the specimens show discontinuity within the landscape.
Possible	Based upon existing knowledge of the genus / family there is a possibility that the species may have a restricted range. Where habitats containing the specimens may show discontinuity within the landscape. Potential SRE species may be assigned one of the sub categories below: A. Data deficient i.e. new species, lack of distribution, taxonomic or collecting knowledge, juvenile specimens, wrong sex for identification B. Habitat indicators C. Morphology indicators D. Molecular evidence E. Research and expertise of WAM staff/taxonomic specialists
Widespread	Not a SRE, a wide ranging distribution of > 10,000 km^2

1.5. Conservation Legislation and Guidance Statements

Terrestrial SRE species are protected under state legislation via the Wildlife Conservation (WC) Act (1950), the Environmental Protection Act (1986) and federally under the Environment Protection and Biodiversity Conservation (EPBC) Act (1999). The assessment of SRE fauna for environmental impact assessment (EIA) is undertaken in Western Australia with regard to the Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA2016).

At the state level, the WC Act provides a list of species that have special protection as species listed under the Wildlife Conservation (Specially Protected Fauna) Notice 2015 (DPaW 2015). This notice is updated periodically by the Department of Biodiversity, Conservation and Attractions (DBCA) (formerly Department of Parks and Wildlife, DPaW) and the current list (December 2016) includes numerous subterranean species, mainly from the Cape Range and Pilbara regions including crustaceans, arachnids and myriapods that are considered to be “rare or likely to become extinct, as critically endangered fauna, or are declared to be fauna that is in need of special protection” (DPaW 2016). In addition to the specially protected fauna, DBCA also maintains a list of Priority fauna that are considered to be of conservation significance but do not meet the criteria for formal listing under the WC Act as Scheduled species. The Priority fauna list is irregularly updated by DBCA and, although it offers no formal legislative protection, these species are generally considered in the EIA process.

There is no current ability for the state government of Western Australia to formally list Threatened or Priority Ecological Communities (TECs/PECs), however, a list of such communities is maintained by DBCA and overseen by the Minister for the Environment. Communities that are not considered by DBCA to be threatened but may be vulnerable to future impacts are classed as PECs.

The WC Act is expected to be imminently replaced by the new Biodiversity Conservation Act that has yet to be enacted into law. This new act has been passed by the lower house of the State parliament and will be capable of protecting both species and ecological communities under legislation.

The federal EPBC Act protects both species and ecological communities. The most relevant listing for SRE fauna is the mygalomorph spider *Idiosoma nigrum* that occurs in the Wheatbelt region and is listed as Vulnerable. No terrestrial SRE species are currently listed under the EPBC Act.

1.6. Report Limitations and Exclusions

This study was limited to the written scope provided in Section 1.1. This study was limited to the extent of information made available to Invertebrate Solutions at the time of undertaking the work. Information not made available to this study, or which subsequently becomes available may alter the conclusions made herein.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. Invertebrate Solutions has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by Invertebrate Solutions described in this report (this section and throughout this report). Invertebrate Solutions disclaims liability arising from any of the assumptions being incorrect.

Invertebrate Solutions has prepared this report on the basis of information provided by 360 Environmental on behalf of Subsea7 and others (including Government authorities), which Invertebrate Solutions has not independently verified or checked beyond the agreed scope of work. Invertebrate Solutions does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.7. Assumptions

Invertebrate Solutions has made the following assumptions in the writing of this report and its subsequent conclusions:

- The potential impacts identified and assessed in Section 4 are not necessarily exhaustive and may change with additional detail regarding the potential development.
- The impacts to SRE invertebrates may require additional investigation in the event the development plan changes substantially.

2. Desktop Methods

The SRE invertebrate desktop review comprises of two distinct sections:

- An assessment of the likelihood that SRE invertebrate species are present in the habitats located within the Study area.
- Consideration of the potential impacts to SRE invertebrate species that may occur as a result of the Project.

2.1 Likelihood of SRE invertebrate occurrence

The likelihood of SRE invertebrate species occurring in the Study area was assessed using a combination of regional and local botanical and landform information and database searches including:

- Analysis of published and unpublished reports concerning SRE invertebrate from the region.
- Botanical and vegetation mapping and other information available for the Study area.
- Results of a Protected Matters Search from the Federal Government's Department of the Environment and Energy website.
- Records of fauna held by the Western Australian Museum.

Based on the analysis of all available information the Study area was assigned a level of likelihood to support SRE invertebrates of either 'Low', 'Moderate', 'High', or 'Definite'.

2.2 Potential Impacts to SRE invertebrates

The potential impacts of development on invertebrates may be categorised as:

- Direct impacts; and
- Indirect impacts.

Direct impacts are the obvious and unavoidable destruction or degradation of habitat, generally native vegetation that occurs due to clearing (e.g. infrastructure areas etc). Indirect impacts are generally gradational, and more difficult to predict and manage because they may occur at moderate to large distances from the project footprint. These impacts may be expressed some time after development has begun.

The zone of influence for indirect impacts may be considerably larger than areas of direct distance. Potential indirect impacts of development include:

- Alteration of surface hydrology regimes, sedimentation, and water quality (e.g. under and proximal to roads and infrastructure);
- Surface water contamination from plant equipment and infrastructure;
- Dust deposition;
- Vibration disturbance from operational activities; and
- Risk of extinction from reduction and/or fragmentation in habitat.

The Project aspects were reviewed to assess the potential severity of impact to potential SRE habitats. In evaluating the relevance of these factors to the Project, consideration was given to the magnitude, duration and spatial extent of the impacts, where known. This assessment has taken the approach of considering these broad categories of potential impacts and evaluating their occurrence and relative severity. The impacts were then assigned a level of either 'Low', 'Moderate', or 'High'. Where an impact is designated as 'Low' no further consideration to this impact is required if all assumptions made throughout this report are correct.

3. Desktop SRE invertebrate Review

3.1 SRE invertebrates of Cape Range

The Cape Range in Western Australia is a significant world hotspot for subterranean biodiversity contained with the extensive limestone caves and karstic geologies from the coastal plateau to the range itself (Humphreys 2000, 2004, 2008), however, information regarding the terrestrial invertebrates is more limited. The majority of terrestrial invertebrate records are for the Cape Range itself rather than the coastal plains.

3.2 SRE Habitat in the Project Area

The vegetation and landform units identified in the Detailed flora and vegetation assessment (360 Environmental, 2017) was used to assess the Project area for potential SRE habitat. None of the habitats identified would provide habitat isolates that would be likely to contain SRE taxa. All the vegetation units are laterally continuous within the region and not limited to the Project area (Table 2)

Table 2 Vegetation units in the Project Area and SRE fauna habitat potential (After 360 Environmental 2017, refer Appendix 2).

Landform	Vegetation Unit (after 360 Environmental 2017)	SRE Fauna Suitability
Plain	*Acacia gregorii* low open shrubland over *Trioida epactia* closed grassland	Low
	Acacia coriacea and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland	Low
	Acacia sclerosperma subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland	Low
	Acacia bivenosa open shrubland over *Triodia epactia* hummock grassland	Low
	Melaleuca cardiophylla low shrubland over *Triodia epactia* hummock grassland	Low
	Stemodia sp. *Onslow* low open shrubland over *Triodia epactia* hummock grassland	Low
Saline flat	*Tecticornia ?indica* and *Frankenia pauciflora* low shrubland on saline flat	Low
Dune crest	*Acacia stellaticeps* and *Scaevola sericophylla* low open shrubland over *Triodia epactia* open grassland	Low
Drainage line	*Acacia coriacea* and *Cullen* sp. shrubland over *Sida rohlenae* subsp. *rohlenae* low shrubland over *Triodia epactia*	Low

3.3 Local historical occurrence of potential SRE Invertebrates

A search was undertaken of the Western Australian Museum databases for Crustaceans (WAM 2016a) and Arachnids/Myriapods (WAM 2016b) and records contained in Slack-Smith (1993). The searches were undertaken as a 100 km x 100 km rectangle centred on the inland termination point

of the Project area (-22.3325504°S 114.0737961°E). The results of these were filtered for potential SRE species are shown in Table 3.

No SRE invertebrates have previously been recorded from the Project area (WAM 2016a and 2016b), however, there are nine confirmed SRE species (all land snails) and seven Potential SRE species (data deficient) within the broader Study area.

Table 3 Potential SRE Invertebrates in WAM databases recorded from within the Desktop Study area.

Higher Classification	Genus and Species	SRE status and Notes
Gastropoda: Pupilidae	*Pupiodes contrarius*	Widespread species, occurs on coastal plain,
Gastropoda: Camaenidae *Sinumelonine*	*Plectorhagaha* sp. 1	Confirmed SRE, on coastal plain west of Learmonth.
	Gen. 1. sp.1	Confirmed SRE, monotypic genus on the range and west coast
	Gen. 2. sp.1	Confirmed SRE, occurs on the range south of Charles Knife Road.
	Gen. 3. *rugus*	Confirmed SRE, occurs on the range and west coast
	Gen. 3 sp.1	Confirmed SRE, occurs on the eastern side of the range.
	Gen. 3 sp. 2	Confirmed SRE, occurs on the western side of the range and west coast
	Gen. 3 sp. 3	Confirmed SRE, known only from Milyering well
	Rhagada sp.1	Confirmed SRE, discontinuous distribution on the range but not on the coastal plain
	Quistrachia sp. 1	Confirmed SRE, On coastal plain
Arachnida: Mygalomorphae: Idiopidae	*Eucyrtops sp. nov.*	Potential (A); only recorded on Cape Range, no records on coastal flats
Arachnida: Pseudoscorpionida: Garypidae	*Synsphyronus sp.*	Potential (A); only recorded on Cape Range, no records on coastal flats
Arachnida: Pseudoscorpionida: Olpiidae	*Austrohorus sp.*	Potential (A); only recorded on Cape Range, no records on coastal flats
Diplopoda: Polydesmida: Paradoxosomatidae	*Antichiropus humphreysi*	Potential (A); only recorded on Cape Range, no records on coastal flats
	Boreohesperus capensis	Potential (A); only recorded on Cape Range, no records on coastal flats
Diplopoda: Polyzoniida: Siphonotidae	*`Megalosiphon humphreysi`*	Potential (A); only recorded on Cape Range, no records on coastal flats
Chilopoda: Geophilida: Mecistocephalidae	*Mecistocephalus sp.*	Potential (A); only recorded on Cape Range, no records on coastal flats
Chilopoda: Scutigerida: Scutigeridae	*Thereuopoda lesueurii*	Widespread, not an SRE

All of the potential and the majority confirmed SRE invertebrates have been recorded from the central Cape Range itself rather than the coastal plain areas. This is especially true for the Camaenid land snails as they tend to be more common on the outcropping limestone rather than other substrates. The Project area, due to its coverage of sand dunes and lack of outcropping limestone or calcareous material would therefore limit its potential to contain landsnails.

4. SRE preliminary impact assessment

The anticipated activities at the Learmonth Bundle Project area include land clearing, construction of buildings and surface access roads, storage of hydrocarbons and minor excavation for the purposes of building footings.

The final extent and impact of the proposed development will be unknown until the completion of more detailed development proposal by Subsea7.

The clearing of native vegetation on the surface is considered to be the most significant impact from the Learmonth Bundle Project, although the impact is still considered to be Low upon any potential SRE invertebrates present due to the limited extent within the scale of the region and absence of any restricted habitat types (Table 4).

The alteration of surface hydrology is the second most significant impact to any SRE fauna and relates to the construction of roads, buildings and other hard stand areas that will modify moist areas that act as *refugia* to SRE species. These impacts are also considered to be Low.

The storage of hydrocarbons on site should be limited and all storage areas fully bunded. The risk of hydrocarbon contamination is anticipated to be Low, however, should a major spill occur then the impacts could be significant.

Table 4 Risk of impact to subterranean fauna from the proposed Project

SRE fauna presence	Disturbance mechanism	Risk of Impact to SRE Fauna Community (if present)
Low	Vegetation clearing, increased sedimentation and weed incursion	Low
	Alteration of surface hydrology	Low
	Hydrocarbon spills	Low

4.1 Cumulative impacts

Cumulative impacts in the local region are expected to be minimal with the only other major impacts being the Learmonth airport and associated Department of Defence facility and the coastal highway. The primary cumulative impacts from these developments are land clearance and altered hydrology, however, these are relatively small in the scale of the eastern side of the Cape Range and the area of uncleared and unaltered land. It is anticipated that the Learmonth Bundle Project will not add significantly to the cumulative impacts to SRE fauna in the local area especially since habitat for SRE fauna is absent from the Project area.

5. Conclusions and Recommendations

The desktop assessment for SRE invertebrates recorded nine confirmed SRE species (all land snails) and seven Potential SRE species (data deficient) within the broader Study area. The majority of these species are restricted to the central Cape Range itself and do not occur within the Project Area, located on the coastal plain. Two species of Camaenid land snails, *Plectorhagaha* sp. 1 and *Quistrachia* sp. 1 that are Confirmed SRE species may potentially occur on the coastal plain in the vicinity of the Project area, however, the absence of outcropping limestone substantially reduces the likelihood of their occurrence specifically within the Project area. These species are considered to have a low likelihood of occurring within the Project A=area due to an absence of suitable habitat.

The potential for impacts to SRE fauna, if present, are currently considered low from the proposed development, although the final impact would be dependent upon the specifics of the final development.

5.1 Recommendations

The following recommendations are made with regard to the potential development of the Project:

- No further investigation of SRE invertebrates is required based on the currently available information regarding both the likelihood of occurrence and potential impacts from the Project.
- The surface clearing footprint and positioning of infrastructure should be tailored to minimise clearing.
- Hydrocarbons storage areas should be fully bunded.

6. References

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Appendix 1

Department of Parks and Wildlife Conservation Codes (November 2015)

Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T **Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR **Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN **Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU **Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX **Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA **Migratory birds protected under an international agreement**

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

CD Conservation dependent fauna

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS Other specially protected fauna

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

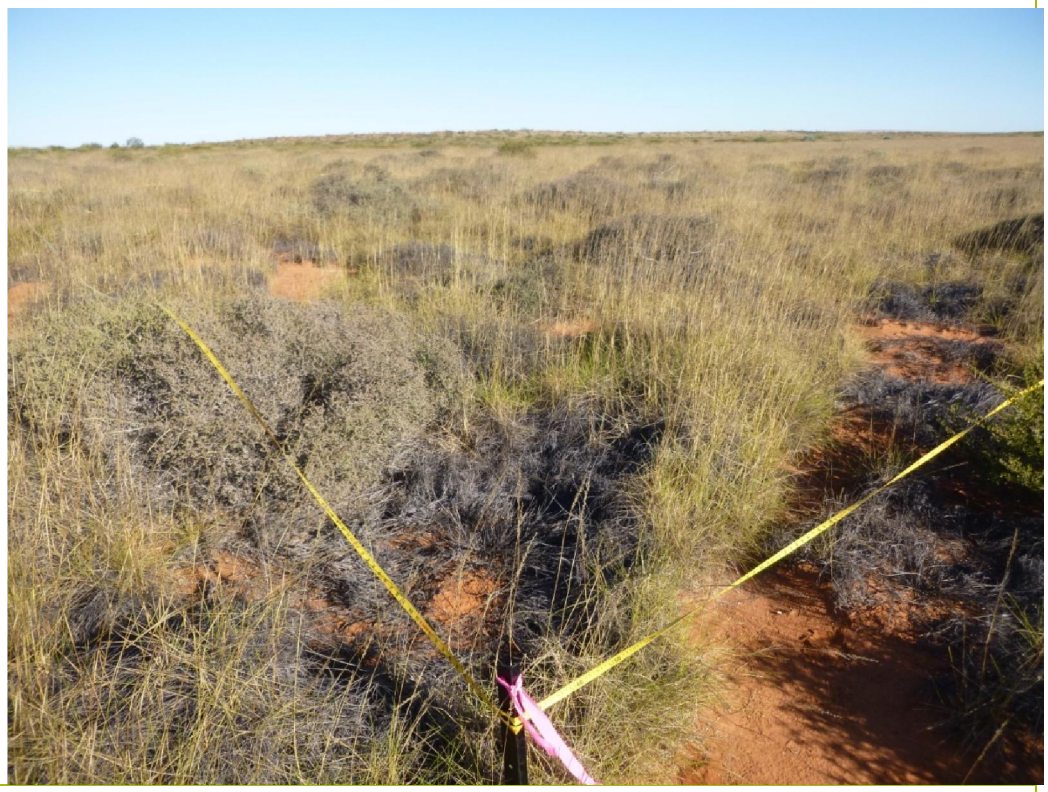
*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

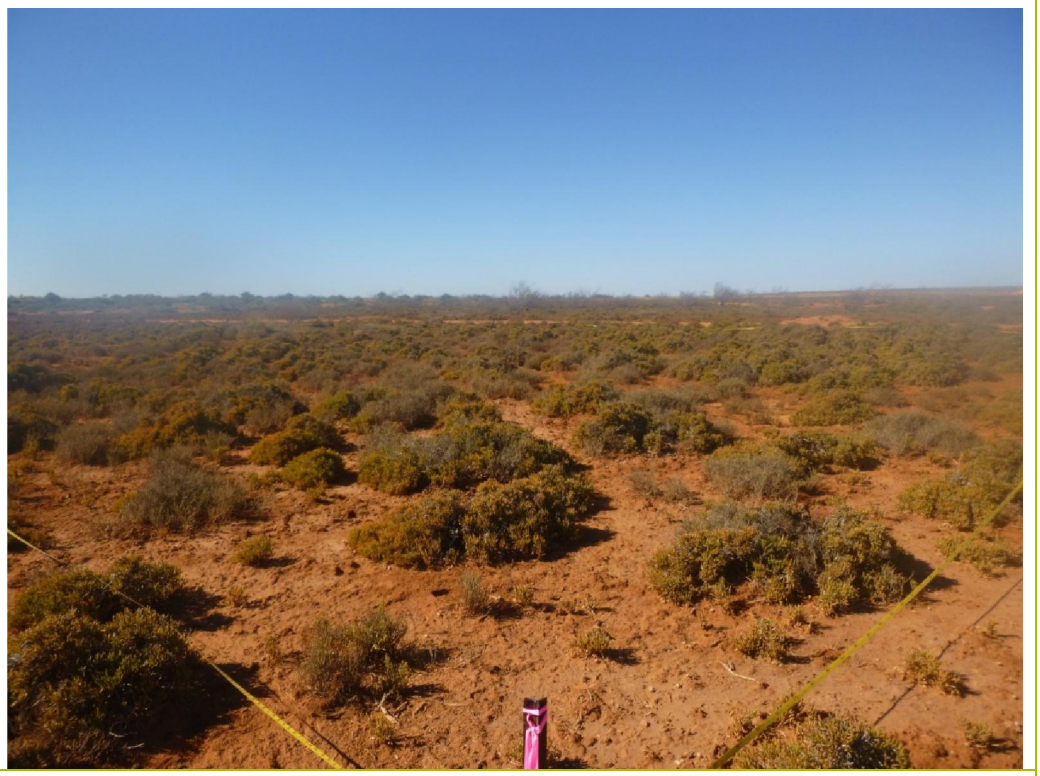
Appendix 2

360 Environmental Vegetation Types (360 Environmental 2017)

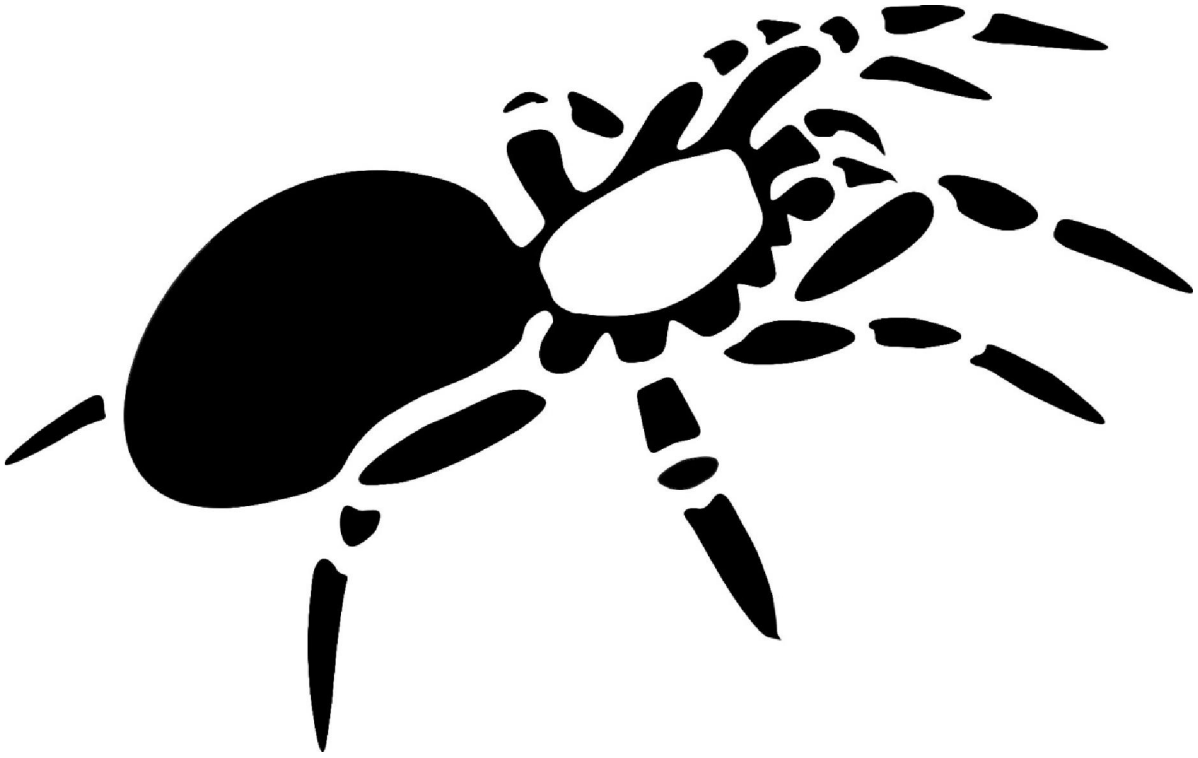
LANDFORM	VEGETATION UNIT CODE	DESCRIPTION
Plain	AgTe	*Acacia gregorii* low open shrubland over *Trioida epactia* closed grassland 
Plain	AcAtTe	*Acacia coriacea* and *Acacia tetragonophylla* open shrubland over *Triodia epactia* hummock grassland 

LANDFORM	VEGETATION UNIT CODE	DESCRIPTION
Plain	AsTe	*Acacia sclerosperma* subsp. *sclerosperma* shrubland over *Triodia epactia* hummock grassland 
Plain	AbTe	*Acacia bivenosa* open shrubland over *Triodia epactia* hummock grassland 

LANDFORM	VEGETATION UNIT CODE	DESCRIPTION
Plain	Mcte	*Melaleuca cardiophylla* low shrubland over *Triodia epactia* hummock grassland 
Plain	SoTe	*Stemodia* sp. *Onslow* low open shrubland over *Triodia epactia* hummock grassland 

LANDFORM	VEGETATION UNIT CODE	DESCRIPTION
Saline flat	TiFp	*Tecticornia ?indica* and *Frankenia pauciflora* low shrubland on saline flat 
Dune crest	AsSs	*Acacia stellaticeps* and *Scaevola sericophylla* low open shrubland over *Triodia epactia* open grassland 

LANDFORM	VEGETATION UNIT CODE	DESCRIPTION
Drainage line	AcC	*Acacia coriacea* and *Cullen* sp. shrubland over *Sida rohlenae* subsp. *rohlenae* low shrubland over *Triodia epactia* 



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