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Environmental Consultancy

Shire of Dandaragan: Jurien East Road - Cockleshell Gully Road to Brand Highway
Level 1 Flora, Vegetation and Vertebrate Fauna Survey, Autumn and Spring 2016




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Version 2

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This document describes the results of a combined Level 1 flora, vegetation and fauna reconnaissance survey and targeted flora survey carried out by Maia Environmental Consultancy (Maia) and Western Wildlife for the Shire of Dandaragan along Jurien East Road from Cockleshell Gully Road (SLK24) to Brand Highway (SLK0).

Photographs on front page – left to right: *Calytrix fraseri*, Wandoo woodland, *Banksia menziesii*, mixed heathland (all photographs taken by Maia).

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Acronyms and Abbreviations

aff.	Affinity
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BVSA	Beard vegetation system association
BoM	Bureau of Meteorology
CAMBA	China-Australia Migratory Bird Agreement
CBC	Carnaby's Black-Cockatoo
Coomallo IBA	Coomallo Important Bird Area
DAFWA	Department of Agriculture and Food Western Australia
DBH	Diameter at breast height
DEC	Department of Environment and Conservation
DER	Department of Environment Regulation
DoP	Department of Planning
DotE	Department of the Environment (current DotEE)
DotEE	Department of the Environment and Energy
DPaW	Department of Parks and Wildlife
DPP	Declared pest plant
DRF	Declared Rare Flora
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally sensitive area
GDA94	Geocentric Datum of Australia, 1994
GFG	Griffin floristic group
GoWA	Government of Western Australia
GPS	Global Positioning System
GFG	Griffin floristic group
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
JAMBA	Japan-Australia Migratory Bird Agreement
km	Kilometre
m	Metre
mm	Millimetre
Maia	Maia Environmental Consultancy Pty Ltd
MGA50	Map Grid of Australia zone 50
MVT	Maia vegetation type
NVCP	Native Vegetation Clearing Permit
NVIS	National Vegetation Information System
P (1-4)	Priority 1 to Priority 4 flora
PCZ	Proposed clearing zone
PEC	Priority ecological community
PPA	Priority protection area
PST	Potentially significant taxon
RE	Range extension
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SA	System association

ShofD	Shire of Dandaragan
SLK	Straight-line kilometre
sp.	Species -single
sp. indeterminate	Species cannot be determined, insufficient material
spp.	Species - multiple
subsp.	Subspecies
T	Threatened flora species
TEC	Threatened ecological community
TFS	Targeted flora survey
TP	Threatened and Priority Flora list
TPFL	Threatened and Priority Flora database
TFS	Targeted flora survey
VA	Vegetation association
var.	Variety
WA	Western Australia
WAH	Western Australian Herbarium
WA Herb	Western Australian Herbarium List
WAOL	Western Australian Organism List
WC Act	*Wildlife Conservation Act 1950*
WoNS	Weed of National Significance
*****	Indicates a weed species

Summary

Background and Methods

- The Shire of Dandaragan is planning to upgrade Jurien East Road between Brand Highway and Cockleshell Gully Road in the Wheatbelt of Western Australia (WA). Maia Environmental Consultancy Pty Ltd (Maia) and Western Wildlife were contracted by the Shire of Dandaragan to carry out a Level 1 flora, vegetation and vertebrate fauna survey within an approximately 24 kilometres (km) long and approximately 20 metres (m) wide (including road pavement and road edges) section of the road corridor. The survey included a Level 1 flora and vegetation reconnaissance survey in April 2016, a follow-up targeted flora survey in October and a vertebrate fauna reconnaissance survey in December 2016.
- The section of road corridor surveyed is referred to as the Survey Area in this report and the area where clearing is proposed is referred to as the Proposed Clearing Zone (PCZ).

Flora

- Four hundred and nineteen (419) taxa from 183 genera and 62 families were recorded in the Survey Area: the flora is typical of the location, as it is relatively species rich in the undisturbed areas.
- One threatened species (*Thelymitra stellata* listed as Endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Wildlife Conservation Act 1950* (WC Act)), 14 priority (P) species (*Grevillea amplexans* subsp. *adpressa* (P1), *Acacia retrorsa* (P2), *Synaphea lesueurensis* (P2), *Synaphea sparsiflora* (P2), *Drosera marchantii* subsp. *prophylla* (P3), *Haemodorum loratum* (P3), *Lechenaultia juncea* (P3), *Lepidobolus quadratus* (P3), *Patersonia argyrea* (P3), *Synaphea endothrix* (P3), *Thysanotus vernalis* (P3), *Eucalyptus macrocarpa* subsp. *elachantha* (P4), *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) and *Xanthosia tomentosa* (P4)), and 1 potentially conservation significant flora (CSF) species (*Synaphea* sp.) were located in the Survey Area.
- Seven of the 15 CSF species and the *Synaphea* sp. will not be impacted by the proposed works because they do not occur in the PCZ. Potential impact to the seven species occurring in the PCZ ranges from approximately 0.7% (*Synaphea endothrix* (P4)) to 8.6% (*Synaphea sparsiflora* (P2)) of the estimated number of currently known plants. However, actual impacts are likely to be lower than this as only 8% of the vegetation outside the boundary of the PCZ but within the Survey Area was assessed compared with 100% of the vegetation in the PCZ and there are likely to be more CSF in the areas not surveyed.
- One of the 38 weed species located in the Survey Area is listed as a Declared Plant in WA - *Echium plantagineum* (Patterson's Curse/Salvation Jane). It is declared as a C3 (Management) pest in the Shire of Dandaragan and some form of management should be applied to this species to reduce its numbers.

Vegetation

- Impact to the six Beard vegetation system associations (BVSA) occurring in the PCZ will be less than 0.03% of their pre-European extents in the Geraldton Sandplains bioregion; this will not bring the total level of clearing of them to below the threshold level of 30%.
- Nine vegetation types were mapped in the Survey Area: *Banksia* Forest (*B***F**), *Corymbia* Forest (*C***F**), *Eucalyptus* and *Banksia* Woodland (*EB***WL**), *Eucalyptus*/*Corymbia* Forest (*E***F**-1), *Eucalyptus* Forest (*E***F**-2), Mixed Heathland (M**HL**), *Mesomelaena* Sedgeland (*M***SEL**) and two Mixed Shrublands (M**SL**-1 and M**SL**-2). The vegetation types are similar to vegetation mapped in the surrounding areas and regionally. Approximately 2.38 ha of intact vegetation (across all MVTs) will be cleared for the proposed works.
- The structure of most of the vegetation in the Survey Area (approximately 88%) is intact and the remainder has been altered by patches of clearing and weeds (approximately 12%).

Fauna

- Carnaby's Black-Cockatoo (CBC; Threatened, Endangered) was recorded in the Survey Area as well as evidence of foraging on *Banksia* species (spp.).
- CBC is known to breed in the Coomallo Important Bird Area, which is adjacent to the eastern section of the Survey Area.
- The Survey Area contains high-value (*B***F**, *EB***WL**, M**SL**-1) and moderate value (M**SL**-2) foraging habitat in the form of *Banksia* woodlands and shrublands. Up to approximately 0.47 ha of high value/quality foraging

habitat could be cleared for the proposed works.

- The Survey Area contains potential breeding habitat for CBC (*E***F**-2) and approximately 0.15 ha of this habitat will be cleared for the works. Sixteen trees fitting the DBH criteria for potential breeding habitat trees were located in the PCZ, though no trees with suitably-sized hollows were noted. No roosting habitat areas are known in the area, although Flooded Gum and Marri trees in association with the creek-lines are potentially roosting habitat.
- Other conservation significant fauna species that potentially occur in the survey area are the Rainbow bee-eater (International Agreement (IA)), Peregrine Falcon (Other Specially Protected fauna (OS)), Fork-tailed swift (IA), a native bee *Hylaeus globuliferus* (P3) and the Western brush wallaby (P4).

Ecological Communities and Other Significant Areas

- The Survey Area does not fall in an area currently listed as a threatened or priority ecological community (TEC or PEC). None of the vegetation types recorded in the Survey Area match descriptions for any of the currently known TECs in the region. The Survey Area is not in the Swan Coastal Plain or Jarrah Forest IBRA bioregion and therefore *EB***WL** does not match the key diagnostic criteria for the Banksia Woodlands of the Swan Coastal Plain TEC. *EB***WL** is similar to the description for a P3 PEC listed for the Midwest region - Banksia dominated woodlands of the Swan Coastal Plain IBRA region. Approximately 0.36 ha of this vegetation type will be cleared for the proposed works.
- The Survey Area is not within, but much of it is surrounded by, the Coomallo Nature Reserve which is on the Register of National Estate. Much of the Survey Area lies in an EPA Red Book area and Environmentally Sensitive Area (ESA), which covers the Coomallo Nature Reserve. The Survey Area also lies in a Schedule 1 area - the Geraldton Sandplains bioregion.

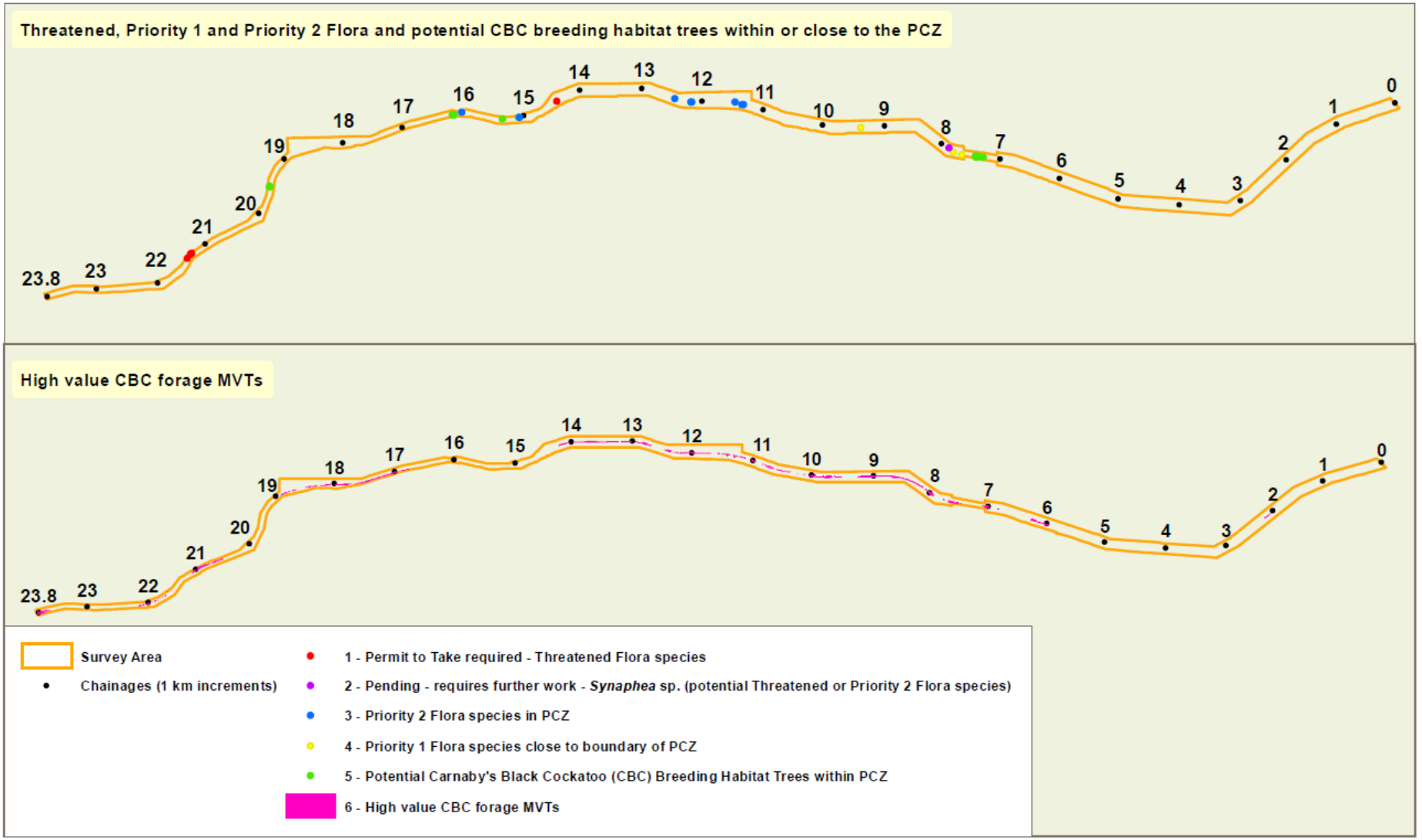
Phytophthora Dieback

- Forty-one (41) of the species recorded in the Survey Area are listed as species susceptible to Dieback. BVSAs 1031 and 1031.1 are highly susceptible to Phytophthora Dieback and a positive *Phytophthora* point is located in the Survey Area.

Recommendations

- The *Thelymitra stellata* located in the Survey Area must not be cleared or impacted unless appropriate state and federal approvals have been applied for and granted. The area covered by vegetation within 50 m of a threatened flora location is an ESA and must not be cleared unless a Native Vegetation Clearing Permit has been approved and issued.
- The potentially significant *Synaphea* sp. should be buffered so that the plants located close to the PCZ are not inadvertently impacted. The location should be visited at an appropriate time in spring 2017 so that flowering specimens can be collected in order to confirm their identity. Similarly, the P1 *Grevillea amplexans* subsp. *adpressa* located outside of but close to the boundary of the PCZ should be avoided because there are few records for this species in the surrounding area and in WA.
- A bilateral agreement between the Commonwealth and WA governments enables the assessment of potential impacts to MNES to be carried out by the Department of Environment Regulation (DER) while assessing the native vegetation clearing permit application. As 0.47 ha of high quality foraging habitat and 0.15 ha of potential breeding habitat for CBC is to be cleared, this does not meet the criteria for high risk of significant impacts in the referral guidelines for three threatened black cockatoo species.
- Direct impact to the vegetation of the Survey Area should be minimised as much as possible and vegetation clearing boundaries clearly identified before commencing any clearing.
- Impact to potential CBC breeding trees (and potential roost tree areas in the creeklines) should be avoided whenever possible. Potential CBC breeding trees should be clearly identified before the works start and every effort made to retain the trees that do not need to be cleared for road safety.
- Standard weed management practices should be used to prevent a) the introduction of new weeds on machinery used for the works and b) the spread of existing weeds along the road corridor when works are carried out. Similarly, standard Phytophthora Dieback hygiene practices should be employed to prevent the potential spread or introduction of the disease into the susceptible native vegetation of the area.
- The map on the following page indicates locations for these important/conservation significant areas.

Map S.1: Significant Areas



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Shire of Dandaragan: Jurien East Road - Cockleshell Gully Road to Brand Highway

Level 1 Flora, Vegetation and Vertebrate Fauna Survey, Autumn and Spring 2016

1 Introduction

1.1 Scope of Work

The Shire of Dandaragan is planning to upgrade Jurien East Road between Cockleshell Gully Road (straight-line kilometres, SLK, 24) and Brand Highway (SLK0) in the Wheatbelt of Western Australia (WA). Maia Environmental Consultancy Pty Ltd (Maia) and Western Wildlife were contracted by the Shire of Dandaragan to carry out a Level 1 flora, vegetation and targeted vertebrate fauna survey within an approximately 24 kilometres (km) long and approximately 20 metres (m) wide (including road pavement and road edges) section of the road corridor. The survey included a Level 1 flora and vegetation reconnaissance survey in April 2016, a follow-up targeted flora survey in October and a vertebrate fauna reconnaissance survey in December 2016.

This report presents the results of a brief desktop study on the conservation significant flora, fauna and vegetation of the area carried out before going to site and the results of the April, October and December field surveys; it also presents a brief discussion of the significance of the flora, vegetation and vertebrate fauna of the area surveyed.

The road reserve along the section of Jurien East Road that was surveyed is referred to as the Survey Area in this report (**Map 9.1, Section 9)** and the area where clearing is proposed is referred to as the Proposed Clearing Zone (PCZ).

1.2 Survey Area Location and Size

Cockleshell Gully Road is approximately 15 km and Brand Highway approximately 39 km north-east of Jurien Bay in the Shire of Dandaragan (**Map 9.1, Section 9**). The Survey Area covers approximately 408 hectares (ha).

2 BACKGROUND INFORMATION

2.1 BIOREGIONAL SETTING

Information on the bioregion, sub-region, geology, soil landscape units, pre-European vegetation associations, land systems, environmentally sensitive areas (ESA), conservation estate, Schedule 1 areas, Environmental Protection Authority (EPA) Red Book areas, significant water bodies, rivers and drainage lines and *Phytophthora* Dieback is summarised in **Table 2.1**.

Table 2.1: Background information

Background information on the Survey Area	
IBRA bioregion and subregion (**Map 9.2A, Section 9**)	Geraldton Sandplains bioregion and Lesueur Sandplain subregion. Source: Department of the Environment and Energy (DotEE) (2016a)
Soil landscape mapping units (**Map 9.2B, Section 9**)	The soil landscapes of the Survey Area comprise seven units: • Rises and low hills on sedimentary rocks north and south of the Mount Lesueur area. Variable soils including red/brown non-cracking clays, brown loamy earths, and grey/brown shallow loamy duplexes. Woodlands (224Mt). • Drainage line and adjacent very gently inclined footslopes; mainly sandy duplexes, brown deep sand and brown sandy earth (224Ny_1). • Laterite plateau residual; shallow gravel, shallow sand over duricrust, sandy gravels (224Ye_1). • Plateau residuals, very gently to gently inclined hillcrest and hillslopes; pale sandy gravels, shallow gravel over duricrust, gravelly pale deep sand, pale and yellow deep sands (224Ye_2). • Colluvial slopes and some plateau remnants, very gently to gently inclined hillslopes and sand filled minor valleys; pale and yellow deep sands, pale sandy gravels, shallow gravel over duricrust, some sandy duplexes and sandy earths (224Ye_3). • Plateau residuals, complex of Ye2 and Ye3; pale sandy gravels, gravelly pale deep sand, shallow gravel over duricrust, pale deep sand, some sandy duplexes, yellow deep sand (224Ye_4). • Sandstone outcrop, often ferruginised (224Ye_5). Source: Department of Agriculture and Food Western Australia (DAFWA) (2014a, 2014b).

Background information on the Survey Area	
Geology (**Map 9.2C, Section 9**)	The surface geology of the Survey Area is mapped as six units: • Pisolitic, nodular or vuggy ferruginous laterite; some lateritic soils; ferricrete; magnesite; ferruginous and siliceous duricrusts and reworked products, calcrete, kaolinised rock, gossan; residual ferruginous saprolite (Czl). • Sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand (Czs). • Sandstone, siltstone, shale, coal (Joc). • Basal conglomerate overlain by dune quartz sand with heavy mineral concentrations (Qdcb). • Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite (Qrc). • Feldspathic sandstone (-Rsl). Source: Stewart *et al.* (2008).
Pre-European vegetation associations and system associations (**Map 9.2D, Section 9**)	The Survey Area is located in Beard's Northern Sandplains physiographic region in the Irwin Botanical District of the South West Province of WA. Five of Beard's vegetation associations (BVA) and system associations (BVSA) occur in the areas surveyed (DAFWA, 2012a.): • BVA 4; BVSA 4.8 (Medium woodland; marri & wandoo). • BVA 1030; BVSA 1030.2 (Low woodland; *Banksia attenuata* & *B. menziesii*). • BVA 1031; BVSAs 1031 & 1031.1 (Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath). • BVA 1032; BVSA 1032.1 (Mosaic: Medium woodland; marri, wandoo, powderbark / Shrublands; dryandra heath). • BVA 1034; BVSA 1034 (Medium woodland; marri, wandoo & powderbark). The pre-European and current extent of the five BVAs in the Geraldton Sandplains IBRA bioregion overall is listed in **Tables 6.2** and **6.3** along with the amount in reserves and the prioritisation for reservation of the vegetation associations.
Environmentally sensitive areas (ESA), conservation estate, Schedule 1 areas and EPA Red Book areas (**Map 9.3, Section 9**)	Much of the Survey Area is in an ESA, an EPA Red Book area and an area on the Register of National Estate. The Coomallo Nature Reserve lies to the north and south of much of the Survey Area but the road reserve is not part of the reserve. The Survey Area lies in a Schedule 1 area - the Geraldton Sandplains bioregion. Source: Department of Parks and Wildlife (DPaW 2014, 2016a), Department of Environment Regulation (DER; 2014, 2015).
Significant water bodies, rivers and drainage lines (**Map 9.3, Section 9**)	No Ramsar wetland, wetlands on the Directory of Important Wetlands, Department of Planning Aboriginal Wetlands or geomorphic wetlands occur in or close to the Survey Area. A number of drainage lines including Coomallo Creek cross the Survey Area. Source: DotE (2010), DotEE (2016b), Department of Planning (DoP, 2016), Geoscience Australia (2006).

Background information on the Survey Area	
Phytophthora dieback	*Phytophthora* is a pathogen that travels from the roots of plants via a microscopic water mould in the soil, soil water or through root-to-root contact and causes Phytophthora Dieback (DEC, 2006). Once infected, the root systems of the plants are destroyed thus starving the plants of water and nutrients leading to the eventual death of the plant. Dieback can lead to loss of biodiversity, extinctions of threatened flora and fauna, reduced species richness of plants, loss of key understorey species and loss of habitat and food sources for fauna. Approximately 40% (2,300 species) of flora species recorded in the South-west botanical province are susceptible to Phytophthora Dieback (DEC, 2006). Several *Phytophthora* species are present in native vegetation in the south-west of WA, the most destructive being *Phytophthora cinnamomi*. Project Dieback has created a publicly available map showing locations of soils samples with a positive reading for *Phytophthora cinnamomi* in the south-west of WA (Project Dieback, 2014a). **Figure 2.1** indicates the susceptibility of vegetation within and around the Survey Area to *Phytophthora cinnamomi*. The following BVSAs of the Project Area are rated as having high susceptibility – BVSAs 1031 and 1031.1, (dark orange colour on **Figure 2.1**). BVSAs 4.8 and 1032.1 are rated as having moderate susceptibility (light orange colour on **Figure 2.1**) while BVSA 1034 is not mapped as having high or moderate susceptibility. One positive *Phytophthora multivora* point is located within the Survey Area boundary (as of 30 June 2016) (red dot on **Figure 2.1**).
 **Figure 2.1: Vegetation susceptibility to *Phytophthora cinnamomi* dieback (Project Dieback, 2014a)**	
Phytophthora dieback continued	Priority Protection Areas (PPAs) are areas representing significant biodiverse ecosystems and communities vulnerable to Phytophthora Dieback in the south-west of WA and identified for state level Phytophthora Dieback management and investment (Project Dieback, 2014b). The goal is to protect and conserve the most significant examples of biodiverse ecosystems and communities in the south-west, which are vulnerable to or threatened by Phytophthora Dieback (Project Dieback, 2014b). **Figure 2.2** shows the PPAs within and around the Survey Area. No PPAs occur in the Survey Area. The nearest PPA is within and just adjacent to Lesueur National Park and is listed as an Uninfested High Value Landscape (orange honeycomb-shaped polygon in the top left corner of **Figure 2.2**). A 10 km buffer around this Uninfested High Value Landscape PPA lies over the Survey Area and some of the PPA Asset and Management boundaries lie over a large section of the Survey Area.

Background information on the Survey Area

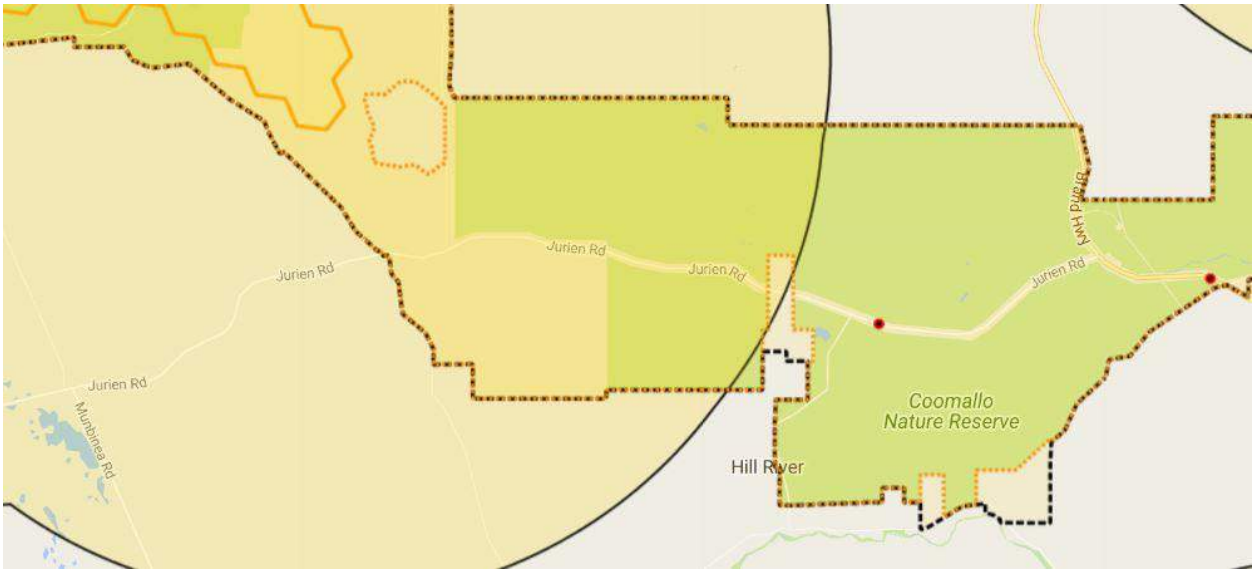

Figure 2.2: Priority Protection Areas, Assets and Management Boundaries (Project Dieback, 2014b)

2.2 RAINFALL

The closest Bureau of Meteorology (BoM) weather station to the Survey Area is Jurien Bay (BoM station number 9131) located approximately 14 km southwest of the Survey Area. Long-term (1968 to 2016 and 2007-2016) and 2016 monthly total rainfall data collected at Jurien Bay from January to September is listed in **Table 2.2** (BoM, 2016a).

Most of the yearly rainfall is typically received during June and July at Jurien Bay (**Table 2.2**) (BoM, 2016a).

Rainfall received between January and September 2016 (583.4 millimetres (mm)) was much higher than the all records and 10 year long-term means calculated for the same nine months (488.9 mm and 443.3 mm respectively).

Total rainfall in the three months before the end of April survey (February, March, April – 134.7 mm) was higher than the all records and 10 year long-term means for those three months (59.4 mm and 54.5 mm respectively).

Total rainfall in the three months before the October survey (July, August and September – 229.4 mm) was a little lower than the all records and 10 year long-term means for those three months (239.3 mm and 237.3 mm respectively). However, June 2016 rainfall was much higher than the all records mean (105.3 mm) and also the 10 year mean (80.7 mm).

Based on the rainfall data recorded in the months before the surveys and the long-term records the vegetation in the Survey Area should have been in above average condition in autumn and in average condition in spring.

Table 2.2: Actual (2016) and long-term (1968-2016) monthly rainfall (mm) at Jurien Bay (BoM, 2016a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total to end Sept
Rainfall records (mm) from Jurien Bay (Station Number 9131, 1968 - 2016)													
2016	**16.2**	**0.8**	**57.0**	**76.9**	**60.7**	**142.4**	**121.7**	**79.4**	**28.3**				**583.4**
Feb-Apr		0.8	57.0	76.9									134.7
Jul-Sept							121.7	79.4	28.3				229.4
L-t $^{68-16}$	**6.7**	**13.8**	**14.9**	**30.7**	**78.2**	**105.3**	**114.2**	**80.0**	**45.1**				**488.9**
Feb-Apr		13.8	14.9	30.7									59.4
Jul-Sept							114.2	80.0	45.1				239.3
L-t$^{07-16}$	**6.5**	**8.3**	**19.6**	**26.6**	**64.3**	**80.7**	**122.0**	**71.9**	**43.5**				**443.3**
Feb-Apr		8.3	19.6	26.6									54.5
Jul-Sept							122.0	71.9	43.5				237.3

Note: L-t $^{68-16}$ = long-term rainfall data recorded from 1968-2016; L-t $^{68-16}$ = long-term rainfall data recorded from 2007-2016 (BoM, 2016a).

BoM's rainfall deciles maps for 1 February to 30 April and 1 July to 30 September 2016 (**Figure 2.3** and **2.4**) show the Survey Area (black dot) in an area that received very much above average to above average rainfall in the three months before the autumn survey and average to below average rainfall in the three months before the spring targeted flora survey (BoM, 2016b).

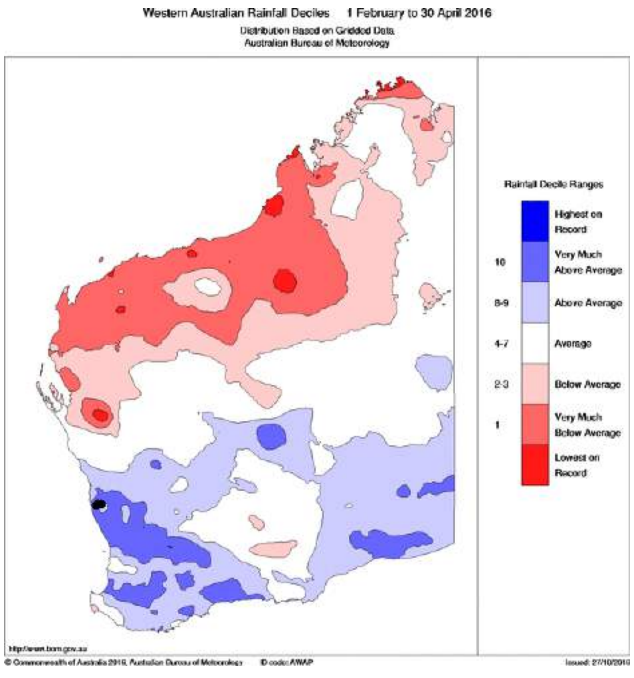

Figure 2.3: Western Australian rainfall deciles, 1 February to 30 April 2016 (BoM, 2016b)

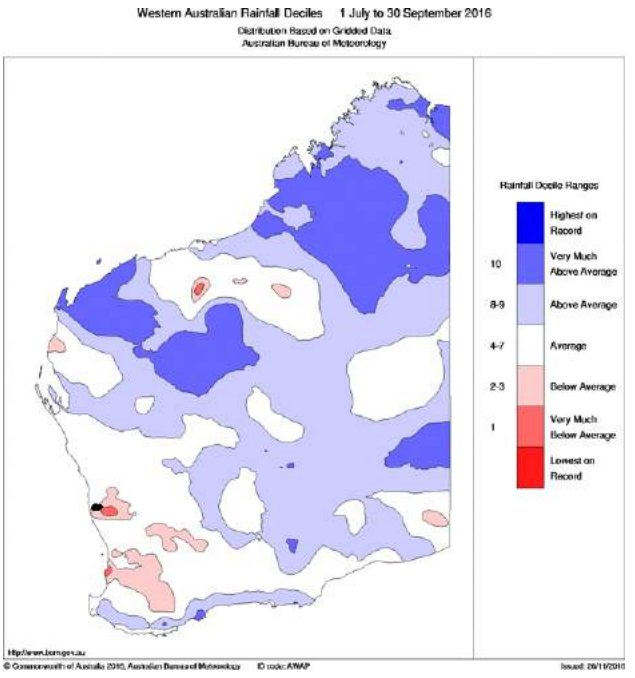

Figure 2.4: Western Australian rainfall deciles, 1 July to 30 September 2016 (BoM, 2016b)

3 METHODS –SURVEY, TAXONOMY AND VEGETATION MAPPING

3.1 FIELD SURVEY METHODS

3.1.1 Flora and Vegetation (Maia)

The survey methodology was designed to comply with the following:

- Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA and DPaW, 2015; EPA, 2016);
- EPA Position Statement 3, Terrestrial Biological Surveys as an element of Biodiversity Protection (EPA, 2002); and,
- Environmental Protection Authority (EPA) Guidance Statement 51, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004a).

Before undertaking the survey the botanists familiarised themselves with the conservation significant species produced by the database and literature searches.

A Level 1 autumn reconnaissance survey was carried out by two botanists from April 27 to April 29, 2016 (five survey days). A targeted flora survey (TFS) was carried out by two botanists from October 8 to October 13, 2016 (10 survey days).

In April 2016 the botanists assessed 27 (approximately 10 m x 10 m) relevés in the Survey Area. In October 2016 the botanists re-assessed 11 relevés (to recollect specimens from plants that were not flowering or fruiting in autumn and therefore could not be identified to species level) and walked approximately 54 km of traverses in the Survey Area. The spring follow-up survey was carried out to target the spring flowering conservation significant species listed in the results of the database searches.

Relevé locations are shown on **Map 9.4 (Section 9)** and the information collected at each is provided in **Appendix 1**. Relevé locations were chosen before the survey using aerial imagery. Relevés were placed to capture each habitat visible on the aerial imagery and with respect to pre-European vegetation and soil-landscape mapping in the Survey Area. The final placement of the relevés was selected by the botanists while carrying out the survey. The following parameters were recorded at each relevé site:

- Location details including Global Positioning System (GPS) co-ordinates (Geocentric Datum of Australia, 1994 (GDA94)).
- Site parameters such as soil description, topography and general habitat description, rock type and cover.
- A photograph of the site.
- Vegetation condition using the scale and criteria in EPA and DPaW (2015) (see **Table 3.3**).
- Notes on any disturbance to the vegetation.
- Fire history.
- A description of the vegetation structure including the height, percentage cover and dominant species within each stratum.
- The name, height, percentage cover and any other significant recording details for any other species located at the relevé.

Traverses were walked on both sides of the Jurien East Road between six to eight metres from the road pavement. Each botanist surveyed a band of intact/undisturbed vegetation approximately 5 m wide on each side of the road and the section of road shoulder between the road pavement (bitumen) to the intact/undisturbed vegetation (PCZ). Traverses were walked outside of the impact zone where each botanist surveyed a band of vegetation

approximately 10 m wide. Traverses walked in the Survey Area are shown on **Map 9.4** (**Section 9**). Conservation significant species previously located in the Survey Area, known to occur in the area and surrounds, any novel species and introduced species were targeted while walking traverses. When known or suspected conservation significant species or weeds were located the botanists recorded their location on a GPS and their numbers were either counted or estimated (if populations were too large to count). While walking traverses the botanists also: recorded information when any apparently different vegetation association was encountered while walking between sites; noted changes in vegetation condition and any disturbance to the vegetation; and, collected specimens of and recorded the names of any taxa not already collected at relevés.

3.1.2 Fauna (Western Wildlife)

The survey methodology was designed to comply with the following:

- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DPaW, 2010).
- Environmental Protection Authority (EPA) Guidance Statement 56, Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004b); and
- EPA Position Statement 3, Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002).
- EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species (DSEWPaC, 2012).

Three tree species suitable for Carnaby's Black-Cockatoo (CBC) were identified when the April 2016 survey was carried out: *Corymbia calophylla* (Marri), *Eucalyptus rudis* (Flooded Gum) and *Eucalyptus wandoo* subsp. *pulverea* (Wandoo) (DSEWPaC, 2012). Therefore, while carrying out the TFS in October, the botanists measured the diameter at breast height (DBH) of these tree species. The DBH was measured at a height of 1.5 m from ground level using DBH tapes. Locations of Flooded Gum and Wandoo trees with a DBH of 30 cm or greater and Marri trees with a DBH of 50 cm or greater were recorded using a GPS, and a photograph of each tree was taken.

The botanists also recorded hearing or seeing CBC while carrying out the TFS and made a note of the location, time and approximately how many CBC were seen.

Using the information collected in April and October a targeted fauna survey was then conducted by one zoologist on December 7, 2016 (one survey day). The survey area assessed through a combination of walking and driving the route. The primary focus of the fauna survey was a search for potential breeding, roosting or foraging habitats for CBC. In addition, all vertebrate fauna encountered were recorded, and the habitats assessed for their potential to support other fauna species of conservation significance.

CBC foraging habitat in the study area was identified by:

- Using the results of the flora and vegetation survey to determine the presence of known CBC food plants such as *Banksia* species (spp.) in each habitat.
- Assessing the prevalence of CBC food plants in each habitat during the site visit.
- Searching for evidence of CBC foraging, such as chewed *Banksia* nuts during the site visit.

Potential breeding habitat in the study area was identified by:

- Recording all Marri (*Corymbia calophylla*) and Flooded Gum (*Eucalyptus rudis*) trees with a diameter at breast height (DBH) $\geq$ 50cm and all Wandoo (*Eucalyptus wandoo*) trees with a DBH $\geq$ 30cm.
- Searching all trees identified above, for the presence of hollows of suitable size, and any evidence of current use for breeding. However, all hollows are not visible from the ground, and hollows were not assessed for depth, aspect or other characteristics that may affect usage by birds.

Potential roosting habitat in the study area was identified by:

- Searching for locations that match the roost site characteristics for CBC (e.g. large eucalypts or pines in riparian environments).
- Searching for evidence of roosting, such as scats or feathers, in any identified potential roost areas.

3.2 Database Search Methods

Information on the flora species, fauna species and ecological communities occurring in the Survey Area and surrounds was gathered from the sources listed in **Table 3.1**. The areas over which the DPaW searches were carried out are shown on **Map 9.5 (Section 9)**.

Table 3.1: Databases used or searched

Database	Reference or reference number
Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search Tool	DotEE (2016c)
Department of Parks and Wildlife's (DPaW) NatureMap	DPaW (2007-)
DPaW 's Threatened and Priority Flora database (TPFL)	Reference #12-0416FL
DPaW 's Threatened and Priority Flora List (TP)	Reference #12-0416FL
DPaW 's Threatened Fauna Databases	Reference FAUNA#5200
The Western Australian Herbarium (WA Herb)	Reference #212-0416FL
DPaW 's Threatened Ecological Communities database	Reference #14-0416EC
Co-ordinates used for EPBC Act search: the road centreline buffered by 3 km (search ref. no. PMST NCQIOY). **Co-ordinates used for NatureMap search - flora:** 30° 13' 11" S,115° 08' 26" E 30° 13' 13" S,115° 10' 17" E 30° 11' 32" S,115° 15' 52" E 30° 12' 44" S,115° 22' 04" E 30° 11' 44" S,115° 24' 04" E 30° 11' 44" S,115° 25' 50" E 30° 15' 08" S,115° 25' 55" E 30° 15' 11" S,115° 23' 55" E 30° 16' 05" S,115° 22' 13" E 30° 14' 52" S,115° 16' 00" E 30° 16' 42" S,115° 10' 30" E 30° 16' 40" S,115° 08' 29" E 30° 13' 10" S,115° 08' 26" E 30° 13' 11" S,115° 08' 26" E. **Co-ordinates used for NatureMap search - fauna:** 30° 13' 14" S, 115° 16' 38" E buffered by 25km. **Co-ordinates used for DPaW Threatened Flora, Fauna and Ecological Community searches:** The Threatened Flora search is the road centreline buffered by 2.5 km. The Threatened Fauna and Ecological Communities searches are a 20 km buffer around the following coordinates: 334984 m E and 6654244 m N (GDA94, MGA50). See the search area map for the boundaries used.	

The following lists were searched/referenced to determine whether any weeds identified in the EPBC Act Protected Matters and NatureMap searches were any of the following (Australian Government, 2016):

- Weeds of National Significance (WoNS);
- On the National Environmental Alert List;
- On the Sleeper Weed List;
- A Species Targeted for Eradication;
- A Species Targeted for Biological Control; or
- A Declared Pest (plant) in WA (DAFWA, 2016a).

The results of the database searches are discussed in **Section 4**. **Table A2.1 (Appendix 2)** lists the conservation significant flora species, **Table A2.2** the conservation significant fauna species and **Table A2.3** the weed species collated from the database searches.

3.3 Project Team

The project team and their roles are listed in **Table 3.2**.

Table 3.2: Project team

Project team			
Name	**Qualification**	**Project role**	**DPaW flora / DRF licence numbers**
Christina Cox	PhD	Report	Not applicable
Scott Hitchcock	BSc	Senior Botanist - report and field survey	SL011785 / 07-1617
Rochelle Haycock	BSc	Senior Botanist - report and field survey	SL011786 / 127-1516
Cate Tauss	BSc Hons.	Taxonomist	Not applicable
Jenny Wilcox	BSc Hons.	Zoologist (Western Wildlife) – report and field survey	Not applicable

3.4 Plant Taxonomy and Nomenclature

At least one specimen of every taxon encountered during the April and October 2016 surveys was collected for taxonomic verification in Perth. In many cases multiples of flowering or fruiting specimens were collected to assist with identification or to differentiate between priority and non-priority subspecies. Cate Tauss (consultant taxonomist) identified specimens collected from the Survey Area using relevant taxonomic keys and reference specimens at the WA Herbarium; she also liaised with relevant experts at the WA Herbarium as necessary.

Species names used in this report are those adopted by the WA Herbarium (WAH) and they have been checked against current FloraBase records (WAH, 1998-). Undescribed species are referred to in the report and listed in the species list as “sp.” (species).

3.5 Vegetation Mapping

Aerial photography on Landgate Slip Enabler and captured in October 2015 was used to map the vegetation types at a scale of 1:1,000 in ArcGIS 10.4.1.

Notes made by the botanists while carrying out the survey were used to delineate the boundaries of each type. Statistical analyses were not carried out to define the vegetation types of the Survey Area.

Vegetation types were described according to the dominant species in each structural class and using the current National Vegetation Information System (NVIS) methodology at the association level (Level 5). At this level up to three strata and a maximum of three taxa per stratum are used to describe the association (Executive Steering Committee for Australian Vegetation Information (ESCAVI), 2003). The NVIS structural formation terminology is outlined in **Appendix 3**; it utilises growth forms **(Table A3.1)**, height classes **(Table A3.2)** and foliage cover characteristics **(Table A3.3)**.

Vegetation type descriptions included in site sheets **(Appendix 1)** use the sub-association level (Level 6), where up to eight sub-strata and a maximum of five taxa per stratum are used to describe the sub-association (ESCAVI, 2003).

3.6 Vegetation Condition

Vegetation condition was mapped using data collected from relevés and notes recorded while walking traverses. Field assessments of vegetation condition were updated as necessary once the plant identifications had been confirmed and the number, ecological impact and invasiveness ratings of the weed species determined (DPaW, 2016b). The vegetation condition scale used is that for the South West and Interzone Provinces indicated in EPA and DPaW (2015) and included in **Table 3.3**.

Table 3.3: Vegetation condition scale (EPA and DPaW, 2015)

Vegetation condition	South West and Interzone Botanical Provinces
1	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
2	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
3	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
5	
6	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
7	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

3.7 Impacts

3.7.1 Conservation Significant Flora and Potential Carnaby's Black-Cockatoo Breeding Habitat

Impact estimated to CSF located in the proposed clearing zone (PCZ) are Maia's best estimates based on publicly available information sourced from FloraBase and the results of the two surveys conducted by Maia in April and October 2016. Impacts are likely to be lower than the percentages stated in the report because only 8% of the vegetation within the Study Area but outside the boundary of the PCZ was assessed compared with 100% of the vegetation of the PCZ.

CSF and potential CBC breeding tree locations were intersected with the PCZ using ArcGIS 10.4.1 to determine impacts to CSF and potential CBC trees.

3.7.2 Vegetation

The latest aerial imagery available to Maia is the WA Now Mosaic aerial photograph captured in October 2015 and downloaded from Landgate SLIP imagery. Since October 2015 the Shire of Dandaragan has carried out routine

maintenance in the existing road shoulder and these changes are not visible on the aerial imagery. Therefore the actual clearing extent along the road could be further from the centreline than indicated. The road was surveyed by surveyors in April 2016 and Maia conducted their surveys for the Shire in April and October 2016.

Maia was provided with non-georeferenced DWG CAD files by the Shire of Dandaragan's engineering consultants. The DWG polyline file was georeferenced in Jurien Coastal Grid 94. The CAD programs used to generate these files do not export DWG files with a georeferenced or world file. Maia georeferenced and spatially adjusted the polylines using the affine transformation in ArcGIS by using five survey markers provided in the CAD file with Landgate's geodetic survey markers. Some sections of the PCZ vegetation, the assumed current clearing extent and road centreline do not align exactly with the WA Now Mosaic aerial imagery because of the angle at which the imagery was captured. The vegetation extent polyline is broken in some places and some sections of the PCZ extend beyond the known vegetation extent in these areas.

In order to estimate as accurately as possible the area of intact native vegetation to be cleared, the road corridor clearing extent (mapped by Maia using the October 2015 imagery) was buffered by 1 m on both sides of the road to allow for the mulching that has been carried out in the road corridor but which cannot be seen on the aerial imagery. The native vegetation mapped within the 1 m buffer was considered to be already cleared.

In addition to this, in order to more accurately calculate the area of high quality CBC foraging habitat to be impacted by the proposal, in May 2017 Maia walked the current clearing boundary (i.e. the boundary of routinely cleared vegetation with undisturbed native vegetation) in areas where high value CBC foraging habitat was mapped. Sections where there were large gaps in the vegetation extent polyline were also walked.

4 RESULTS – DATABASE SEARCHES

4.1 CONSERVATION SIGNIFICANT FLORA

Conservation significant flora species produced by the database and literature searches are listed in **Table A2.1 (Appendix 2)** and their locations are shown by rank on **Map 9.6 (Section 9).**

4.1.1 Threatened Flora

4.1.1.1 COMMONWEALTH *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999*

Some flora species are protected by Australian Government legislation based on the perceived levels of threat to the species population at a national level. These species are placed within one of six conservation categories **(Table A4.1, Appendix 4)** and four of these categories are specially protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DotEE, 2016d).

The results of a search carried out using the EPBC Act Protected Matters Search Tool (DotEE, 2016c) listed 25 threatened species or the species habitat either likely to or that may occur within the search area **(Table A2.1, Appendix 2)**. One of the species listed as Endangered – *Thelymitra stellata* - has a record within 170 m of the centreline of the Jurien East Road but it is not within the Survey Area **(Map 9.6, Section 9)**.

4.1.1.2 WESTERN AUSTRALIAN *WILDLIFE CONSERVATION ACT 1950*

In WA a number of species are protected by the *Wildlife Conservation Act 1950* (WC Act) the term Threatened Flora is applied to extant Declared Rare Flora (DRF) and Presumed Extinct Flora to presumed extinct DRF. These species are listed under Schedule 1 and 2 of the WC Act and the most recent threatened flora/DRF list was published on January 6, 2017 (Government of Western Australia (GoWA), 2017). Extant threatened flora species can be listed as critically endangered, endangered or vulnerable (DPaW 2015a and defined in **Table A4.2, Appendix 4**).

In October 2016, 86 threatened flora species were listed as occurring in the Geraldton Sandplains bioregion and 60 in the Lesueur Sandplain subregion (WAH, 1998-).

The results of the search carried out using NatureMap (DPaW, 2007-) listed 10 threatened species protected by the WC Act with records in the search area **(Table A2.1, Appendix 2)**. One of the species (listed as Endangered) has a record on the boundary of the Jurien East Road reserve **(Map 9.6, Section 9)** – *Thelymitra stellata*.

4.1.2 Priority Flora

Because of the large WA flora, many species are known from only a few collections, or a few sites, and have not been adequately surveyed or are adequately known are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened list for other than taxonomic reasons and these species can be placed on a priority species list (listed as Priority (P) 1 to 4). Categories and definitions for priority flora species are included in **Table A4.3 (Appendix 4)**.

The most recent Threatened and Priority Flora List was published on March 8, 2017 (Smith, 2017).

In March 2017, 509 priority flora species were listed on FloraBase as occurring in the Geraldton Sandplains bioregion and 302 in the Lesueur Sandplain subregion (WAH, 1998-).

When all database search results were collated with the results of DPaW search reference number 12-0416FL, 51 priority flora species were listed as having records within approximately 3 km of the Survey Area: three of these were Priority (P) 1 species, nine are P2 species, 22 are P3 species and 17 are P4 species **(Table A2.1, Appendix 2).**

Six priority species have been recorded previously within the Jurien East Road reserve – *Synaphea lesueurensis* (P2), *Drosera marchantii* subsp. *prophylla* (P3), *Haemodorum loratum* (P3), *Synaphea endothrix* (P3), *Grevillea rudis* (P4) and *Thysanotus glaucus* (P4) **(Map 9.6, Section 9)**.

4.2 Conservation Significant Fauna (Western Wildlife)

Conservation significant fauna species produced by the database and literature searches are listed in **Table A2.2 (Appendix 2)** and shown on **Map 9.7 (Section 9).**

4.2.1 Threatened Fauna

4.2.1.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Fauna species regarded as threatened, or listed as migratory, are protected under the EPBC Act as "Matters of National Environmental Significance". Threatened fauna are placed within one of six conservation categories **(Table A4.1, Appendix 4)** of which four categories are specially protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DotEE, 2016d). Migratory species listed under the EPBC Act are those recognised under international agreements. These agreements are the China-Australia Migratory Bird Agreement (CAMBA), the Japan-Australia Migratory Bird Agreement (JAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA), or species listed under the Bonn Convention for which Australia is a range state.

The results of a search carried out using the EPBC Act Protected Matters Search Tool (DotEE, 2016c) listed 24 threatened/migratory species or the species habitat either likely to or that may occur within the search area **(Table A2.2, Appendix 2)**. Of these, three are listed as Critically Endangered, four as Endangered, three as Vulnerable and the remainder as Migratory Species Protected under an International Agreement (IA). Note that not all these species are likely to occur in the survey area, as their habitat requirements are not met or are known to be locally extinct.

4.2.1.2 Western Australian *Wildlife Conservation Act 1950*

The WC Act is State legislation for fauna protection administered by DPaW. Fauna species specially protected under the WC Act include threatened species (Critically Endangered - Schedule 2, Endangered – Schedule 3 or Vulnerable – Schedule 4), Migratory Birds Protected under an International Agreement (Schedule 5), Other Specially Protected Fauna (Schedule 6) and Conservation Dependent Fauna (Schedule 7) **(Table A4.2, Appendix 4)**.

The most recent Wildlife Conservation (Specially Protected Fauna) Notice was published on January 6, 2017 (GoWA, 2017).

The database searches indicate that 28 fauna species listed under the WC Act have been recorded in the vicinity of the Survey Area **(Table A2.2, Appendix 2)**. Of these, one is listed as Critically Endangered, two as Endangered, eight as Vulnerable and one as Other Specially Protected Fauna. The remaining species are listed as Migratory Birds Protected under an IA, and some threatened fauna are listed as IA in addition to their ranking as threatened species. Note that not all these species are likely to occur in the survey area, as their habitat requirements are not met or are known to be locally extinct.

4.2.2 Priority Fauna

In WA, DPAW maintains a Priority Fauna List consisting of species that are not considered to be threatened under State or Commonwealth Acts, but are poorly known, under-represented in the conservation estate or considered conservation dependent. Categories and definitions for priority fauna species are included in **Table A4.3 (Appendix 4)**.

The most recent Priority Fauna List was published by DPaW on January 6, 2017 (DPaW, 2017). The database search results indicated that four Priority fauna species have been recorded in the vicinity of the survey area **(Table A2.2, Appendix 2)**. These include two invertebrates, a bird and a mammal. One species is Priority 3; a native bee (*Hylaeus globuliferus*), and the remainder are Priority 4; the Graceful Sunmoth (*Synemon gratiosa*), Hooded Plover (*Charadrius rubricollis*) and Western brush wallaby (*Macropus irma*).

4.3 Introduced Flora

4.3.1 Weeds of National Significance

A number of lists of weeds of national interest are currently recognised (e.g. Weeds of National Significance list, WoNS). The nature of the weeds and the resulting actions required for their control determine on which list a weed species may appear. Some weeds are of particular concern and, as a result, have been listed for priority management or in legislation. The weed lists are available on the Australian Government's website (Australian Government, 2016). These lists are: WoNS, National Environmental Alert, Sleeper Weeds, Six Species Targeted for National Eradication and Species Targeted for Biological Control.

- Three WoNS were listed in the Protected Matters Search Tool results – *Asparagus asparagoides*, *Chrysanthemoides monilifera* and *Tamarix aphylla*. *Genista* sp. x *Genista monspessulana* was also listed in the EPBC Act Protected Matters Search Tool results and *Genista monspessulana* is a WoNS. None of these species were listed in the NatureMap search results as actually having records within 3 km of the Survey Area **(Figure A2.1, Appendix 2)**.
- *Asparagus asparagoides* and *Chrysanthemoides monilifera* are listed as species targeted for biological control.

4.3.2 Plant Pests Declared in Western Australia

To protect WA agriculture DAFWA regulates harmful plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA, 2016a). Under the BAM Act all declared pests are placed in one of three control categories and these are explained in **Table A5.1, Appendix 5** (DAFWA, 2016b).

- Three Declared Pest plants were listed in the results of the EPBC Act Protected Matters Search Tool search as potentially having habitat in the search area - *Asparagus asparagoides, Chrysanthemoides monilifera* and *Tamarix aphylla*. *Asparagus asparagoides* and *Tamarix aphylla* are categorized as C3 pests and *Chrysanthemoides monilifera* is categorized as a C1 pest.
- No declared plants were listed in the results of the NatureMap search (DPaW, 2007-).

4.3.3 Environmental Weeds

The NatureMap search (DPaW, 2007-) listed 45 weed species with records in the search area. The EPBC Protected Matters Search Tool (DotEE, 2016c) listed four weed species (additional to the WoNS noted above) or the species' habitat which may occur within the search area **(Table A2.3, Appendix 2)**.

DPaW prioritises weeds in each region based on their invasiveness, ecological impact, potential and current distribution and feasibility of control. The resulting priorities focus on weeds considered to be high impact, rapidly invasive and still at a population size that can feasibly be eradicated or contained to a manageable size. Summaries of the species' ecological impact and invasiveness rankings are provided to help landholders, community groups and private enterprises manage weeds that might impact on the natural environment (DPaW, 2016b). Current regional impact and invasiveness ratings for the different regions are available on DPaW's website (DPaW, 2016b).

The Midwest region impact and invasiveness ratings ((DPaW, 2016b) for all weed species listed in the search results are presented in **Table A2.3, Appendix 2**. Eighteen of these weed species have a high ecological impact and a rapid invasiveness.

4.4 Threatened and Priority Ecological Communities

Some ecological communities are protected by Australian Government legislation (the EPBC Act) based on the perceived levels of threat to the community or species population at a national level. They are listed as threatened ecological communities – TECs – and can be listed as Critically Endangered, Endangered or Vulnerable. The list of communities is available on the Department of Environment and Energy website.

- One federally protected TEC was listed in the EPBC Act Protected Matters Search Tool results (DotEE, 2016c). The Banksia Woodlands of the Swan Coastal Plain ecological community was listed as Endangered on 16 September 2016 (DotEE, 2016e) and the search results indicated that community is likely to occur in the database search area (**Figure A2.3, Appendix 2**). Its distribution is shown in **Figure A2.3, Appendix 2**.

Some TECs are informally listed as significant in WA. The WA Minister for Environment may list an ecological community as being threatened if the community is presumed to be totally destroyed or at risk of becoming totally destroyed. Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on a priority list and are referred to as priority ecological communities (PECs; listed as Priority 1 to 5). The criteria and categories for TECs and PECs are detailed in **Table A4.4, A4.5** and **A4.6** in **Appendix 4**.

The most recent TEC list is correct to October 6, 2016 and includes four TECs listed for the Geraldton Sandplains bioregion (DPaW, 2016d).

- Two TECs were listed in the results of the DPaW ecological community search carried out over the database search area (reference 14-0416EC) - 'Lesueur-Coomallo Floristic Community D1 (Species-rich low heath dominated by *Allocasuarina microstachya*)' (Critically Endangered TEC) and 'Lesueur-Coomallo Floristic Community A1.2 (Species-rich heath with emergent *Hakea obliqua*)' (Endangered TEC). These TECs are not mapped in the Survey Area; the closest location is 5.5 km north of the Survey Area (**Map 9.8, Section 9**).

The most recent PEC list is dated November 30, 2016 (DPaW, 2016c) and includes 109 PECs listed in DPaW's Midwest region.

- Three PECs were listed in the results of the DPaW ecological community search carried out over the database search area (reference 14-0414EC) - 'Lesueur-Coomallo Floristic Community DFGH' (P1 PEC), 'Lesueur-Coomallo Floristic Community M2 (*Melaleuca preissiana* woodland)' (P1 PEC) and '*Petrophile chrysantha* low heath on Lesueur dissected uplands (Gp200-170)' (P2 PEC). These three PECs are not mapped in the Survey Area; the closest location is 14 km north of the Survey Area (**Map 9.8, Section 9**).

However, this search was carried out in April 2016, and the most recent PEC list includes another PEC in the Midwest that could be relevant to the Survey Area:

- Banksia dominated woodlands of the Swan Coastal Plain IBRA region, listed as a Priority 3(iii) PEC in WA (and as and Endangered TEC under the EPBC Act).

5 Results - Survey

5.1 Coverage Achieved over Survey Area

Coverage achieved in the Survey Area is listed in **Table 5.1**. Both sides of the road were assessed between Cockleshell Gully Road (SLK24) to Brand Highway (SLK0). The width of vegetation that could be potentially impacted by the proposed works was assessed on both sides of the road. The road shoulder was surveyed (from the road pavement (bitumen) to the intact/undisturbed vegetation) along with approximately 5 m of the intact/undisturbed vegetation (i.e. the PCZ). In addition to this, approximately 30.62 ha and 30.62 km of additional traverses were walked in the Survey Area away from the PCZ. Twenty-seven relevés were assessed in April 2016 and 11 of them were re-assessed in October 2016.

Table 5.1: Coverage Achieved

Date	Attribute	Area (ha) / Length (km)	Coverage achieved in proposed clearing zone (%)	Coverage achieved via additional traverses within Survey Area (%)
April and October 2016	Relevés – 27 assessed	-	-	-
October 2016	Traverses along roadside (in PCZ)	26.20 / 23.82	100	-
	Additional traverses (outside of PCZ but within Study Area)	30.62 / 30.62	-	7.50

5.2 Flora

5.2.1 General Flora

Summary information collated on the flora of the Survey Area is included in **Table 5.2** and a list of the flora taxa recorded is included as **Table A6.1, Appendix 6**.

Table 5.2: General flora of the Survey Area

Factor	April 2016	October 2016	Total for both surveys
Number of taxa	230	272	419
Number of families	41	57	62
Number of genera	109	150	183
Perennials (%)	97.39	79.78	86.40
Annuals (%)	2.61	20.22	13.60
Flowering (%)	17.83	63.97	45.11
Fruiting (%)	31.74	14.34	18.62
Flowering and fruiting (%)	7.83	13.60	15.51
All reproductive material (%)	57.39	91.91	79.24
Most common families	Proteaceae (44 taxa), Myrtaceae (36 taxa) and Fabaceae (34 taxa)	Myrtaceae (28 taxa), Proteaceae (26 taxa), Fabaceae (22 taxa)	Proteaceae (53 taxa each), Myrtaceae (52 taxa), Fabaceae (49 taxa)
Most common genera	*Banksia* (16 taxa), *Hakea* (12 taxa), *Acacia* (nine taxa)	*Stylidium* (17 taxa), *Drosera* (11 taxa), *Acacia, Lechenaultia* and *Verticordia* (six taxa each)	*Stylidium* (18 taxa), *Banksia* (17 taxa), *Drosera* (13 taxa)

The identities of 26 taxa could not be confirmed beyond genus due to a lack of flowering or fruiting material – *Acacia* ?*stenoptera*, *Allocasuarina* sp., *Brachyscome* sp., *Caladenia* sp., *Desmocladus* sp., *Drosera* ?*pallida*, *Drosera* ?*parvula*, *Gastrolobium* sp., *Hibbertia* ?*rupicola*, *Hypolaena* sp., *Jacksonia* ?*restioides*, *Jacksonia* sp., *Labichea* sp., *Lepidosperma* ?*squamatum*, *Leptomeria* ?*preissiana*, *Lomandra* sp., *Scaevola* sp., *Senecio* sp., *Stenanthemum* sp., *Stylidium* ?*diuroides*, *Stylidium* ?*miniatum*, *Stylidium* ?*piliferum, Synaphea* sp., *Thysanotus* ?*thyrsoideus*, *Verticordia* sp., *Wahlenbergia* ?*preissii*. However, four of these taxa were not included in the counts, as they are likely to be species already in the species list: *Acacia* ?*stenoptera*, *Stylidium* ?*diuroides*, *Stylidium* ?*miniatum* and *Stylidium* ?*piliferum*. A fifth species has also not been included in the counts - *Acacia pulchella* – which was collected in April when it wasn't in flower and it is likely to be one of the two *A. pulchella* varieties already in the species list (*Acacia pulchella* var. *glaberrima* and *A. p*. var. *pulchella*).

5.2.2 Range Extensions

Species have a typical range which is indicated by their known distribution records. Sometimes species are recorded during a survey, which have not been located previously in the area; these species are described as range extensions. In many cases a range extension reflects a lack of surveys in a particular area or submissions of flora records to the WA Herbarium rather than a true range extension.

Using 100 km as the minimum distance from an existing record to define a range extension, three range extension species were collected from the Survey Area **(Table 5.3)**.

Table 5.3: Range extension species located in the Survey Area

Species	Closest WAH (1998 -) record from Survey Area	Distance and direction from Survey Area
**Gladiolus caryophyllaceus*	Gabalong (Avon Wheatbelt bioregion)	110 km south-east
Scholtzia spatulata	Useless Loop, Kalbarri (Geraldton Sandplains)	305 km north
Stylidium diversifolium	Armadale (Jarrah Forest bioregion)	235 km south-south east

5.2.3 Conservation Significant Flora

The following conservation significant flora species were located in the Survey Area:

- One species protected by the EPBC Act and WC Act was recorded in the Survey Area – *Thelymitra stellata* (listed as Endangered under both acts).
- Fourteen confirmed priority species were located in the Survey Area: *Grevillea amplexans* subsp*. adpressa* (P1), *Acacia retrorsa* (P2), *Synaphea lesueurensis* (P2), *Synaphea sparsiflora* (P2), *Drosera marchantii* subsp. *prophylla* (P3), *Haemodorum loratum* (P3), *Lechenaultia juncea* (P3), *Lepidobolus quadratus* (P3), *Patersonia argyrea* (P3), *Synaphea endothrix* (P3), *Thysanotus vernalis* (P3), *Eucalyptus macrocarpa* subsp*. elachantha* (P4), *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) and *Xanthosia tomentosa* (P4).
- One potentially significance taxon (*Synaphea* sp.) was collected from the Survey Area - see **Section 5.2.4**.

Descriptions for and photographs of the confirmed conservation significant flora (CSF) species are included in **Table 5.5**. Their locations are shown on **Maps 9.11 to 9.32, Section 9**. A legend for this series of maps is included as **Map 9.9, Section 9** and an overall map reference map as **Map 9.10**.

The coordinates, SLKs and distances for the CSF species from the Jurien East Road centreline have been supplied to the Shire of Dandaragan as a separate document. The number of plants of each CSF species located in the Survey Area is included in **Table 5.4** along with the number of plants within the PCZ and in culverts.

Table 5.4: Number of plants of conservation significant species recorded in the Survey Area

Column 1	2	3	4	5	6	7	8		9
Species	Rank	FloraBase records (estimate of number of plants)	Maia records within Survey Area	Maia records outside Survey Area	Total	DPaW record within Survey Area	Within proposed clearing zone (PCZ)		In a culvert
							Ch 0 -7 km	Ch 7-23.8 km	
Thelymitra stellata	T	23 (122)	19	0	141	0	0	0*	0
Grevillea amplexans subsp. *adpressa*	P1	4 (8)	3	0	11	0	0		0
Acacia retrorsa	P2	29 (179)	7	0	186	0	0	2	0
Synaphea lesueurensis	P2	16 (250)	43	0	293	0 (discount as record is near Maia records)	0		0
Synaphea sparsiflora	P2	16 (291)	48	0	339	0	0	29	0
Drosera marchantii subsp. *prophylla*	P3	24 (810)	17	4	831	1	0		0
Haemodorum loratum	P3	21 (94)	242	2	338	1	1	10	4
Lechenaultia juncea	P3	21 (233)	1	0	234	0	0		0
Lepidobolus quadratus	P3	45 (45+)	8	0	53+	0	0		0
Patersonia argyrea	P3	10 (46)	28	0	74	0	0	6	0
Synaphea endothrix	P3	14 (77)	63	8	148	0 (record is near Maia records)	1	0	0
Thysanotus vernalis	P3	11 (11)	100	0	111	0	0	2	0
Eucalyptus macrocarpa subsp. *elachantha*	P4	54 (54+)	1	0	55+	0	0		0
Grevillea rudis	P4	65 (65+)	10	0	75+	0 (plants not found)	0 (plants not found)		0
Hemiandra sp. Watheroo (S. Hancocks 4)	P4	44 (44+)	5	0	49+	0	0	2	0
Thysanotus glaucus	P4	24 (64)	1	65	130	0 (plants not found)	0 (plants not found)		0
Xanthosia tomentosa	P4	49 (4,055)	239	0	4,294	0	0		0
Synaphea sp.	PST	-	2	0	2+	0	0		0

Note: Column 2: T = Threatened Flora species, P1-P4 = Priority 1 to Priority 4 Flora species, PST = Potentially Significant Taxon. Column 3: Florabase records = estimated number of plants from current records on FloraBase (WAH, 1998-). Column 5: Maia records outside Survey Area = number of additional plants located during the surveys along Jurien East Road outside of the Survey Area. Column 3 and column 6: FloraBase records and Total plant numbers have been estimated only for those species with 24 or fewer FloraBase records or that occur in the proposed clearing zone (FloraBase records for *Synaphea* sp. have not been estimated as it could be one of two species and it will not be impacted by the proposed clearing). Column 6: Total = column 3+ column 4 + column 5. Column 7: DPaW record within Survey Area = DPaW search reference #12-0416FL. Column 8: Ch = chainage, * = the plants are not within the proposed clearing zone; however, the proposed clearing zone will intersect the 50 m threatened flora buffer.

5.2.4 Potentially Significant Taxon

One potentially significant taxon (PST) was recorded in the Survey Area. A specimen determined to be a *Synaphea* sp. was collected from one location. The specimen is taxonomically similar to *S. quartzitica* and *S. xela*. A fruiting specimen was collected; however, flowers are needed to confirm its identity.

Synaphea quartzitica is currently listed as a threatened species under both the EPBC Act (Endangered) and WC Act (Endangered) while *S. xela* is currently listed as a Priority 2 species. *S. xela* has records within 3 km of the Survey Area while the closest record for *S. quartzitica* is approximately 55 km from the junction of Brand Highway with Jurien Road East and, based on their known distribution and the geology of the Survey Area, the specimen collected is more likely to be *S. xela* than *S. quartzitica*.

Synaphea sp. was recorded at one location (2 plants) in the Survey Area **(Map 9.18, Section 9)**. The plants were located on a sandy lateritic hill and they were fruiting in October 2016.

Scanned specimen

Table 5.5: Conservation significant flora species located in the Survey Area

<table>
<tr><th>Species description and habitat</th><th colspan="2">Photographs</th></tr>
<tr><td>Thelymitra stellata (T) - Orchidaceae

A terrestrial orchid growing to 25 cm high on a robust stem. It has up to six symmetrical flowers, 2.5–3 cm in diameter. The flowers are usually golden brown but may be yellow with orange stripes on the sepals and petals. The flowers have a broad column and its hood is fringed and is usually bright orange. A single, lily-like leaf (up to 9 cm long and 4 cm wide) clasps the base of the stem. The plants flower from late September to early November and grow in gravelly loam among low scrub in Jarrah (Eucalyptus marginata) and Wandoo (Eucalyptus wandoo) woodland, and in low heath on lateritic hill tops (Brown, Thomson-Dans & Marchant, 1998).

The plants were in flower in October 2016 and were growing on lateritic rises.</td><td> 
Growth habit</td><td> 
Close-up of flower</td></tr>
<tr><td>Grevillea amplexans subsp. adpressa (P1) - Proteaceae

A spreading shrub growing from 1 to 2 m high and 1.5 m wide. Its branches and lower leaf surfaces are hairy and it produces white-cream flowers from August to October. It grows in yellow sand or loam and on dunes and road verges (WAH, 1998-).

The plants were growing on the sandy footslopes and sandy laterite midslopes in the Survey Area and they were flowering and fruiting in October 2016.</td><td colspan="2"> 
Pressed specimen</td></tr>
</table>

Species description and habitat	Photographs	
***Acacia retrorsa* (P2) - Fabaceae** A prostrate, sprawling shrub growing from 0.05 to 0.5 m high and 0.4 to 2 m wide. Yellow flowers are produced from August to September and the species grows in grey sand and lateritic gravel and sandy loam (WAH, 1998-). The plants were found on sandy lateritic hills in the Survey Area and they were fruiting in October 2016.	 **Growth habit**	 **Close-up of phyllodes and stem**
***Synaphea lesueurensis* (P2)** A shrub growing from 0.25 to 0.6 m high and that flowers from August to October. It is found growing on laterite, sandy soils over laterite of sandstone and on hillslopes (WAH, 1998-). The plants were found on sandy lateritic hills in the Survey Area and they were flowering in October 2016.	 **Growth habit**	 **Close-up of leaves and flowers**

Species description and habitat	Photographs
Synaphea sparsiflora (P2) - Proteaceae A shrub growing to 0.6 m high and 1 m wide. It produces yellow flowers from August to September and grows in sandy loam over laterite (WAH, 1998-). The plants were found on sandy lateritic hills and on sandy hills in the Survey Area and they were flowering and fruiting in October 2016. Photography by R. Butcher & S.J. Patrick. Image used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Wednesday, 7 December 2016.	
***Drosera marchantii* subsp. *prophylla* (P3) - Droseraceae** It is an erect, tuberous, perennial herb growing from 0.1 m to 0.3 m high. It produces white flowers from June to July and tends to grow on laterite-silica sand soils and on hilltops (WAH, 1998-). The plants were found on sandy lateritic hills and sandy hills in the Survey Area and they were flowering in October 2016. Photography by S.J. Patrick. Images used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Wednesday, 7 December 2016.	

Species description and habitat	Photographs	
***Haemodorum loratum* (P3) - Haemodoraceae** *H. loratum* is a bulbaceous, perennial herb, growing from 0.45 to 1.2(-2) m high. Its flowers are black/brown-black/green and they are produced in November. It is found growing in grey or yellow sand and gravel (WAH, 1998-). The plants were flowering in October 2016 and they were found on the sandy footslopes and sandy lateritic hills of the Survey Area.	 **Stem base and leaves**	 **Flowers**
***Lechenaultia juncea* (P3) - Goodeniaceae** Reed-like leschenaultia is a grass-like, erect perennial herb or shrub growing to 0.5 m high. Its flowers are blue and they are produced from November to December. It is found growing in white, grey or yellow and sandy gravel (WAH, 1998-). The plants were flowering in October 2016 and they were found on the sandy hills of the Survey Area. Photography by I.R. Dixon & S.J. Patrick. Images used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Thursday, 1 December 2016.	 **Growth habit**	 **Close-up of flower**

Species description and habitat	Photographs	
***Lepidobolus quadratus* (P3) - Restionaceae** It is a rhizomatous, caespitose perennial, herb (sedge-like), growing from 0.15 to 0.3 m high. Its flowers are brown/red and are produced from August to September. It is found growing on lateritic gravel, grey/white sand and in dry kwongan vegetation (WAH, 1998-). The plants were flowering in October 2016 and they were found on the sandy laterite hills of the Survey Area. Photography by M. Hancock & K.A. Meney. Images used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Thursday, 1 December 2016.	 **Growth habit and flowers (WAH, 1998 -)**	 **Close-up of stems (WAH, 1998 -)**
***Patersonia argyrea* (P3) - Iridaceae** It is a rhizomatous, tufted perennial, herb (sedge-like), growing to 0.4 m high. Its flowers are violet-purple or other colours and they are produced from September to November. It is found growing on grey sand and lateritic gravel (WAH, 1998-). The plants were flowering in October 2016 and they were found on the sandy laterite hills of the Survey Area.	 **Growth habit**	 **Close-up of flower**

<table>
<tr><th>Species description and habitat</th><th colspan="2">Photographs</th></tr>
<tr><td>Synaphea endothrix (P3) - Proteaceae

An erect, clumped shrub growing to 0.6 m in height. The flowers are yellow and are produced from August to September (WAH, 1998-).

It is found on gravelly loam, sand and on lateritic rises (WAH, 1998-).

The plants were flowering and fruiting in October 2016 and they were found on the sandy lateritic hills of the Survey Area.</td><td colspan="2"> 
Scanned specimen</td></tr>
<tr><td>Thysanotus vernalis (P3) - Asparagaceae

A perennial herb with tuberous roots growing to 0.3 m high. It produces purple flowers from September to October and tends to grow on sandy loam soils (WAH, 1998-).

The plants were flowering in October 2016 and they were found on the sandy hills and sandy lateritic hills of the Survey Area.</td><td> 
Growth habit</td><td> 
Close-up of leaves and flowers</td></tr>
</table>

<table>
<tr><th>Species description and habitat</th><th colspan="2">Photographs</th></tr>
<tr><td>Eucalyptus macrocarpa subsp. elachantha (P4) - Myrtaceae

Small-leaved Mottlecah is a spreading or sprawling mallee growing from 0.8 to 4 m high. Its bark is smooth and grey over salmon pink. The flowers are red-pink and are produced from August to September or November to December (WAH, 1998-).

It is found on white or grey sand over laterite on hillslopes, ridges and sandplains (WAH, 1998-).

The plants were fruiting in October 2016 and they were found on the sandy lateritic hills of the Survey Area.

Photographs: Centre for Plant Biodiversity Research (2006).</td><td> 
Growth habit</td><td> 
Close-up of flower and leaves</td></tr>
<tr><td>Hemiandra sp. Watheroo (S. Hancocks 4) – (P4) Lamiaceae

Hemiandra are rigid shrubs bearing essential oils. They usually growing to between 0.1-1.0 m high.

The plants were flowering in October 2016 and they were found on the footslopes and midslopes of lateritic uplands with a surface layer of white to grey sand in the Survey Area.</td><td colspan="2"> 
Scan of specimen</td></tr>
</table>

Species description and habitat	Photographs	
***Xanthosia tomentosa* (P4)** Lesueur Southern Cross is a prostrate to ascending perennial herb growing to 0.9 m high. The white-cream-pink flowers are produced from September to December. This species grows on lateritic gravelly soils (WAH, 1998 -). The plants were flowering in October 2016 and were located on sandy lateritic hills in the Survey Area.	 **Growth habit**	 **Close-up of flower**

5.2.5 Introduced Flora

5.2.5.1 NATIONAL WEEDS LISTS

- No weeds on any of the national weeds lists were recorded at the Survey Area.

5.2.5.2 PLANT PESTS DECLARED IN WESTERN AUSTRALIA

- One plant species declared as a pest in WA was recorded at the Survey Area – *Echium plantagineum* (Patterson's Curse / Salvation Jane), which is declared as a C3 (Management) pest in many shires in WA including in the Shire of Dandaragan.

5.2.5.3 ENVIRONMENTAL WEEDS

Thirty-seven environmental weed species were located in the Survey Area. These species are listed in **Table 5.6** along with their Midwest region impact and invasiveness ratings (DPaW, 2016b); 12 of the 38 weed species located have a high ecological impact and a rapid invasiveness.

The locations of these weed species are shown on **Maps 9.11 to 9.32, Section 9**. *Gladiolus caryophyllaceus i*s considered to be range extension of 110 km. Thirteen of the 38 species were listed in the database search results and have been recorded in the surrounding area (in bold font in **Table 5.6**). The locations have been supplied to the Shire of Dandaragan electronically but are not included as an appendix in this report.

Table 5.6: Weed species located in the Survey Area and DPaW Midwest ratings

Species (Common name)	Rank	Ecological impact	Invasiveness
Echium plantagineum (Patterson's Curse/Salvation Jane)	Declared Plant (C3) in the Shire of Dandaragan	High	Rapid
Aira caryophyllea (Silver Hair-grass)	EW	High	Rapid
***Arctotheca calendula* (Capeweed)**	**EW**	**High**	**Rapid**
Avena barbata (Bearded Oat*)*	EW	High	Rapid
***Briza maxima* (Blowfly Grass)**	**EW**	**Unknown**	**Rapid**
***Briza minor* (Shivery Grass)**	**EW**	**Unknown**	**Rapid**
Bromus diandrus (Great Brome)	EW	High	Rapid
Centaurium erythraea (Common Centaury)	EW	Low	Rapid
Dischisma arenarium (Dischisma)	EW	Low	Rapid
Ehrharta calycina (Perennial Veldt Grass)	EW	High	Rapid
***Ehrharta longiflora* (Annual Veldt Grass)**	**EW**	**Unknown**	**Rapid**
Eragrostis curvula (South African Lovegrass)	EW	High	Rapid
Gladiolus caryophyllaceus (Wild Gladiolus)	EW	High	Rapid
Hordeum leporinum (Barley Grass)	EW	Unknown	Rapid
***Hypochaeris glabra* (Smooth Catsear)**	**EW**	**Low**	**Rapid**
Hypochaeris radicata (Flat Weed)	EW	Not listed	
Leptospermum laevigatum (Coastal Tea-tree)	EW	High	Moderate
Lolium perenne (Perennial Ryegrass)	EW	Unknown	Rapid
Lotus subbiflorus (Lotus)	EW	Unknown	Moderate

Species (Common name)	Rank	Ecological impact	Invasiveness
Lupinus cosentinii (Sandplain lupin)	EW	Medium	Medium
***Lysimachia arvensis* (Pimpernel)**	**EW**	**Low**	**Rapid**
***Monoculus monstrosus* (Stinking Roger)**	**EW**	**Unknown**	**Rapid**
Ornithopus compressus (Yellow Serradella)	EW	Low	Rapid
Orobanche minor (Broom Rape)	EW	Unknown	Rapid
Oxalis pes-caprae (Soursob)	EW	High	Slow
***Petrorhagia dubia* (Velvety Pink)**	**EW**	**Low**	**Rapid**
Raphanus raphanistrum (Wild Radish)	EW	High	Rapid
Romulea rosea (Guilford Grass)	EW	High	Rapid
Silene gallica (Small Catchfly)	EW	Low	Rapid
Solanum nigrum (Black Berry Nightshade)	EW	Unknown	Rapid
***Sonchus asper* (Rough Sowthistle)**	**EW**	**Unknown**	**Rapid**
Sonchus oleraceus (Common Sowthistle)	EW	Unknown	Rapid
Trifolium campestre (Hop Clover)	EW	High	Moderate
Trifolium hirtum (Rose Clover)	EW	Unknown	Moderate
***Urospermum picroides* (False Hawkbit)**	**EW**	**High**	**Rapid**
***Ursinia anthemoides* subsp. *anthemoides* (Ursinia)**	**EW**	**High**	**Rapid**
***Vulpia muralis* (Wall Fescue)**	**EW**	**Unknown**	**Rapid**
***Wahlenbergia capensis* (Cape Bluebell)**	**EW**	**Unknown**	**Rapid**

Note: EW = environmental weed. Bold font indicates species listed in results of database searches and that have been recorded in the surrounding area.

5.3 Fauna (Western Wildlife)

5.3.1 Fauna Habitats

The main fauna habitats present in the Survey Area are:

- *Banksia* woodlands and shrublands (Maia vegetation types (MVT) *B***F**, *EB***WL**, M**SL**-1)
- Marri woodland (MVT *C***F**)
- Wandoo woodland (MVT *E***F**-2)
- Low heathlands and shrublands (MVTs M**SL**-2, M**HL**)
- Creeklines (MVT *E***F**-1)
- Winter-wet depressions (MVT *M***SEL**)

All fauna habitats are in very good to excellent condition. The portion of the Survey Area within the Coomallo Nature Reserve is part of a relatively extensive area of continuous habitat. The western portion of the Survey Area is within a continuous strip of habitat either side of the existing road, but set within a more fragmented environment.

5.3.2 Faunal Assemblages

The faunal assemblages of the Survey Area are likely to be typical of the region and relatively intact within Coomallo Nature Reserve. In the western portion of the Survey Area the habitats are more fragmented, and it is likely that the faunal assemblage is less species rich. Twenty-two fauna species were recorded opportunistically

during the site visit (**Table 5.7**). This is a small proportion of the number of species likely to occur, but as the Survey Area is a narrow strip, for many species it is likely to be a small part of a larger home-range or foraging area.

The *Banskia* woodlands and shrublands are likely to support a large suite of species, including honeyeaters and other nectar-feeding species that are likely to move into the area to take advantage of this seasonal resource. When the *Banksia* and *Hakea* spp. are seeding, these species provide a food resource for parrots and cockatoos. The dense vegetation in low heathlands and shrublands provides nesting habitat and shelter for small insectivorous bird species. Woodlands of Marri, Wandoo and creek-lines with Flooded Gum potentially support hollow-nesting birds such as the Striated pardalote (*Pardalotus striatus*), Sacred kingfisher (*Todiramphus sanctus*) and Australian ringneck (*Platycercus zonarius*). Hollows and tree crevices also provide habitat for roosting bats and arboreal reptiles such as some geckoes and the Black-tailed tree monitor (*Varanus tristis*). The sandy soils associated with *Banksia* shrublands and woodlands are likely to support a diverse assemblage of reptiles, many of which burrow in sand, shelter in leaf litter or utilise understorey vegetation. The creek-lines and winter-wet depressions potentially support breeding of native frogs when water is present. Burrowing frog species such as the Moaning frog (*Heleioporus eyrei*) also forage in terrestrial habitats, often occurring at considerable distances from wetlands.

Table 5.7: Fauna observed in the Survey Area

Fauna species	Common name	Notes
Cacatua roseicapilla	Galah	
Calyptorhynchus latirostris	Carnaby's black-cockatoo	Evidence: foraging on *Banksia*
Cheramoeca leucosterna	White-backed swallow	
Colluricincla harmonica	Grey shrike-thrush	
Corvus coronoides	Australian raven	
Cracticus tibicen	Australian magpie	
**Dacelo novaeguinea*	*Laughing kookaburra	
Falco cenchroides	Australian kestrel	
Gliciphila melanops	Tawny-crowned honeyeater	
Lichmera indistincta	Brown honeyeater	
Macropus fuliginosus	Western grey kangaroo	Scats and tracks present
Malurus splendens	Splendid fairywren	
Menetia greyii	Dwarf skink	
Oryctolagus cuniculus	European rabbit	
Pachycephala rufiventris	Rufous whistler	
Pardalotus striatus	Striated pardalote	
Petrochelidon nigricans	Tree martin	
Phylidonyris niger	White-cheeked honeyeater	
Rhipidura albiscapa	Grey fantail	
Rhipidura leucophrys	Willie wagtail	
Smicrornis brevirostris	Weebill	
Tiliqua rugosa	Bobtail	

Note: * in front of a fauna species and common name indicates an introduced species.

5.3.3 Conservation Significant Fauna

Several species of conservation significant fauna have been identified as potentially occurring in the area on the basis of database searches and literature review **(Table A2.2, Appendix 2)**. Of these, many are unlikely to occur as their habitat requirements are not met within the Survey Area. This includes almost all Migratory Birds protected under an International Agreement, the Southern right whale (*Eublaena australis*) and Hooded plover (*Charadrius rubricollis*), as these species require marine or wetland habitats, which are absent from the Survey Area. Other species may once have occurred, but are now locally extinct, including the Western ground parrot (*Pezoporus flaviventris*), Chuditch (*Dasyurus geoffroii*) and Ghost bat (*Macroderma gigas*). Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) is listed in **Table A2.2 (Appendix 2)**, but any records for this species in the area are likely to be historical records of Carnaby's black-cockatoo, prior to this species being recognised as taxonomically distinct in the 1980s. The current distribution of Baudin's black-cockatoo does not extend into the Survey Area.

The remaining species are currently known to occur in terrestrial habitats in the vicinity of the Survey Area, and are discussed in the following sections.

5.3.3.1 CARNABY'S BLACK-COCKATOO

Carnaby's black-cockatoo (CBC) (*Calyptorhynchus latirostris*) is listed as Endangered under both the EBPC Act and WC Act. It is endemic to the southwest of WA, occurring mostly in the wheatbelt but also on the Swan Coastal Plain and wetter southwest (Johnstone and Storr, 1998; DPaW, 2013). The population size is estimated to be 40,000 birds and still declining (Garnett *et al*. 2011).

Typically, CBC breeds in the inland wheatbelt region, nesting in large hollows in smooth-barked eucalypts such as the Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*), though it occasionally uses other tree species (Johnstone and Storr, 1998; DPaW, 2013): during the non-breeding season (January – July), most of the population moves west and south towards the coast (DPaW, 2013).

CBC forage on the seeds of a range of plant species, but are particularly attracted to proteaceous heaths, *Banksia* and *Eucalyptus* woodlands and pine plantations (Johnstone and Storr, 1998). On the Swan Coastal Plain, important food plants include *Banksia attenuata*, *B. menziesii*, *B. grandis*, *B. ilicifolia*, *B. sessilis*, *B. prionotes*, Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*) (Shah, 2006). In breeding areas it is important to have sufficient foraging resources in close proximity to nest hollows, typically within 12 km (Garnett *et al*. 2011).

CBC generally roost in tall native or introduced eucalypts or pines in riparian habitats or near permanent water (DSEWPaC, 2012). Shah (2006) found that of 16 CBC roost sites she identified on the Swan Coastal Plain, all but one were in *Pinus* or *Eucalyptus* species. Similarly, Burnham *et al*. (2010) found that 29 CBC roost sites for which the tree species were recorded were in *Pinus* or *Eucalyptus* species.

The main threats to CBC are habitat loss, competition for nesting hollows, habitat degradation and illegal trade in eggs and nestlings (DSEWPaC, 2012). Habitat loss is the primary cause of the decline of this species, with much of its wheatbelt habitat cleared or fragmented, and the clearing of heathland around breeding sites has reduced the foraging opportunities for birds raising young (Cale, 2003). Within remnant wheatbelt woodlands there is little regeneration of eucalypts and the remaining hollows are deteriorating, and CBC may face competition for remaining hollows from other bird species and feral bees (*Apis mellifera*) (DSEWPaC, 2012; Cale, 2003).

CBC was observed in the Survey Area during the flora and vegetation surveys and these locations are shown on maps in **Section 9**. There are several database records in and near the Survey Area **(Map 9.7, Section 9)**. Evidence of foraging black-cockatoos was ubiquitous in the *Banksia* woodlands and shrublands of the Survey Area (shown on **Maps 9.11 to 9.32, Section 9** and descriptions for the vegetation types in **Table 5.8**). All of the *Banksia*

woodlands and shrublands in the Survey Area are likely to support foraging black-cockatoos. Vegetation types with a high proportion of *Banksia* species (*B***F**, *EB***WL** and M**SL**-1) have the highest value, and shrublands with scattered *Banksia* and other proteaceous species (M**SL**-2) are of moderate value. The locations where evidence of foraging on *Banksia* nuts by CBC was recorded are shown on the maps in **Section 9**. Although no evidence of foraging was noted in the Marri woodland (vegetation type *C***F**) during the site visit, it is also likely to be foraging habitat.

The Wandoo woodland and to a lesser extent the Marri woodlands and Flooded Gum in the creeklines are potentially CBC breeding habitat. Eighty-one trees with a DBH of the relevant size or range to provide breeding habitat were identified during the survey: Marri, DBH≥ 50 cm, seven trees; Flooded Gum DBH≥ 50 cm, 33 trees; Flooded Gum, DBH ≥ 30 – 50 cm, seven trees; Wandoo DBH ≥ 30 cm, 34 trees **(Maps 9.11 to 9.32, Section 9)** - though none appeared to contain hollows of a suitable size to currently support black-cockatoo breeding. However, the Survey Area is close to known breeding sites in the Coomallo Important Bird Area (IBA), where at least 1% of the breeding population of CBC are known to occur (BirdLife International, 2016a). The Coomallo IBA consists of 2,078 ha of nesting and foraging habitat, including Coomallo Creek Nature Reserve, Badgingarra National Park and private property (BirdLife International, 2016a).

Sixteen of the 81 trees fitting the DBH criteria to provide breeding habitat are located within the PCZ –11 Flooded Gum trees and five Wandoo trees (locations shown on maps in **Section 9** and listed along with comments and a photograph of each tree in **Table A7.1, Appendix 7**).

No CBC roost sites were identified; though CBC is unlikely to roost in the same place year-round as it undertakes seasonal movements. Marri and Flooded Gum in association with the creek-lines are potentially roosting habitat.

5.3.3.2 GILLED SLENDER BLUE-TONGUE

The Gilled slender blue-tongue (*Cyclodomorphus branchialis*) is listed as Vulnerable under the WC Act. This species is known from few records, mostly restricted to a small area of the Midwest coast in the region of Geraldton, east to about Mt Magnet (Bush *et al*., 2007). There is a single record near Jurien Bay on NatureMap (DPaW, 2007-), but the majority of records are from further north. This reptile is thought to favour *Acacia* woodlands on loamy soils and rocky areas (Bush *et al*., 2007), neither of which are present in the Survey Area. Though known from the region, it is considered unlikely that the Gilled slender blue-tongue is present in the Survey Area.

5.3.3.3 WESTERN SPINY-TAILED SKINK

The Western spiny-tailed skink (*Egernia stokesii badia*) is listed as Endangered under the EPBC Act and Vulnerable under the WC Act. This species has a restricted distribution, occurring in wheatbelt eucalypt woodlands between Mullewa and Kellerberrin (Bush *et al*., 2007). Most records in the region are from York Gum (*Eucalyptus loxophleba*) woodland, with some records in Gimlet (*E. salubris*) or Salmon Gum (*E. salmonophloia*) woodlands (DotEE, 2016f). Within these woodlands, the Western Spiny-tailed skink lives in hollow logs or, increasingly, under rubbish such as old tin (DotEE, 2016f). Although this species has been recorded nearby **(Map 9.7, Section 9)**, it is unlikely that it occurs in the Survey Area due to the lack of York Gum woodland or hollow logs.

5.3.3.4 MALLEEFOWL

The Malleefowl (*Leipoa ocellata*) is listed as Vulnerable under both the EPBC Act and WC Act. The Malleefowl is a bird of dense shrublands, mulga woodlands and mallee woodlands, and used to be common in the southern arid and semi-arid areas of WA (Johnstone and Storr, 1998). In order to construct their nests (mounds), the Malleefowl needs leaf litter on sandy substrates (Benshemesh, 2007). As Malleefowl nest on the ground, the eggs

and flightless chicks are vulnerable to predation by introduced predators. However, the main threat to the Malleefowl is habitat loss and the fragmentation and degradation of remaining habitat, as well as the death of adults on roads (Benshemesh, 2007; Garnett *et al*., 2011). Although there are records of the Malleefowl in the vicinity of the Survey Area **(Table A2.2, Appendix 2)**, it is not known to breed in the area (BirdLife International, 2016a).

5.3.3.5 RAINBOW BEE-EATER

The Rainbow bee-eater (*Merops ornatus*) is listed under the WC Act as a Migratory Bird protected under an International Agreement, but has been recently removed from the list of Migratory species maintained under the EPBC Act. This species is common and widespread in WA, migrating southwards in summer to breed. Breeding occurs in burrows dug into the ground, often in sand along tracks and firebreaks. The Rainbow Bee-eater is highly likely to occur in the Survey Area as a seasonal visitor, potentially breeding in most habitats present. However, as the Rainbow Bee-eater has an extremely large range and an extremely large population size that does not appear to be declining (BirdLife International, 2016b), it is unlikely that changes to the Survey Area will have a significant impact on the conservation status of this species.

5.3.3.6 PEREGRINE FALCON

The Peregrine falcon (*Falco peregrinus*) is listed as Other Specially Protected Fauna under the WC Act. The Peregrine Falcon is a widespread bird of prey that globally has a very large range and a very large population that appears to be secure (BirdLife International, 2016b). In Western Australia the population is secure, though this species may experience reductions at a local level due to human disturbance at nesting sites (Debus, 1998). The Peregrine Falcon nests mainly on ledges on cliffs or rocky outcrops, and it may also use tall trees (Johnstone and Storr, 1998), or take advantage of man-made structures such as abandoned open pits or quarries. There is a record of this species close to the eastern end of the Survey Area **(Map 9.7, Section 9)**. Though the Peregrine Falcon is likely to occur in the Survey Area, it is unlikely that breeding habitat is present. Clearing in the Survey Area is unlikely to significantly impact the conservation status of this species.

5.3.3.7 FORK-TAILED SWIFT

The Fork-tailed swift (*Apus pacificus*) is listed under both the EPBC Act and the WC Act as a Migratory Bird protected under an International Agreement. The Fork-tailed swift is a non-breeding visitor to Australia between September and April, and though it can be common further north, in southwest Australia this species is generally scarce (Boehm, 1962; Johnstone and Storr, 1998). Although a migratory species, the Fork-tailed swift has a large range and a large population that appears to be stable (Birdlife International, 2016b). In WA, the Fork-tailed Swift is a largely aerial species and unlikely to be affected by changes to the Survey Area.

5.3.3.8 NATIVE BEE (*HYLAEUS GLOBULIFERUS*)

The native bee *Hylaeus globuliferus* is listed as Priority 3 by DPaW and has been recorded in the vicinity of the Survey Area on databases **(Table A2.2, Appendix 2)**. This species is endemic to southwest WA and poorly known. This species potentially occurs in the Survey Area.

5.3.3.9 WESTERN BRUSH WALLABY

The Western brush wallaby (*Macropus irma*) is listed as Priority 4 by DPaW. In the Action Plan for Australian Mammals 2012 it is listed as of Least Concern (Woinarski *et al*., 2014), as although this species has decreased in range, its abundance has increased within its remaining range, due to fox control. The Western Brush Wallaby is endemic to the southwest of WA, favouring open forest and woodland, as well as seasonally wet flats with grasses and thickets (Van Dyck and Strahan, 2008). The home-range size of this species has been estimated at about

9.9 ha for males and 5.3 ha for females (Bamford and Bamford, 1999), so the Survey Area is likely to represent a small part of the home-range of a few individuals. There are nearby database records for this species **(Map 9.7, Section 9)**, and the Western Brush Wallaby is highly likely to occur in the Survey Area, using most habitats. However, the area to be cleared is only likely to represent a small reduction of habitat for this species in the local area.

5.3.3.10 GRACEFUL SUNMOTH

The Graceful sunmoth (*Synemon gratiosa*) is listed as Priority 4 by DPAW, after being downgraded from its threatened status in 2013. The larvae of this species feeds on *Lomandra maritima* in coastal areas and *Lomandra hermaphrodita* in *Banksia* woodlands, with sunmoths more common in coastal areas (Bishop *et al*., 2010). The Graceful sunmoth has been recorded in the vicinity of the study area on databases **(Table A2.2, Appendix 2)**, but records in this region are restricted to the coastal plain (Bishop *et al*., 2010). Although the Survey Area contains *Banksia* woodlands, the Graceful sunmoth has not been recorded in this habitat in the northern part of its range.

5.4 VEGETATION

5.4.1 Vegetation Types of the Survey Area

Nine vegetation types were described (**Table 5.8**) and mapped in the Survey Area (**Maps 9.11 to 9.32, Section 9)**. The legend for these vegetation types is provided on **Map 9.9, Section 9** and the map sequence shown on **Map 9.11**.

Table 5.8 provides the following information on each vegetation type mapped in the Survey Area:

- the broad floristic formation;
- vegetation association;
- average vegetation condition, including any weed species recorded;
- associated habitat;
- associated species; and
- relevés assessed.

Information collected at each relevé is included in **Table A1.1, Appendix 1**.

In order to correlate with the broad floristic formation descriptions, vegetation descriptions have been ordered using the dominant cover class as the indicator and not the dominant stratum e.g. Sedgeland of *Mesomelaena pseudostygia* with an Open Low Shrubland of *Daviesia angulata*, *D*. *nudiflora* and *Eremaea violacea* subsp. *rhaphiophylla.*

The codes used for the vegetation types are based on the broad floristic formation e.g. M**SL** for mixed Shrubland, *EB***WL** for *Eucalyptus* and *Banksia* Woodland and *B***F** for *Banksia* Forest and the code is suffixed by a number to distinguish between multiple *Eucalyptus* forest and mixed shrubland e.g. M**SL**-1 and M**SL**-2.

Areas already cleared (for roads, tracks etc.) have been mapped as **C** (cleared).

The regional and local significance of these vegetation types is discussed in **Section 6.3**.

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Table 5.8: Vegetation types mapped in the Survey Area

Code	Vegetation type broad floristic formation, description, associated species, average condition and relevés		Photograph
*B***F**	**Broad floristic formation**: *Banksia* Forest **Description**: Open Low Forest of *Banksia prionotes* with a mixed Open Low Shrubland mainly of *Melaleuca leuropoma*, *Hibbertia hypericoides* and *Conospermum stoechadis* subsp. *stoechadis* and an Open Sedgeland of *Mesomelaena pseudostygia* and *Lepidosperma agricola*	**Associated species**: *Adenanthos cygnorum*, *Banksia attenuata*, *Jacksonia floribunda*, *Petrophile macrostachya*, *Scaevola repens* var. *repens*, *Burchardia congesta*, *Dasypogon obliquifolius*, *Hypocalymma xanthopetalum*, *Lepidobolus preissianus*, *Orianthera spermacocea*, *Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia*	
	Habitat: At the base of laterite uplands and on sandy flats of laterite uplands with a surface layer of white sand	**Average vegetation condition**: (2) Vegetation structure intact **Relevés**: R01, R02, R12	
*C***F**	**Broad floristic formation**: *Corymbia* Forest **Description**: Open Low Forest of *Corymbia calophylla* with a mixed Open Low Shrubland mainly of *Calothamnus quadrifidus* subsp. *quadrifidus*, *Xanthorrhoea preissii* and *Hibbertia hypericoides* and a Sparse Sedgeland of *Ecdeiocolea monostachya* and *Mesomelaena pseudostygia*	**Associated species**: *Acacia latipes* subsp. *latipes*, *Adenanthos cygnorum*, *Alexgeorgea nitens*, *Bossiaea eriocarpa*, *Cassytha racemosa*, *Conostephium preissii*, *Conostylis aculeata* subsp. *preissii*, *Hypocalymma xanthopetalum*, *Leucopogon propinquus*, *Macrozamia fraseri*, *Melaleuca leuropoma*, *Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya*	
	Habitat: Midslopes and minor depressions of lateritic uplands	**Vegetation condition**: (2) Vegetation structure intact **Relevés**: R10, R11	

Code	Vegetation type broad floristic formation, description, associated species, average condition and relevés		Photograph
*EB***WL**	**Broad floristic formation**: *Eucalyptus* and *Banksia* Woodland **Description**: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with a mixed Open Mid Shrubland mainly of *Melaleuca leuropoma*, *Allocasuarina humilis* and *Xanthorrhoea preissii* with an Open Sedgeland of *Mesomelaena pseudostygia* and *Georgeantha hexandra*	**Associated species**: *Alexgeorgea nitens*, *Banksia shuttleworthiana*, *Burchardia congesta*, *Calothamnus quadrifidus* subsp. *quadrifidus*, *Cassytha racemosa*, *Conospermum wycherleyi* subsp. *glabrum*, *Conostylis setigera* subsp. *setigera*, *Hakea ruscifolia*, *Laxmannia sessiliflora* subsp. *drummondii*, *Patersonia occidentalis* var. *occidentalis*, *Schoenus pleiostemoneus*, *Stirlingia latifolia*	
	Habitat: Footslopes and midslopes of lateritic uplands with a surface layer of white to grey sand	**Average vegetation condition**: (2) Vegetation structure intact **Relevés**: R04, R06, R07, R16, R18	
*E***F-**1	**Broad floristic formation**: *Eucalyptus/Corymbia* Forest **Description**: Open Tall Forest of *Eucalyptus rudis* +/- *Corymbia calophylla* with an Open Tall Shrubland of *Melaleuca rhaphiophylla* and either a Tussock Grassland of Poaceae sp. and **Eragrostis curvula* or a Sparse Sedgeland of *Baumea juncea* and *Lepidosperma* ?*squamatum*	**Associated species**: *Cassytha racemosa*, *Chorizandra enodis*, *Ecdeiocolea monostachya*, *Jacksonia sternbergiana*, *Leptocarpus coangustatus*, *Melaleuca eleuterostachya*, *Scaevola* sp.	
	Habitat: Drainage lines and depressions	**Average vegetation condition**: (2) Vegetation structure intact **Relevés**: R05, R08, R17	

Code	Vegetation type broad floristic formation, description, associated species, average condition and relevés		Photograph
*E***F-2**	**Broad floristic formation**: *Eucalyptus* Forest **Description**: Open Tall Forest of *Eucalyptus wandoo* subsp. *pulverea* with an Open Low Shrubland of *Acacia pulchella* var. *glaberrima*, *Hakea lissocarpha* and *Hibbertia hypericoides*	**Associated species**: *Acacia barbinervis* subsp. *borealis*, *Astroloma serratifolium*, *Austrostipa elegantissima*, *Conostylis aurea*, *Daviesia angulata*, *Desmocladus asper*, *Thomasia foliosa*, *Xanthorrhoea preissii*	
	Habitat: Hill slopes and minor valley lower slopes with a surface layer of laterite and white / grey sandy loam	**Vegetation condition**: (3) Vegetation structure altered **Relevés**: R09	
M**HL**	**Broad floristic formation**: Mixed Heathland **Description**: Low mixed Heathland mainly of *Hibbertia hypericoides*, *Petrophile macrostachya* and *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) with a Sparse Sedgeland of *Mesomelaena pseudostygia*	**Associated species**: *Allocasuarina humilis*, *Banksia carlinoides*, *Calothamnus sanguineus*, *Cassytha racemosa*, *Caustis dioica*, *Gastrolobium polystachyum*, *Hakea incrassata*, *H. neospathulata*, *Hibbertia acerosa*, *H. crassifolia*, *Hypocalymma xanthopetalum*, *Melaleuca trichophylla*, *Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia*, *Stylidium repens*, *Synaphea interioris*	
	Habitat: Upperslopes and crests of lateritic uplands and lateritic outcropping on shallow soils with a surface layer of laterite rocks and gravel	**Average vegetation condition**: (2) Vegetation structure intact **Relevés**: R13, R19, R21, R22, R24, R25	

Code	Vegetation type broad floristic formation, description, associated species, average condition and relevés		Photograph
*M*SEL	**Broad floristic formation**: *Mesomelaena* Sedgeland **Description**: Sedgeland of *Mesomelaena pseudostygia* with an Open Low Shrubland of *Daviesia angulata*, *D. nudiflora* and *Eremaea violacea* subsp. *rhaphiophylla*	**Associated species**: *Acacia pulchella* var. *glaberrima*, *Austrostipa elegantissima*, *Banksia shuttleworthiana*, *Conostylis setigera* subsp. *setigera*, **Ehrharta calycina*, *Hibbertia huegelii*, *H. hypericoides*, *Jacksonia nutans*, *Lepidobolus preissianus*, *Lepidosperma apricola*, *Lomandra preissii*, *L. sericea*, *Melaleuca leuropoma*, *Orianthera spermacocea*, *Patersonia occidentalis* var. *occidentalis*, *Schoenus pedicellatus*, *Scholtzia involucrata*, *Stylidium repens*	
	Habitat: Low lying sandy winter wet depressions adjacent to cleared paddocks. It appears to be disturbed *B***F** and *EB***WL** but lacking a tall shrub or low tree stratum	**Vegetation condition**: (3) Vegetation structure altered **Relevés**: R03	
M**SL**-1	**Broad floristic formation**: Mixed Shrubland **Description**: Mixed Low Shrubland mainly of *Melaleuca leuropoma*, *Leucopogon conostephioides* and *Hypocalymma xanthopetalum* with an Open Mid Shrubland of *Banksia attenuata*, *Adenanthos cygnorum* and *Eremaea ?pauciflora* x *beaufortioides* and a Sparse Sedgeland of *Mesomelaena pseudostygia* and *Lepidobolus preissianus*	**Associated species**: *Allocasuarina humilis*, *Astroloma xerophyllum*, *Calothamnus sanguineus*, *Cassytha racemosa*, *Caustis dioica*, *Conospermum wycherleyi* subsp. *glabrum*, *Conostephium pendulum*, *Conostylis aurea*, *Dasypogon obliquifolius*, *Hibbertia huegelii*, *Lepidosperma calcicola*, *Leucopogon conostephioides*, *Petrophile macrostachya*, *Stirlingia latifolia*	
	Habitat: Sandy areas on the slopes, crests and between lateritic outcroppings on laterite uplands with a surface layer of white sand	**Average vegetation condition**: (2) Vegetation structure intact **Relevés**: R14, R15	

<table>
<tr><th>Code</th><th colspan="2">Vegetation type broad floristic formation, description, associated species, average condition and relevés</th><th>Photograph</th></tr>
<tr><td rowspan="2">MSL-2</td><td>Broad floristic formation: Mixed Shrubland

Description: Mixed Open Low Shrubland mainly of Beaufortia squarrosa, Stirlingia latifolia and Hibbertia hypericoides with a mixed Sparse Mid Shrubland mainly of Banksia candolleana, Allocasuarina humilis and Banksia incana and Isolated Tall Shrubs of Hakea psilorrhyncha and/or Banksia attenuata or Isolated Mallee Trees of Eucalyptus todtiana</td><td>Associated species: Alexgeorgea nitens, Astroloma xerophyllum, Banksia shuttleworthiana, Calothamnus sanguineus, Chordifex sinuosus, Conospermum wycherleyi subsp. glabrum, Conostylis aurea, Dasypogon obliquifolius, Hypocalymma xanthopetalum, Jacksonia floribunda, Lepidobolus preissianus, Melaleuca leuropoma, Mesomelaena pseudostygia, Petrophile macrostachya</td><td rowspan="2">  </td></tr>
<tr><td>Habitat: Midslopes, crests and between lateritic outcroppings on laterite uplands with a surface layer of laterite gravel and white to yellow sand</td><td>Average vegetation condition: (2) Vegetation structure intact

Relevés: R20, R23, R26, R27</td></tr>
</table>

Note: * in front of a plant name indicates a weed species.

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5.4.2 Vegetation Type Cover in the Survey Area

The area and cover of each of the vegetation types mapped in the Survey Area is listed in **Table 5.9**.

Table 5.9: Area and cover of vegetation types mapped

Vegetation type code - broad floristic formation	Mapped in the Survey Area	
	Area (ha)	Cover (%)
*B***F** – *Banksia* Forest	21.77	5.33
*C***F** – *Corymbia* Forest	22.36	5.48
*EB***WL** – *Eucalyptus* and *Banksia* Woodland	50.63	12.41
*E***F**-1 – *Eucalyptus* Forest	3.51	0.86
*E***F**-2 – *Eucalyptus* Forest	6.90	1.69
M**HL** – Mixed Heathland	66.72	16.35
*M***SEL** – *Mesomelaena* Sedgeland	10.39	2.55
M**SL**-1 – Mixed Shrubland	88.81	21.76
M**SL**-2 – Mixed Shrubland	86.32	21.16
C - Cleared	50.64	12.41
TOTAL	408.06	100

5.4.3 Vegetation Condition

Using the average vegetation condition assigned to the relevés surveyed in each vegetation type, weed information, notes recorded by botanists while traversing the Survey Area and any obvious disturbance seen on aerial photography while mapping the vegetation, the dominant vegetation condition is 2 (83.35%) **(Map 9.33, Section 9)**. Additional information on the condition of the vegetation is included in **Table 5.10**.

Table 5.10: Vegetation condition

Vegetation condition	Area (ha) / cover (%) in the Survey Area	Number and proportion (%) of relevés at this rating	Mapped as	Comments
2: Vegetation structure intact.	340.13 / 83.35	85.19	*B***F**, **C**F, *EB***WL**, *E***F**-1, M**HL**, M**SL**-1, M**SL**-2	Includes the majority of the Survey Area, which is uncleared with no significant weeds.
3: Vegetation structure altered	17.29 / 4.24	14.81	*E***f** – 2, *M***SEL**	Previous clearing has occurred in these areas and they contain bare patches of ground with some native species regrowth and weed species throughout. The structure of the vegetation has been altered in these areas; however, with time, it is likely to return to the state of the surrounding vegetation.
7: Completely or almost without native vegetation.	50.64 / 12.41	NA	C	Areas mapped as cleared include the existing Jurien East road, tracks, firebreaks, gravel pits and drainage culverts and have been assigned a condition rating of 7. These areas were generally completely cleared of vegetation or contained some regrowth of native species.

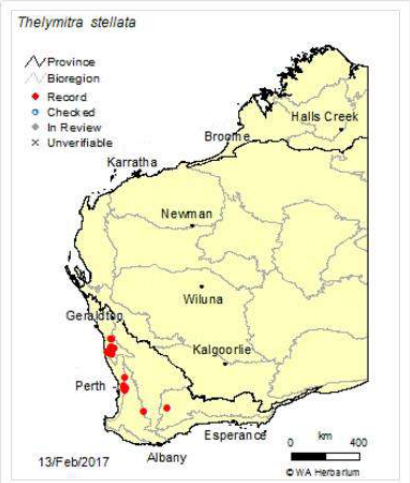
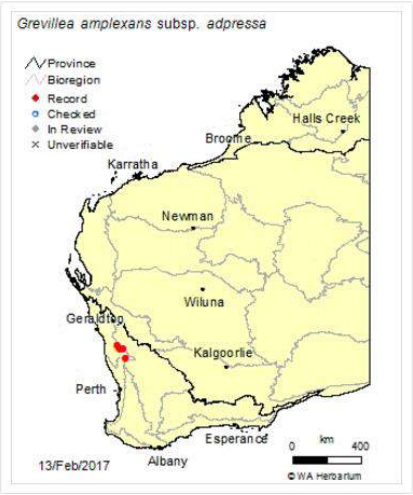
6 DISCUSSION

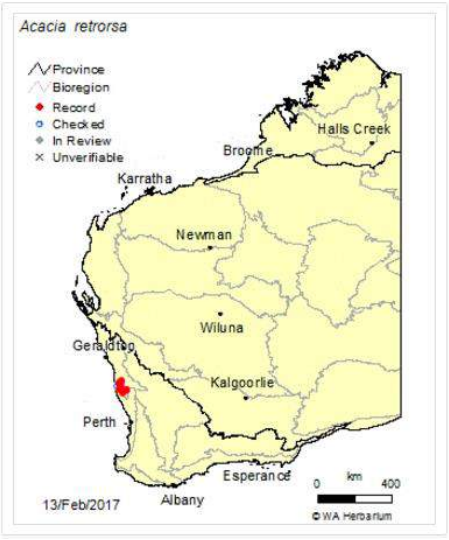
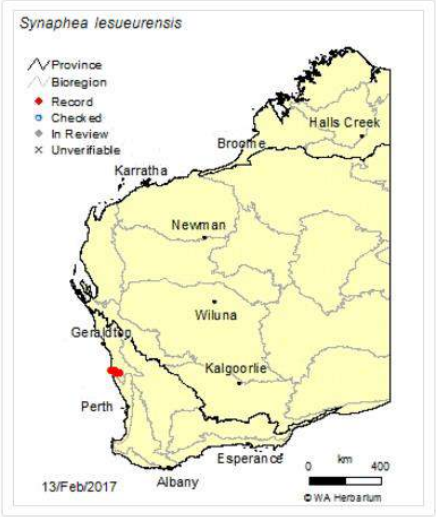
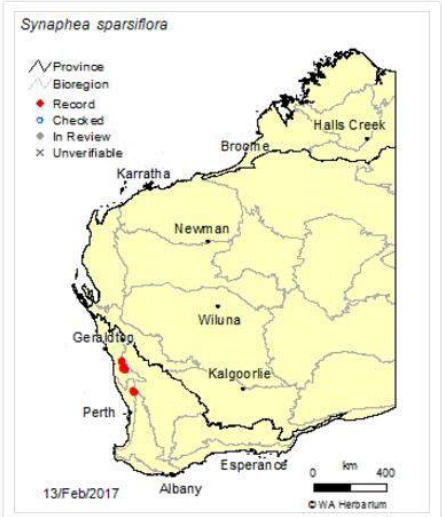
A discussion of the conservation significance of the flora, vegetation and Carnaby's black-cockatoo habitat of the Survey Area follows.

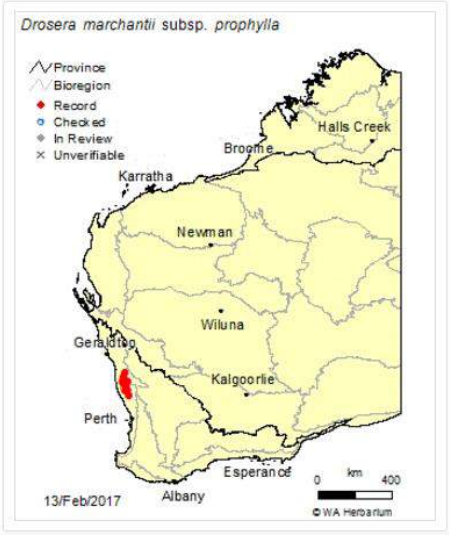
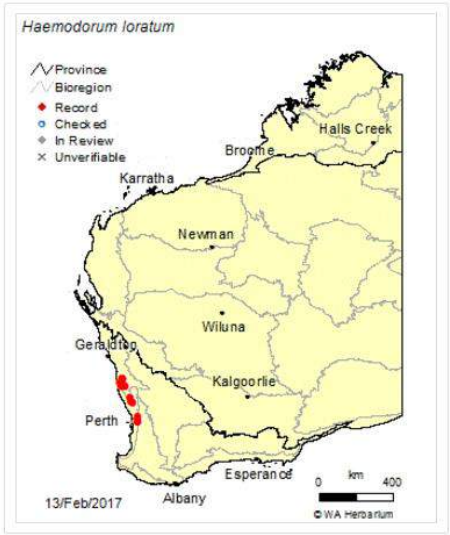
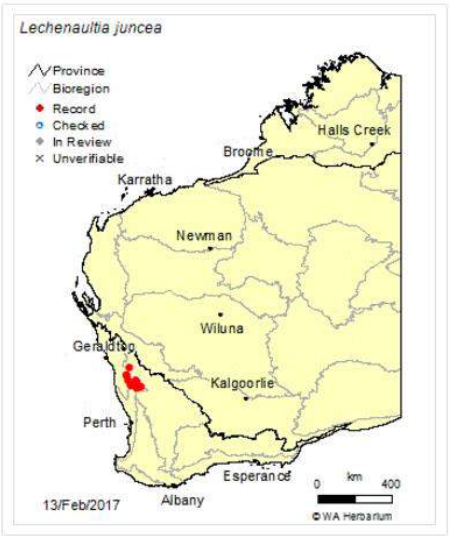
6.1 FLORA OF CONSERVATION SIGNIFICANCE

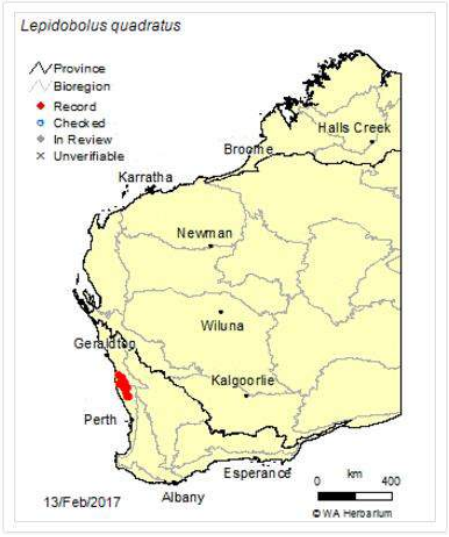
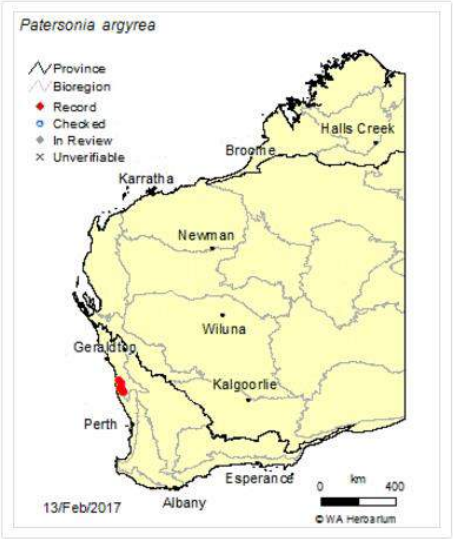
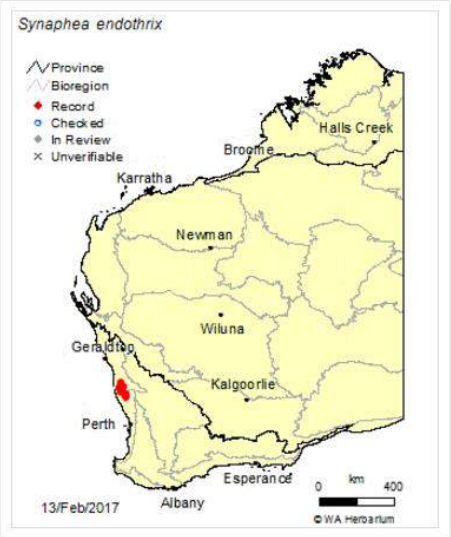
The current status of the CSF species located in the Survey Area is described in **Table 6.1**. Their regional distribution is shown and an indication of the populations currently occurring in protected areas is noted. The number of plants located in the Survey Area is also noted along with the vegetation types and habitat in which each species was found and the potential impacts to each species from the proposed works. Impacts are estimated using plant numbers and records on FloraBase and Survey Area records.

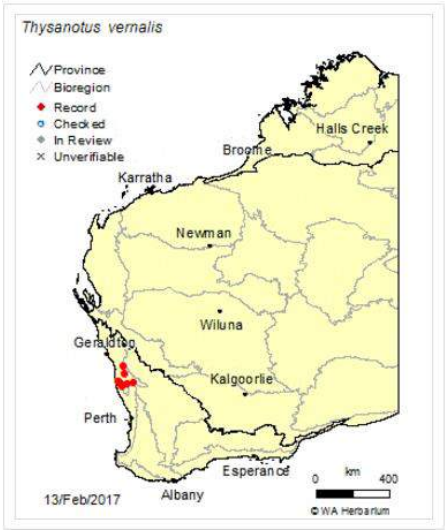
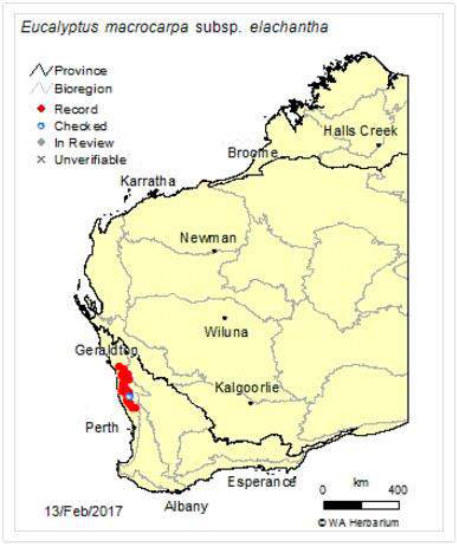
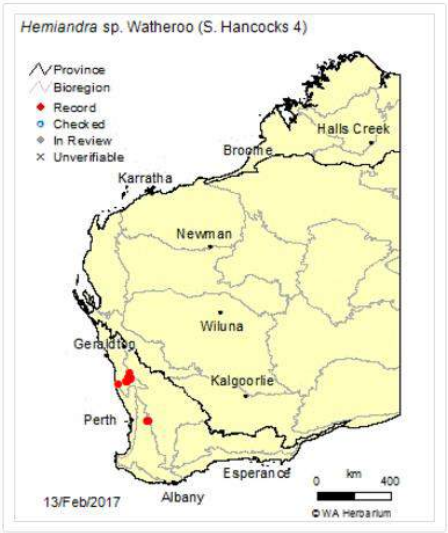
Table 6.1: Conservation significant flora species

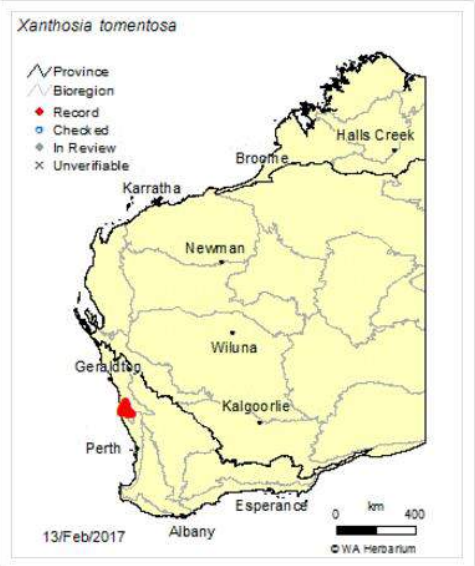
Current status and potential impacts	Current distribution
Thelymitra stellata (Threatened) has 23 records on FloraBase (WAH, 1998-). These records are in the Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest, Avon Wheatbelt and Mallee bioregions (DPaW, 2007-). Ten of the 23 records (43%) are on DPaW-managed land (WAH, 1998-). It was recorded at 5 locations in the Survey Area (19 plants) on mid slopes to crests with a surface layer of laterite gravel and outcropping and in vegetation type M**HL**. These plants are not in the proposed clearing zone (PCZ) and they will not be impacted by the proposed works, however, a 50 m buffer placed around them would intersect the PCZ.	
Grevillea amplexans subsp. *adpressa* (Priority 1) has 4 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains and Avon Wheatbelt bioregions (DPaW, 2007-). None of the records is on DPaW-managed land (WAH, 1998-). It was recorded at 3 locations in the Survey Area (3 plants) on foot slopes to mid slopes and mid to upper slopes of low hills on white/grey sand and mid slopes to crests with a surface layer of laterite gravel and outcropping and in three vegetation types - *EB***WL**, M**HL** and M**SL-1**. These plants were not located within the PCZ and they will not be impacted by the proposed works.	

Current status and potential impacts	Current distribution
Acacia retrorsa (P2) has 29 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains (Lesueur Sandplain subregion) and Swan Coastal Plain (Perth subregion) bioregions (DPaW, 2007-). Twelve of these 29 records (41%) are on DPaW-managed land – Lesueur National Park and Hill River Nature Reserve (WAH, 1998-). It was recorded at 6 locations in the Survey Area (7 plants) on sandy lateritic hillslopes and in three vegetation types - ***C*F**, ***E*F-2** and M**HL**. It was also recorded in regrowth in areas that had been previously cleared. Two *Acacia retrorsa* (P2) were recorded in the PCZ and an additional 184 plants (approximately) are known from FloraBase records and this survey i.e. a maximum of 1.1% of the currently known records for this species could be impacted.	
Synaphea lesueurensis (P2) has 16 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains bioregion (DPaW, 2007-). Ten of the 16 records (63%) are on DPaW-managed land (WAH, 1998-). It was recorded at 34 locations in the Survey Area (43 plants) on mid slopes to crests with a surface layer of laterite gravel and outcropping in one vegetation type – M**HL**. It was also recorded in regrowth in areas that had been previously cleared. These plants were not located within the PCZ and they will not be impacted by the proposed works.	
Synaphea sparsiflora (P2) has 16 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains and Swan Coastal Plain bioregions (DPaW, 2007-). None of the 16 records are on DPaW-managed land (WAH, 1998-). It was recorded at 11 locations in the Survey Area (48 plants) on mid slopes to crests with a surface layer of laterite gravel and outcropping, on mid to upper slopes of low hills on grey/white sand in two vegetation types – M**HL and** M**SL**-1. It was also recorded in regrowth in areas that had been previously cleared. Twenty-nine *Synaphea sparsiflora* (P2) were recorded in the PCZ and an additional 310 plants are known from the estimate of plant numbers from FloraBase records and this survey i.e. up to 8.6% of the currently known records for this species could be impacted.	

Current status and potential impacts	Current distribution
Drosera marchantii subsp. *prophylla* (P3) has 24 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains bioregion (DPaW, 2007-). Six of the 24 records (25%) are on DPaW-managed land (WAH, 1998-). It was recorded at 15 locations in the Survey Area (17 plants) in different habitats and in three vegetation types – M**HL,** M**SL**-1, M**SL**-2. These plants were not located within the PCZ and they will not be impacted by the proposed works.	
Haemodorum loratum (P3) has 20 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains and Swan Coastal Plain bioregions (DPaW, 2007-). Six of the 20 records (30%) are on DPaW-managed land (WAH, 1998-). It was recorded at 186 locations in the Survey Area (242 plants) in many different habitats and in seven of the nine vegetation types mapped in the Survey Area – *B***F**, *C***F**, *EB***WL** M**HL,** M**SL**-1, M**SL**-2 and *M***SEL**. It was also recorded in areas of regrowth that had been previously cleared. Eleven *Haemodorum loratum* (P3) were recorded in the PCZ and an additional 327 plants are estimated from FloraBase records and this survey i.e. up to 3.3% of the currently known records for this species could be impacted.	
Lechenaultia juncea (P3) has 21 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains and Avon Wheatbelt bioregions (DPaW, 2007-). Eight of the 21 (38%) records are either shown or stated to be on DPaW-managed land (WAH, 1998-). It was recorded at 1 location in the Survey Area (1 plant) on mid to upper slopes of low hills on grey/white sand and in one vegetation type - M**SL**-1. This plant was not located in the PCZ and it will not be impacted by the proposed works.	

Current status and potential impacts	Current distribution
Lepidobolus quadratus (P3) has 45 records on FloraBase and they are all in the Geraldton Sandplains bioregion (WAH, 1998-). [Although, many more records are shown along the northern coast of the Pilbara and Carnarvon bioregions on NatureMap; and, as these are not on FloraBase it is assumed they are not correct.] Some of the records lie on DPaW-managed land – in South Eneabba Nature Reserve and Coomallo Nature Reserve (DPaW, 2007-). It was recorded at 3 locations in the Survey Area (8 plants) on mid to upper slopes of low hills on grey/white sand and mid slopes to crests with a surface layer of laterite gravel and outcropping in two vegetation types – M**HL** and M**SL**-1. These plants were not located within the PCZ and they will not be impacted by the proposed works.	
Patersonia argyrea (P3) has 10 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains bioregion (DPaW, 2007-). Four of the 10 records (40%) are shown on DPaW-managed land (WAH, 1998-). It was recorded at 25 locations in the Survey Area (28 plants) in different habitats and in four vegetation types - *C***F**, *EB***WL** M**HL** and M**SL**-1 – and also in areas of regrowth where the vegetation had been cleared previously. Six *Patersonia argyrea* (P3) were recorded in the PCZ and an additional 68 plants are estimated from FloraBase records and this survey i.e. up to 8.1% of the currently known records for this species could be impacted.	
Synaphea endothrix (P3) has 14 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains bioregion (DPaW, 2007-). Two of the 14 records (14%) are shown on DPaW-managed land (WAH, 1998-). It was recorded at 48 locations in the Survey Area (63 plants) in a number of different habitats as it was recorded in five of the vegetation types - *EB***WL,** M**HL,** M**SL**-1, M**SL**-2 and *M***SEL**. It was also recorded in areas of regrowth that had been previously cleared. One *Synaphea endothrix* (P3) was recorded in the PCZ and an additional 147 plants are estimated from FloraBase records and this survey i.e. up to 0.7% of the currently known records for this species could be impacted.	

Current status and potential impacts	Current distribution
Thysanotus vernalis (P3) has 11 records on FloraBase (WAH, 1998-) and they are all in the Geraldton Sandplains bioregion (DPaW, 2007-). Six of the 11 records (55%) are shown on DPaW-managed land while a seventh is noted as being in Wotto Nature Reserve but its location is not shown within the reserve boundaries (WAH, 1998-). It was recorded at 54 locations in the Survey Area (100 plants) in a number of different habitats as it was recorded in four of the vegetation types - *B***F**, *C***F**, *E***F**-2 and M**HL**. Two *Thysanotus vernalis* (P3) were recorded in the PCZ and an additional 109 plants are estimated from FloraBase records and this survey i.e. up to 1.8% of the currently known records for this species could be impacted.	
Eucalyptus macrocarpa subsp. *elachantha* (P4) has 54 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains and Swan Coastal Plain bioregions (DPaW, 2007-). Records are shown on DPaW-managed land - South Eneabba, Hill River and R46899 nature reserves (DPaW, 2007-). It was recorded at 1 location in the Survey Area (1 plant) in one vegetation type - M**SL**-2. This plant was not located within the PCZ and it will not be impacted by the proposed works.	
Hemiandra sp. Watheroo (S. Hancocks 4) (P4) has 44 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains, Swan Coastal Plain and Jarrah Forest bioregions (DPaW, 2007-). Records are shown on DPaW-managed land – including Alexander Morrison, Watheroo and Wandoo national parks (DPaW, 2007-). It was recorded at 2 locations in the Survey Area (5 plants) on foot slopes to mid slopes on white/grey sand in one vegetation type - *EB***WL**. Two *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) were recorded in the PCZ and an additional 47 plants are estimated from FloraBase records and this survey i.e. up to 4.1% of the currently known records for this species could be impacted.	

Current status and potential impacts	Current distribution
Xanthosia tomentosa (P4) has 49 records on FloraBase (WAH, 1998-) and they are in the Geraldton Sandplains, Swan Coastal Plain and Jarrah Forest bioregions (DPaW, 2007-). Records are shown on DPaW-managed land – and include in South Eneabba Nature Reserve, Lesueur National Park, Coomallo Nature Reserve and Lupton Conservation Park - approximately 50% of the records are shown on DPaW managed land (DPaW, 2007-). It was recorded at 172 locations in the Survey Area (239 plants) on mid slopes to crests with a surface layer of laterite gravel and outcropping in only one vegetation type - M**HL** – and also in areas of regrowth that had been cleared previously. This plant was not located within the PCZ and it will not be impacted by the proposed works.	

Note: Images used with the permission of the Western Australian Herbarium, Department of Parks and Wildlife (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Wednesday, 8 March 2017.

6.2 VEGETATION

The vegetation of Survey Area is discussed in the following sub-sections.

6.2.1 Beard's Pre-European Vegetation Mapping

Five Beard vegetation associations (BVAs) are mapped in the Survey Area – 4, 1030, 1031, 1032 and 1034 and their extent, distribution and protection in the Geraldton Sandplains region is listed in **Table 6.2** along with the prioritisation for reservation in the Lesueur Sandplain subregion for each BVA. Native vegetation in the Geraldton Sandplains bioregion has been extensively cleared and between 34% and 78% of the five BVAs currently remains.

The extent, distribution and protection of the six Beard vegetation system associations (BVSAs; 4.8, 1030.2, 1031 and 1031.1, 1032.1 and 1034) in the Geraldton Sandplains region is listed in **Table 6.3**; between 32% and 78% of these BVSAs currently remains.

The proportion of the current Geraldton Sandplains extent of the six BVSAs occurring in the Survey Area is between 0.07% and 1.54% (**Table 6.4**).

The PCZ is in the EPA's Position Statement 2 Agricultural Region (EPA, 2000). Impact to each of the five BVAs occurring in the areas to be cleared within the PCZ will be less than 0.03% of the pre-European extent in the Geraldton Sandplains bioregion and this will not bring the level of the total clearing in the Geraldton Sandplains bioregion below the threshold level of 30% stated in EPA (2000).

Table 6.2: Pre-European vegetation associations of the Survey Area – Geraldton Sandplains bioregion

BVA (DAFWA, 2012a)	Description	Pre-European extent (ha) in GES	Current extent (ha) in GES	Remaining in GES (%)	Current Extent Protected in GES (%)	Prioritisation for Reservation in GES02 (Desmond and Chant, 2001)
4	Medium woodland; marri & wandoo	5,336.70	2,130.04	39.91	6.78	Medium
1030	Low woodland; *Banksia attenuata* & *B. menziesii*	3,848.52	2,790.59	72.51	54.24	Low
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath	241,349.97	83,154.99	34.45	14.72	Low
1032	Mosaic: Medium woodland; marri,wandoo, powderbark / Shrublands; dryandra heath	8,317.21	6,472.06	77.82	61.65	Low
1034	Medium woodland; marri, wandoo & powderbark	1,762.99	1,091.34	61.90	36.73	Medium

Notes re Table 6.2, 6.3 and 6.4: Source = Government of Western Australia (GoWA) (2015a), unless noted otherwise; BVA = Beard vegetation association; GES = Geraldton Sandplains bioregion; GES02 = Lesueur Sandplain subregion; Current Extent Protected = Current Extent Protected (IUCN 1-4) for Conservation (proportion of pre-European extent).

Table 6.3: Pre-European vegetation system associations of the Survey Area – Geraldton Sandplains region

BVSA	Pre-European extent (ha) in GES	Current extent (ha) in GES	Remaining in GES (%)	Current Extent Protected in GES (%)
4.8	4,687.58	2,045.33	43.63	7.34
1030.2	1,556.67	555.90	35.71	4.86
1031	16,486.71	9,759.97	59.20	47.10
1031.1	224,863.27	73,395.02	32.64	12.35
1032.1	8,317.21	6,472.06	77.82	61.65
1034	1,762.99	1,091.34	61.90	36.73

Table 6.4: Current Geraldton Sandplains extent of Beard's vegetation system associations in the Survey Area

BVSA	Area (ha) in the Survey Area	Proportion of the Survey Area (%)	Current extent in GES (ha)	Proportion of current GES extent in the Survey Area (%)
4.8	25.57	6.27	2,045.33	1.25
1030.2	0.38	0.09	555.90	0.07
1031	35.96	8.81	9,759.97	0.37
1031.1	285.23	69.90	73,395.02	0.39
1032.1	27.61	6.77	6,472.06	0.43
1034	16.83	4.12	1,091.34	1.54
Cleared	16.48	4.04		
Total	408.06	100.00	93,319.62	

6.2.2 Vegetation types mapped by Maia

The occurrence and significance of the nine vegetation types mapped by Maia (MVTs) in the Survey Area is discussed below.

Based on the dominant and associated species, two of the MVTs (*B***F** and *EB***WL**) are similar to vegetation communities that form the EPBC listed TEC "Banksia Woodlands of the Swan Coastal Plain". The key diagnostic characteristics and condition thresholds for this TEC are included in the guidance notes relating to the community (DotEE, 2016g). MVTs *B***F** and *EB***WL** are dominated by three of the diagnostic *Banksia* species of this community (*Banksia attenuata*, *B*. *menziesii* and *B*. *prionotes*). However, another diagnostic character is that the ecological community is located in the Swan Coastal Plain IBRA bioregion or as pockets of the Darling and Whicher escarpments in the Jarrah Forest IBRA bioregion: as the Survey Area is not on the Swan Coastal Plain or Jarrah Forest IBRA bioregions, these MVTs do not meet that key diagnostic characteristic for this TEC.

MVT *B***F** was mapped over 21.77 ha at the base of laterite uplands and in sandy pockets between the slopes of laterite uplands with a surface layer of white sand. Griffin (1994) carried out a survey of the northern sandplains between Perth and Geraldton and this MVT is similar to Griffin Floristic Group (GFG) 20-11, which was recorded on plains and pediment slopes with grey over yellow sand and occasionally lateritic gravels. It is relatively widespread with sites from this group distributed between Eneabba and Chittering (Griffin, 1994). *Haemodorum loratum* and *Thysanotus vernalis* (both P3) were recorded in this MVT.

MVT *C***F** was also mapped over 22.36 ha on the midslopes and minor depressions of lateritic uplands with a surface layer of lateritic gravel and white / grey sand. It is similar to GFG 20-6, a variable group with sites sharing few common dominant species. GFG 20-6 was mainly recorded on slopes (including pediment) and some uplands with brown loamy gravels (often lateritic, some schist or granitic) uplands with grey or orange loamy lateritic gravels and was mostly recorded between Chittering and Walebing and rarely to Eneabba (Griffin, 1994). *Acacia retrorsa* (P2), *Haemodorum loratum*, *Patersonia argyrea* and *Thysanotus vernalis* (all P3) were recorded in this MVT.

MVT *EB***WL** was mapped over 50.63 ha on the footslopes and midslopes of lateritic uplands with a surface layer of white to grey sand. It is similar to GFG 20-12 which was recorded on plains, flats and depressions on moderate to well drained grey to yellow sands. It is relatively widespread with sites from this group distributed between Jurien Bay and Ellenbrook (Griffin, 1994). This MVT is most likely the P3 PEC 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' but which also occurs in the Midwest region and is characterised by *Banksia attenuata* and *B*. *menziesii* on deep sands. *Grevillea amplexans* subsp. *adpressa* (P1), *Drosera marchantii* subsp. *prophylla*, *Haemodorum loratum*, *Patersonia argyrea*, *Synaphea endothrix*, *Thysanotus vernalis* (all P3) and *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) were recorded in this MVT.

MVT *E***F**-1 was mapped over 3.51 ha on drainage lines and depressions. It is similar to GFG 20-7 which was described as having a highly variable suite of species, occuring on depressions and valley flats with brown sand (or loamy sand), presumably over clay, and is widespread from Three Springs to Jurien and Chittering and Ellenbrook (Griffin, 1994). No CSF species were recorded in this MVT.

MVT *E***F**-2 was mapped over 6.90 ha on hill slopes and minor valley lower slopes with a surface layer of laterite and white / grey sandy loam. It is similar to GFG 20-5 which occurs mainly on slopes (including pediment) with brown loamy gravels and occurs between Walebing to Chittering with some sites as far north as Burma Road (north-west of Mingenew) (Griffin, 1994). *Acacia retrorsa* (P2) and *Thysanotus vernalis* (P3) were recorded in this MVT.

MVT M**HL** was mapped over 66.72 ha on the upperslopes and crests of lateritic uplands and lateritic outcrops on shallow soils with a surface layer of laterite rocks and gravel. It is similar to GFG 20-13 and occurs on uplands and well drained slopes with grey sandy lateritic gravel between Eneabba, Lesueur, Watheroo and Dandaragan (Griffin, 1994). *Thelymitra stellata* (T), *Grevillea amplexans* subsp. *adpressa* (P1), *Acacia retrorsa*, *Synaphea lesueurensis*, *Synaphea sparsiflora* (all P2), *Drosera marchantii* subsp. *prophylla*, *Haemodorum loratum*, *Lepidobolus quadratus*,

Patersonia argyrea, *Synaphea endothrix*, *Thysanotus vernalis* (all P3), *Xanthosia tomentosa* (P4) and *Synaphea* sp. (PST) were recorded in this MVT.

MVT M**SEL** was mapped over 10.39 ha on lower lying areas adjacent to cleared paddocks in thin bands of remanant vegetation. It is similar to GFGs 20-11 and 20-12 but is lacking the characteristic *Banksia* species and is most likely disturbed patches of MVTs *B***F** and *EB***WL**. *Haemodorum loratum* (P3) was recorded in this MVT.

MVT M**SL**-1 was mapped over 88.81 ha on sandy areas on the slopes, crests and between lateritic outcroppings on laterite uplands with a surface layer of white sand. It is similar to GFG 20-11, which was recorded on plains and pediment slopes with grey over yellow sand and occasionally lateritic gravels. It is relatively widespread with sites from this group distributed between Eneabba and Chittering (Griffin, 1994). *Grevillea amplexans* subsp. *adpressa* (P1), *Synaphea sparsiflora* (P2), *Drosera marchantii* subsp. *prophylla*, *Haemodorum loratum*, *Lechenaultia juncea*, *Lepidobolus quadratus*, *Patersonia argyrea*, *Synaphea endothrix* (all P3) were recorded in this MVT.

MVT M**SL**-2 was mapped over 86.32 ha of the Survey Area on slopes and crests and between lateritic outcroppings on laterite uplands with a surface layer of laterite gravel and white sand. It is similar to GFG 20-12, which was recorded on plains, flats and depressions on moderate to well drained grey to yellow sands. It is relatively widespread with sites from this group distributed between Jurien Bay and Ellenbrook (Griffin, 1994). This MVT is also similar to MVT *EB***WL** but was characterised by a Mixed Low Shrubland as opposed to a Low Woodland. *Drosera marchantii* subsp. *prophylla*, *Haemodorum loratum*, *Synaphea endothrix* (all P3) and *Eucalyptus macrocarpa* subsp. *elachantha* (P4) were recorded in this MVT.

The nine vegetation types mapped in the Survey Area are therefore similar to vegetation mapped in the surrounding areas and regionally. One of them, *EB***WL**, could be the P3 'Banksia dominated woodlands of the Swan Coastal Plain IBRA region' PEC, which is also listed as a PEC of the Midwest region.

Some of this information is summarised in **Table 6.5**.

Table 6.5: Extent, significant flora, condition and wider occurrence of Maia vegetation types mapped in the Survey Area

MVT	Area (ha)	CSF in MVT	Vegetation condition	Occurs outside Survey Area?
*B***F**	21.77	Hl, Tv	2	Yes
*C***F**	22.36	Ar, Hl, Pa, Tv	2	Yes
*EB***WL**	50.63	Dmp, Gaa, Hl, Hsp.W, Pa, Se, Tv	2	Yes
*E***F**-1	3.51	None	2	Yes
*E***F**-2	6.90	Ar, Tv	2	Yes
M**HL**	66.72	Ar, Dmp, Gaa, Hl, Lq, Pa, Se, Sl, Ssp., Ss, Ts, Tv, Xt	2	Yes
*M***SEL**	10.39	Hl, Se	3	Yes
M**SL**-1	88.81	Dmp, Gaa, Hl, Lj, Lq, Pa, Se, Ss	2	Yes
M**SL-2**	86.32	Dmp, Eme, Hl, Se	2	Yes
C	50.64	Hl, Pa, Se, Sl, Ss, Tv, Xt	7	
Total Area	**408.06**			

Notes: MVT = Maia vegetation type; Ar = *Acacia retrorsa*, Dmp = *Drosera marchantii* subsp. *prophylla*, Eme = *Eucalyptus macrocarpa* subsp. *elachantha*, Gaa = *Grevillea amplexans* subsp. *adpressa*, Hl = *Haemodorum loratum*, Hsp.W = *Hemiandra* sp. Watheroo (S. Hancocks 4), Lj = *Lechenaultia juncea*, Lq = *Lepidobolus quadratus*, Pa = *Patersonia argyrea*, Se = *Synaphea endothrix*, Sl = *Synaphea lesueurensis*, Ssp. = *Synaphea* sp., Ss = *Synaphea sparsiflora*, Ts = *Thelymitra stellata*, Tv = *Thysanotus vernalis*, Xt = *Xanthosia tomentosa;* 2 = vegetation structure intact; 3 = vegetation structure altered 7 = cleared areas.

6.3 Carnaby's Black-Cockatoo and Other Significant Fauna (Western Wildlife)

CBC was recorded in the Survey Area, and evidence of foraging on *Banksia* species was also recorded in the *Banksia* woodlands and shrublands. *Banksia* woodlands and shrublands (*B***F**, *EB***WL**, M**SL**-1) are high value/quality foraging habitat, while shrublands with scattered *Banksia* and *Hakea* (M**SL**-2) are of moderate value. The Survey Area includes Wandoo woodland (*E***F**-2), a habitat that potentially supports breeding, though no current breeding trees were recorded within the PCZ. CBC is known to breed nearby, with at least 1% of the breeding population present in the adjacent Coomallo IBA (Birdlife International, 2016a). Thus foraging habitat within the Survey Area may be within a regionally important area supporting breeding of this species where it is within 12 km of the breeding population, and important for birds in the non-breeding season as they move towards to coast to forage.

Other conservation significant species that potentially occur in the survey area are the Rainbow bee-eater (IA), Peregrine Falcon (OS), Fork-tailed swift (IA), a native bee *Hylaeus globuliferus* (P3) and the Western brush wallaby (P4).

6.4 Ecological Communities and Ecosystems at Risk

6.4.1 Threatened Ecological Communities

- Based on the dominant and associated species, two of the MVTs (*B***F** and *EB***WL**) are similar to vegetation communities that form the EPBC listed Threatened Ecological Community "Banksia Woodlands of the Swan Coastal Plain". However, another diagnostic character is that the ecological community is located on the Swan Coastal Plain IBRA bioregion or as pockets of the Darling and Whicher escarpments in the Jarrah Forest IBRA bioregion: as the Survey Area is not on the Swan Coastal Plain or Jarrah Forest IBRA bioregions, these MVTs in the Survey Area do not meet that key diagnostic characteristic.

- No vegetation types recorded in the Survey Area are the same as any other TECs currently listed for the Geraldton Sandplains bioregion.

6.4.2 Priority Ecological Communities

- One vegetation type, *EB***WL**, is similar to the description for a P3 PEC listed as occurring in the Midwest region - Banksia dominated woodlands of the Swan Coastal Plain IBRA region - which is commonly dominated or co-dominated by *Banksia attenuata* and *B. menziesii* on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands.

6.5 Phytophthora Dieback

Forty-one of the species recorded in the Survey Area in April and October 2016 are listed as species susceptible to *Phytophthora cinnamomi* (CPSM, 2014): *Adenanthos cygnorum, Allocasuarina humilis, Andersonia heterophylla, Andersonia lehmanniana* subsp. *lehmanniana*, *Astroloma xerophyllum, Banksia armata* var. *armata*, *Banksia bipinnatifida* subsp. *multifida*, *Banksia candolleana, Banksia menziesii, Banksia prionotes, Banksia telmatiaea, Bossiaea eriocarpa, Calytrix fraseri, Conospermum stoechadis* subsp. *stoechadis*, *Conostephium pendulum, Dampiera alata, Daviesia decurrens, Eremaea beaufortioides* var. *beaufortioides*, *Eremaea beaufortioides* var. *microphylla*, *Eucalyptus todtiana, Gompholobium knightianum, Hakea trifurcata, Hibbertia acerosa, Hibbertia huegelii, Hibbertia hypericoides, Jacksonia floribunda, Jacksonia sternbergiana, Labichea punctata, Lambertia multiflora* var. *multiflora*, *Leucopogon conostephioides, Leucopogon propinquus, Opercularia vaginata, Petrophile linearis, Scholtzia involucrata, Stirlingia latifolia, Thomasia grandiflora, Thysanotus multiflorus, Trymalium ledifolium, Verticordia densiflora* var. *cespitosa*, *Verticordia grandis, Xanthorrhoea preissii*. None of the CSF species located during these surveys are likely to be susceptible.

Remnant vegetation in the Survey Area is mapped as being susceptible to Phytophthora Dieback and the BVSAs mapped as highly susceptible are 1031 and 1031.1 (Project Dieback, 2014a).

6.6 Clearing Principles

Under the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation requires a permit unless its purpose is exempt. Any vegetation clearing requiring a Native Vegetation Clearing Permit (NVCP) needs to address 10 clearing principles as part of the permitting process.

The 10 clearing principles are addressed with respect to the Survey Area in **Table 6.6**.

Table 6.6: Clearing principles and the Survey Area

Clearing principle	Jurien East Road proposed clearing zone and Survey Area
a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	**At variance to this principle** The Survey Area lies in an area known for its high species diversity (DPaW, 2007-). Diversity at the relevés assessed in the Survey Area varied from a low of 11 taxa to a high of 49 in each approximately 10 m by 10 m relevé and the average was 32. The number of taxa recorded in the Survey Area (419 taxa) is high; however, an approximately 24 km long linear corridor was surveyed with a number of different vegetation types occurring in the corridor, including forest, woodland and mixed heath. The PCZ has been mostly previously cleared for ongoing maintenance / upkeep and small areas of intact native vegetation will need to be cleared for the proposed works along a 17 km section of the road corridor (chainage 7 to 24). Approximately 2.38 ha of previously undisturbed native vegetation will be cleared.
b) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	**At variance to this principle** Evidence of foraging activities by CBC was noted in the *Banksia* woodlands and shrublands (*B***F**, *EB***WL**, M**SL**-1). This habitat is likely to be of high value as foraging habitat. Some of this foraging habitat is likely to be within 12 km of a known breeding population of CBC, and thus of importance to breeding birds. Although no current breeding population appears to be present, the Wandoo woodland (*E***F**-2) is a vegetation type that potentially supports breeding by CBC. Clearing of more than 1 ha of high value foraging habitat and/or any part of a vegetation community known to contain breeding habitat is considered to be a high risk of significant impact to CBC (DSEWPaC, 2012). Approximately 0.47 ha <u>in total</u> of the three high value foraging habitat MVTs (*B***F**, *EB***WL**, M**SL**-1) will be cleared within the PCZ and approximately 0.15 ha of <u>potential</u> (rather than known) breeding habitat - *E***F**-2. The clearing proposed will be less than 1 ha (0.62 ha).
c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	**Not at variance to this principle** One Threatened / DRF species was located in the Survey Area – *Thelymitra stellata* (Endangered). These plants will be avoided, a buffer of 50 m will be placed around the plants and vegetation will only be cleared within this buffer under an approved NVCP. Fourteen priority species were located in the Survey Area and 7 of these 14 occur in the PCZ: *Acacia retrorsa* (P2), *Synaphea sparsiflora* (P2), *Haemodorum loratum* (P3), *Patersonia argyrea* (P3), *Synaphea endothrix* (P3), *Thysanotus vernalis* (P3) and *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4). Two additional species were listed in the results of the DPaW searches (*Grevillea rudis* (P4) and *Thysanotus glaucus* (P4)); however, the botanists surveyed the locations and could not find them. Two *Acacia retrorsa* (P2) were recorded in the PCZ and an additional 184 plants are estimated from FloraBase records and from this survey i.e. a maximum of 1.1% of the estimate of currently known records for this species could be impacted.

Clearing principle	Jurien East Road proposed clearing zone and Survey Area
	Twenty-nine *Synaphea sparsiflora* (P2) were recorded in the PCZ and an additional 310 plants are estimated from FloraBase records and from this survey i.e. a maximum of 8.6% of the estimate of currently known records for this species could be impacted. Eleven *Haemodorum loratum* (P3) were recorded in the PCZ and an additional 327 plants are estimated from FloraBase records and from this survey i.e. a maximum of 3.3% of the estimate of currently known records for this species could be impacted. Six *Patersonia argyrea* (P3) were recorded in the PCZ and an additional 68 plants are estimated from FloraBase records and from this survey i.e. a maximum of 8.1% of the estimate of currently known records for this species could be impacted. One *Synaphea endothrix* (P3) was recorded in the PCZ and an additional 147 plants are estimated from FloraBase records and from this survey i.e. a maximum of 0.7% of the estimate of currently known records for this species could be impacted. Two *Thysanotus vernalis* (P3) were recorded in the PCZ and an additional 109 plants are estimated from FloraBase records and from this survey i.e. a maximum of 1.8% of the estimate of currently known records for this species could be impacted. Two *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) were recorded in the PCZ and an additional 47 plants are estimated from FloraBase records and this survey i.e. a maximum of 4.1% of the currently known records for this species could be impacted. Based on the number of plants located in areas searched away from the PCZ but within the Survey Area it is likely more plants of each of these seven species would be found in the wider Survey Area (and in the neighbouring Coomallo Nature Reserve), and that the impacts to these species will actually be less than those calculated. None of the habitats/MVTs occurring in the small areas to be cleared within the PCZ is restricted to the PCZ and these MVTs have been mapped in the parts of the Survey Area outside the PCZ. Records for *Acacia retrorsa* (P2), *Haemodorum loratum* (P3), *Patersonia argyrea* (P3), *Synaphea endothrix* (P3), *Thysanotus vernalis* (P3) and *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) occur on lands managed by DPaW outside of the PCZ and Survey Area. *Synaphea sparsiflora* (P2) has no known records on land managed by DPaW but has records away from the Survey Area. These priority species do not therefore rely on the habitats/MVTs of the PCZ and Survey Area for their continued existence.
d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a TEC.	**Not at variance to this principle** The native vegetation in the PCZ does not comprise the whole or a part of a TEC. The nearest known TEC is 3.5 km north of the PCZ. The MVTs mapped in the PCZ either do not match the descriptions for or do not meet key diagnostic characteristics for currently listed TECs in the Geraldton Sandplains or adjacent bioregions.
e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	**Not at variance to this principle** Native vegetation in the Geraldton Sandplains bioregion has been extensively cleared and between 32% and 78% of the six BVSAs occurring in the Survey Area currently remains (GoWA, 2015a). The PCZ occurs with the EPA's Position Statement 2 Agricultural Region (EPA, 2000). The impact to the six BVSAs occurring in the areas to be cleared within the PCZ is about 0.03% of the pre-European extent in the Geraldton Sandplains bioregion and this will not bring the level of total clearing in the Geraldton Sandplains bioregion below the threshold level of 30% (EPA, 2000) for any of these BVSAs. Approximately 2.38 ha of native vegetation will need to be cleared for the proposed works. This small area will not have a significant impact on these remnants, as each of the clearing areas within the PCZ is very small (the largest of the individual patches of vegetation to be cleared is estimated to be 0.34 ha) and none of the patches of clearing will divide the remnants further. All nine MVTs mapped in the Survey Area

Clearing principle	Jurien East Road proposed clearing zone and Survey Area
	will be impacted by the proposed clearing in the PCZ; hese MVTs are also mapped in the wider Survey Area. The PCZ covers 38.03 ha and 93.75% of this area has already been cleared and an additional 2.38 ha (6.25%) will need to be cleared for the proposed upgrade works.
f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	**At variance to this principle** No currently known protected or significant wetlands occur in PCZ and Survey Area. Coomallo Creek passes through a section of the Survey Area and the PCZ – approximately 0.03 ha of MVT *E***F**-1 will be cleared in the PCZ in this area. Munbinea Creek also passes through a section of the Survey Area and PCZ – approximately 0.06 ha of MVT *E***F**-1 will be cleared in the PCZ in this area.
g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	**Not at variance to this principle** As only 2.38 ha of additional clearing will be carried out along a 17 km stretch of road reserve it should not cause appreciable land degradation.
h) Native vegetation should not be cleared if the clearing of vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	**Not at variance to this principle** The clearing within the PCZ will take place in the road reserve and not within the boundaries of the Coomallo Nature Reserve. Reserve 24276 occurs to the south of the Survey Area and adjacent to Coomallo Nature Reserve and no vegetation will be cleared within the boundaries of this reserve. The clearing in the PCZ will not impact on the environmental values of these reserves.
i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	**Not at variance to this principle** The relatively small area of additional clearing proposed along this existing road should not cause long-term deterioration in the quality of surface or underground water.
j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	**Not at variance to this principle** The relatively small area of additional clearing proposed along the existing road corridor should not cause or exacerbate the incidence or intensity of flooding. Some of the proposed works involves upgrading of existing drainage areas to improve drainage along this section of the road.

6.7 Survey Limitations

Guidance Statement 51 (EPA, 2004a) states that reports produced on flora and vegetation surveys for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used: a suggested list of constraints that these may cover is provided in Guidance Statement 51. Each of these constraints is discussed with respect to this survey (**Table 6.7**).

Table 6.7: Survey limitations

Limitation	Comment
Sources of information and availability of contextual information (i.e. pre-existing background versus new material)	**No limitation** A desktop study was carried out and the results of the database and literature searches are provided in **Table 2.1**. The EPBC Act Protected Matters search tool and NatureMap were used. Relevant environmental GIS layers were downloaded through Landgate's Slip Enabler and DotEE's Find Environmental Data and the results are listed in **Table 2.4**. Beard's pre-European vegetation mapping, native vegetation extent and the Government of Western Australia's vegetation statistics were also used. Selected publicly available information on floristic surveys conducted in the vicinity of the Survey Area was referenced e.g. Griffin, 1994.
The scope (i.e. what life forms, etc., were sampled)	**No limitation** Vascular flora species and vertebrate fauna of the Survey Area.
Proportion of flora collected and identified (based on sampling, timing and intensity)	**No limitation** Four hundred and nineteen taxa (419) were recorded from 62 families and 183 genera and 38 (9%) of the 419 taxa were weeds. Twenty-six taxa could not be identified beyond genus. Flowering material was used to identify 45% of the species list, fruiting material 19% and both flowering and fruiting material 15% i.e. 79% of the species list was identified from fertile material. Where possible at least one specimen of each species encountered during the survey was collected and species were re-collected if flowering or fruiting material was located. The survey was carried out in autumn and spring and the rainfall in the three months before the autumn survey was very much above average and before the spring survey average / below average. The spring survey was timed to coincide with flowering times of threatened flora that have been recorded in the area previously. Twenty-seven relevés and approximately 57 ha were assessed by traverses within the Survey Area: 100% of the proposed works corridor/clearing zone (PCZ) was assessed and approximately 8% of the remaining vegetation in the Survey Area.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed?)	**No limitation** A combined Level 1 flora and vegetation reconnaissance and targeted flora survey was conducted over the Survey Area. The vegetation and targeted flora surveys were split, the vegetation survey carried out in autumn and the targeted survey in spring. The survey was carried out in this way in order to target the many CSF that have been recorded in the surrounding area and that mostly flower in spring. The coverage achieved was good and the botanists walked traverses in the PCZ and in the wider area, which will not be impacted, to allow impacts to any CSF located in the PCZ to be estimated. All known and suspected CSF species located were counted and recorded on a GPS. Further work may be needed to confirm the identification of the *Synaphea* sp. collected from the Survey Area if more vegetation clearing is planned in the future. However, the plants recorded in the Survey Area are not in the current PCZ and it will not be impacted by the proposed works.

Limitation	Comment
Mapping reliability	**Moderate limitation**
	The vegetation was mapped at a scale of 1:1,000 using the latest imagery available – the WA Now Mosaic aerial photography was captured in October 2015 and sourced from Landgate SLIP Imagery. Information on vegetation type boundaries and habitat changes were noted while carrying out the survey. In March 2016, the Shire of Dandaragan mulched the existing road shoulder and these changes are not visible on the aerial imagery. Therefore the actual clearing extent along the road will be further from the centreline than indicated. An additional 1 m was added to the mapped clearing extent within the PCZ in order to calculate impacts to MVTs, CBC habitat and BVSAs. In addition to this in May 2017 the clearing boundary was walked in areas of high value CBC habitat to be able to more accurately calculate the clearing required in these MVTs. In the areas that were walked the existing clearing boundary was between 1 m and 6 m from the edge of the bitumen. The datum for Landgate Aerial imagery is WGS84. All data collected and mapped by Maia is in datum GDA94. Therefore any data displayed on maps might be out by 1 to 2 m. Maia was provided with non-georeferenced DWG CAD files by the Shire of Dandaragan's engineering consultants. The DWG polyline file was georeferenced in Jurien Coastal Grid 94. The CAD programs used to generate these files do not export DWG files with a georeferenced or world file. Maia georeferenced and spatially adjusted the polylines using the affine transformation in ArcGIS by using five survey markers provided in the CAD file with Landgate's geodetic survey markers. Some sections of the PCZ vegetation, assumed current clearing extent and centreline do not align exactly with the WA Now Mosaic aerial imagery because of the angle at which the image was captured. The vegetation extent polyline is broken in some areas and some sections of the PCZ extend beyond the known vegetation extent in these areas. In May 2017 much of the road corridor between chainage 7 and chainage 24 was walked in order to determine the current clearing boundary from routine road maintenance. The areas where high value CBC foraging habitat was mapped in the road corridor was prioritised followed by any large areas where clearing boundary information had not been previously recorded. The mapping reliability is considered to be adequate for a Level 1 survey (EPA, 2004).
Timing, weather, season, cycle	**No limitation**
	BoM's rainfall deciles maps for 1 February to 30 April and 1 July to 30 September 2016 show the Survey Area in an area that received very much above average rainfall in the three months before the autumn survey and average to below average rainfall in the three months before the spring survey. Annual species comprised 14% of the species list and over both surveys 79% of the species list was identified from fertile specimens with reproductive material. The spring survey was timed to coincide with the time when most of the CSF previously located in the Survey Area and surrounds tend to flower.
Disturbances (fire, flood, accidental human intervention etc.)	**No limitation**
	No disturbances occurred in the weeks before the survey or while it was being carried out. There was no evidence of any recent fires in the Survey Area.
Intensity (in retrospect, was the intensity adequate?)	**No limitation**
	100% of the PCZ was surveyed by the botanists and approximately 8% of the remainder of the Survey Area. Good coverage was achieved over the area that could be impacted and traverses were walked in areas adjacent to where CSF species were located in the PCZ to determine whether they also occurred in the adjacent areas.

Limitation	Comment
Resources	**No limitation**
	Adequate resources were employed during the survey. Five person days were spent on the autumn survey and 10 on the spring survey. Two botanists with eight to 10 years of experience in flora and vegetation surveys in WA carried out the surveys.
Access problems	**No limitation**
	There were no access problems as the Survey Area was accessible directly from Jurien East Road.
Experience levels (e.g. degree of expertise in plant identification to taxon level)	**No limitation**
	Scott Hitchcock and Rochelle Haycock have conducted many surveys in WA over the past 8 to 10 years. Specimens for most species recorded were collected for identification at the WA Herbarium in Perth. Specimens were identified by Cate Tauss who has more than 25 years of experience in the taxonomy of the WA flora. Cate liaised with WA Herbarium experts when necessary.

7 SUMMARY OF RESULTS; RECOMMENDATIONS

7.1 FLORA

- Four hundred and nineteen (419) taxa from 183 genera and 62 families were recorded in the Survey Area. The flora of the Survey Area is typical of the location and is relatively species rich in undisturbed areas.
- One threatened species (*Thelymitra stellata* listed as Endangered under both the EPBC and WC acts), 14 priority flora species (*Grevillea amplexans* subsp*. adpressa* (P1), *Acacia retrorsa* (P2), *Synaphea lesueurensis* (P2), *Synaphea sparsiflora* (P2), *Drosera marchantii* subsp. *prophylla* (P3), *Haemodorum loratum* (P3), *Lechenaultia juncea* (P3), *Lepidobolus quadratus* (P3), *Patersonia argyrea* (P3), *Synaphea endothrix* (P3), *Thysanotus vernalis* (P3), *Eucalyptus macrocarpa* subsp*. elachantha* (P4), *Hemiandra* sp. Watheroo (S. Hancocks 4) (P4) and *Xanthosia tomentosa* (P4)), and 1 potentially significant flora species (*Synaphea* sp.) were located in the Survey Area.
- Seven of the 15 CSF species and the *Synaphea* sp. located in the Survey Area will not be impacted by the proposed works because they do not occur in the PCZ. Potential impact to the seven species that will be impacted ranges from approximately 0.7% (*Synaphea endothrix* (P3)) to 8.6% (*Synaphea sparsiflora* (P2)). However, impacts are likely to be lower than this as only 8% of the vegetation outside the boundary of the PCZ was assessed compared with 100% of the vegetation in the PCZ and there are likely to be more CSF in the area outside the PCZ in the areas not surveyed.
- No weed species on any of the national weed lists were located in the Survey Area. One weed species located in the Survey Area is listed as a Declared Plant in WA - *Echium plantagineum* (Patterson's Curse / Salvation Jane), which is declared as a C3 (Management) pest in many shires in WA including in the Shire of Dandaragan and some form of management should be applied to alleviate its impact/reduce its numbers or distribution. Thirty-seven other weed species were also located in the Survey Area.

7.2 FAUNA (WESTERN WILDLIFE)

- CBC (Threatened, Endangered) was recorded in the Survey Area as well as evidence of foraging on *Banksia* species.
- The Survey Area contains both high-value (MVTs *B***F**, *EB***WL**, M**SL**-1) and moderate value (MVT M**SL**-2) foraging habitat in the form of *Banksia* woodlands and shrublands. Approximately 0.47 ha (in total) of the three high-value MVTs will be cleared for the proposed works.
- The Survey Area contains potential breeding habitat for CBC (MVT *E***F**-2) and approximately 0.15 ha of this potential breeding habitat will be cleared in the PCZ. Though no trees with suitably-sized hollows were noted, 16 trees fitting the DBH criteria for potential breeding habitat were located in the PCZ. CBC is known to breed nearby in the Coomallo Important Bird Area, adjacent to the eastern end of the Survey Area.
- No roosting habitat areas are known in the area, although Flooded Gum and Marri trees in association with the creek-lines are potentially roosting habitat.
- Other conservation significant species that potentially occur in the survey area are the Rainbow bee-eater (IA), Peregrine Falcon (OS), Fork-tailed swift (IA), a native bee *Hylaeus globuliferus* (P3) and the Western brush wallaby (P4).

7.3 VEGETATION

- Impact to the six BVSAs occurring in the areas to be cleared within the PCZ will be less than 0.03% of their pre-European extents in the Geraldton Sandplains bioregion and this will not bring the level of total clearing for any of them to below the threshold level of 30%.
- Nine vegetation types were mapped in the Survey Area: *Banksia* Forest, *Corymbia* Forest, *Eucalyptus* and *Banksia* Woodland, *Eucalyptus*/*Corymbia* Forest, *Eucalyptus* Forest, Mixed Heathland, *Mesomelaena* Sedgeland and two different types of Mixed Shrubland. These nine vegetation types are similar to

vegetation mapped in the surrounding areas and regionally. In total approximately 2.38 ha of intact vegetation (across all MVTs) will be cleared for the proposed works.

- The structure of most of the vegetation (approximately 88%) in the Survey Area is intact and the remainder (approximately 12%) has been altered by patches of clearing and weeds.

7.4 Ecological Communities and Other Significant Areas

- The Survey Area does not fall within an area identified as a currently-listed TEC or PEC.
- None of the vegetation types recorded in the Survey Area is the same as any of the currently known TECs in the subregion. The Survey Area is not in the Swan Coastal Plain or Jarrah Forest IBRA bioregion and therefore does not match the criteria for the Banksia Woodlands of the Swan Coastal Plain TEC.
- One vegetation type, *EB***WL,** is similar to the description for a P3 PEC listed for the Midwest region - Banksia dominated woodlands of the Swan Coastal Plain IBRA region. Approximately 0.36 ha of this vegetation type will be cleared for the proposed works.
- The Survey Area is not within, but much of it is surrounded by, the Coomallo Nature Reserve, which is also on the Register of National Estate.
- An EPA Red Book area and ESA cover the Coomallo Nature Reserve and much of the Survey Area.
- All of the Survey Area lies in a Schedule 1 area - the Geraldton Sandplains bioregion.

7.5 Phytophthora Dieback

- Forty-one of the species recorded in the Survey Area are listed as species susceptible to Dieback and BVSAs 1031 and 1031.1, which comprise approximately 79% of the Survey Area, are highly susceptible to Phytophthora Dieback. A positive sample for *Phytophthora* has been recorded in the Survey Area.

7.6 Recommendations

- The *Thelymitra stellata* located in the Survey Area must not be cleared or impacted unless appropriate state and federal approvals have been applied for and granted. In addition to this the area covered by vegetation within 50 m of a threatened flora location is an ESA and this vegetation must not be cleared without a NVCP having been applied for and granted.
- The potentially significant *Synaphea* sp. should be avoided and the location buffered so that the plants are not inadvertently impacted. The location should be visited at an appropriate time in spring 2017 so that flowering specimens can be collected in order to confirm the identity and significance of the plants.
- While not a threatened species, the P1 *Grevillea amplexans* subsp*. adpressa* located close to the PCZ should be avoided because there are few records for this species in the surrounding area and in WA.
- A bilateral agreement between the Commonwealth and WA governments enables the assessment of potential impacts to MNES to be carried out by the Department of Environment Regulation while assessing the native vegetation clearing permit application. As 0.47 ha of high quality foraging habitat and 0.15 ha of potential breeding habitat for CBC is to be cleared, this does not meet the criteria for high risk of significant impact in the referral guidelines for three threatened black cockatoo species.
- Direct impact to the vegetation of the Survey Area should be minimised as much as possible and vegetation clearing boundaries clearly identified before commencing any clearing.
- Impact to potential CBC breeding trees (and potential roost tree areas in the creeklines) should be avoided whenever possible. Potential CBC breeding trees should be clearly identified before the works start and every effort made to retain the trees that do not need to be cleared for road safety.
- Standard weed management practices should be employed to prevent a) the introduction of new weeds on machinery used for the works and b) the spreading of existing weeds along the road corridor when the works are carried out.
- Standard Phytophthora Dieback hygiene practices should be employed to prevent the potential spread or introduction of the disease into the susceptible native vegetation of the area.

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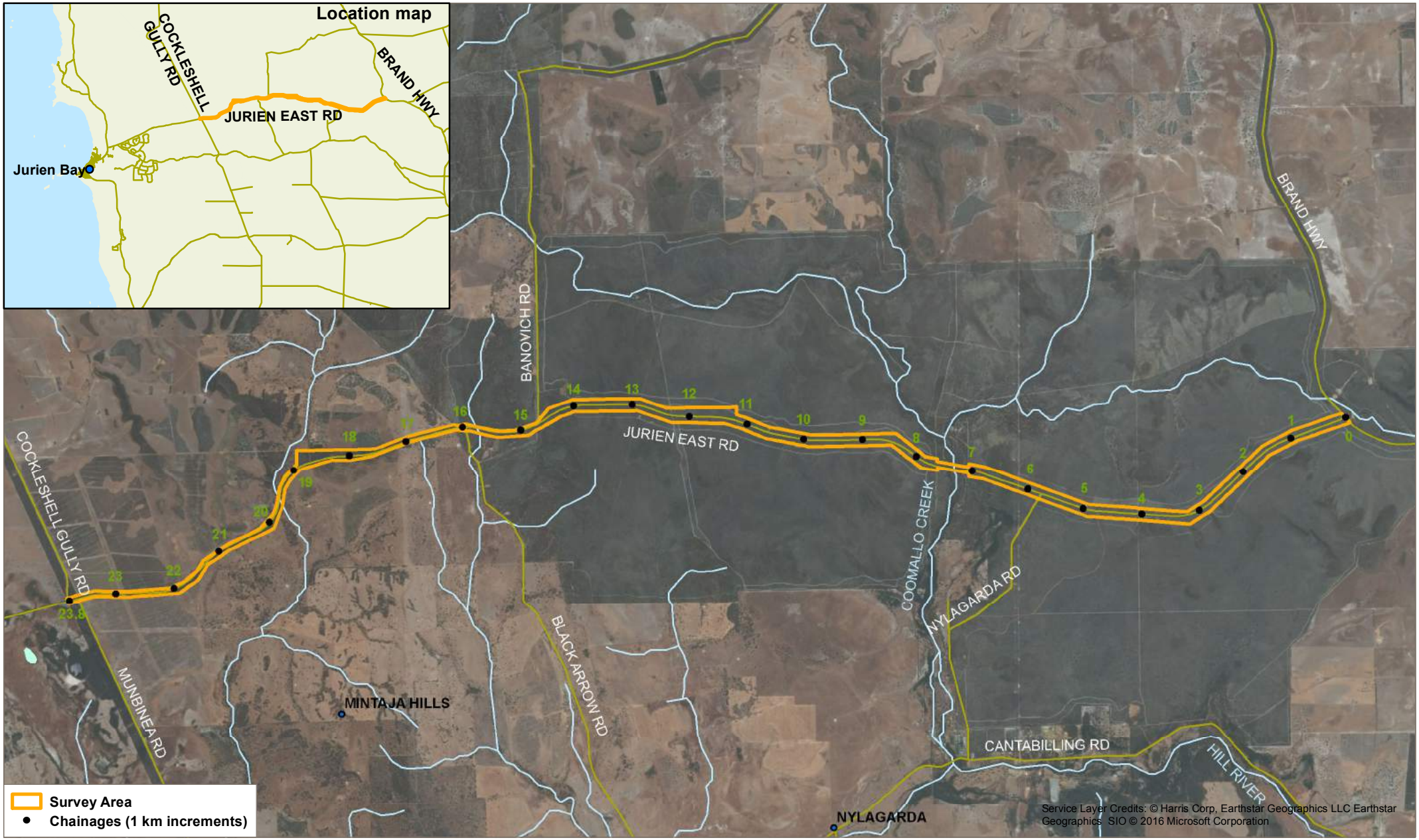
9 MAPS

Notes for Maps 9.1 to 9.33:

The chainages displayed on the following maps were determined by constructing points in ArcGIS at a distance of either 1 km (Map 9.11 and 9.33) or 0.1 km (all other maps) apart and starting at the intersection of Brand Highway with Jurien East Road. Main Roads Western Australia's road centrelines shapefile was used as centreline for the road. Chainages are not the same as SLKs. No SLKs are displayed on these maps.



Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Places
Roads (MRWA)
Lakes
Watercourse lines

Survey Area

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.1
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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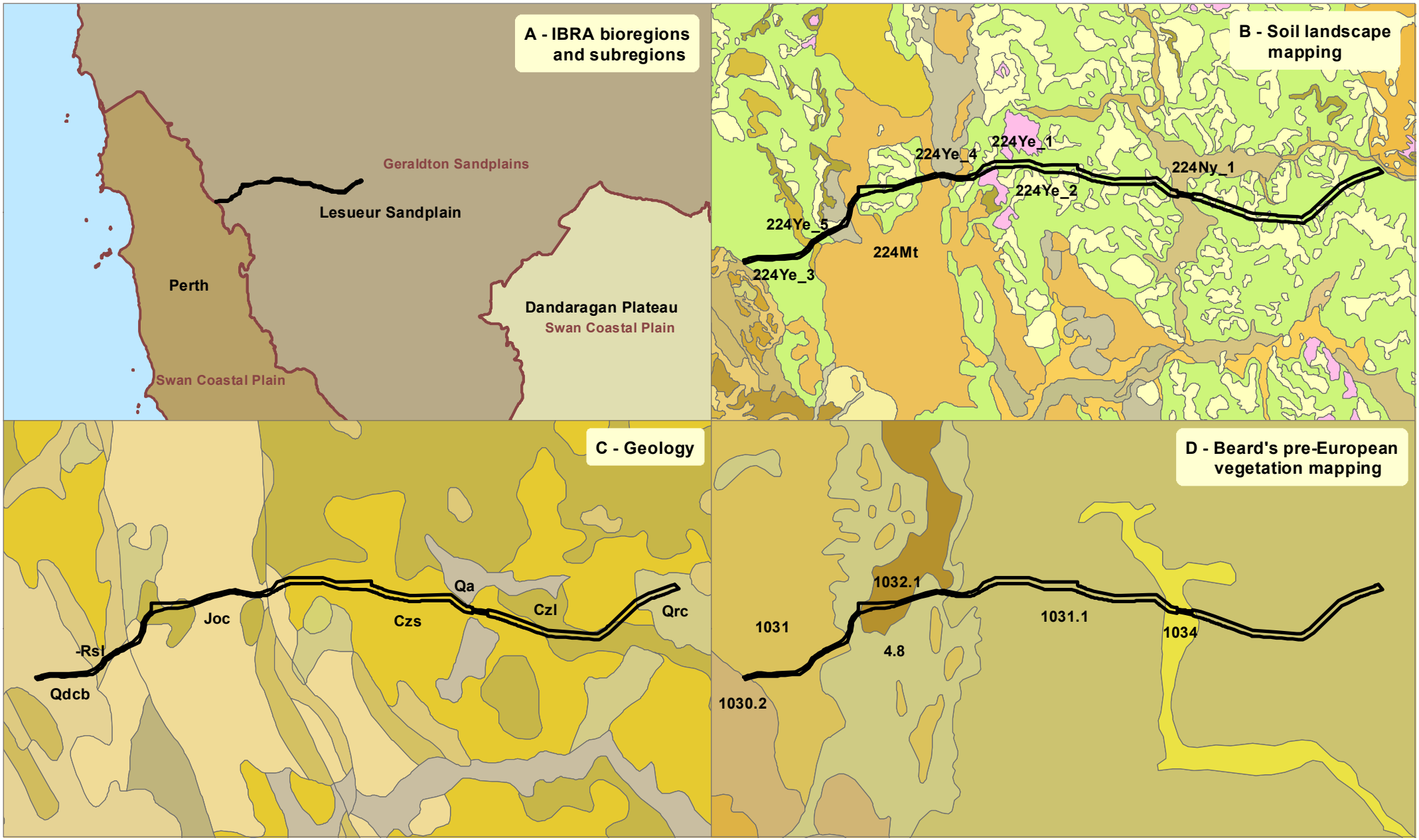

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Survey Area

IBRA bioregions and subregions, soil landscape mapping, geology and Beard's pre-European vegetation mapping (vegetation system associations)

maia

N

Datum: GDA 1994, MGA 50

Map: 9.2
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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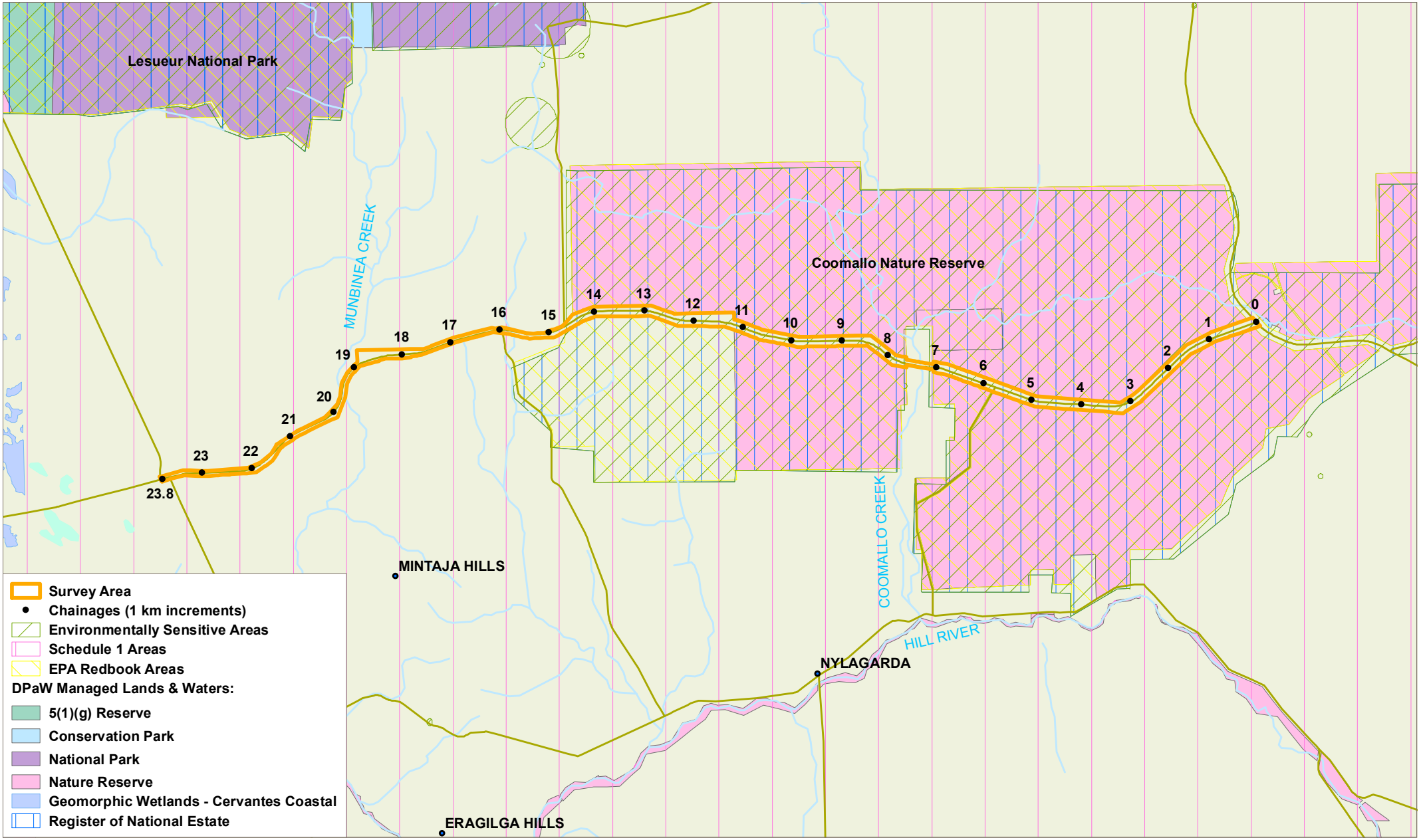

Places
Roads (MRWA)
Lakes
Watercourse lines

Protected and significant areas

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.3
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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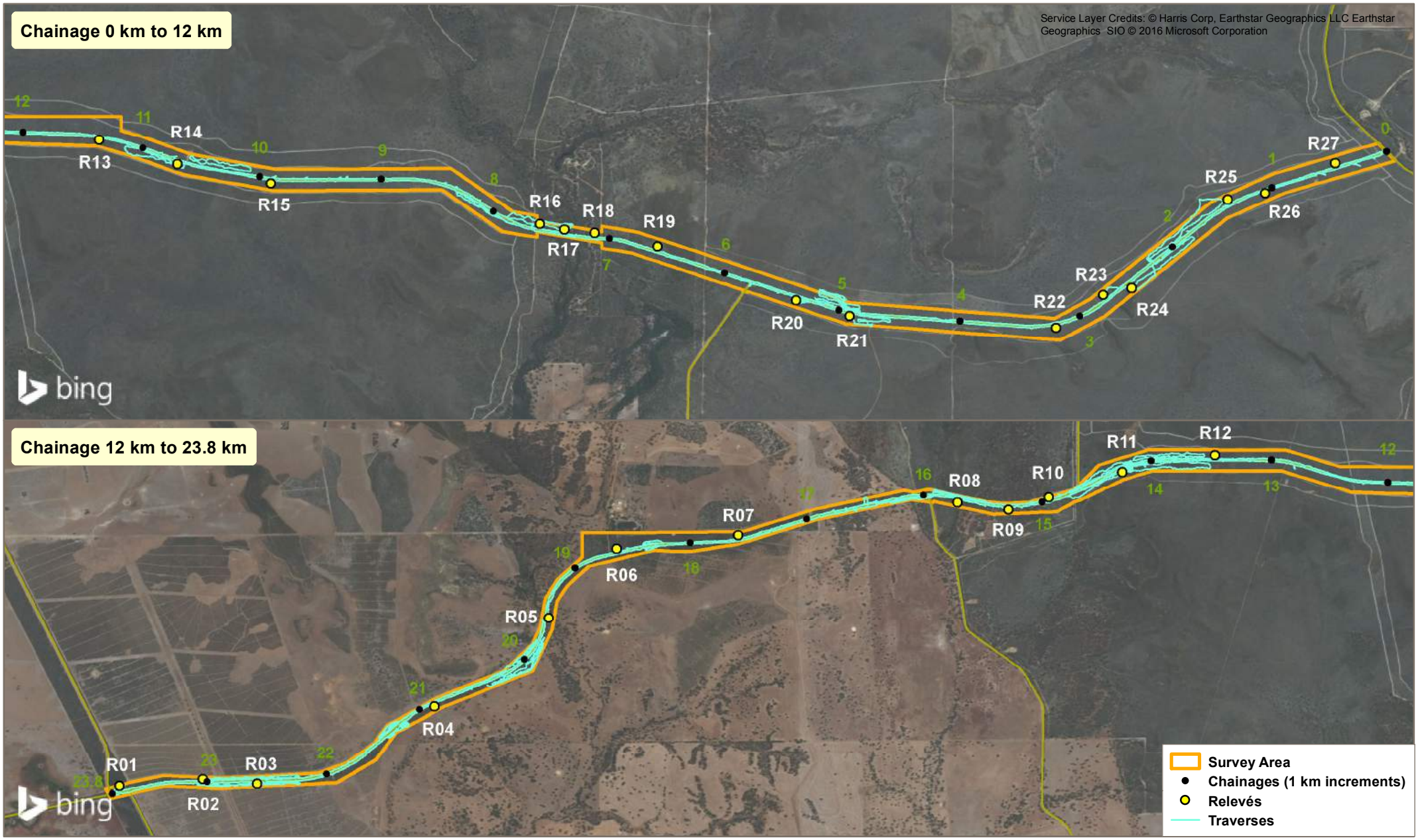

Location Map

Roads (MRWA)

Relevés and traverses

maia

N

Datum: GDA 1994, MGA 50

Map:	9.4
Prepared for:	SofD
Drawn by:	RH
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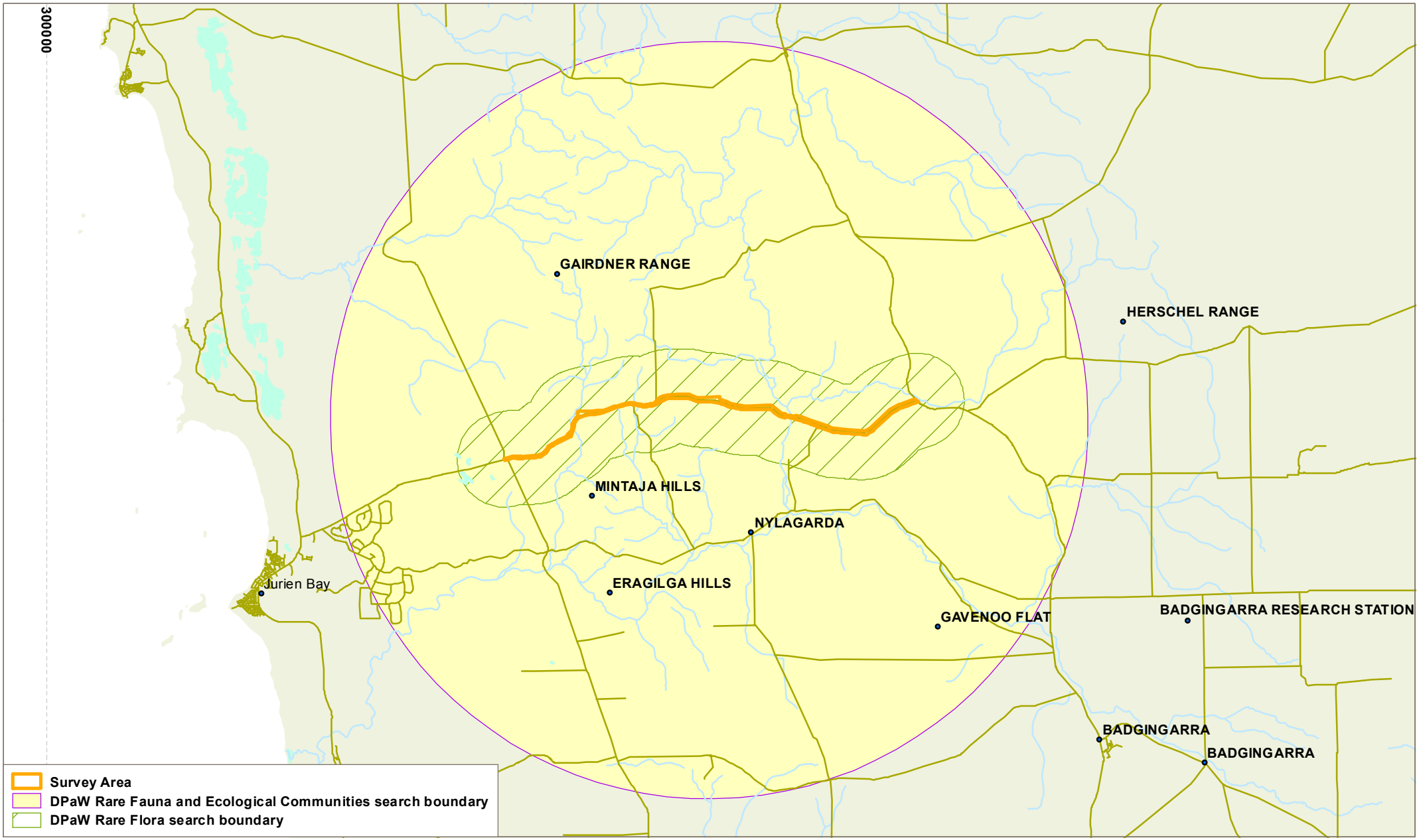

Location Map

Places
Roads (MRWA)
Lakes
Watercourse lines

Database search areas

maia

N

0 5

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.5
Prepared for: SofD
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Version: 1 **Size:** A4

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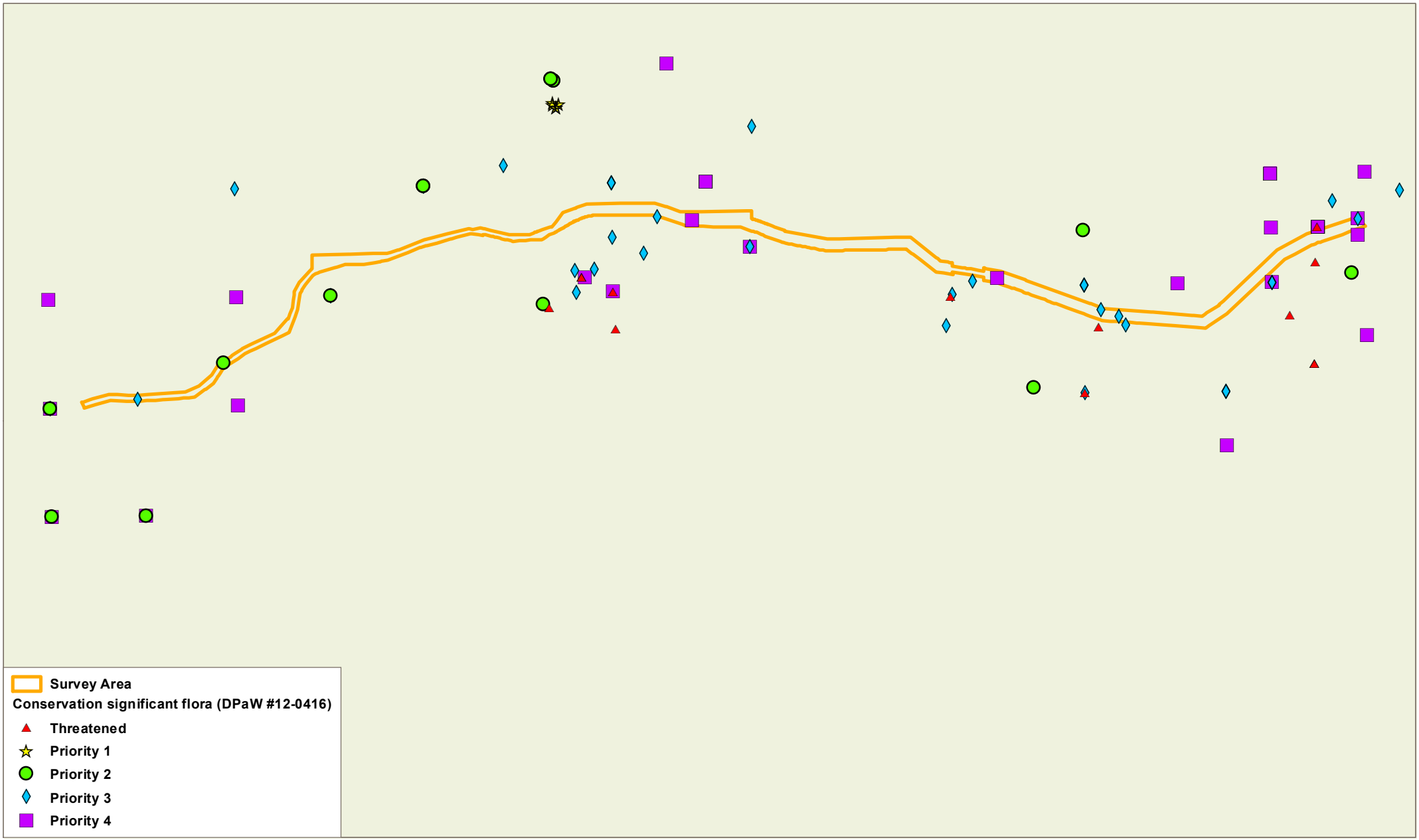

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Conservation significant flora
(DPaW search reference #12-0416FL)

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.6
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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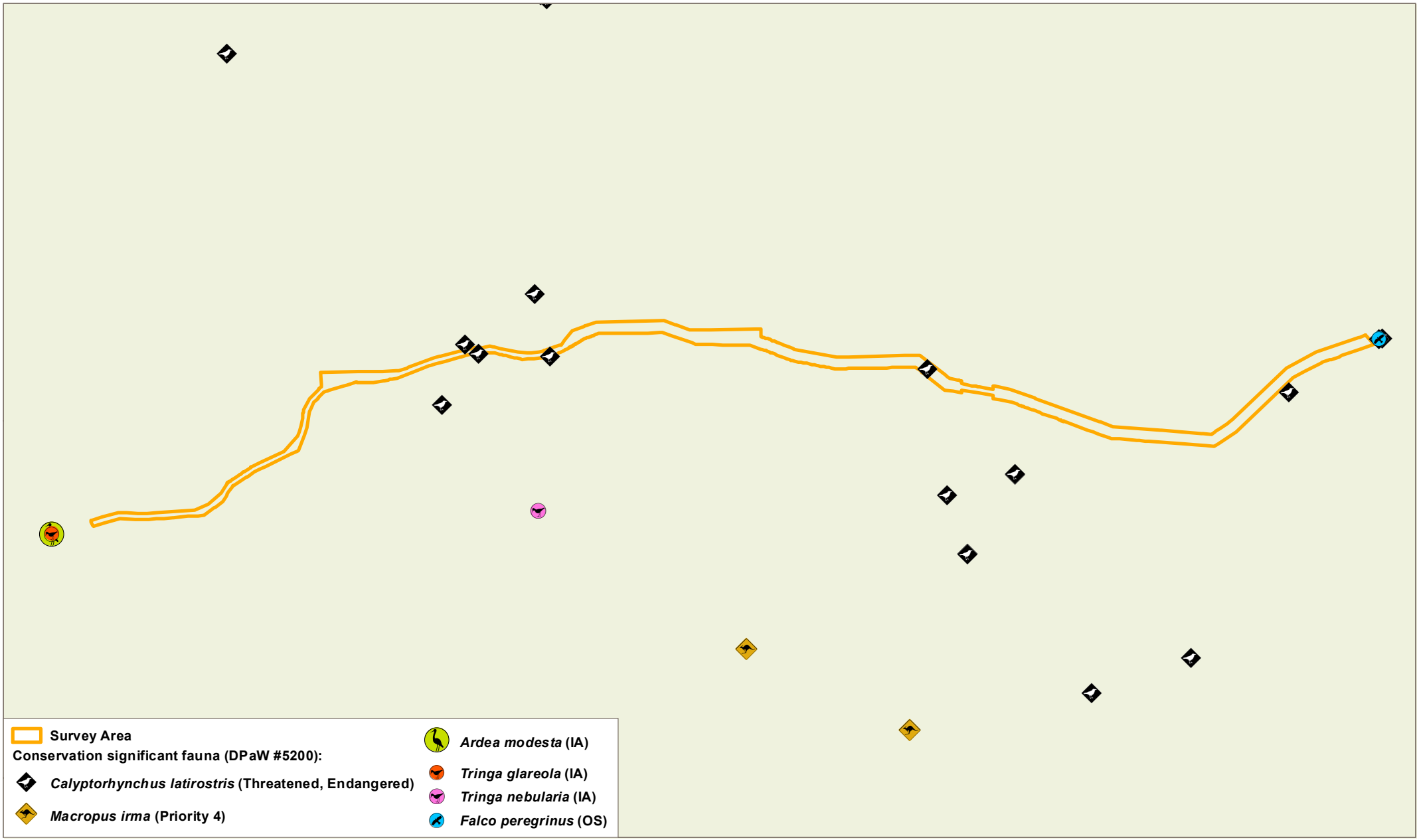

Conservation significant fauna (DPaW search reference #5200)

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.7
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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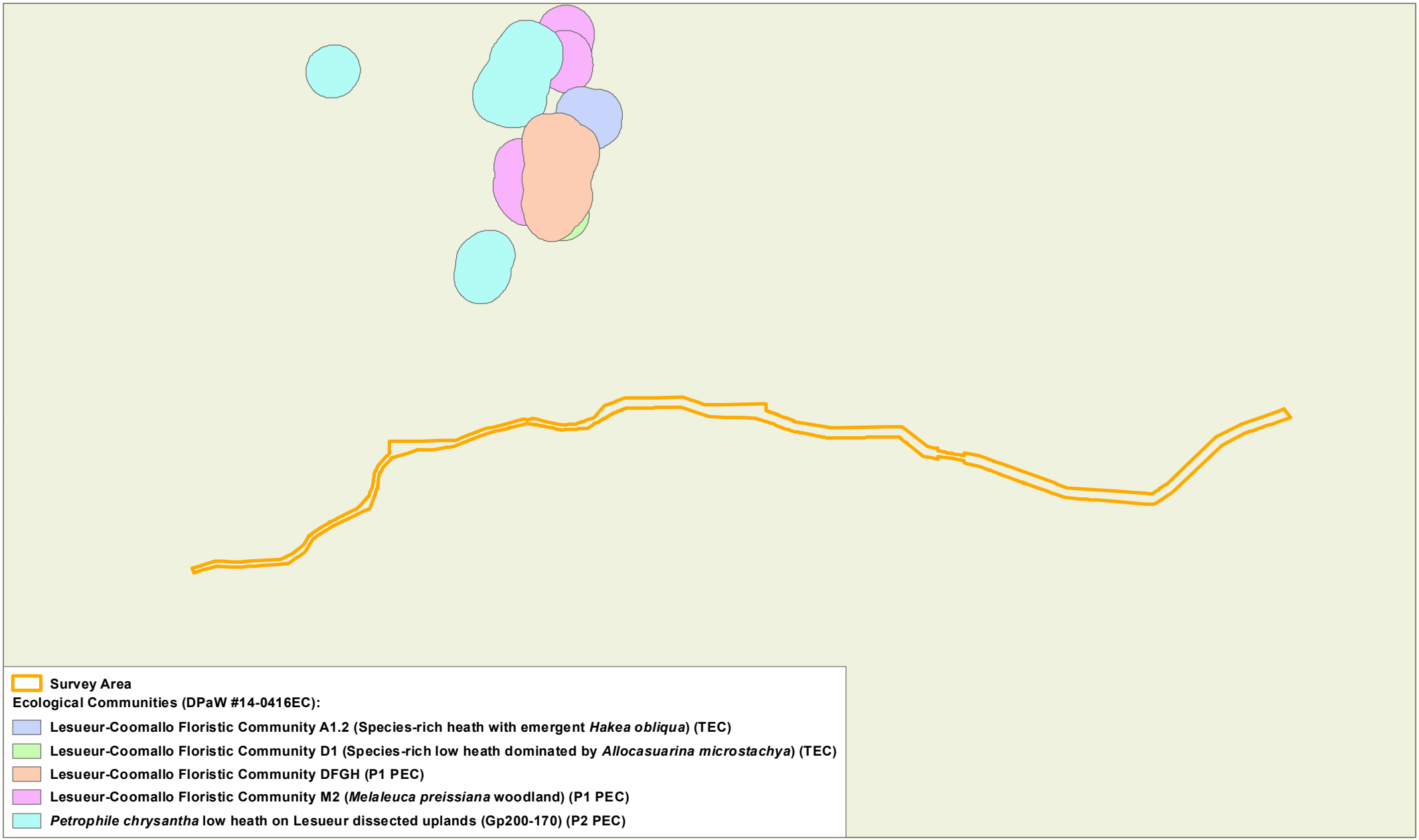

Threatened and Priority Ecological Communities (DPaW search reference #14-0416EC)

maia

N

0 2

Kilometres

Datum: GDA 1994, MGA 50

Map: 9.8
Prepared for: SofD
Drawn by: RH
Date: 06/12/2016
Version: 1 **Size:** A4

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Survey Area
Chainages (0.1 km increments)
Roads (MRWA)

JURIEN_ROAD_BDRY_JCG94:

Proposed clearing zone
Vegetation tree canopy (assumed current extent of clearing)
Weeds (Maia)
Threatened Flora 50 m buffer

Conservation significant flora (Maia):

Thelymitra stellata (T)
Grevillea amplexans subsp. *adpressa* (P1)
Acacia retrorsa (P2)
Synaphea lesueurensis (P2)
Synaphea sparsiflora (P2)
Drosera marchantii subsp. *prophylla* (P3)
Haemodorum loratum (P3)
Lechenaultia juncea (P3)
Lepidobolus quadratus (P3)
Patersonia argyrea (P3)
Synaphea endothrix (P3)
Thysanotus vernalis (P3)
Eucalyptus macrocarpa subsp. *elachantha* (P4)
Hemiandra sp. Watheroo (S. Hancocks 4) (P4)
Xanthosia tomentosa (P4)
Synaphea sp. (PST)
Conservation significant flora (DPaW #12-0416)

Carnaby's Black Cockatoo (Maia):

CBC Heard
CBC Seen

Carnaby's Black Cockatoo - Trees (Maia, Western

Corymbia calophylla (DBH > 50 cm)
Eucalyptus rudis (DBH > 30 - 50 cm)
Eucalyptus rudis (DBH > 50 cm)
Eucalyptus wandoo (DBH > 50 cm)
Carnaby's Black Cockatoo - foraging evidence (Western Wildlife)

Vegetation Types (Maia):

BF Open Low Forest of *Banksia prionotes* with a mixed Open Low Shrubland mainly of *Melaleuca leuropoma*, *Hibbertia hypericoides* and *Conospermum stoechadis* subsp. *stoechadis* and an Open Sedgeland of *Mesomelaena pseudostygia* and *Lepidosperma agricola*

CF Open Low Forest of *Corymbia calophylla* with a mixed Open Low Shrubland mainly of *Calothamnus quadrifidus* subsp. *quadrifidus*, *Xanthorrhoea preissii* and *Hibbertia hypericoides* and a Sparse Sedgeland of *Ecdeiocolea monostachya* and *Mesomelaena pseudostygia*

EBWL Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with a mixed Open Mid Shrubland mainly of *Melaleuca leuropoma*, *Allocasuarina humilis* and *Xanthorrhoea preissii* with an Open Sedgeland of *Mesomelaena pseudostygia* and *Georgeantha hexandra*

EF-1 Open Tall Forest of *Eucalyptus rudis* +/- *Corymbia calophylla* with an Open Tall Shrubland of *Melaleuca rhaphiophylla* and either a Tussock Grassland of Poaceae sp. and **Eragrostis curvula* or a Sparse Sedgeland of *Baumea juncea* and *Lepidosperma ?squamatum*

EF-2 Open Tall Forest of *Eucalyptus wandoo* subsp. *pulverea* with an Open Low Shrubland of *Acacia pulchella* var. *glaberrima*, *Hakea lissocarpha* and *Hibbertia hypericoides*

MHL Low mixed Heathland mainly of *Hibbertia hypericoides*, *Petrophile macrostachya* and *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) with a Sparse Sedgeland of *Mesomelaena pseudostygia*

MSEL Sedgeland of *Mesomelaena pseudostygia* with an Open Low Shrubland of *Daviesia angulata*, *D. nudiflora* and *Eremaea violacea* subsp. *rhaphiophylla*

MSL-1 Mixed Low Shrubland mainly of *Melaleuca leuropoma*, *Leucopogon conostephioides* and *Hypocalymma xanthopetalum* with an Open Mid Shrubland of *Banksia attenuata*, *Adenanthos cygnorum* and *Eremaea ? pauciflora* x *beaufortioides* and a Sparse Sedgeland of *Mesomelaena pseudostygia* and *Lepidobolus preissianus*

MSL-2 Mixed Open Low Shrubland mainly of *Beaufortia squarrosa*, *Stirlingia latifolia* and *Hibbertia hypericoides* with a mixed Sparse Mid Shrubland mainly of *Banksia candolleana*, *Allocasuarina humilis* and *Banksia incana* and Isolated Tall Shrubs of *Hakea psilorrhyncha* and/or *Banksia attenuata* or Isolated Mallee Trees of *Eucalyptus todtiana*

C Cleared

Legend items
Map 9.11 - Map 9.32

maia

N

Datum: WGS84

Map: 9.9
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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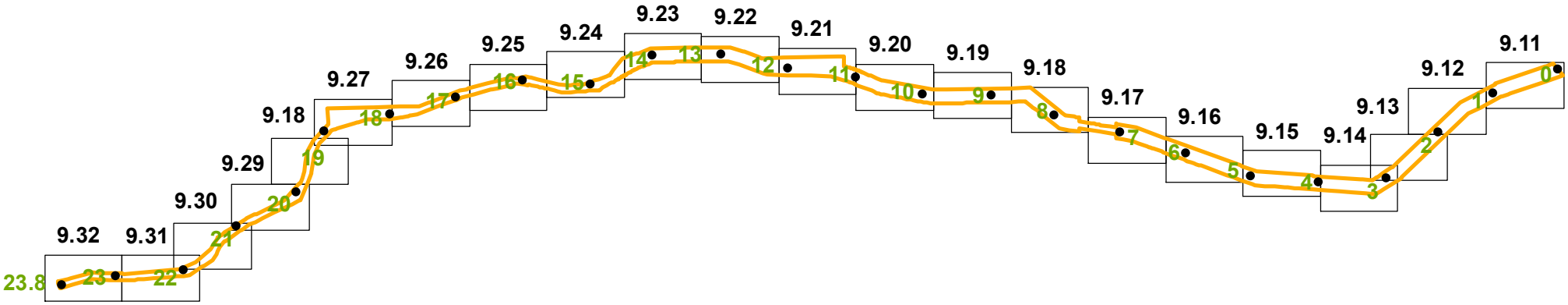

Legend items
Map 9.11 - Map 9.32

maia

N

Datum: WGS84

Map: 9.10
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Version: 2 **Size:** A4

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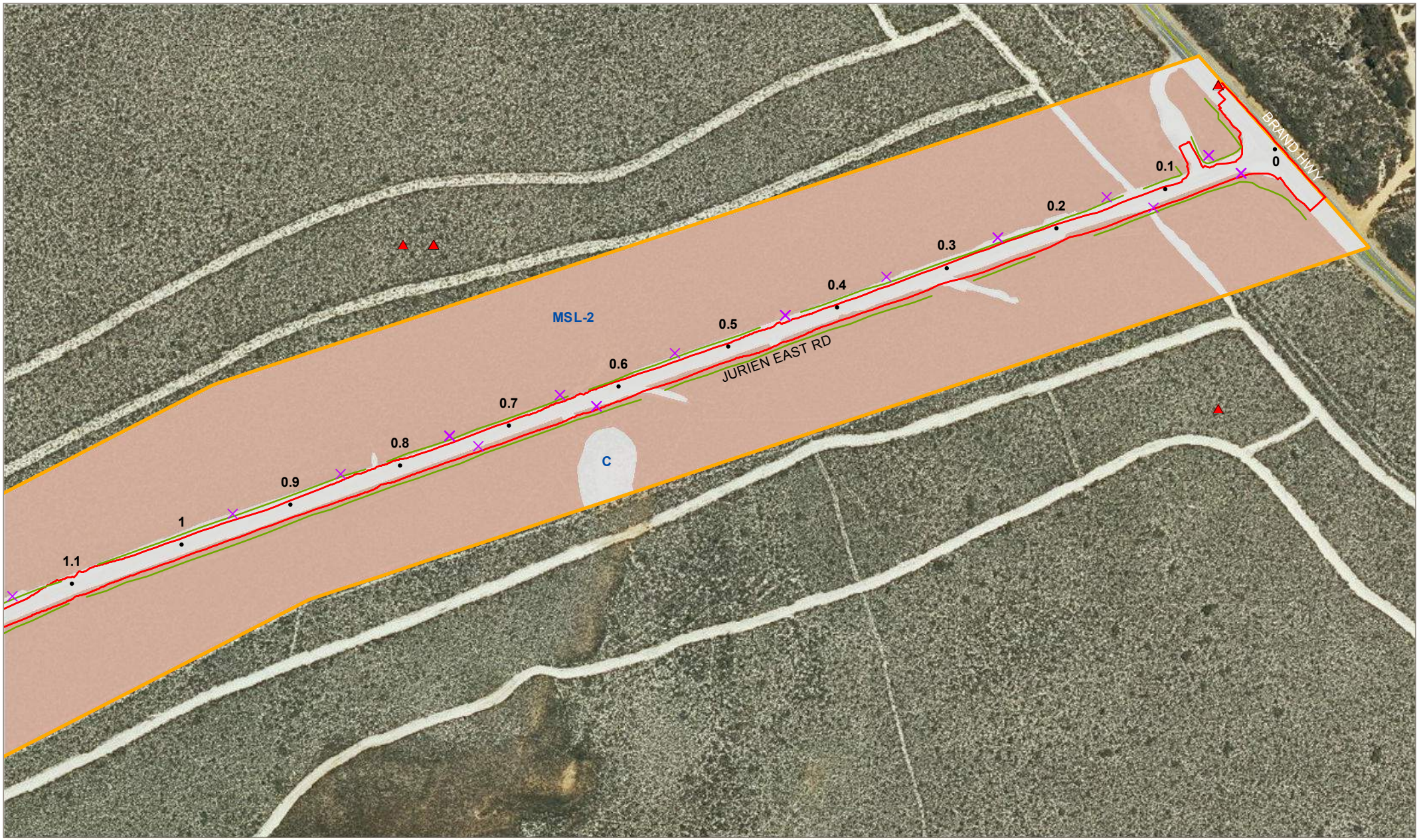

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Perth

Chainage 0 km to 1.1 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.11
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Perth

Chainage 1.1 km to 2 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.12
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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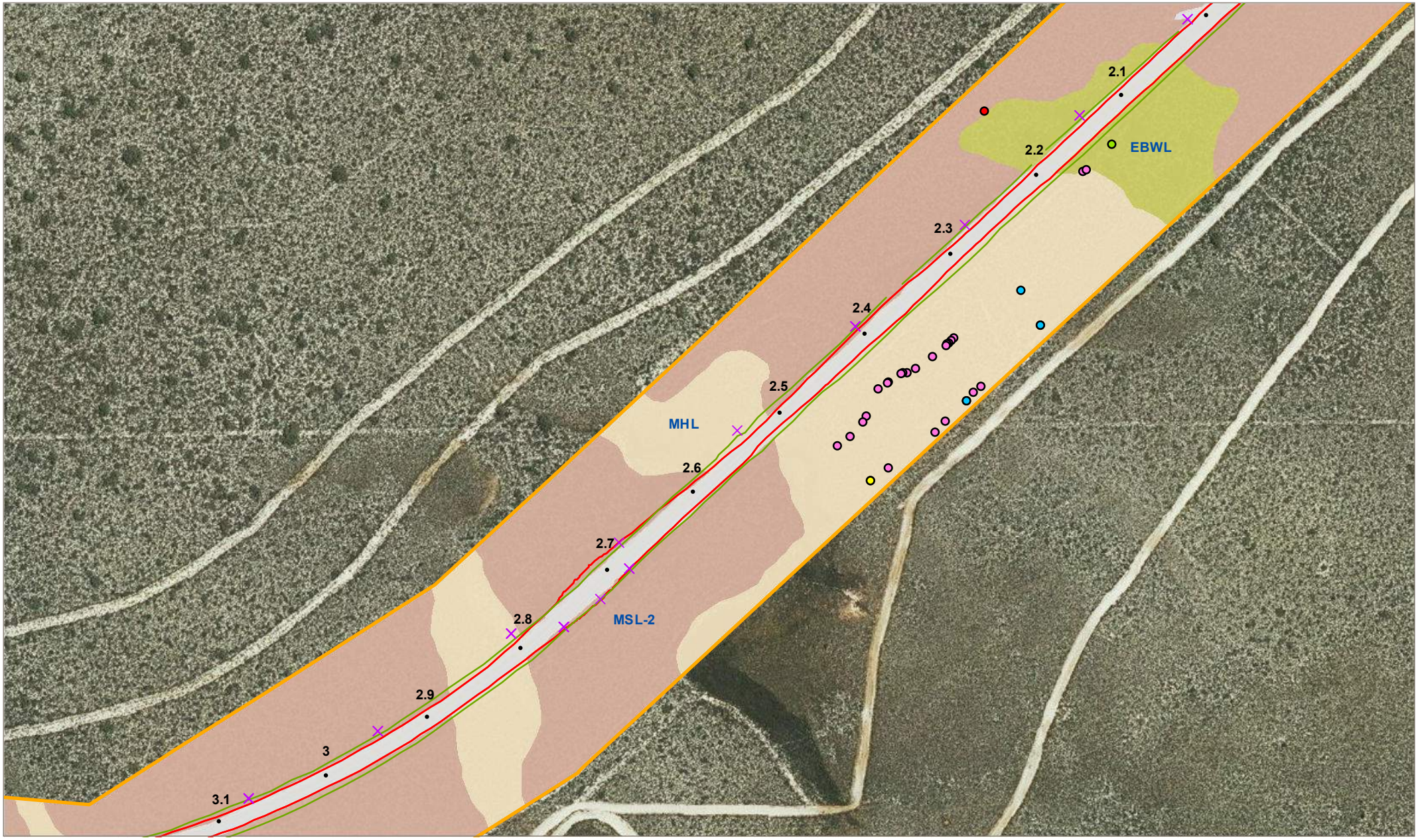

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 2 km to 3.1 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.13
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Chainage 2.8 km to 4 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.14
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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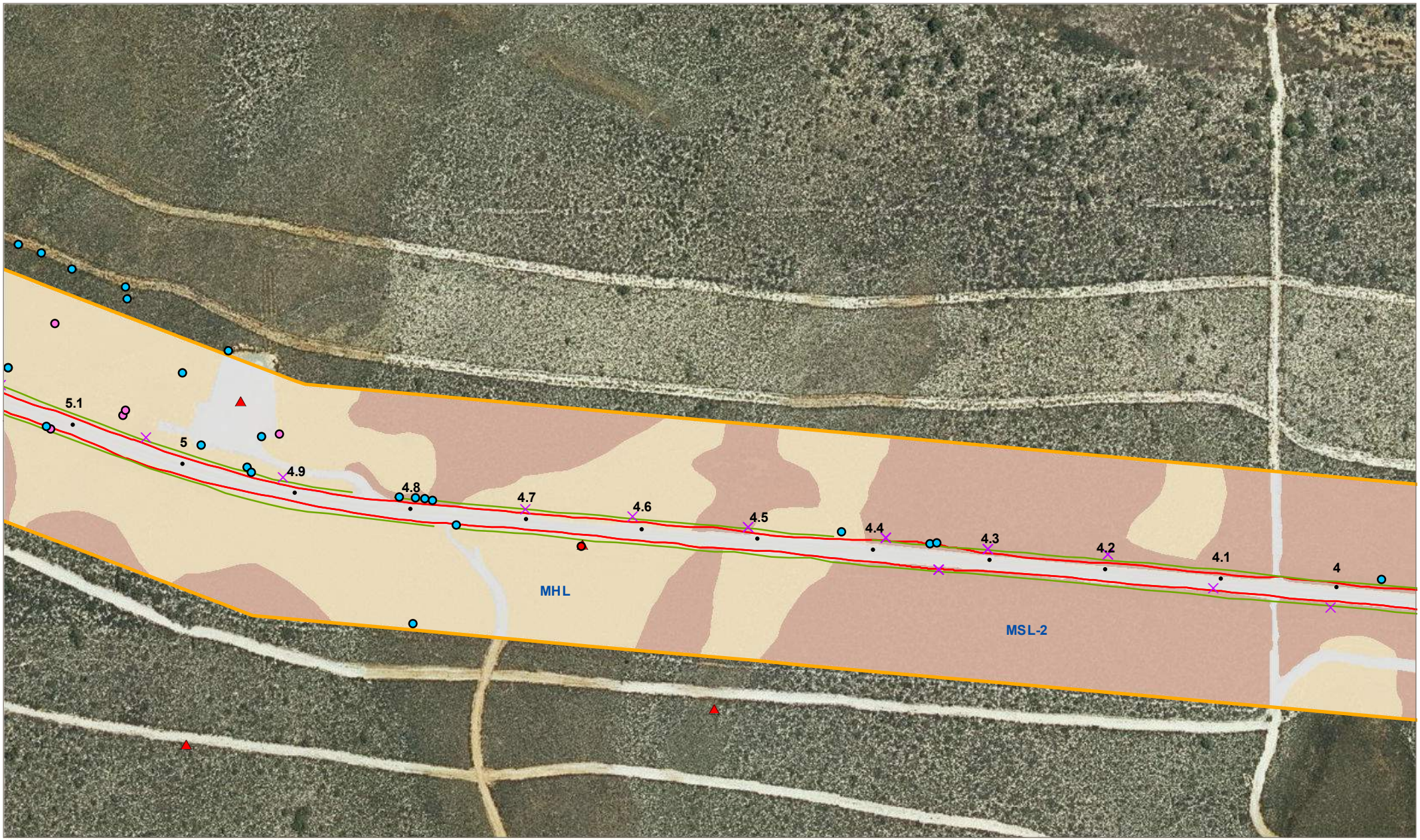

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Perth

Chainage 4 km to 5.1 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.15
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 5.1 km to 6.3 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.16
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Date: 05/04/2017
Version: 2 **Size:** A4

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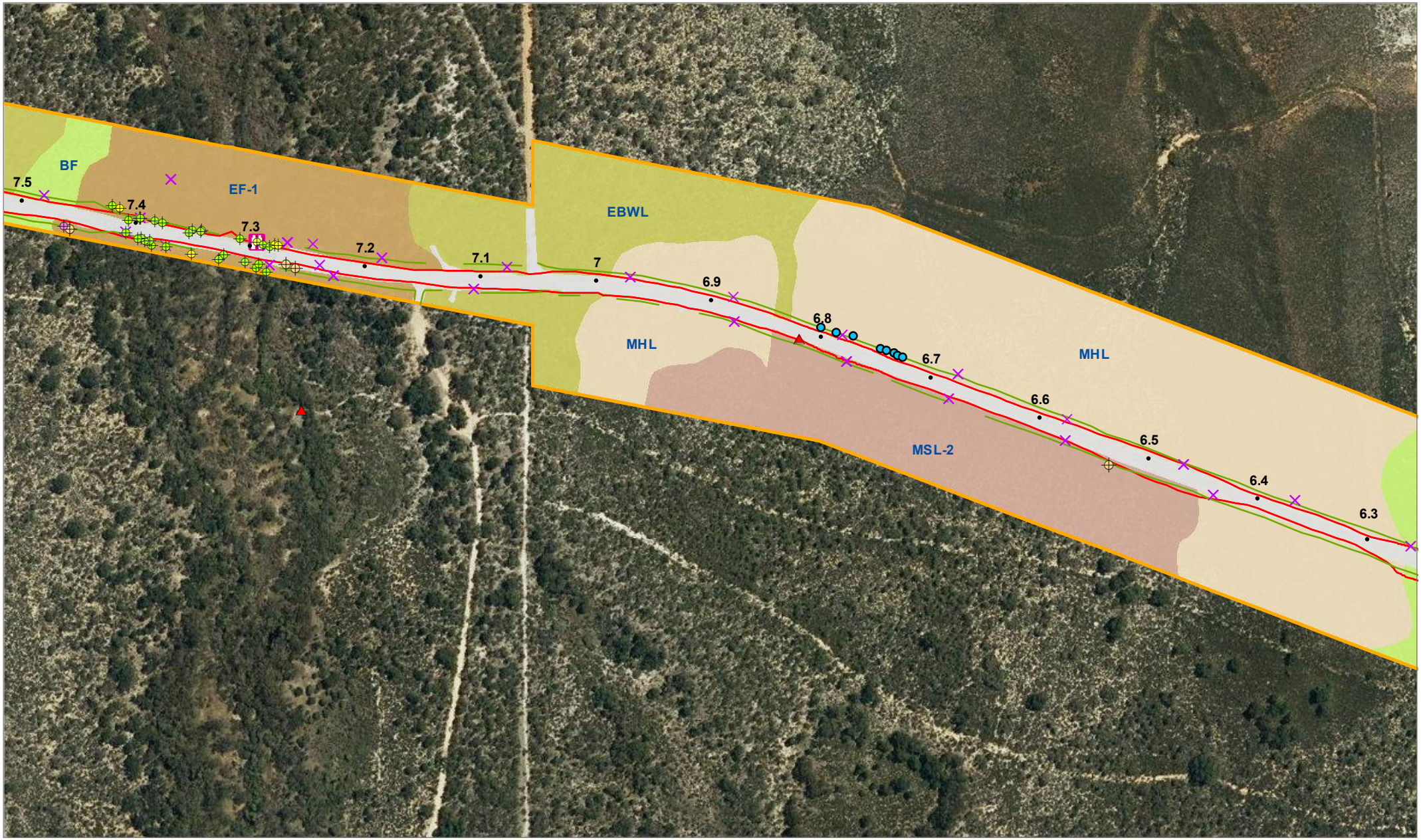

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 6.3 km to 7.4 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.17
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 7.4 km to 8.7 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.18
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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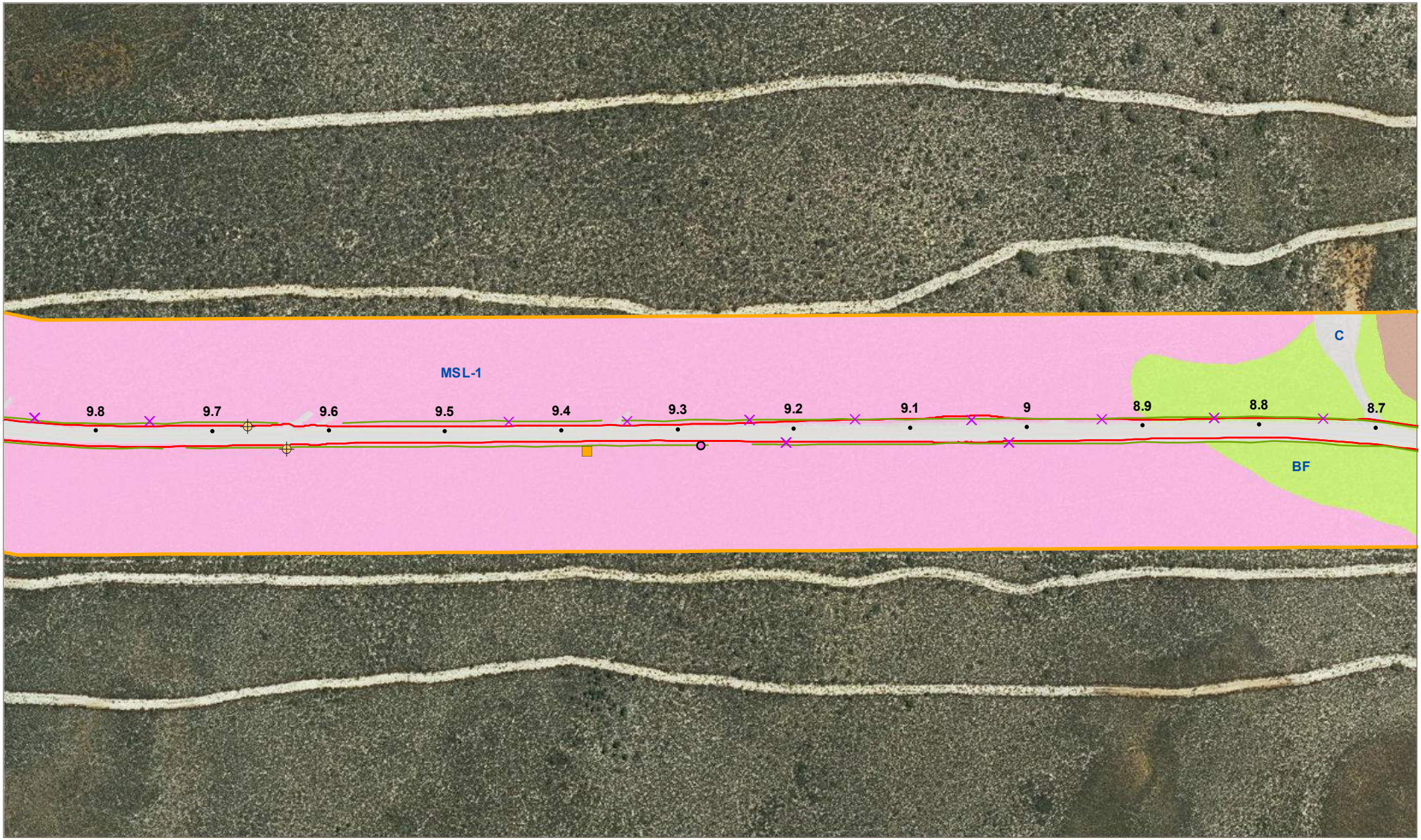

Location Map

Chainage 8.7 km to 9.8 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.19

Prepared for: SofD

Drawn by: RH

Date: 05/04/2017

Version: 2 **Size:** A4

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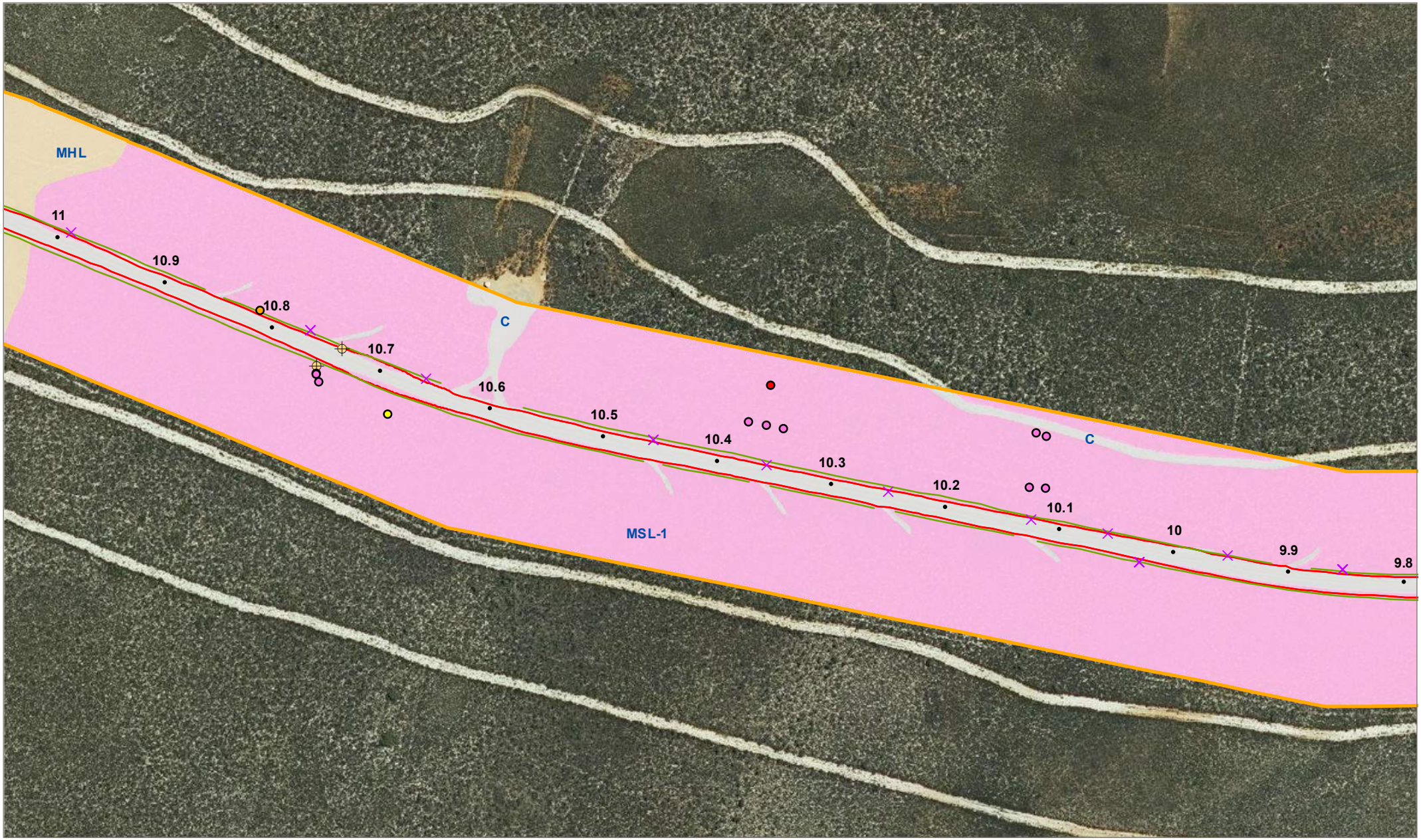

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 9.8 km to 11 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.20
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 11 km to 12.1 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.21
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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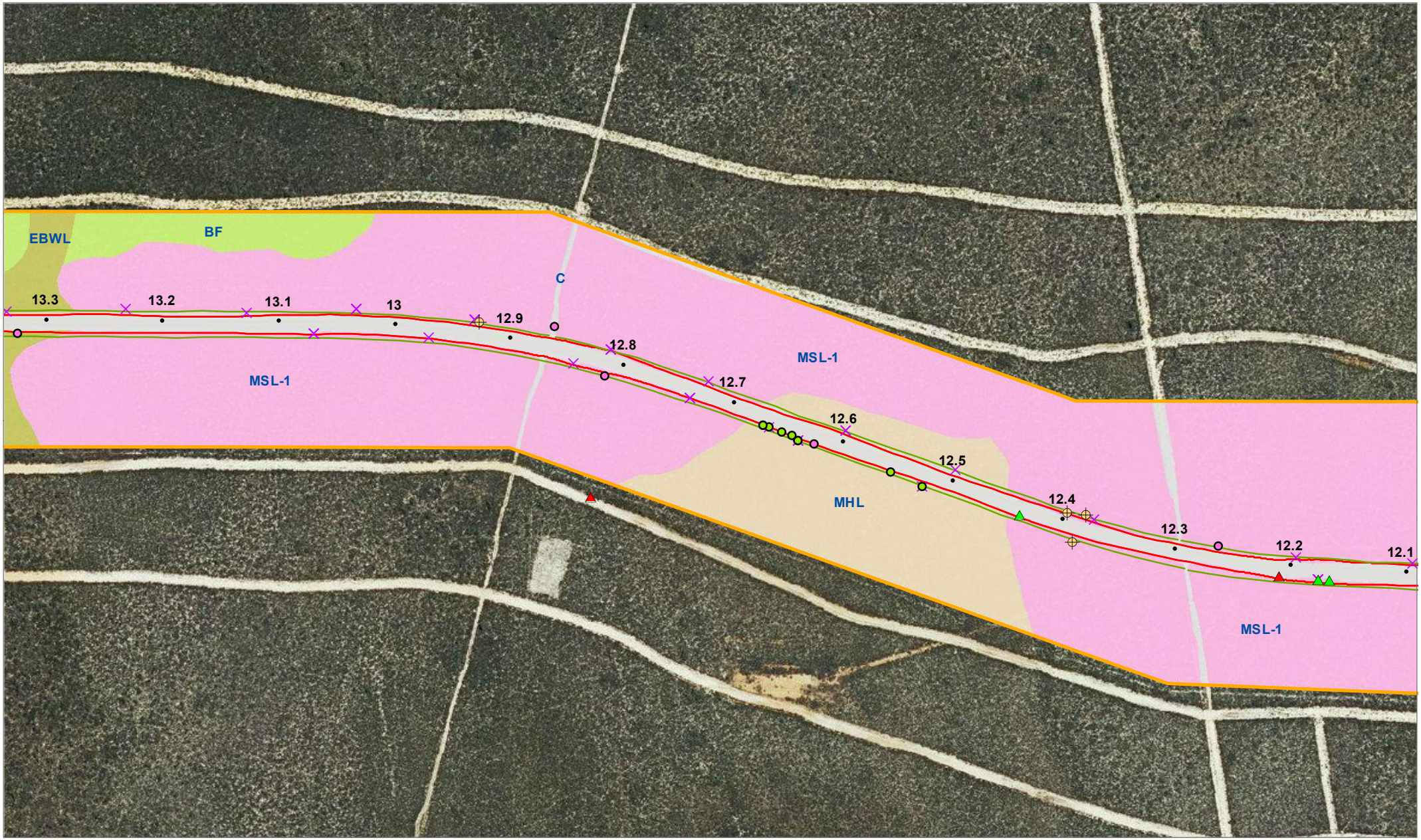

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 12.1 km to 13.3 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.22
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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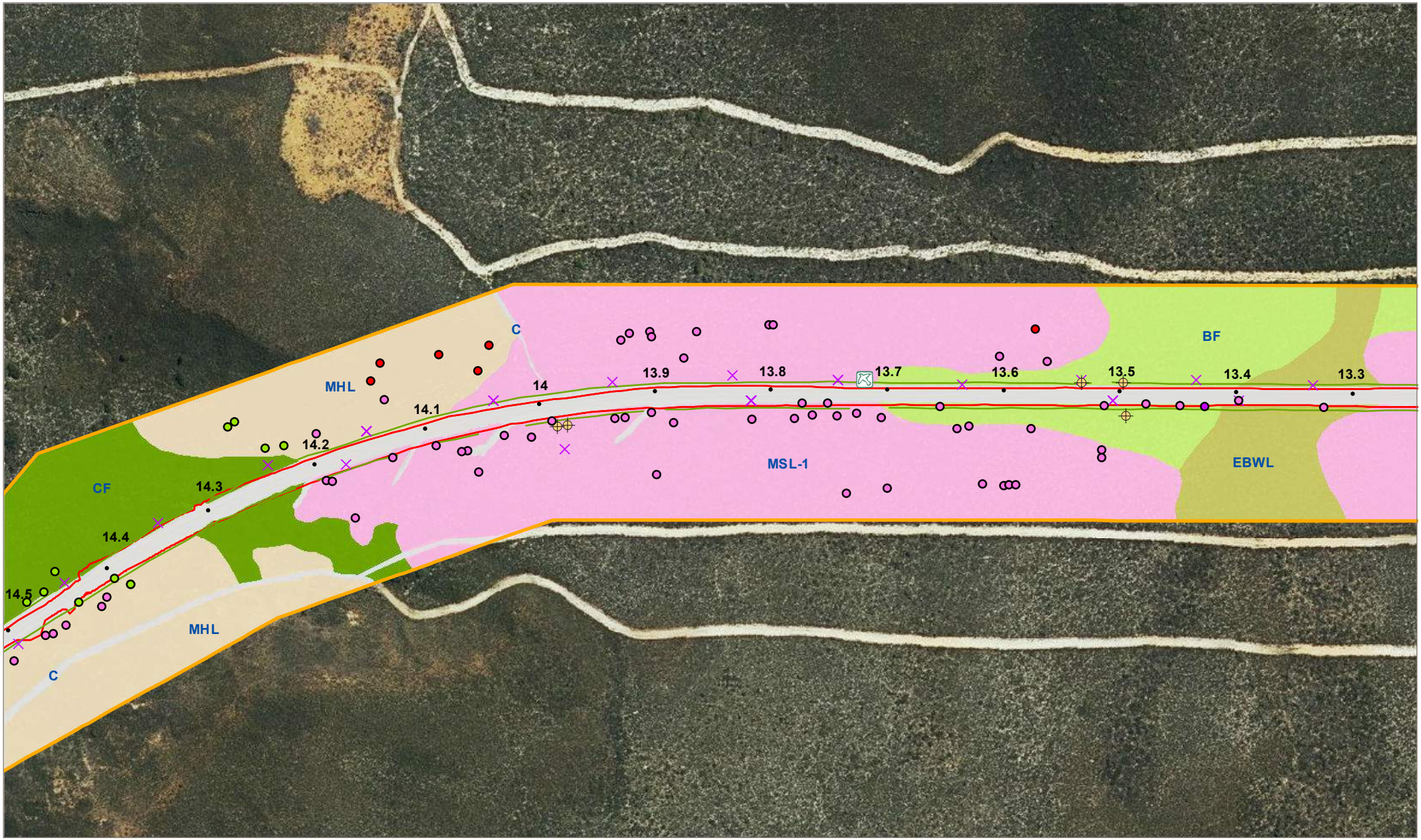

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 13.3 km to 14.5 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.23
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Chainage 14.5 km to 15.6 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.24

Prepared for: SofD

Drawn by: RH

Date: 05/04/2017

Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 15.6 km to 16.8 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.25
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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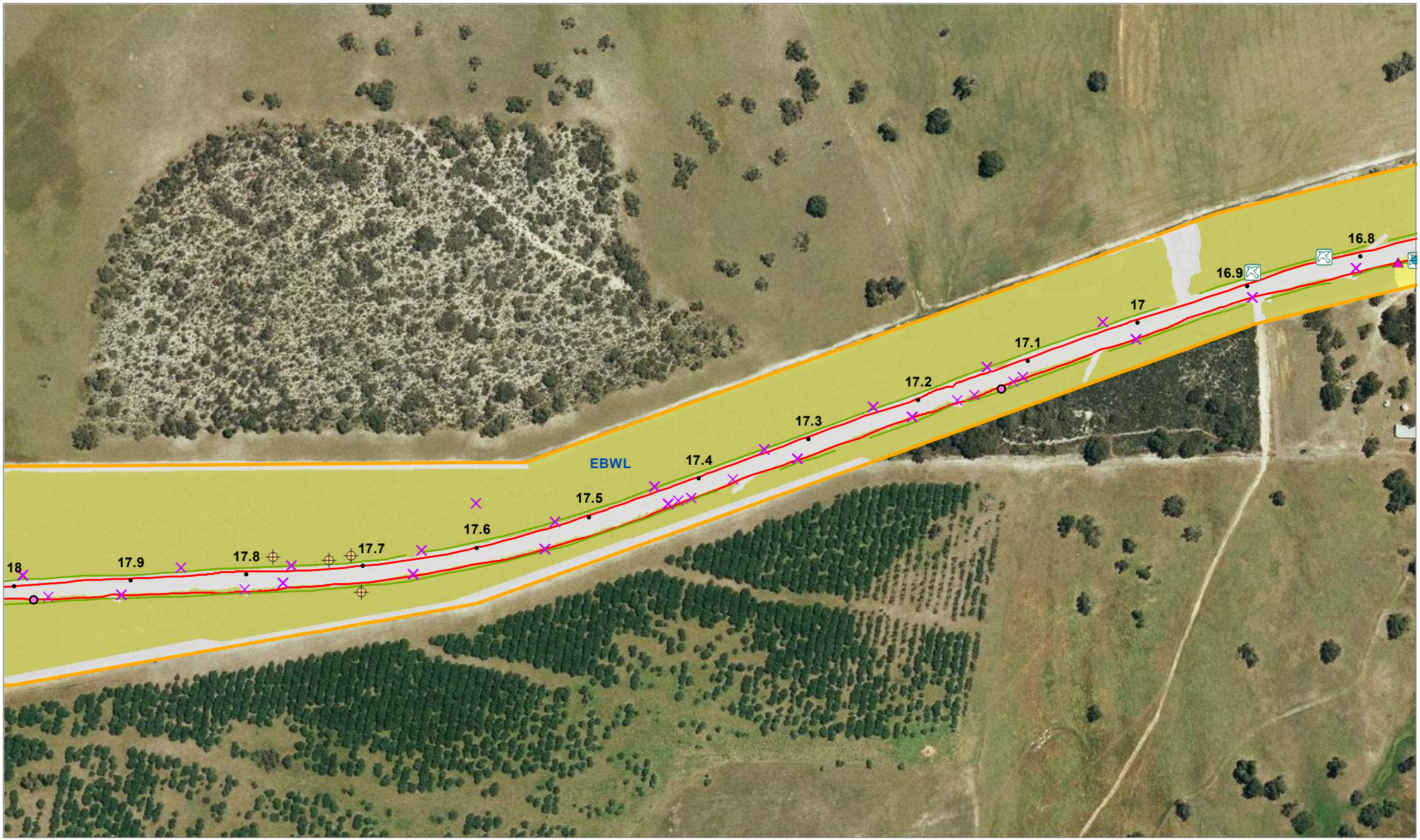

Location Map

Chainage 16.8 km to 18 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.26
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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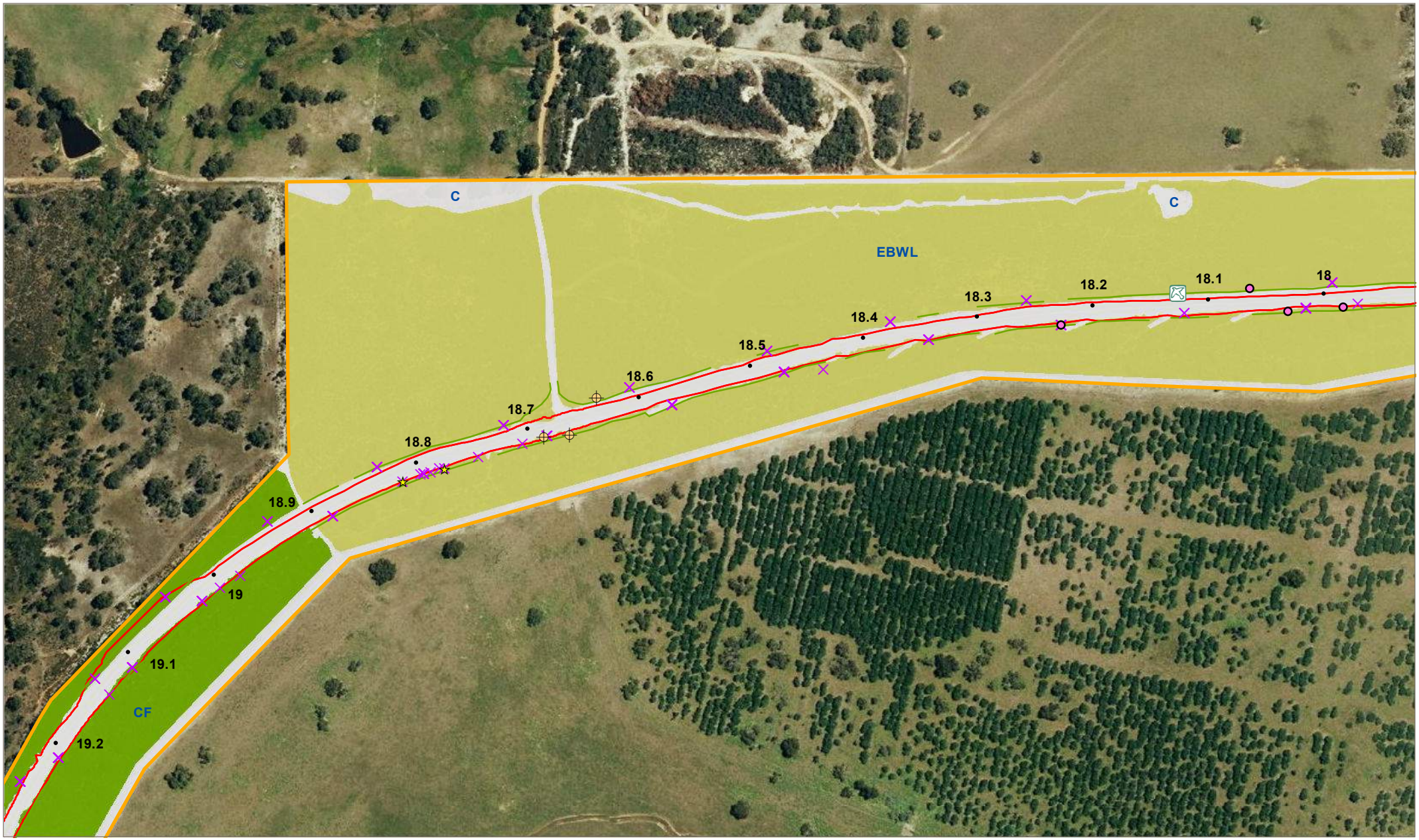

Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 18 km to 19.2 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.27
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Chainage 19.2 km to 19.9 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.28
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Chainage 19.9 km to 21.1 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map:	9.29
Prepared for:	SofD
Drawn by:	RH
Date:	05/04/2017
Version:	2 **Size:** A4

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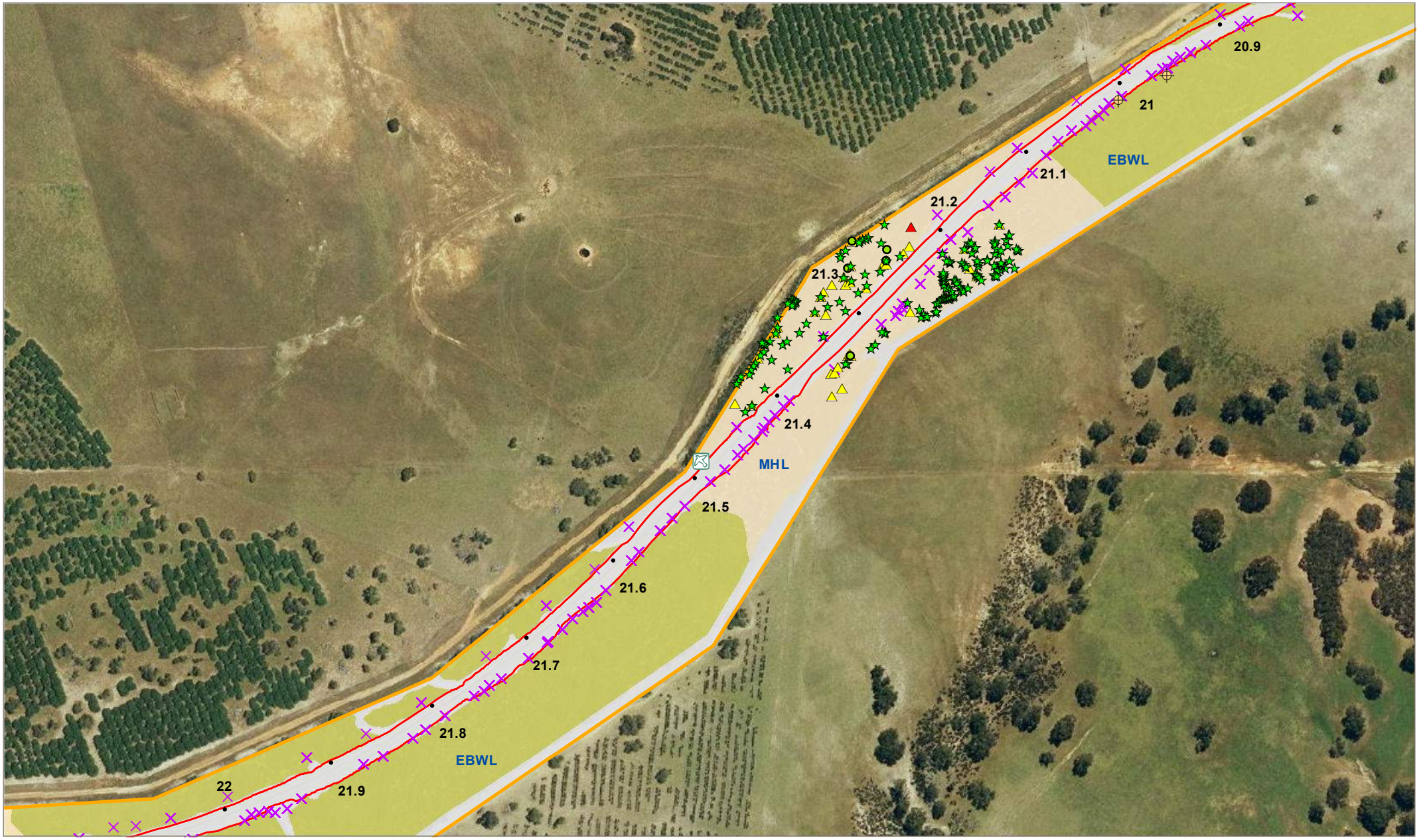

Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Perth

Chainage 20.9 km to 22 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.30
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 21.8 km to 22.9 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.31
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

Port Hedland
Newman
Wiluna
Geraldton
Perth

Chainage 22.9 km to 23.8 km

maia

N

0 0.1

Kilometres

Datum: WGS84

Map: 9.32
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 2 **Size:** A4

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Location Map

- Port Hedland
- Newman
- Wiluna
- Geraldton
- Kalgoorlie
- Perth

Roads (MRWA)

Vegetation condition

maia

N

Datum: GDA 1994, MGA 50

Map: 9.33
Prepared for: SofD
Drawn by: RH
Date: 05/04/2017
Version: 1 **Size:** A4

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APPENDIX 1: RELEVÉ SITE INFORMATION

Table A1.1: Information collected at relevé sites

Relevé:	R01	Described by:	Scott Hitchcock & Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	324260	mE	6652224	mN	
Habitat:		Hill (gentle footslope)					
Soil:		Yellow-white sand					
Rocks:		None					
Mapped as:		*B***F**					
Vegetation Type:		Open Low Forest of *Banksia prionotes* with an Open Low Shrubland of *Melaleuca leuropoma* and *Conospermum stoechadis* subsp. *Stoechadis*, a Sparse Tall Shrubland of *Adenanthos cygnorum* and a Sparse Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside, unfenced					
Fire Age:		None evident					
Taxa (36):		*Acacia pulchella* var. *glaberrima*, *Adenanthos cygnorum, Alexgeorgea nitens, Amphipogon turbinatus, Banksia dallanneyi* subsp. *media*, *Banksia prionotes, Burchardia congesta, Calothamnus sanguineus, Cassytha racemosa, Comesperma scoparium, Conospermum stoechadis* subsp. *stoechadis*, *Conostylis aurea, Dasypogon obliquifolius, Drosera menziesii* subsp. *penicillaris*, *Gompholobium tomentosum, Haemodorum spicatum, Hakea costata, Hemiphora bartlingii, Hibbertia hypericoides, Hybanthus calycinus, Hypocalymma xanthopetalum, Jacksonia floribunda, Lepidobolus preissianus, Melaleuca leuropoma, Mesomelaena pseudostygia, Monotaxis grandiflora* var. *grandiflora*, *Opercularia vaginata, Orianthera spermacocea, Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia, Petrophile macrostachya, Scaevola repens* var. *repens*, ***Scholtzia spatulata*** **(RE),** *Stylidium crossocephalum, Thysanotus patersonii, Verticordia grandis*					

Relevé:	R02	Described by:	Scott Hitchcock & Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	324954	mE	6652301	mN	
Habitat:		Hill (gentle west-facing footslope to midslope)					
Soil:		Yellow-white sand					
Rocks:		None					
Mapped as:		*B***F**					
Vegetation Type:		Low Woodland of *Banksia prionotes* with Open Tussock Grassland of ****Ehrharta calycina*** with Sparse Mid Shrubland of *Adenanthos cygnorum* and Sparse Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		3 (Vegetation structure altered)					
Disturbances:		Weeds, largely cleared roadside, fenced					
Fire Age:		None evident					
Taxa (29):		*Adenanthos cygnorum, Austrostipa elegantissima,* ***Avena barbata*,*** *Banksia prionotes, Brachyscome* sp., ***Briza maxima*,*** *Comesperma scoparium, Daviesia podophylla,* ***Ehrharta calycina*, Ehrharta longiflora*,*** *Haemodorum spicatum, Hakea lissocarpha, Hibbertia hypericoides,* ***Hypochaeris glabra*,*** *Jacksonia floribunda, Jacksonia* sp., *Lepidobolus preissianus, Mesomelaena pseudostygia, Microtis media,* ***Monoculus monstrosus*,*** *Orianthera spermacocea, Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia, Petrophile macrostachya, Scaevola repens* var. *repens*, *Schoenus brevisetis, Schoenus pedicellatus,* ***Sonchus oleraceus*,*** *Trachymene ornata*					

Relevé:	R03	Described by:	Scott Hitchcock & Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	325407	mE	6652262	mN	
Habitat:		Hill (gentle west-facing footslope to midslope)					
Soil:		Yellow-white sand					
Rocks:		None					
Mapped as:		*M***SEL**					
Vegetation Type:		Sedgeland of *Mesomelaena pseudostygia* with Open Low Shrubland of *Daviesia angulata*, *Daviesia nudiflora* and *Eremaea violacea* subsp. *rhaphiophylla*					
Vegetation Condition:		3 (Vegetation structure altered)					
Disturbances:		Weeds, largely cleared roadside, fenced					
Fire Age:		None evident					
Taxa (32):		*Acacia pulchella* var. *glaberrima*, *Anigozanthos humilis, Austrostipa elegantissima, Banksia shuttleworthiana, Brachyscome* sp., *Cassytha racemosa, Conostylis setigera* subsp. *setigera*, *Daviesia angulata, Daviesia nudiflora,* ***Ehrharta calycina*,*** *Eremaea violacea* subsp. *rhaphiophylla*, *Hibbertia huegelii, Hibbertia hypericoides, Isotropis cuneifolia, Jacksonia nutans, Lepidobolus preissianus, Lepidosperma apricola, Leptospermum spinescens, Lomandra preissii, Lomandra sericea, Melaleuca leuropoma, Mesomelaena pseudostygia, Orianthera spermacocea, Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia, Petrophile macrostachya, Pileanthus filifolius, Pilostyles hamiltonii, Scaevola repens* var. *repens*, *Schoenus pedicellatus, Scholtzia involucrata, Stylidium repens*					

Relevé:	R04	Described by:	Scott Hitchcock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	326868	mE	6653033	mN	
Habitat:		Hill (gentle south-west facing hilltop)					
Soil:		Yellow-white sand					
Rocks:		Laterite stones					
Mapped as:		*EB***WL**					
Vegetation Type:		Open Mid Shrubland of *Allocasuarina humilis* with Open Low Shrubland of *Petrophile macrostachya* and *Hibbertia hypericoides* with Open Sedgeland of *Mesomelaena pseudostygia* and Open Mallee Woodland of *Eucalyptus todtiana*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside, litter, fenced					
Fire Age:		None evident					
Taxa (31):		*Acacia pulchella* var. *glaberrima*, *Acacia stenoptera, Alexgeorgea nitens, Allocasuarina humilis, Blancoa canescens, Boronia ramosa* subsp. *anethifolia*, *Bossiaea eriocarpa, Calothamnus sanguineus, Conostephium pendulum, Conostephium preissii, Conostylis aurea, Daviesia angulata, Daviesia nudiflora, Eremaea asterocarpa* subsp. *asterocarpa*, *Eucalyptus todtiana, Gompholobium knightianum, Gompholobium tomentosum, Hibbertia huegelii, Hibbertia hypericoides, Hypocalymma xanthopetalum, Isotropis cuneifolia, Jacksonia* sp., *Laxmannia sessiliflora* subsp. *drummondii*, *Lepidobolus preissianus, Melaleuca leuropoma, Mesomelaena pseudostygia, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Pileanthus filifolius, Scaevola repens* var. *repens*, *Xanthorrhoea preissii*					

Relevé:	R05	Described by:	Scott Hitchcock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	327804	mE	6653894	mN	
Habitat:		Creek (gentle bed)					
Soil:		Brown sand					
Rocks:		None					
Mapped as:		*E***F**-1					
Vegetation Type:		Open Tall Forest of *Eucalyptus rudis* and *Corymbia calophylla* with Open Low Forest of *Melaleuca rhaphiophylla* and Tussock Grassland of **Ehrharta longiflora* and ****Eragrostis curvula***					
Vegetation Condition:		3 (Vegetation structure altered)					
Disturbances:		Weeds, largely cleared roadside, litter					
Fire Age:		None evident					
Taxa (22):		***Avena barbata*,*** *Brachyscome* sp., ***Briza maxima*,*** *Corymbia calophylla, Ecdeiocolea monostachya,* ***Echium plantagineum* (DPP),** ***Ehrharta longiflora*, Eragrostis curvula*,*** *Eucalyptus rudis,* ***Hordeum leporinum*,*** *Jacksonia sternbergiana, Juncus pallidus,* ***Lolium perenne*, Lupinus cosentinii*, Lysimachia arvensis*,*** *Melaleuca rhaphiophylla,* ***Orobanche minor*, Oxalis pes-caprae*,*** *Senecio* sp., ***Solanum nigrum*, Sonchus oleraceus*,*** *Tetraria octandra*					

Relevé:	R06	Described by:	Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	328359	mE	6654564	mN	
Habitat:		Hill (gentle west-facing midslope)					
Soil:		Grey-white sand					
Rocks:		None					
Mapped as:		*EB***WL**					
Vegetation Type:		Open Low Forest of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with Open Low Shrubland of *Eremaea pauciflora* var. *lonchophylla*, *Melaleuca leuropoma* and *Stirlingia latifolia* with Sparse Mid Shrubland of *Eremaea pauciflora* var. *lonchophylla* and *Acacia pulchella* var. *glaberrima* and Sparse Sedgeland of *Schoenus pedicellatus* and *Alexgeorgea nitens*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside					
Fire Age:		None evident					
Taxa (26):		*Acacia pulchella* var. *glaberrima*, *Alexgeorgea nitens, Banksia attenuata, Banksia menziesii, Boronia ramosa* subsp. *anethifolia*, *Burchardia congesta, Calytrix fraseri, Cassytha racemosa, Conostephium pendulum, Eremaea asterocarpa* subsp. *asterocarpa*, *Eremaea pauciflora* var. *lonchophylla*, *Eucalyptus todtiana, Gompholobium tomentosum, Hypocalymma xanthopetalum, Jacksonia floribunda, Laxmannia ramosa* subsp. *ramosa*, *Lomandra preissii, Lomandra* sp., *Lyginia barbata, Macrozamia fraseri, Melaleuca leuropoma, Patersonia occidentalis* var. *occidentalis*, *Schoenus pedicellatus, Scholtzia involucrata, Stirlingia latifolia, Xanthorrhoea preissii*					

Relevé:	R07	Described by:	Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	329366	mE	6654710	mN	
Habitat:		Hill (gentle west-facing midslope)					
Soil:		Grey-white sand					
Rocks:		None					
Mapped as:		*EB***WL**					
Vegetation Type:		Low Shrubland of *Conospermum wycherleyi* subsp. *glabrum*, *Jacksonia floribunda* and *Calothamnus sanguineus* with Open Mallee Woodland of *Eucalyptus todtiana* with Sparse Tall Shrubland of *Banksia attenuata* with Sparse Mid Shrubland of *Melaleuca leuropoma* and Sparse Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside					
Fire Age:		None evident					
Taxa (48):		*Allocasuarina humilis, Anigozanthos humilis, Austrostipa compressa, Banksia attenuata, Banksia shuttleworthiana, Burchardia congesta, Calandrinia corrigioloides, Calothamnus sanguineus, Cassytha racemosa, Centrolepis aristata, Comesperma scoparium, Conospermum wycherleyi* subsp. *glabrum*, *Conostephium pendulum, Conostylis aurea, Conostylis setigera* subsp. *setigera*, *Cryptandra myriantha, Drosera ?pallida, Drosera erythrorhiza, Drosera menziesii* subsp. *penicillaris*, *Drosera stolonifera, Eremaea asterocarpa* subsp. *asterocarpa*, *Eucalyptus todtiana, Haemodorum spicatum, Hakea eneabba, Hakea ruscifolia, Hibbertia hypericoides, Hypocalymma xanthopetalum,* ***Hypochaeris radicata*,*** *Jacksonia floribunda, Lepidobolus preissianus, Leptomeria ?preissiana, Leptospermum spinescens, Lomandra hastilis, Melaleuca leuropoma, Mesomelaena pseudostygia,* ***Monoculus monstrosus*,*** *Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Scaevola repens* var. *repens*, *Scaevola* sp., *Schoenus pedicellatus, Schoenus pleiostemoneus, Stirlingia latifolia, Stylidium crossocephalum, Stylidium ecorne, Thysanotus patersonii, Trachymene ornata, Xanthorrhoea preissii*					

Relevé:	R08	Described by:	Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	331185	mE	6655054	mN	
Habitat:		Drainage line (gentle bed)					
Soil:		Brown-grey sandy-clay loose soil					
Rocks:		None					
Mapped as:		*E***F**-1					
Vegetation Type:		Sedgeland of *Chorizandra enodis* and *Leptocarpus coangustatus* with Open Tall Shrubland of *Melaleuca eleuterostachya* and Isolated Low Trees of *Eucalyptus rudis*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside, fenced					
Fire Age:		None evident					
Taxa (11):		*Acacia stenoptera, Chorizandra enodis, Eucalyptus rudis, Hypolaena* sp., *Leptocarpus coangustatus, Melaleuca eleuterostachya, Scaevola* sp., *Velleia trinervis, Verticordia densiflora* var. *cespitosa*, *Viminaria juncea*					

Relevé:	R09	Described by:	Scott Hitchcock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	331611	mE	6654991	mN	
Habitat:		Hill (gentle hilltop)					
Soil:		Orange-brown sand					
Rocks:		Laterite gravel					
Mapped as:		*E***F**-2					
Vegetation Type:		Open Tall Forest of *Eucalyptus wandoo* subsp. *pulverea* with Open Low Shrubland of *Acacia pulchella* var. *glaberrima*, *Hakea lissocarpha* and *Hibbertia hypericoides*					
Vegetation Condition:		3 (Vegetation structure altered)					
Disturbances:		Largely cleared roadside, litter, fenced					
Fire Age:		None evident					
Taxa (13):		*Acacia barbinervis* subsp. *borealis*, *Acacia pulchella* var. *glaberrima*, *Astroloma serratifolium, Austrostipa elegantissima, Conostylis aurea, Daviesia angulata, Desmocladus asper, Eucalyptus wandoo* subsp. *pulverea*, *Hakea lissocarpha, Hibbertia crassifolia, Hibbertia hypericoides, Thomasia foliosa, Xanthorrhoea preissii*					

Relevé:	R10	Described by:	Scott Hitchcock & Rochelle Haycock		Date:	27/04/2016	Photo:
Location (GDA94):		MGA50	331944	mE	6655114	mN	
Habitat:		Hill (gentle west-facing midslope)					
Soil:		Grey-white sand					
Rocks:		None					
Mapped as:		*C***F**					
Vegetation Type:		Open Mallee Forest of *Corymbia calophylla* with Open Mid Shrubland of *Calothamnus quadrifidus* subsp. *quadrifidus* with Open Low Shrubland of *Calothamnus quadrifidus* subsp. *quadrifidus*, *Xanthorrhoea preissii* and *Hibbertia hypericoides* and Sparse Sedgeland of *Ecdeiocolea monostachya* and *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Largely cleared roadside, fenced					
Fire Age:		None evident					
Taxa (25):		*Acacia pulchella* var. *pulchella*, *Adenanthos cygnorum, Alexgeorgea nitens, Bossiaea eriocarpa, Caesia* sp. Wongan (K.F. Kenneally 8820), *Calothamnus quadrifidus* subsp. *quadrifidus*, *Cassytha racemosa, Cheilanthes austrotenuifolia, Conostephium preissii, Conostylis aculeata* subsp. *preissii*, *Corymbia calophylla, Drosera erythrorhiza, Drosera stolonifera, Ecdeiocolea monostachya,* ***Ehrharta longiflora*,*** *Hakea lissocarpha, Hibbertia hypericoides, Leucopogon propinquus, Macrozamia fraseri, Mesomelaena pseudostygia, Microtis media, Neurachne alopecuroidea, Stylidium calcaratum, Thysanotus patersonii, Xanthorrhoea preissii*					

Relevé:	R11	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	332551	mE	6655367	mN	
Habitat:		Hill (gentle midslope)					
Soil:		Brown sandy-loam loose soil					
Rocks:		Laterite gravel					
Mapped as:		*C***F**					
Vegetation Type:		Low Woodland of *Corymbia calophylla* with Open Mid Shrubland of *Xanthorrhoea preissii* and *Calothamnus quadrifidus* subsp. *quadrifidus* with Open Low Shrubland of *Hibbertia hypericoides* and *Bossiaea eriocarpa* and Open Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		Old (> 5yrs)					
Taxa (30):		*Acacia latipes* subsp. *latipes*, *Acacia stenoptera, Banksia shuttleworthiana, Bossiaea eriocarpa, Calothamnus quadrifidus* subsp. *quadrifidus*, *Calothamnus sanguineus, Cassytha racemosa, Caustis dioica, Conostephium preissii, Conostylis aculeata* subsp. *preissii*, *Conostylis aurea, Corymbia calophylla, Daviesia angulata, Eucalyptus gittinsii* subsp. *illucida*, *Gastrolobium polystachyum, Gompholobium tomentosum, Hakea conchifolia, Hibbertia hypericoides, Hypocalymma xanthopetalum, Lambertia multiflora* var. *multiflora*, *Laxmannia sessiliflora* subsp. *drummondii*, *Lepidosperma calcicola, Leucopogon propinquus, Macrozamia fraseri, Melaleuca leuropoma, Mesomelaena pseudostygia, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Stenanthemum* sp., *Xanthorrhoea preissii*					

Relevé:	R12	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	333320	mE	6655540	mN	
Habitat:		Hill (hilltop)					
Soil:		Yellow-grey sand					
Rocks:		None					
Mapped as:		*B***F**					
Vegetation Type:		Sedgeland of *Mesomelaena pseudostygia* and *Lepidosperma apricola* with Open Low Woodland of *Banksia prionotes* and *Banksia attenuata* with Sparse Mid Shrubland of *Hakea trifurcata* and *Daviesia angulata* and Sparse Low Shrubland of *Hibbertia hypericoides*, *Stirlingia latifolia* and *Petrophile macrostachya*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (35):		*Acacia latipes* subsp. *latipes*, *Adenanthos cygnorum, Allocasuarina humilis, Banksia attenuata, Banksia prionotes, Banksia shuttleworthiana, Beaufortia squarrosa, Burchardia congesta, Calothamnus quadrifidus* subsp. *quadrifidus*, *Conospermum wycherleyi* subsp. *glabrum*, *Conostylis setigera* subsp. *setigera*, *Dasypogon obliquifolius, Daviesia angulata, Eremaea beaufortioides* var. *beaufortioides*, *Georgeantha hexandra, Hakea trifurcata, Hibbertia acerosa, Hibbertia hypericoides, Hypocalymma xanthopetalum, Hypolaena pubescens, Jacksonia floribunda, Jacksonia nutans, Labichea* sp., *Laxmannia sessiliflora* subsp. *drummondii*, *Lepidosperma apricola, Melaleuca leuropoma, Mesomelaena pseudostygia, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Scaevola repens* var. *repens*, *Schoenus pleiostemoneus, Stenanthemum* sp., *Stirlingia latifolia, Verreauxia reinwardtii, Xanthorrhoea preissii*					

Relevé:	R13	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	335388	mE	6655240	mN	
Habitat:		Hill (gentle north-facing midslope)					
Soil:		White sand					
Rocks:		Laterite stones					
Mapped as:		M**HL**					
Vegetation Type:		Low Shrubland of *Calothamnus sanguineus*, *Isopogon linearis* and *Hakea incrassata* with Sparse Mid Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (37):		*Andersonia involucrata, Babingtonia grandiflora, Banksia armata* var. *armata*, *Banksia bipinnatifida* subsp. *multifida*, *Banksia dallanneyi* subsp. *media*, *Banksia incana, Calothamnus sanguineus, Caustis dioica, Chordifex sinuosus, Cyathochaeta avenacea, Dampiera alata, Daviesia polyphylla, Desmocladus asper, Gastrolobium polystachyum, Grevillea synapheae* subsp. *pachyphylla*, *Hakea incrassata, Hakea neospathulata, Hakea stenocarpa, Hibbertia acerosa, Hibbertia crassifolia, Hibbertia hypericoides, Hibbertia mylnei, Hovea trisperma, Hypocalymma xanthopetalum, Isopogon linearis, Lambertia multiflora* var. *multiflora*, *Leucopogon* sp. Lesueur (B. Evans 530), *Melaleuca trichophylla, Patersonia occidentalis* var. *occidentalis*, *Petrophile brevifolia, Pimelea sulphurea, Schoenus brevisetis, Stylidium adpressum, Stylidium repens, Synaphea interioris, Tetraria microcarpa, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé:	R14	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	336033	mE	6655020	mN	
Habitat:		Hill (gentle north-facing hilltop)					
Soil:		White sand					
Rocks:		None					
Mapped as:		M**SL**-1					
Vegetation Type:		Low Shrubland of *Melaleuca leuropoma*, *Leucopogon conostephioides* and *Hypocalymma xanthopetalum* with Open Mid Shrubland of *Banksia attenuata*, *Adenanthos cygnorum* and *Eremaea ectadioclada*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (43):		*Adenanthos cygnorum, Astroloma xerophyllum, Banksia attenuata, Beaufortia squarrosa, Calothamnus sanguineus, Cassytha racemosa, Caustis dioica, Chordifex sinuosus, Conospermum wycherleyi* subsp. *glabrum*, *Conostephium pendulum, Conostylis aurea, Corynanthera flava, Dampiera linearis, Darwinia speciosa, Dasypogon obliquifolius, Daviesia podophylla, Drosera* ?*parvula, Drosera eneabba, Drosera erythrorhiza, Drosera menziesii* subsp. *penicillaris*, *Eremaea beaufortioides* var. *microphylla*, *Eremaea ectadioclada, Grevillea synapheae* subsp. *pachyphylla*, *Haemodorum spicatum, Hakea psilorrhyncha, Hibbertia huegelii, Hypocalymma xanthopetalum, Jacksonia floribunda, Lechenaultia stenosepala, Lepidobolus preissianus,* ***Lepidobolus quadratus*** **(P3),** *Lepidosperma calcicola, Leucopogon conostephioides, Melaleuca leuropoma, Melaleuca trichophylla, Mesomelaena pseudostygia, Petrophile macrostachya, Petrophile rigida, Stirlingia latifolia, Strangea cynanchicarpa, Stylidium crossocephalum, Thysanotus patersonii, Verticordia grandis*					

Relevé:	R15	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	336801	mE	6654851	mN	
Habitat:		Hill (gentle east-facing midslope)					
Soil:		Grey-white sand					
Rocks:		None					
Mapped as:		MSL-1					
Vegetation Type:		Low Shrubland of *Melaleuca leuropoma* with Open Mid Shrubland of *Eremaea beaufortioides* var. *beaufortioides* and *Conospermum wycherleyi* subsp. *glabrum* and Open Sedgeland of *Mesomelaena pseudostygia* and *Lepidobolus preissianus*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (20):		*Allocasuarina humilis, Banksia attenuata, Banksia prionotes, Calothamnus sanguineus, Cassytha racemosa, Conospermum wycherleyi* subsp. *glabrum*, *Conostylis aurea, Dasypogon obliquifolius, Eremaea beaufortioides* var. *beaufortioides*, *Hakea costata, Hypocalymma xanthopetalum, Lepidobolus preissianus, Melaleuca leuropoma, Melaleuca systena, Mesomelaena pseudostygia, Petrophile macrostachya, Stenanthemum* sp., *Stirlingia latifolia, Stylidium crossocephalum, Verreauxia reinwardtii*					

Relevé:	R16	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	339010	mE	6654498	mN	
Habitat:		Hill (gentle midslope)					
Soil:		Yellow-grey sand					
Rocks:		None					
Mapped as:		*EB***WL**					
Vegetation Type:		Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with Open Mid Shrubland of *Eremaea beaufortioides* var. *beaufortioides*, *Allocasuarina humilis* and *Xanthorrhoea preissii* with Open Sedgeland of *Mesomelaena pseudostygia* and *Georgeantha hexandra* and Sparse Low Shrubland of *Conospermum wycherleyi* subsp. *glabrum* and *Calothamnus quadrifidus* subsp. *quadrifidus*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (44):		*Acacia latipes* subsp. *latipes*, *Alexgeorgea nitens, Allocasuarina humilis, Anigozanthos humilis, Austrostipa compressa, Banksia attenuata, Banksia menziesii, Banksia shuttleworthiana, Calothamnus quadrifidus* subsp. *quadrifidus*, *Cassytha racemosa, Centrolepis aristata, Centrolepis drummondiana, Conospermum wycherleyi* subsp. *glabrum*, *Conostylis setigera* subsp. *setigera*, *Dianella revoluta* var. *divaricata*, *Drosera erythrorhiza, Drosera humilis, Eremaea beaufortioides* var. *beaufortioides*, *Eucalyptus todtiana, Georgeantha hexandra, Hakea costata, Hakea ruscifolia,* ***Hypochaeris radicata*,*** *Hypolaena pubescens, Isotoma hypocrateriformis, Jacksonia hakeoides, Jacksonia sternbergiana, Labichea punctata, Laxmannia sessiliflora* subsp. *drummondii*, ***Lolium perenne*, Lysimachia arvensis*,*** *Mesomelaena pseudostygia, Patersonia occidentalis* var. *occidentalis*, *Podotheca angustifolia, Pterochaeta paniculata, Schoenus nanus, Schoenus pleiostemoneus, Stirlingia latifolia, Stylidium maitlandianum, Stylidium repens, Trachymene ornata,* ***Vulpia muralis*, Wahlenbergia capensis*,*** *Xanthorrhoea preissii*					

Relevé:	R17	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	339216	mE	6654451	mN	
Habitat:		Drainage line (bed)					
Soil:		White-grey clayey-sand					
Rocks:		None					
Mapped as:		*E***F**-1					
Vegetation Type:		Open Tall Forest of *Eucalyptus rudis* with Open Tall Shrubland of *Melaleuca rhaphiophylla* and *Jacksonia sternbergiana* with Sparse Sedgeland of *Baumea juncea* and *Lepidosperma* ?*squamatum* and Isolated Low Shrubs of *Jacksonia sternbergiana*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Weeds, unfenced					
Fire Age:		None evident					
Taxa (16):		***Avena barbata*,*** *Baumea juncea, Cassytha racemosa,* ***Ehrharta longiflora*,*** *Eucalyptus rudis, Jacksonia sternbergiana, Juncus pallidus, Lepidosperma* ?*squamatum*, ***Lysimachia arvensis*,*** *Melaleuca rhaphiophylla,* ***Monoculus monstrosus*,*** *Oxalis perennans, Patersonia occidentalis* var. *occidentalis*, *Podolepis aristata* subsp. *affinis*, ***Sonchus asper*,*** *Trachymene ornata*					

Relevé:	R18	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	339462	mE	6654423	mN	
Habitat:		Hill (gentle footslope)					
Soil:		Grey-white sand					
Rocks:		None					
Mapped as:		*EB***WL**					
Vegetation Type:		Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* with Open Mid Shrubland of *Scholtzia involucrata* and *Macrozamia fraseri* and Open Low Shrubland of *Calytrix fraseri*, *Scholtzia involucrata* and *Stirlingia latifolia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (22):		*Acacia blakelyi, Acacia pulchella* var. *glaberrima*, *Alexgeorgea nitens, Austrostipa elegantissima, Banksia attenuata, Banksia menziesii, Brachyscome* sp., *Burchardia congesta, Calothamnus quadrifidus* subsp. *quadrifidus*, *Calytrix fraseri, Conostylis aculeata* subsp. *preissii*, *Drosera* ?*pallida*, *Eucalyptus todtiana, Hibbertia subvaginata, Laxmannia sessiliflora* subsp. *drummondii*, *Lomandra caespitosa, Macrozamia fraseri, Melaleuca leuropoma, Patersonia occidentalis* var. *occidentalis*, *Rytidosperma caespitosum, Scholtzia involucrata, Stirlingia latifolia*					

Relevé:	R19	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	339980	mE	6654299	mN	
Habitat:		Hill (gentle south-facing midslope)					
Soil:		Yellow-white sand					
Rocks:		None					
Mapped as:		M**HL**					
Vegetation Type:		Open Mid Shrubland of *Gastrolobium spinosum*, *Daviesia angulata* and *Hakea trifurcata* with Open Low Shrubland of *Calothamnus quadrifidus* subsp. *quadrifidus*, *Banksia carlinoides* and *Hibbertia crassifolia* and Open Sedgeland of *Mesomelaena pseudostygia* and *Ecdeiocolea monostachya*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (36):		*Acacia lasiocarpa* var. *lasiocarpa*, *Allocasuarina humilis, Andersonia involucrata, Banksia carlinoides, Banksia platycarpa, Banksia shuttleworthiana, Calothamnus quadrifidus* subsp. *quadrifidus*, *Calothamnus sanguineus, Calytrix leschenaultii, Calytrix sapphirina, Cassytha racemosa, Comesperma scoparium, Conostephium preissii, Daviesia angulata, Daviesia nudiflora, Ecdeiocolea monostachya, Gastrolobium* sp., *Gastrolobium spinosum, Georgeantha hexandra, Hakea incrassata, Hakea trifurcata, Hibbertia crassifolia, Hibbertia hypericoides, Hypocalymma xanthopetalum, Isotropis cuneifolia, Jacksonia* ?*restioides*, *Leucopogon oliganthus, Lysinema pentapetalum, Melaleuca trichophylla, Mesomelaena pseudostygia, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Schoenus pleiostemoneus, Stylidium repens, Tetraria microcarpa, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé:	R20	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	341123	mE	6653811	mN	
Habitat:		Hill (midslope)					
Soil:		White-grey sand					
Rocks:		Laterite gravel					
Mapped as:		M**SL**-2					
Vegetation Type:		Open Mid Shrubland of *Beaufortia squarrosa*, *Adenanthos cygnorum* and *Allocasuarina humilis* with Open Low Shrubland of *Hibbertia hypericoides*, *Beaufortia squarrosa* and *Conospermum wycherleyi* subsp. *glabrum* with Isolated Low Trees of *Banksia attenuata* and Isolated Sedges of *Mesomelaena pseudostygia* and *Lepidobolus preissianus*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (48):		*Adenanthos cygnorum, Allocasuarina humilis, Anigozanthos humilis, Austrostipa compressa, Babingtonia grandiflora, Baeckea grandis, Banksia attenuata, Banksia shuttleworthiana, Beaufortia squarrosa, Cassytha racemosa, Centrolepis aristata, Comesperma calymega, Conospermum wycherleyi* subsp. *glabrum*, *Conostephium pendulum, Drosera* ?*pallida*, *Drosera* ?*parvula*, *Drosera eneabba, Drosera menziesii* subsp. *penicillaris*, *Eremaea beaufortioides* var. *beaufortioides*, *Gompholobium tomentosum, Haemodorum spicatum, Hakea costata, Hibbertia hypericoides, Hibbertia subvaginata, Jacksonia nutans, Lepidobolus preissianus, Leptospermum oligandrum, Levenhookia stipitata, Melaleuca leuropoma, Mesomelaena pseudostygia, Patersonia juncea, Petrophile linearis, Petrophile macrostachya, Podotheca angustifolia, Pterochaeta paniculata, Schoenus nanus, Stackhousia pubescens, Stirlingia latifolia, Stylidium crossocephalum, Stylidium purpureum, Synaphea aephynsa,* ***Synaphea endothrix*** **(P3),** *Synaphea spinulosa* subsp. *spinulosa*, *Trachymene ornata, Verreauxia reinwardtii, Wahlenbergia* ?*preissii*, *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404), *Xanthosia huegelii*					

Relevé:	R21	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	341564	mE	6653671	mN	
Habitat:		Hill (gentle hilltop)					
Soil:		White sand					
Rocks:		Laterite gravel					
Mapped as:		M**HL**					
Vegetation Type:		Low Shrubland of Mixed shrubs dominated by *Banksia glaucifolia*, *Synaphea interioris* and *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) with Sparse Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (39):		*Allocasuarina humilis, Astroloma glaucescens, Astroloma stomarrhena, Banksia glaucifolia, Banksia grossa, Banksia nana, Banksia polycephala, Beaufortia squarrosa, Calothamnus torulosus, Cassytha racemosa, Caustis dioica, Comesperma scoparium, Conostylis androstemma, Conothamnus trinervis, Daviesia decurrens, Desmocladus* sp., *Eremaea asterocarpa* subsp. *asterocarpa*, *Gastrolobium spinosum, Hakea auriculata, Hakea incrassata, Hibbertia* ?*rupicola, Hibbertia acerosa, Hibbertia crassifolia, Hibbertia hypericoides, Hibbertia mylnei, Hovea trisperma, Hypocalymma xanthopetalum, Lepidosperma tenue, Lysinema pentapetalum, Mesomelaena pseudostygia, Mesomelaena tetragona, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Pimelea sulphurea, Schoenus pleiostemoneus, Stylidium diuroides* subsp. *diuroides, Stylidium repens, Synaphea interioris, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé:	R22	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	343258	mE	6653581	mN	
Habitat:		Outcrop (hilltop)					
Soil:		White-grey sand					
Rocks:		Laterite gravel					
Mapped as:		M**HL**					
Vegetation Type:		Low Shrubland of *Petrophile macrostachya*, *Banksia carlinoides* and *Melaleuca trichophylla* with Sparse Mid Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404) and Sparse Sedgeland of *Mesomelaena pseudostygia*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (26):		*Allocasuarina humilis, Allocasuarina microstachya, Austrostipa compressa, Banksia carlinoides, Bossiaea eriocarpa, Calothamnus hirsutus, Calothamnus sanguineus, Cassytha racemosa, Caustis dioica, Conostylis aurea, Daviesia daphnoides, Desmocladus asper, Gastrolobium polystachyum, Hakea neospathulata, Hakea psilorrhyncha, Hibbertia acerosa, Hibbertia hypericoides,* ***Lepidobolus quadratus*** **(P3),** *Lepidosperma* ?*squamatum*, *Leucopogon* sp. Lesueur (B. Evans 530), *Melaleuca trichophylla, Mesomelaena pseudostygia, Petrophile brevifolia, Petrophile macrostachya, Stylidium repens, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé:	R23	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	343640	mE	6653899	mN	
Habitat:		Hill (west-facing hilltop)					
Soil:		White-grey sand					
Rocks:		None					
Mapped as:		M**SL**-2					
Vegetation Type:		Open Low Shrubland of *Hibbertia hypericoides* and *Beaufortia squarrosa* with Sparse Mid Shrubland of *Banksia candolleana*, *Leptospermum oligandrum* and *Allocasuarina humilis* with Sparse Sedgeland of *Mesomelaena pseudostygia* and Isolated Mallee Trees of *Eucalyptus todtiana*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (49):		*Alexgeorgea nitens, Allocasuarina humilis, Anigozanthos humilis, Austrostipa compressa, Banksia candolleana, Banksia polycephala, Beaufortia squarrosa, Burchardia congesta, Calothamnus sanguineus, Chordifex sinuosus, Comesperma calymega, Conospermum wycherleyi* subsp. *glabrum*, *Conostylis aurea, Dasypogon obliquifolius, Daviesia daphnoides, Drosera* ?*pallida, Drosera* ?*parvula, Drosera eneabba, Drosera erythrorhiza, Drosera stolonifera, Eremaea ectadioclada, Eucalyptus todtiana, Gompholobium shuttleworthii, Gompholobium tomentosum, Haemodorum spicatum, Hibbertia hypericoides, Hypocalymma xanthopetalum, Jacksonia floribunda, Kunzea glabrescens, Lechenaultia stenosepala, Leptospermum oligandrum, Leptospermum spinescens, Lomandra hastilis, Melaleuca leuropoma, Mesomelaena pseudostygia, Nuytsia floribunda, Patersonia occidentalis* var. *occidentalis*, *Petrophile macrostachya, Podotheca gnaphalioides, Polianthion wichurae, Stenanthemum* sp., *Stirlingia latifolia, Stylidium crossocephalum, Stylidium repens, Thysanotus patersonii, Trachymene ornata, Verticordia grandis, Xanthorrhoea preissii, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé:	R24	Described by:	Scott Hitchcock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	343873	mE	6653968	mN	
Habitat:		Hill (hilltop)					
Soil:		White-grey sand					
Rocks:		Laterite stones					
Mapped as:		M**HL**					
Vegetation Type:		Low Shrubland of *Banksia carlinoides*, *Calothamnus sanguineus* and *Beaufortia squarrosa* with Sparse Mid Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (31):		*Allocasuarina humilis, Astroloma glaucescens, Austrostipa compressa, Banksia carlinoides, Banksia nana, Banksia platycarpa, Banksia telmatiaea, Beaufortia squarrosa, Calectasia narragara, Calothamnus sanguineus, Calytrix leschenaultii, Caustis dioica, Conostylis aurea, Daviesia daphnoides, Daviesia epiphyllum, Daviesia nudiflora, Gastrolobium polystachyum, Haemodorum laxum, Hakea conchifolia, Hakea neospathulata, Hakea stenocarpa, Hibbertia hypericoides, Hypocalymma xanthopetalum, Leucopogon conostephioides, Lomandra preissii, Mesomelaena pseudostygia, Petrophile brevifolia, Petrophile macrostachya, Stylidium repens, Synaphea spinulosa* subsp. *spinulosa*, *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)					

Relevé: R25	Described by: Rochelle Haycock	Date: 28/04/2016	Photo:
Location (GDA94):	MGA50 344646 mE 6654813 mN		
Habitat:	Hill (moderate south-facing midslope)		
Soil:	White sand		
Rocks:	Laterite boulders		
Mapped as:	M**HL**		
Vegetation Type:	Low Shrubland of *Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404), *Petrophile macrostachya* and *Marianthus ringens* with Open Sedgeland of *Lepidosperma calcicola* and *Lepidosperma tenue*		
Vegetation Condition:	2 (Vegetation structure intact)		
Disturbances:	Unfenced		
Fire Age:	None evident		
Taxa (32):	*Acacia lasiocarpa* var. *lasiocarpa*, *Allocasuarina humilis, Austrostipa compressa, Banksia carlinoides, Boronia ramosa* subsp. *anethifolia*, *Calandrinia corrigioloides, Dampiera alata, Desmocladus asper, Desmocladus flexuosus, Dodonaea ericoides, Drosera erythrorhiza, Eremaea violacea* subsp. *rhaphiophylla*, *Glischrocaryon aureum, Hakea anadenia, Hakea lissocarpha, Hibbertia hypericoides, **Hypochaeris radicata*,** Lepidosperma calcicola, Lepidosperma tenue, Leucopogon conostephioides, Lomandra micrantha* subsp. *micrantha*, *Marianthus ringens, Opercularia vaginata, Petrophile chrysantha, Petrophile macrostachya, Pterochaeta paniculata, Rytidosperma caespitosum, Scaevola glandulifera, Synaphea interioris, Trachymene ornata, Trymalium ledifolium, Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)		

Relevé: R26	Described by: Rochelle Haycock	Date: 28/04/2016	Photo:
Location (GDA94):	MGA50 344954 mE 6654878 mN		
Habitat:	Hill (midslope)		
Soil:	Yellow-white sand		
Rocks:	None		
Mapped as:	M**SL**-2		
Vegetation Type:	Open Low Shrubland of *Banksia candolleana*, *Beaufortia squarrosa* and *Allocasuarina humilis* with Open Sedgeland of *Mesomelaena pseudostygia* and *Alexgeorgea nitens* and Sparse Mid Shrubland of *Banksia grossa* and *Calothamnus sanguineus*		
Vegetation Condition:	2 (Vegetation structure intact)		
Disturbances:	Unfenced		
Fire Age:	None evident		
Taxa (34):	*Alexgeorgea nitens, Allocasuarina humilis, Andersonia heterophylla, Astroloma stomarrhena, Astroloma xerophyllum, Banksia candolleana, Banksia grossa, Banksia nana, Banksia shuttleworthiana, Beaufortia squarrosa, Blancoa canescens, Burchardia congesta, Calothamnus sanguineus, Cassytha racemosa, Chordifex sinuosus, Conostylis aurea, Conostylis setigera* subsp. *setigera*, *Dasypogon obliquifolius, Daviesia decurrens, Daviesia podophylla, Drosera* ?*parvula*, *Hakea psilorrhyncha, Hypocalymma xanthopetalum, Jacksonia floribunda, Lasiopetalum drummondii, Leptospermum spinescens, Lomandra preissii, Mesomelaena pseudostygia, Petrophile linearis, Pimelea sulphurea, Schoenus curvifolius, Schoenus pedicellatus, Schoenus pleiostemoneus, Stirlingia latifolia*		

Relevé:	R27	Described by:	Rochelle Haycock		Date:	28/04/2016	Photo:
Location (GDA94):		MGA50	345522	mE	6655168	mN	
Habitat:		Hill (midslope)					
Soil:		Yellow-white sand					
Rocks:		None					
Mapped as:		MSL-2					
Vegetation Type:		Open Low Shrubland of *Beaufortia squarrosa*, *Eremaea pauciflora* var. *calyptra* and *Hibbertia hypericoides* with Sparse Mid Shrubland of *Banksia candolleana*, *Lambertia multiflora* var. *multiflora* and *Banksia incana* with Sparse Sedgeland of *Alexgeorgea nitens* and *Mesomelaena pseudostygia* and Isolated Tall Shrubs of *Hakea psilorrhyncha*					
Vegetation Condition:		2 (Vegetation structure intact)					
Disturbances:		Unfenced					
Fire Age:		None evident					
Taxa (41):		*Alexgeorgea nitens, Allocasuarina humilis, Andersonia heterophylla, Astroloma xerophyllum, Banksia candolleana, Banksia incana, Banksia nana, Banksia shuttleworthiana, Beaufortia squarrosa, Blancoa canescens, Calytrix variabilis, Cassytha racemosa, Chordifex sinuosus, Conospermum wycherleyi* subsp. *glabrum*, *Conostylis aurea, Conostylis setigera* subsp. *setigera*, *Dasypogon obliquifolius, Daviesia nudiflora, Drosera* ?*parvula*, *Eremaea pauciflora* var. *calyptra*, *Eucalyptus todtiana, Hakea eneabba, Hakea psilorrhyncha, Hemiphora bartlingii, Hibbertia hypericoides, Jacksonia floribunda, Lambertia multiflora* var. *multiflora*, *Lepidosperma apricola, Leptospermum spinescens, Leucopogon conostephioides, Lyginia barbata, Lysinema pentapetalum, Mesomelaena pseudostygia, Mesomelaena tetragona, Patersonia occidentalis* var. *occidentalis*, *Petrophile linearis, Petrophile macrostachya, Pimelea sulphurea, Schoenus curvifolius, Schoenus pleiostemoneus, Stirlingia latifolia*					

Note: * = environmental weed, DPP = Declared Pest Plant, P3 = Priority 3 species, RE = range extension species, subsp. = subspecies, var. = variety, sp. = species.

APPENDIX 2: DATABASE SEARCH RESULTS

Table A2.1: Conservation significant flora listed in the database search results

Species	EPBC Act Listing	WC Act Listing	Priority Rank	Searches
Banksia serratuloides subsp. *perissa*	Critically Endangered	Critically Endangered		EPBC
Calectasia cyanea	Critically Endangered	Critically Endangered		NM
Tetratheca nephelioides	Critically Endangered	Endangered		EPBC
Caladenia huegelii	Endangered	Critically Endangered		EPBC
Drakaea elastica	Endangered	Critically Endangered		EPBC
Eucalyptus absita	Endangered	Critically Endangered		EPBC
Eucalyptus x balanites	Endangered	Critically Endangered		EPBC
Eucalyptus impensa	Endangered	Critically Endangered		EPBC
Grevillea batrachioides	Endangered	Critically Endangered		EPBC
Grevillea humifusa	Endangered	Critically Endangered		EPBC, NM, TPFL
Hemiandra gardneri	Endangered	Critically Endangered		EPBC
Caladenia hoffmanii	Endangered	Endangered		EPBC
Eucalyptus leprophloia	Endangered	Endangered		EPBC, NM, TPFL, WAHERB
Eucalyptus pruiniramis	Endangered	Endangered		EPBC, NM
Leucopogon obtectus	Endangered	Endangered		EPBC
Thelymitra stellata	**Endangered**	**Endangered**		**EPBC, NM, TPFL, WAHERB**
Andersonia gracilis	Endangered	Vulnerable		EPBC
Paracaleana dixonii	Endangered	Vulnerable		EPBC, NM, TPFL
Acacia forrestiana	Vulnerable	Vulnerable		EPBC
Anigozanthos viridis subsp. *terraspectans*	Vulnerable	Vulnerable		EPBC
Eleocharis keigheryi	Vulnerable	Vulnerable		EPBC
Eucalyptus crispata	Vulnerable	Endangered		EPBC
Eucalyptus johnsoniana	Vulnerable	Vulnerable		EPBC
Eucalyptus lateritica	Vulnerable	Endangered		EPBC, NM, TPFL
Eucalyptus suberea	Vulnerable	Vulnerable		EPBC, NM, TPFL
Hakea megalosperma	Vulnerable	Vulnerable		EPBC, NM, TPFL
Banksia catoglypta	Not listed	Vulnerable		NM
Lasiopetalum ogilvieanum			P1	NM
Leucopogon ozothamnoides			P1	NM
Stylidium sp. Banovich Road (F. & J. Hort 1884)			P1	NM, WAHERB
Acacia retrorsa			P2	NM, WAHERB
Arnocrinum gracillimum			P2	NM, TPFL
Dampiera sp. Jurien (G. Lullfitz s.n. 10/7/1986)			P2	NM, WAHERB

Species	EPBC Act Listing	WC Act Listing	Priority Rank	Searches
Eucalyptus angularis			P2	NM
Hemigenia curvifolia			P2	NM
Lepyrodia curvescens			P2	NM, WAHERB
Persoonia filiformis			P2	NM, WAHERB
Synaphea lesueurensis			**P2**	**NM, WAHERB**
Synaphea xela			P2	NM, WAHERB
Acacia epacantha			P3	NM, WAHERB
Acacia plicata			P3	NM, WAHERB
Allocasuarina ramosissima			P3	NM
Austrostipa sp. Cairn Hill (M.E. Trudgen 21176)			P3	NM, WAHERB
Banksia fraseri var. *crebra*			P3	NM, WAHERB
Banksia subulata			P3	NM
Beaufortia bicolor			P3	NM, WAHERB
Byblis gigantea			P3	NM
Centrolepis milleri			P3	NM, WAHERB
Drosera marchantii* subsp. *prophylla			**P3**	**NM, TPFL, WAHERB**
Grevillea thyrsoides subsp. *pustulata*			P3	NM
Grevillea thyrsoides subsp. *thyrsoides*			P3	NM
Haemodorum loratum			**P3**	**NM, TPFL, WAHERB**
Hakea longiflora			P3	NM, WAHERB
Jacksonia anthoclada			P3	NM
Lepidobolus quadratus			P3	NM, WAHERB
Patersonia argyrea			P3	NM, WAHERB
Phlebocarya pilosissima subsp. *pilosissima*			P3	NM
Stylidium torticarpum			P3	NM, WAHERB
Synaphea endothrix			**P3**	**NM, TPFL, WAHERB**
Thysanotus anceps			P3	NM, WAHERB
Verticordia fragrans			P3	NM, WAHERB
Calytrix chrysantha			P4	NM, TPFL, WAHERB
Conostephium magnum			P4	NM, WAHERB
Darwinia pimelioides			P4	NM
Desmocladus elongatus			P4	NM, WAHERB
Eucalyptus exilis			P4	NM
Eucalyptus pendens			P4	NM, TPFL, WAHERB
Grevillea rudis			**P4**	**NM, WAHERB**
Grevillea saccata			P4	NM
Hakea neurophylla			P4	NM, WAHERB
Hibbertia propinqua			P4	NM, WAHERB

Species	EPBC Act Listing	WC Act Listing	Priority Rank	Searches
Hypolaena robusta			P4	NM, WAHERB
Lepidium pseudotasmanicum			P4	NM
Stylidium aeonioides			P4	NM, WAHERB
Stylidium inversiflorum			P4	NM, WAHERB
Thelymitra apiculata			P4	NM, WAHERB
Thysanotus glaucus			**P4**	**NM, TPFL**
Xanthosia tomentosa			P4	NM, WAHERB

Note: P1 – P4 = Priority 1 to Priority 4 species; EPBC = EPBC Act Protected Matters Search Tool (DotEE, 2016c), NM = NatureMap (DPaW, 2007-), TPFL = DPaW's Threatened and Priority Flora database (search reference 12-0416FL), WAHERB = DPaW's Western Australian Herbarium database (search reference 12-0416FL). CSFL in bold font have been found in or on the boundary of the Jurien East Road reserve previously.

Table A2.2: Conservation significant fauna species listed in the database search results

Species	Common Name	EPBC Act Listing	WC Act Listing	Priority Rank	Search Results
Pezoporus flaviventris	Western ground parrot	Critically Endangered	Critically Endangered		DPaW
Calidris ferruginea	Curlew sandpiper	Critically Endangered, IA	Vulnerable, IA		EPBC
Calyptorhynchus baudinii	Baudin's cockatoo	Vulnerable	Endangered		DPaW
Calyptorhynchus latirostris	**Carnaby's black cockatoo**	**Endangered**	**Endangered**		**DPaW, EPBC, NM**
Cyclodomorphus branchialis	Gilled slender blue-tongue	-	Vulnerable		DPaW, NM
Dasyurus geoffroii	Chuditch, Western quoll	Vulnerable	Vulnerable		EPBC
Egernia stokesii badia	Western spiny-tailed skink	Endangered	Vulnerable		DPaW, EPBC, NM
Eubalaena australis	Southern right whale	Endangered	Vulnerable		DPaW
Leipoa ocellata	Malleefowl	Vulnerable	Vulnerable		DPaW, EPBC, NM
Macroderma gigas	Ghost Bat	-	Vulnerable		DPaW
Numenius madagascariensis	Eastern Curlew	Critically Endangered, IA	Vulnerable, IA		EPBC
Ardea modesta	Eastern great egret	Migratory birds protected under an international agreement (IA)			DPaW, NM
Arenaria interpres	Ruddy turnstone	Migratory birds protected under an international agreement (IA)			DPaW
Calidris acuminata	Sharp-tailed sandpiper	Migratory birds protected under an international agreement (IA)			DPaW
Calidris alba	Sanderling	Migratory birds protected under an international agreement (IA)			DPaW, NM
Calidris ruficollis	Red-necked stint	Migratory birds protected under an international agreement (IA)			DPaW
Limosa lapponica	Bar-tailed godwit	Migratory birds protected under an international agreement (IA)			DPaW
Macronectes giganteus	Southern giant petrel	Endangered, IA	IA		DPaW
Merops ornatus	Rainbow bee-eater	-	IA		DPaW, NM
Pluvialis squatarola	Grey plover	Migratory birds protected under an international agreement (IA)			DPaW

Species	Common Name	EPBC Act Listing	WC Act Listing	Priority Rank	Search Results
Puffinus pacificus	Wedge-tailed shearwater	Migratory birds protected under an international agreement (IA)			DPaW
Tringa glareola	Wood sandpiper	Migratory birds protected under an international agreement (IA)			DPaW, NM
Tringa nebularia	Common greenshank	Migratory birds protected under an international agreement (IA)			DPaW
Falco peregrinus	Peregrine falcon	-	Other specially protected fauna (OS)		DPaW, NM
Apus pacificus	Fork-tailed swift	Migratory birds protected under an international agreement (IA)			EPBC
Ardea ibis	Cattle egret	Migratory birds protected under an international agreement (IA)			EPBC
Motacilla cinerea	Grey wagtail	Migratory birds protected under an international agreement (IA)			EPBC
Pandion haliaetus	Osprey	Migratory birds protected under an international agreement (IA)			EPBC
Hylaeus globuliferus	A native bee			P3	DPaW, NM
Charadrius rubricollis	Hooded plover			P4	DPaW
Macropus irma	Western brush wallaby			P4	DPaW
Synemon gratiosa	Graceful sunmoth			P4	DPaW

Note: P1 – P4 = Priority 1 to Priority 4 species; EPBC = EPBC Act Protected Matters Search Tool (DotEE, 2016c), NM = NM = NatureMap (DPaW, 2007-), DPaW = DPaW's threatened fauna databases (search reference FAUNA#5200). IA = international agreement, OS = other specially protected fauna. Conservation significant fauna in bold have been recorded in the Jurien East Road reserve.

Table A2.3: Weed species listed in database search results and DPaW Midwest weed rankings (DPaW, 2016b)

Species (Common name)	Rank	Ecological Impact	Invasiveness	Searches
Tamarix aphylla (Tamarisk)	WoNS, DP (C3 – whole of state)	Not available		EPBC
Chrysanthemoides monilifera (Bitou Bush)	WoNS, STBC, DP (C1 – whole of state)	**Alert**		EPBC
Asparagus asparagoides (Bridal Creeper)	WoNS, STBC, DP (C3 – whole of state)	Not available		EPBC
Genista sp. X *Genista monspessulana* (Broom)	Possible WoNS and STBC	Not available		EPBC
Arctotheca calendula (Cape Weed)	EW	High	Rapid	NM
Bartsia trixago	EW	High	Rapid	NM
Cenchrus ciliaris (Buffel Grass)	EW	High	Rapid	EPBC
Centaurea melitensis (Maltese Cockspur)	EW	High	Rapid	NM
Cotula coronopifolia (Waterbuttons)	EW	High	Rapid	NM
Cyperus tenuiflorus (Scaly Sedge)	EW	High	Rapid	NM
Paspalum dilatum	EW	High	Rapid	NM
Urospermum picroides (False Hawkbit)	EW	High	Rapid	NM
Ursinia anthemoides subsp. *anthemoides*	EW	High	Rapid	NM
Chenopodium glaucum (Glaucous Goosefoot)	EW	Low	Rapid	NM

Species (Common name)	Rank	Ecological Impact	Invasiveness	Searches
Dischisma capitatum (Woolly-headed Dischisma)	EW	Low	Rapid	NM
Erodium cicutarium (Common Storksbill)	EW	Low	Rapid	NM
Hypochaeris glabra (Smooth Catsear)	EW	Low	Rapid	NM
Lysimachia arvensis (Pimpernel)	EW	Low	Rapid	NM
Petrorhagia dubia (Velvety Pink)	EW	Low	Rapid	NM
Spergularia diandra (Lesser Sand Spurry)	EW	Low	Rapid	NM
Stachys arvensis (Staggerweed)	EW	Low	Rapid	NM
Stellaria media (Chickweed)	EW	Low	Rapid	NM
Vellereophyton dealbatum (White Cudweed)	EW	Low	Rapid	NM
Centaurium tenuiflorum	EW	Low	Slow	NM
Digitaria ciliaris (Summer Grass)	EW	Low	Slow	NM
Parentucellia latifolia (Common Bartsia)	EW	Medium	Rapid	NM
Briza maxima (Blowfly Grass)	EW	Unknown	Rapid	NM
Briza minor (Shivery Grass)	EW	Unknown	Rapid	NM
Conyza sumatrensis	EW	Unknown	Rapid	NM
Cotula bipinnata (Ferny Cotula)	EW	Unknown	Rapid	NM
Crassula natans var. *minus*	EW	Unknown	Rapid	NM
Ehrharta longiflora (Annual Veldt Grass)	EW	Unknown	Rapid	NM
Galium murale (Small Goosegrass)	EW	Unknown	Rapid	NM
Monoculus monstrosus	EW	Unknown	Rapid	NM
Monopsis debilis var. *depressa*	EW	Unknown	Rapid	NM
Pentameris airoides subsp. *airoides*	EW	Unknown	Rapid	NM
Sonchus asper (Rough Sowthistle)	EW	Unknown	Rapid	NM
Vulpia bromoides (Squirrel Tail Fescue)	EW	Unknown	Rapid	NM
Vulpia muralis	EW	Unknown	Rapid	NM
Vulpia myuros forma myuros	EW	Unknown	Rapid	NM
Wahlenbergia capensis (Cape Bluebell)	EW	Unknown	Rapid	NM
Zaluzianskya divaricata (Spreading Night Phlox)	EW	Unknown	Rapid	NM
Cerastium pumilum	EW	Unknown	Moderate	NM
Trifolium subterraneum (Subterranean Clover)	EW	Unknown	Moderate	NM
Bromus hordeaceus (Soft Brome)	EW	Unknown	Slow	NM
Bromus madritensis (Madrid Brome)	EW	Unknown	Slow	NM
Brachypodium distachyon (False Brome)	EW	Unknown	Unknown	NM
Campylopus introflexus	EW	Not available		NM
Cyperus polystachyos (Bunchy Sedge)	EW	Not available		NM
Juncus articulatus (Jointed Rush)	EW	Not available		NM
Olea europaea (Olive)	EW	Not available		EPBC
Pinus radiata (Radiata Pine)	EW	Not available		EPBC
Urochloa mutica (previously *Brachiaria mutica*, Para Grass)	EW	Not available		EPBC

Note: EW = environmental weed, DP = Declared Pest, STBC = Species Targeted for Biological Control, WoNS = Weed of National Significance; EPBC = EPBC Act Protected Matters Search Tool (DotEE, 2016c), NM = NatureMap (DPaW, 2007-).

Figure A2.1: NatureMap Search Results (DPaW, 2007 -)

NatureMap
Mapping Western Australia's biodiversity

Jurien East Road Cockleshell Gully Road to Brand Hwy

Created By Guest user on 20/09/2016

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Polygon'
Vertices	30° 13' 11" S,115° 08' 26" E 30° 13' 13" S,115° 10' 17" E 30° 11' 32" S,115° 15' 52" E 30° 12' 44" S,115° 22' 04" E 30° 11' 44" S,115° 24' 04" E 30° 11' 44" S,115° 25' 50" E 30° 15' 08" S,115° 26' 55" E 30° 16' 11" S,115° 23' 55" E 30° 16' 05" S,115° 22' 13" E 30° 14' 52" S,115° 16' 00" E 30° 16' 42" S,115° 10' 30" E 30° 16' 40" S,115° 08' 29" E 30° 13' 10" S,115° 08' 26" E 30° 13' 11" S,115° 08' 26" E
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	774	1825
Priority 1	3	9
Priority 2	9	31
Priority 3	22	57
Priority 4	17	58
Rare or likely to become extinct	10	41
TOTAL	**835**	**2021**

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Rare or likely to become extinct					
1.	32622	*Banksia catoglypta*		T	
2.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
3.	5691	*Eucalyptus lateritica (Laterite Mallee)*		T	
4.	13543	*Eucalyptus leptophloia (Scaly Butt Mallee)*		T	
5.	13040	*Eucalyptus pruiniramis*		T	
6.	5781	*Eucalyptus suberea (Mount Lesueur Mallee)*		T	
7.	15987	*Grevillea humifusa*		T	
8.	2180	*Hakea megalosperma (Lesueur Hakea)*		T	
9.	13867	*Paracaleana dixonii*		T	
10.	10862	*Thelymitra stellata (Star Orchid)*		T	
Priority 1					
11.	5042	*Lasiopetalum ogilvieanum*		P1	
12.	6426	*Leucopogon ozothamnoides*		P1	
13.	30275	*Stylidium sp. Banovich Road (F. & J. Hort 1884)*		P1	
Priority 2					
14.	3518	*Acacia retrorsa*		P2	
15.	1263	*Arnocrinum gracillimum*		P2	
16.	18441	*Dampiera sp. Jurien (G. Lullfitz s.n. 10/7/1985)*		P2	
17.	13545	*Eucalyptus angularis*		P2	
18.	6847	*Hemigenia curvifolia*		P2	
19.	19241	*Lepyrodia curvescens*		P2	
20.	14563	*Persoonia filiformis*		P2	
21.	15530	*Synaphea fesueurensis*		P2	
22.	30452	*Synaphea xela*		P2	
Priority 3					
23.	3319	*Acacia epacantha*		P3	
24.	3493	*Acacia plicata*		P3	
25.	1736	*Allocasuarina ramosissima*		P3	
26.	19959	*Austrostipa sp. Cairn Hill (M.E. Trudgen 21178)*		P3	
27.	32527	*Banksia fraseri var. crebra*		P3	
28.	32037	*Banksia subulata (Awled Honeypot)*		P3	
29.	5377	*Beaufortia bicolor*		P3	

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NatureMap
Mapping Western Australia's biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
30.	3178	*Byblis gigantea (Rainbow Plant)*		P3	
31.	45093	*Centrolepis millerl*		P3	
32.	13208	*Drosera marchantii subsp. prophylla*		P3	
33.	14422	*Grevillea thyrsoides subsp. pustulata*		P3	
34.	14423	*Grevillea thyrsoides subsp. thyrsoides*		P3	
35.	1469	*Haemodorum loratum*		P3	
36.	12230	*Hakea longiflora*		P3	
37.	14747	*Jacksonia anthoclada*		P3	
38.	13775	*Lepidobolus quadratus*		P3	
39.	1541	*Patersonia argyrea*		P3	
40.	11557	*Phlebocarya pilosissima subsp. pilosissima*		P3	
41.	17414	*Stylidium torticarpum*		P3	
42.	16858	*Synaphea endothrix*		P3	
43.	1317	*Thysanotus anceps*		P3	
44.	12425	*Verticordia fragrans*		P3	
Priority 4					
45.	5447	*Calytrix chrysantha*		P4	
46.	19026	*Conostephium magnum*		P4	
47.	5623	*Darwinia pimelioides*		P4	
48.	15828	*Desmocladus elongatus*		P4	
49.	5642	*Eucalyptus exilis (Boyagin Mallee)*		P4	
50.	5741	*Eucalyptus pendens (Badgingarra Mallee)*		P4	
51.	2086	*Grevillea rudis*		P4	
52.	2087	*Grevillea saccata (Pouched Grevillea)*		P4	
53.	2186	*Hakea neurophylla*		P4	
54.	35518	*Hibbertia propinqua*		P4	
55.	17622	*Hypolaena robusta*		P4	
56.	3042	*Lepidium pseudotasmanicum*		P4	
57.	7680	*Stylidium aeonioides*		P4	
58.	7743	*Stylidium inversiflorum*		P4	
59.	11032	*Thelymitra apiculata*		P4	
60.	1334	*Thysanotus glaucus*		P4	
61.	6294	*Xanthosia tomentosa (Lesueur Southern Cross)*		P4	
Non-conservation taxon					
62.	15430	*Acacia alata var. tetrantha*			
63.	3231	*Acacia auronitens*			
64.	3242	*Acacia blakelyi*			
65.	3262	*Acacia cochlearia (Rigid Wattle)*			
66.	3303	*Acacia dilatata*			
67.	3409	*Acacia lasiocarpa (Panjang)*			
68.	11619	*Acacia lasiocarpa var. bracteolata*			
69.	11611	*Acacia lasiocarpa var. lasiocarpa*			
70.	3412	*Acacia latipes*			
71.	15476	*Acacia latipes subsp. latipes*			
72.	3442	*Acacia microbotrya (Manna Wattle, Kalyang)*			
73.	11678	*Acacia morrii subsp. recurvistipula*			
74.	3464	*Acacia obovata*			
75.	3502	*Acacia pulchella (Prickly Moses)*			
76.	15481	*Acacia pulchella var. glaberrima*			
77.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
78.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
79.	30033	*Acacia saligna subsp. lindleyi*			
80.	30032	*Acacia saligna subsp. saligna*			
81.	18615	*Acacia sp. Muliewa (B.R. Maslin 4260)*			
82.	15484	*Acacia sphacelata subsp. sphacelata*			
83.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
84.	1209	*Acanthocarpus robustus*			
85.	6205	*Actinotus leucocephalus (Flannel Flower)*			
86.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
87.	1794	*Adenanthos sericeus (Woolly Bush)*			
88.	4582	*Adriana quadripartita (Bitter Bush)*			
89.	1057	*Alexgeorgea subterranea*			
90.	1721	*Allocasuarina campestris*			
91.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
92.	1734	*Allocasuarina microstachya*			
93.	1739	*Allocasuarina thuyoides (Horned Sheoak)*			
94.	1059	*Anarthria humilis*			
95.	1060	*Anarthria laevis*			
96.	6311	*Andersonia heterophylla*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
97.	6314	*Andersonia lehmanniana*			
98.	11606	*Andersonia lehmanniana subsp. pubescens*			
99.		*Andersonia sp.*			
100.	41738	*Andersonia sp. Mysosma (E.A. Griffin 2213)*			
101.	40908	*Androcalva pulchella*			
102.	1409	*Anigozanthos humilis (Catspaw)*			
103.	11434	*Anigozanthos humilis subsp. humilis*			
104.	11261	*Anigozanthos manglesii subsp. manglesii*			
105.	11665	*Anigozanthos manglesii subsp. quadrans*			
106.	1414	*Anigozanthos pulcherrimus (Yellow Kangaroo Paw)*			
107.	29	*Anogramma leptophylla (Annual Fern)*			
108.	6949	*Anthocercis littorea (Yellow Tailflower)*			
109.	1116	*Aphelia brizula*			
110.		*Aphelia sp.*			
111.	7838	*Arctotheca calendula (Cape Weed)*	Y		
112.	1264	*Arnocrinum preissii*			
113.	6330	*Astartea fascicularis*			
114.	6323	*Astroloma ciliatum (Candle Cranberry)*			
115.	6328	*Astroloma glaucescens*			
116.	6332	*Astroloma microdonta (Sandplain Cranberry)*			
117.	42144	*Astroloma oblongifolium*			
118.	6334	*Astroloma pallidum (Kick Bush)*			
119.	14501	*Astroloma sp. Eneabba (N. Marchant s.n. PERTH 01291777)*			
120.	6337	*Astroloma stomarrhena (Red Swamp Cranberry)*			
121.	6339	*Astroloma xerophyllum*			
122.	17234	*Austrostipa compressa*			
123.	17244	*Austrostipa macalpinei*			
124.	17257	*Austrostipa variabilis*			
125.	45398	*Babingtonia erecta*			
126.	45416	*Babingtonia grandiflora (Large-flowered Babingtonia)*			
127.		*Baeckea sp.*			
128.	32681	*Banksia armata (Prickly Dryandra)*			
129.	32682	*Banksia armata var. armata*			
130.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
131.	1809	*Banksia candolleana (Propeller Banksia)*			
132.	32623	*Banksia carlinoides (Pink Dryandra)*			
133.	32578	*Banksia dallanneyi subsp. media*			
134.	32523	*Banksia fraseri var. fraseri*			
135.	32519	*Banksia glaucifolia*			
136.	1820	*Banksia grossa*			
137.	32518	*Banksia hewardiana*			
138.	1823	*Banksia incana*			
139.	32215	*Banksia kippistiana var. kippistiana*			
140.	1825	*Banksia lanata*			
141.	11386	*Banksia leptophylla var. melletica*			
142.	1830	*Banksia littoralis (Swamp Banksia, Pungura)*			
143.	1834	*Banksia menziesii (Firewood Banksia)*			
144.	1835	*Banksia micrantha*			
145.	32206	*Banksia nana (Dwarf Dryandra)*			
146.	32202	*Banksia nivea (Honeypot Dryandra, Pudjam)*			
147.	32203	*Banksia nivea subsp. nivea*			
148.	1842	*Banksia prionotes (Acorn Banksia)*			
149.	32086	*Banksia sclerophylla*			
150.	32074	*Banksia shuttleworthiana (Bearded Dryandra)*			
151.	12111	*Banksia sphaerocarpa var. sphaerocarpa (Fox Banksia)*			
152.	32043	*Banksia stenoprion*			
153.	32042	*Banksia strictifolia*			
154.	1852	*Banksia telmatiaea (Swamp Fox Banksia)*			
155.	32032	*Banksia tridentata (Yellow Honeypot)*			
156.	32315	*Barbula calycina*			
157.	15037	*Bartsia trixago*	Y		
158.	741	*Baumea articulata (Jointed Rush)*			
159.	743	*Baumea juncea (Bare Twigrush)*			
160.	5378	*Beaufortia bracteosa*			
161.	5382	*Beaufortia elegans*			
162.	1417	*Blancoa canescens (Winter Bell)*			
163.	4414	*Boronia cymosa (Granite Boronia)*			
164.	11381	*Boronia ramosa subsp. anethifolia*			
165.	16639	*Boronia scabra subsp. scabra*			
166.	1269	*Borya laciniata*			

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167.	1273	*Borya sphaerocephala (Pincushions)*			
168.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
169.	30136	*Brachyloma preissii subsp. preissii*			
170.	8661	*Brachypodium distachyon (False Brome)*	Y		
171.	7875	*Brachyscome glandulosa*			
172.	7883	*Brachyscome pusilla*			
173.	244	*Briza maxima (Blowfly Grass)*	Y		
174.	245	*Briza minor (Shivery Grass)*	Y		
175.	250	*Bromus hordeaceus (Soft Brome)*	Y		
176.	252	*Bromus madritensis (Madrid Brome)*	Y		
177.		*Bryum pachytheca*			
178.	1366	*Bulbine semibarbata (Leek Lily)*			
179.	1383	*Burchardia bairdiae*			
180.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
181.	20230	*Bybilis lamellata*			
182.	15348	*Caladenia flava subsp. flava*			
183.	15602	*Caladenia footeana*			
184.	15360	*Caladenia longicauda subsp. borealis*			
185.	15369	*Caladenia lorea*			
186.	1611	*Caladenia radialis (Drooping Spider Orchid)*			
187.	18019	*Caladenia vulgata*			
188.	44184	*Calandrinia baccata*			
189.	2846	*Calandrinia calyptrata (Pink Purslane)*			
190.	2847	*Calandrinia composita*			
191.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
192.	16365	*Calandrinia sp. Kenwick (G.J. Keighery 10905)*			
193.	19309	*Calectasia narragara*			
194.	36520	*Callitris acuminata (Dwarf Cypress)*			
195.	36560	*Callitris arenaria (Sandplain Cypress)*			
196.	36600	*Callitris pyramidalis (Swamp Cypress)*			
197.	5411	*Calothamnus hirsutus*			
198.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush, Kwowdjard)*			
199.	36816	*Calothamnus quadrifidus subsp. quadrifidus*			
200.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
201.	5431	*Calothamnus torulosus*			
202.	5441	*Calytrix aurea*			
203.	5450	*Calytrix depressa*			
204.	5458	*Calytrix flavescens (Summer Starflower)*			
205.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
206.	5465	*Calytrix leschenaultii*			
207.	5479	*Calytrix strigosa*			
208.	32338	*Campylopus introflexus*	Y		
209.	2951	*Cassytha flava (Dodder Laurel)*			
210.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
211.	11799	*Cassytha racemosa forma racemosa*			
212.		*Cassytha sp.*			
213.	1742	*Casuarina obesa (Swamp Sheoak, Kuil)*			
214.	760	*Caustis dioica*			
215.	7916	*Centaurea melitensis (Maltese Cockspur)*	Y		
216.	6542	*Centaurium tenuiflorum*	Y		
217.	1120	*Centrolepis aristata*			
218.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
219.	1125	*Centrolepis drummondiana*			
220.	1134	*Centrolepis polygyna (Wiry Centrolepis)*			
221.	13489	*Cerastium pumilum*	Y		
222.		*Ceratodon purpureus convolutus*			
223.	17685	*Chaetanthus aristatus*			
224.	1280	*Chamaescilla corymbosa (Blue Squill)*			
225.	11299	*Chamaescilla corymbosa var. corymbosa*			
226.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
227.	31	*Cheilanthes austrotenuifolia*			
228.	2490	*Chenopodium glaucum (Glaucous Goosefoot)*	Y		
229.		*Chiloscyphus sp.*			
230.	17706	*Chordifex sinuosus*			
231.	763	*Chorizandra enodis (Black Bristlerush)*			
232.	4549	*Comesperma acerosum*			
233.	4551	*Comesperma ciliatum*			
234.	4552	*Comesperma confertum*			
235.	4554	*Comesperma flavum*			
236.	4561	*Comesperma scoparium (Broom Milkwort)*			

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237.		*Comesperma sp.*			
238.	4564	*Comesperma virgatum (Milkwort)*			
239.	1857	*Conospermum acerosum (Needle-leaved Smokebush)*			
240.	15511	*Conospermum boreale*			
241.	15512	*Conospermum boreale subsp. ascendens*			
242.	1859	*Conospermum brachyphyllum*			
243.	15041	*Conospermum canaliculatum*			
244.	15517	*Conospermum canaliculatum subsp. apiculatum*			
245.	15516	*Conospermum canaliculatum subsp. canaliculatum*			
246.	1864	*Conospermum crassinervium (Summer Smokebush)*			
247.	1874	*Conospermum glumaceum (Hooded Smokebush)*			
248.	1876	*Conospermum incurvum (Plume Smokebush)*			
249.	1878	*Conospermum nervosum*			
250.		*Conospermum sp.*			
251.	1882	*Conospermum stoechadis (Common Smokebush)*			
252.	15520	*Conospermum stoechadis subsp. sclerophyllum*			
253.	1885	*Conospermum triplinervium (Tree Smokebush)*			
254.	15521	*Conospermum unilaterale*			
255.	15523	*Conospermum wycherleyi*			
256.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
257.	6348	*Conostephium pendulum (Pearl Flower)*			
258.	6349	*Conostephium preissii*			
259.	11414	*Conostylis aculeata subsp. breviflora*			
260.	1420	*Conostylis androstemma (Trumpets)*			
261.	1421	*Conostylis angustifolia*			
262.	1423	*Conostylis aurea (Golden Conostylis)*			
263.	11438	*Conostylis candicans subsp. candicans*			
264.		*Conostylis crassinerva subsp. absens*			
265.	11773	*Conostylis crassinervia subsp. absens*			
266.	11938	*Conostylis crassinervia subsp. crassinervia*			
267.	1436	*Conostylis juncea*			
268.	1456	*Conostylis stylidioides*			
269.	11870	*Conostylis teretifolia subsp. teretifolia*			
270.	1458	*Conostylis teretiuscula*			
271.	5502	*Conothamnus trinervis*			
272.	20074	*Conyza sumatrensis*	Y		
273.	17104	*Corymbia calophylla (Marri)*			
274.	7943	*Cotula australis (Common Cotula)*			
275.	7944	*Cotula bipinnata (Ferny Cotula)*	Y		
276.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
277.	7946	*Cotula cotuloides (Smooth Cotula)*			
278.	11709	*Crassula colorata var. acuminata*			
279.	15706	*Crassula natans var. minus*	Y		
280.	31671	*Cryptandra intermedia*			
281.	9076	*Cryptandra myriantha*			
282.	4809	*Cryptandra pungens*			
283.	4810	*Cryptandra scoparia*			
284.	4811	*Cryptandra spyridioides*			
285.	40661	*Cycnogeton lineare*			
286.	806	*Cyperus polystachyos (Bunchy Sedge)*	Y		
287.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		
288.	7428	*Dampiera coronata (Wedge-leaved Dampiera)*			
289.	7449	*Dampiera juncea (Rush-like Dampiera)*			
290.	7453	*Dampiera lindleyi*			
291.	7475	*Dampiera spicigera (Spiked Dampiera)*			
292.	7482	*Dampiera teres (Terete-leaved Dampiera)*			
293.	5511	*Darwinia helichrysoides*			
294.	5518	*Darwinia neildiana (Fringed Bell)*			
295.	5522	*Darwinia pauciflora*			
296.	5528	*Darwinia sanguinea*			
297.	5529	*Darwinia speciosa*			
298.	1220	*Dasypogon obliquifolius*			
299.	6218	*Daucus glochidiatus (Australian Carrot)*			
300.	3793	*Daviesia angulata*			
301.	14199	*Daviesia chapmanii*			
302.	3805	*Daviesia decurrens (Prickly Bitter-pea)*			
303.	3807	*Daviesia divaricata (Marno)*			
304.	11879	*Daviesia hakeoides subsp. hakeoides*			
305.	16585	*Daviesia nudiflora subsp. nudiflora*			
306.	3831	*Daviesia pedunculata*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
307.	3833	*Daviesia podophylla*			
308.	3835	*Daviesia preissii*			
309.	3837	*Daviesia quadrilatera*			
310.	3845	*Daviesia triflora*			
311.	17662	*Desmocladus lateriticus*			
312.	17846	*Desmocladus parthenicus*			
313.	16455	*Desmocladus virgatus*			
314.	11636	*Dianella revoluta var. divaricata*			
315.	1289	*Dichopogon preissii*			
316.	311	*Digitaria ciliaris (Summer Grass)*	Y		
317.		*Diplaxia sp.*			
318.	4455	*Dipodiella ferruginea*			
319.	18541	*Dipopeltis huegelii subsp. huegelii*			
320.	18589	*Dipopeltis huegelii subsp. lehmannii*			
321.	7055	*Dischisma capitatum (Woolly-headed Dischisma)*	Y		
322.	42228	*Diuris septentrionalis*			
323.	44162	*Diuris tinkeri*			
324.	3090	*Drosera barbigera*			
325.	13219	*Drosera bulbosa subsp. bulbosa*			
326.	13201	*Drosera eneabba*			
327.	13212	*Drosera erythrorhiza subsp. magna*			
328.	15453	*Drosera gigantea subsp. gigantea*			
329.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
330.	8910	*Drosera humilis*			
331.	3105	*Drosera leucoblasta (White Sundew)*			
332.	11853	*Drosera menziesii subsp. menziesii*			
333.	15710	*Drosera miniata (Orange Sundew)*			
334.	3118	*Drosera pallida (Pale Rainbow)*			
335.	29178	*Drosera porrecta*			
336.	3128	*Drosera ramellosa (Branched Sundew)*			
337.		*Drosera sp.*			
338.	3133	*Drosera subhirtella (Sunny Rainbow)*			
339.	1066	*Ecdeiocolea monostachya*			
340.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
341.	822	*Eleocharis acuta (Common Spikerush)*			
342.	13950	*Eremaea asterocarpa subsp. asterocarpa*			
343.	14097	*Eremaea asterocarpa subsp. brachyclada*			
344.	13952	*Eremaea asterocarpa subsp. histoclada*			
345.	14098	*Eremaea beaufortioides var. beaufortioides*			
346.	14099	*Eremaea beaufortioides var. lachnosanthe*			
347.	13955	*Eremaea ectadioclada*			
348.	5641	*Eremaea pauciflora*			
349.	14103	*Eremaea pauciflora var. calyptra*			
350.	13818	*Eremaea pauciflora var. lonchophylla*			
351.	14104	*Eremaea pauciflora var. pauciflora*			
352.		*Eremaea sp.*			
353.	5643	*Eremaea violacea (Violet Eremaea)*			
354.	17459	*Eremaea violacea subsp. raphiophylla*			
355.	13953	*Eremaea x codonocarpa*			
356.	45253	*Ericomyrtus sp. Mt Leseur (E.A. Griffin 2325)*			
357.	45215	*Ericomyrtus tenuior*			
358.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
359.	4335	*Erodium cygnorum (Blue Heronsbill)*			
360.	12740	*Erymophyllum tenellum*			
361.	6219	*Eryngium pinnatifidum (Blue Devils)*			
362.	5545	*Eucalyptus accedens (Powderbark Wandoo)*			
363.	5548	*Eucalyptus albida (White-leaved Mallee)*			
364.	5628	*Eucalyptus drummondii (Drummond's Gum)*			
365.	19472	*Eucalyptus gittinsii subsp. gittinsii*			
366.	18292	*Eucalyptus gittinsii subsp. illucida*			
367.	5690	*Eucalyptus lane-poolei (Salmon White Gum)*			
368.	42062	*Eucalyptus opimiflora*			
369.	16180	*Eucalyptus pleurocarpa*			
370.	12866	*Eucalyptus pluricaulis subsp. pluricaulis*			
371.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
372.	13511	*Eucalyptus rudis subsp. rudis*			
373.		*Eucalyptus sp.*			
374.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
375.	15137	*Euchiton sphaericus*			
376.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			

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377.	20216	*Ficinia nodosa (Knotted Club Rush)*			
378.	32367	*Fissidens megalotis*			
379.		*Fossombronia sp.*			
380.	907	*Gahnia trifida (Coast Saw-sedge)*			
381.	7323	*Galium murale (Small Goosegrass)*	Y		
382.	20615	*Gastrolobium axiflare*			
383.	3894	*Gastrolobium callistachys (Rock Poison)*			
384.	3906	*Gastrolobium ilicifolium*			
385.	20483	*Gastrolobium linearifolium*			
386.	3910	*Gastrolobium obovatum (Boat-leaved Poison)*			
387.	3912	*Gastrolobium oxylobioides (Champion Bay Poison)*			
388.	3915	*Gastrolobium plicatum*			
389.	3916	*Gastrolobium polystachyum (Horned Poison)*			
390.	3924	*Gastrolobium spinosum (Prickly Poison)*			
391.	18404	*Georgeantha hexandra*			
392.	6143	*Glischrocaryon aureum (Common Popflower)*			
393.	8002	*Gnephosis tenuissima*			
394.	3945	*Gompholobium aristatum*			
395.	3950	*Gompholobium knightianum*			
396.	3955	*Gompholobium preissii*			
397.	19295	*Gompholobium pungens*			
398.	3956	*Gompholobium shuttleworthii*			
399.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
400.	6159	*Gonocarpus nodulosus*			
401.	7495	*Goodenia berardiana*			
402.	7508	*Goodenia filiformis (Thread-leaved Goodenia)*			
403.	12551	*Goodenia micrantha*			
404.	19286	*Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)*			
405.	1948	*Grevillea acrobotrya*			
406.	15763	*Grevillea biformis subsp. biformis*			
407.	2001	*Grevillea eriostachya (Flame Grevillea, Kalmy-kalmypa)*			
408.	17745	*Grevillea shuttleworthiana subsp. canarina*			
409.		*Grevillea sp.*			
410.	14420	*Grevillea synapheae subsp. pachyphylla*			
411.	2115	*Grevillea umbellulata*			
412.	2116	*Grevillea uncinulata (Hook-leaf Grevillea)*			
413.	19231	*Grevillea uncinulata subsp. Coomallo (S.J. Patrick 719)*			
414.	12824	*Grevillea vestita subsp. vestita*			
415.	32386	*Grimmia laevigata*			
416.	2783	*Gyrostemon racemiger*			
417.	2784	*Gyrostemon ramulosus (Corkybark)*			
418.		*Gyrostemon sp.*			
419.	2788	*Gyrostemon subnudus*			
420.	1465	*Haemodorum discolor*			
421.	1473	*Haemodorum simulans*			
422.	1475	*Haemodorum spicatum (Mardja)*			
423.	1476	*Haemodorum venosum*			
424.	17670	*Hakea aradenia*			
425.	2131	*Hakea auriculata*			
426.	2143	*Hakea conchifolia (Shell-leaved Hakea)*			
427.	2146	*Hakea costata (Ribbed Hakea)*			
428.	16908	*Hakea eneabba*			
429.	2158	*Hakea erinacea (Hedge-hog Hakea)*			
430.	2161	*Hakea flabellifolia (Fan-leaved Hakea)*			
431.	2164	*Hakea gilbertii*			
432.	2166	*Hakea incrassata (Marble Hakea)*			
433.	2175	*Hakea lissocarpha (Honey Bush)*			
434.	2179	*Hakea marginata*			
435.	45333	*Hakea neospathulata*			
436.	2197	*Hakea prostrata (Harsh Hakea)*			
437.	12233	*Hakea psilorrhyncha*			
438.	2205	*Hakea smilacifolia*			
439.		*Hakea sp.*			
440.	2206	*Hakea stenocarpa (Narrow-fruited Hakea)*			
441.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
442.	2216	*Hakea varia (Variable-leaved Hakea)*			
443.	1068	*Harperia lateriflora*			
444.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
445.	16933	*Hemiandra glabra*			
446.	6838	*Hemiandra linearis (Speckled Snakebush)*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
447.	6839	*Hemiandra pungens (Snakebush)*			
448.	6840	*Hemiandra rubriflora*			
449.		*Hemiandra sp.*			
450.	38320	*Hemiandra sp. Jurien (B.J. Conn & M.E. Tozer BJC 3885)*			
451.		*Hemiandra sp. Jurien (B.J.Conn 3885 & M.E.Tozer)*			
452.		*Hemigenia sp.*			
453.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
454.	5108	*Hibbertia acerosa (Needle Leaved Guinea Flower)*			
455.	5112	*Hibbertia aurea*			
456.	5116	*Hibbertia crassifolia*			
457.	5134	*Hibbertia huegelii*			
458.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
459.	35520	*Hibbertia leucocrossa*			
460.	5148	*Hibbertia myrtei*			
461.	5171	*Hibbertia spicata*			
462.	5173	*Hibbertia subvaginata*			
463.	4927	*Hibiscus drummondii (Drummond's Hibiscus)*			
464.	6222	*Homalosciadium homalocarpum*			
465.	3967	*Hovea stricta*			
466.	12741	*Hyalosperma cotula*			
467.	5216	*Hybanthus calycinus (Wild Violet)*			
468.	12007	*Hybanthus floribundus subsp. floribundus*			
469.	6223	*Hydrocotyle alata*			
470.	6226	*Hydrocotyle callicarpa (Small Pennywort)*			
471.	5817	*Hypocalymma angustifolium (White Myrtle, Kudjid)*			
472.	5829	*Hypocalymma xanthopetalum*			
473.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
474.	8087	*Isoetopsis graminifolia (Cushion Grass)*			
475.	910	*Isolepis cernua (Nodding Club-rush)*			
476.	20200	*Isolepis cernua var. setiformis*			
477.	912	*Isolepis cyperoides*			
478.	917	*Isolepis marginata (Coarse Club-rush)*			
479.	2219	*Isopogon adenanthoides (Spider Coneflower)*			
480.	2221	*Isopogon asper*			
481.	2227	*Isopogon divergens (Spreading Coneflower)*			
482.	2229	*Isopogon dubius (Pincushion Coneflower)*			
483.	2232	*Isopogon linearis*			
484.	37881	*Isopogon panduratus subsp. panduratus*			
485.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
486.	7398	*Isotoma pusilla (Small Isotome)*			
487.	7399	*Isotoma scapigera (Long-scaped Isotome)*			
488.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
489.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
490.	4005	*Jacksonia condensata*			
491.	4010	*Jacksonia floribunda (Holly Pea)*			
492.	4015	*Jacksonia hakeoides*			
493.	4018	*Jacksonia lehmannii*			
494.	14778	*Jacksonia nutans*			
495.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
496.	1298	*Johnsonia pubescens (Pipe Lily)*			
497.	19632	*Johnsonia pubescens subsp. pubescens*			
498.	1177	*Juncus articulatus (Jointed Rush)*	Y		
499.	1179	*Juncus caespiticius (Grassy Rush)*			
500.	11922	*Juncus kraussii subsp. australiensis*			
501.	1188	*Juncus pallidus (Pale Rush)*			
502.		*Kennedia sp.*			
503.	5022	*Keraudrenia hermanniifolia*			
504.	5023	*Keraudrenia integrifolia (Common Firebush)*			
505.	1221	*Kingia australis (Kingia, Pulonok)*			
506.	5835	*Kunzea micrantha*			
507.	17785	*Kunzea micrantha subsp. petiolata*			
508.	3667	*Labichea lanceolata (Tall Labichea)*			
509.	11289	*Labichea lanceolata subsp. lanceolata*			
510.	3669	*Labichea punctata (Lance-leaved Cassia)*			
511.	18585	*Lagenophora huegelii*			
512.	2249	*Lambertia multiflora (Many-flowered Honeysuckle)*			
513.	15528	*Lambertia multiflora var. multiflora*			
514.	5031	*Lasiopetalum drummondii*			
515.	1305	*Laxmannia omnifertilis*			
516.	11679	*Laxmannia sessiliflora subsp. drummondii*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
517.	11732	*Laxmannia sessiliflora subsp. sessiliflora*			
518.	7568	*Lechenaultia biloba (Blue Lechenaultia)*			
519.	7572	*Lechenaultia expansa*			
520.	7574	*Lechenaultia floribunda (Free-flowering Lechenaultia)*			
521.	7577	*Lechenaultia hirsuta (Hairy Lechenaultia)*			
522.	7580	*Lechenaultia linarioides (Yellow Lechenaultia)*			
523.	7586	*Lechenaultia stenosepala (Narrow-sepaled Leschenaultia)*			
524.		*Lepidobolus quadratus MS*			
525.	42741	*Lepidosperma apricola*			
526.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
527.	940	*Lepidosperma pubisquameum*			
528.	944	*Lepidosperma scabrum*			
529.		*Lepidosperma sp.*			
530.	951	*Lepidosperma viscidum (Sticky Sword Sedge)*			
531.	1653	*Leporella fimbriata (Hare Orchid)*			
532.	2344	*Leptomeria empetriformis*			
533.	5853	*Leptospermum oligandrum*			
534.	5857	*Leptospermum spinescens*			
535.		*Lepyrodia curvescens MS*			
536.	6370	*Leucopogon cochlearifolius*			
537.	6374	*Leucopogon conostephioides*			
538.	6397	*Leucopogon glaucifolius*			
539.	6410	*Leucopogon leptanthus*			
540.	6419	*Leucopogon obtusatus*			
541.	6420	*Leucopogon oldfieldii*			
542.	6430	*Leucopogon planifolius*			
543.	6434	*Leucopogon polymorphus*			
544.	6436	*Leucopogon propinquus*			
545.	6438	*Leucopogon pubescens*			
546.		*Leucopogon sp.*			
547.	20868	*Leucopogon sp. Cataby (F. Hort 1636)*			
548.	34162	*Leucopogon sp. Cockleshell Gully (J.M. Powell 1749)*			
549.	39601	*Leucopogon sp. Coomallo (R.J. Cranfield 1457)*			
550.	17723	*Leucopogon sp. Lesueur (B. Evans 530)*			
551.	6446	*Leucopogon striatus*			
552.	6448	*Leucopogon strongylophyllus*			
553.	39820	*Levenhookia murfetii*			
554.	7672	*Levenhookia octomaculata (Eight-spotted Stylewort)*			
555.	7677	*Levenhookia stipitata (Common Stylewort)*			
556.	36160	*Liparophyllum capitatum*			
557.	20648	*Lissanthe powelliae*			
558.	9289	*Lobelia anceps (Angled Lobelia)*			
559.	7405	*Lobelia rarifolia*			
560.	6506	*Logania campanulata (Bell-flowered Logania)*			
561.	6512	*Logania spermacocea*			
562.	1227	*Lomandra hastilis*			
563.	1243	*Lomandra sericea (Silky Mat Rush)*			
564.	1246	*Lomandra suaveolens*			
565.	18049	*Lyginia imberbis*			
566.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
567.	6456	*Lysinema ciliatum (Curry Flower)*			
568.	34736	*Lysinema pentapetalum*			
569.	2839	*Macarthuria australis*			
570.	1477	*Macropidia fuliginosa (Black Kangaroo Paw)*			
571.	18119	*Macrozamia fraseri*			
572.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
573.	19421	*Marianthus bicolor (Painted Marianthus)*			
574.	17633	*Marianthus erubescens*			
575.	17683	*Meeboldina cana*			
576.	37580	*Melaleuca acutifolia*			
577.	17982	*Melaleuca carrii*			
578.	5893	*Melaleuca concreta*			
579.	5919	*Melaleuca holosericea*			
580.	18112	*Melaleuca leuropoma*			
581.	5949	*Melaleuca platycalyx*			
582.	5958	*Melaleuca radula (Graceful Honeymyrtle)*			
583.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
584.	19365	*Melaleuca ryeae*			
585.	5961	*Melaleuca scabra (Rough Honeymyrtle, Wurru Bush)*			
586.		*Melaleuca sp.*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
587.	18278	*Melaleuca tinkeri*			
588.	5983	*Melaleuca trichophylla*			
589.	5986	*Melaleuca urceolaris*			
590.	5987	*Melaleuca viminea (Mohan)*			
591.	953	*Mesomelaena graciliceps*			
592.	954	*Mesomelaena preissii*			
593.	957	*Mesomelaena tetragona (Semaphore Sedge)*			
594.		*Microcorys sp.*			
595.	15456	*Microcorys sp. Coomallo (L. Haegi 2677)*			
596.	485	*Microlaena stipoides (Weeping Grass)*			
597.	10954	*Microtis media (Tall Mignonette Orchid)*			
598.	15419	*Microtis media subsp. media*			
599.	4091	*Mirbelia floribunda (Purple Mirbelia)*			
600.	4097	*Mirbelia ramulosa*			
601.	29418	*Monocultus monstrosus*	Y		
602.	37440	*Monopsis debilis var. depressa*	Y		
603.	19685	*Monotaxis grandiflora var. grandiflora*			
604.	2412	*Muehlenbeckia adpressa (Climbing Lignum)*			
605.	7289	*Myoporum caprarioides (Slender Myoporum)*			
606.	8114	*Myriocephalus appendiculatus (White-tip Myriocephalus)*			
607.	14187	*Myriocephalus occidentalis*			
608.	2365	*Olax benthamiana*			
609.	2367	*Olax scalariformis*			
610.	8136	*Olearia homolepis*			
611.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
612.	42024	*Olearia sp. Kennedy Range (G. Byrne 56)*			
613.	18255	*Opercularia vaginata (Dog Weed)*			
614.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
615.	30375	*Oxalis exilis*			
616.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
617.	1762	*Parietaria debilis (Pellitory)*			
618.	527	*Paspalum dilatatum*	Y		
619.	1660	*Patersonia occidentalis (Purple Flag, Koma)*			
620.	43761	*Pauridia occidentalis var. occidentalis*			
621.	4346	*Pelargonium littorale*			
622.		*Pelargonium sp.*			
623.	40424	*Pentameris airoides subsp. airoides*	Y		
624.	13911	*Persicaria decipiens*			
625.	2258	*Persoonia comata*			
626.	2281	*Persoonia trinervis*			
627.	2286	*Petrophile brevifolia*			
628.	2288	*Petrophile chrysantha*			
629.	2299	*Petrophile linearis (Pixie Mops)*			
630.	2301	*Petrophile macrostachya*			
631.	2303	*Petrophile megalostegia*			
632.	29208	*Petrophile pilostyla subsp. austrina*			
633.	16874	*Petrophile recurva*			
634.	2306	*Petrophile rigida*			
635.	2308	*Petrophile seminuda*			
636.	2310	*Petrophile shuttleworthiana*			
637.	2312	*Petrophile striata*			
638.	19825	*Petrorhagia dubia*	Y		
639.		*Phaeoceros sp.*			
640.	18535	*Philotheca pinoides*			
641.	18529	*Philotheca spicata (Pepper and Salt)*			
642.	14306	*Philydrella pygmaea subsp. pygmaea*			
643.	1479	*Phlebocarya filifolia*			
644.	4675	*Phyllanthus calycinus (False Boronia)*			
645.	6797	*Physopsis spicata (Hill River Lambstail)*			
646.	6009	*Pileanthus filifolius (Summer Coppercups)*			
647.	6011	*Pileanthus peduncularis (Coppercups)*			
648.	5231	*Pimelea angustifolia (Narrow-leaved Pimelea)*			
649.	5244	*Pimelea floribunda*			
650.	11402	*Pimelea imbricata var. piligera*			
651.	12041	*Pimelea suaveolens subsp. suaveolens*			
652.	5268	*Pimelea sulphurea (Yellow Banjine)*			
653.	18353	*Pithocarpa pulchella var. pulchella*			
654.	6255	*Platysace juncea*			
655.	578	*Poa porphyroclados*			
656.	45237	*Podolepis aristata subsp. aristata*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
657.	8173	*Podolepis capillaris (Wiry Podolepis)*			
658.	8175	*Podolepis gracilis (Slender Podolepis)*			
659.	8177	*Podolepis lessonii*			
660.	8182	*Podotheca angustifolia (Sticky Longheads)*			
661.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
662.	29919	*Poliomthion wichurae*			
663.	4691	*Poranthera microphylla (Small Poranthera)*			
664.	1671	*Prasophyllum elatum (Tall Leek Orchid)*			
665.	16688	*Prasophyllum gracile*			
666.	1677	*Prasophyllum macrostachyum (Laughing Leek Orchid)*			
667.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
668.	10853	*Prasophyllum plumiforme*			
669.	41651	*Pteridium esculentum subsp. esculentum*			
670.	13255	*Pterochaeta paniculata*			
671.	12217	*Pterostylis sanguinea*			
672.		*Pterostylis scabrida*			
673.	1698	*Pterostylis vittata (Banded Greenhood)*			
674.	2733	*Ptilotus humilis*			
675.	2742	*Ptilotus manglesii (Pom Poms, Mulamula)*			
676.	8195	*Quinetia urvillei*			
677.	41063	*Quoya loxocarpa*			
678.	41080	*Quoya verbascina (Golden Bush)*			
679.	32480	*Racopilum cuspidigerum var. convolutaceum*			
680.	2932	*Ranunculus colonorum (Common Buttercup)*			
681.	11254	*Rhagodia preissii subsp. preissii*			
682.	13234	*Rhodanthe manglesii*			
683.	4699	*Ricinocarpos psiliocladus*			
684.	19942	*Ricinocarpos undulatus*			
685.	32426	*Rosulabryum campylothecium*			
686.	40431	*Rytidosperma acerosum*			
687.	40425	*Rytidosperma caespitosum*			
688.	40426	*Rytidosperma occidentale*			
689.	6484	*Samolus repens (Creeping Brookweed)*			
690.	2591	*Sarcocornia blecklana*			
691.	7595	*Scaevola anchusifolia*			
692.	7603	*Scaevola canescens (Grey Scaevola)*			
693.	7613	*Scaevola glandulifera (Viscid Hand-flower)*			
694.	7619	*Scaevola lanceolata (Long-leaved Scaevola)*			
695.	7634	*Scaevola phlebopetala (Velvet Fanflower)*			
696.	12585	*Scaevola repens*			
697.	29356	*Scaevola repens subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)*			
698.	13182	*Scaevola repens var. repens*			
699.	978	*Schoenus brevisetis*			
700.	982	*Schoenus clandestinus*			
701.	984	*Schoenus curvifolius*			
702.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
703.	17617	*Schoenus insolitus*			
704.	1000	*Schoenus minutulus*			
705.	1009	*Schoenus pleiostemoneus*			
706.	17614	*Schoenus plumosus*			
707.	1013	*Schoenus sculptus (Gimlet Bog-rush)*			
708.	1018	*Schoenus subfasciculatus*			
709.	1026	*Schoenus unispiculatus*			
710.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
711.	6034	*Scholtzia laxiflora*			
712.	6037	*Scholtzia parviflora*			
713.	20379	*Scholtzia sp. Jurien (R. Cranfield & P. Spencer RJC 8443)*			
714.	20382	*Scholtzia sp. Wongonderrah (M.E. & M.R. Trudgen MET 12000)*			
715.	6039	*Scholtzia teretifolia*			
716.	6041	*Scholtzia umbellifera*			
717.	25884	*Senecio pinnatifolius var. latilobus*			
718.	8224	*Siloxerus filifolius*			
719.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
720.	14583	*Siloxerus multiflorus*			
721.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
722.	8230	*Sonchus asper (Rough Sowthistle)*	Y		
723.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
724.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
725.	2914	*Spergularia diandra (Lesser Sand Spurry)*	Y		
726.	17551	*Sphaerolobium drummondii*			

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	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
727.	4207	*Sphaerolobium medium*			
728.	10800	*Sphaerolobium pulchellum*			
729.	635	*Sporobolus virginicus (Marine Couch)*			
730.	6930	*Stachys arvensis (Staggerweed)*	Y		
731.	4733	*Stackhousia monogyna*			
732.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
733.	2918	*Stellaria media (Chickweed)*	Y		
734.	13475	*Stenanthemum humile*			
735.	15065	*Stenanthemum notiale subsp. notiale*			
736.	14240	*Stenanthemum reisseki*			
737.	12856	*Stirlingia abrotanoides*			
738.	2316	*Stirlingia latifolia (Blueboy)*			
739.	2317	*Stirlingia simplex*			
740.	2319	*Strangea cynanchicarpa (Heath Strangea)*			
741.	7679	*Stylidium adpressum (Trigger-on-stilts)*			
742.	25831	*Stylidium araeophyllum (Stilt Walker)*			
743.	30276	*Stylidium bicolor*			
744.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
745.	17187	*Stylidium burbidgeanum*			
746.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
747.	7710	*Stylidium cygnorum*			
748.	7713	*Stylidium dichotomum (Pins-and-needles)*			
749.	11808	*Stylidium diuroides subsp. diuroides*			
750.	12848	*Stylidium diuroides subsp. paucifoliatum*			
751.	19251	*Stylidium eriopodum*			
752.	18420	*Stylidium flagellum*			
753.	7749	*Stylidium leptophyllum (Needle-leaved Triggerplant)*			
754.	7760	*Stylidium maitlandianum (Fountain Triggerplant)*			
755.	7762	*Stylidium miniatum (Pink Butterfly Triggerplant)*			
756.	25837	*Stylidium purpureum (Purple Fountain Triggerplant)*			
757.		*Stylidium purpureum MS*			
758.	7783	*Stylidium pycnostachyum (Downy Triggerplant)*			
759.		*Stylidium sp.*			
760.	17578	*Stylidium uduscola*			
761.	3181	*Stylobasium australe*			
762.		*Styphelia tenuifolia*			
763.	16882	*Synaphea aephynsa*			
764.	2329	*Synaphea spinulosa*			
765.	15532	*Synaphea spinulosa subsp. spinulosa*			
766.	2791	*Tersonia cyathiflora (Button Creeper)*			
767.	4528	*Tetratheca confertifolia*			
768.	1702	*Thelymitra campanulata (Shirt Orchid)*			
769.	1718	*Thelymitra villosa (Custard Orchid)*			
770.	5080	*Thomasia foliosa*			
771.	5084	*Thomasia grandiflora (Large Flowered Thomasia)*			
772.	6057	*Thryptomene hyporhytis*			
773.	6060	*Thryptomene mucronulata*			
774.		*Thryptomene sp.*			
775.	1319	*Thysanotus arenarius*			
776.	1338	*Thysanotus manglesianus (Fringed Lily)*			
777.	1351	*Thysanotus sparteus*			
778.	1357	*Thysanotus thyrsoideus*			
779.	1358	*Thysanotus triandrus*			
780.	6268	*Trachymene cyanopetala*			
781.	6280	*Trachymene pilosa (Native Parsnip)*			
782.	1481	*Tribonanthes australis*			
783.	1483	*Tribonanthes longipetala*			
784.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
785.	29481	*Tricoryne sp. Eneabba (E.A. Griffin 1200)*			
786.	4313	*Trifolium subterraneum (Subterranean Clover)*	Y		
787.	146	*Triglochin minutissima*			
788.	147	*Triglochin mucronata*			
789.		*Triglochin procera*			
790.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
791.	32451	*Triquetrella papillata*			
792.	4839	*Trymalium angustifolium*			
793.	11665	*Trymalium ledifolium var. ledifolium*			
794.	13479	*Trymalium ledifolium var. rosmarinifolium*			
795.	98	*Typha domingensis (Bulrush, Djandjid)*			
796.	8254	*Urospermum picroides (False Hawkbit)*	Y		

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797.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
798.	7148	*Utricularia multifida*			
799.	7665	*Velleia trinervis*			
800.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
801.	7666	*Verreauxia reinwardtii (Common Verreauxia)*			
802.	6072	*Verticordia brownii*			
803.	6073	*Verticordia chrysantha*			
804.	12402	*Verticordia chrysanthella*			
805.	6076	*Verticordia densiflora (Compacted Featherflower)*			
806.	12411	*Verticordia densiflora var. cespitosa*			
807.	15432	*Verticordia densiflora var. densiflora*			
808.	12414	*Verticordia densiflora var. stelliuligera*			
809.	15620	*Verticordia endlicheriana var. manicula*			
810.	6082	*Verticordia grandiflora (Claw Featherflower)*			
811.	6083	*Verticordia grandis (Scarlet Featherflower)*			
812.	15433	*Verticordia huegelii var. huegelii*			
813.	12437	*Verticordia lacinlata*			
814.	10822	*Verticordia nobilis*			
815.	6103	*Verticordia ovalifolia*			
816.	6107	*Verticordia pennigera*			
817.	6109	*Verticordia picta (Painted Featherflower)*			
818.	6110	*Verticordia plumosa (Plumed Featherflower)*			
819.	12449	*Verticordia plumosa var. brachyphylla*			
820.		*Verticordia sp.*			
821.	4325	*Viminaria juncea (Swishbush, Koweda)*			
822.	722	*Vulpia bromoides (Squirrel Tail Fescue)*	Y		
823.	11018	*Vulpia muralis*	Y		
824.	33101	*Vulpia myuros forma myuros*	Y		
825.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
826.	7389	*Wahlenbergia preissii*			
827.	13333	*Waitzia suaveolens var. suaveolens*			
828.	32455	*Weissia controversa*			
829.	12072	*Wurmbea dioica subsp. alba*			
830.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
831.		*Xanthorrhoea sp.*			
832.	20658	*Xanthorrhoea sp. Lesueur (G.J. Keighery 16404)*			
833.	6287	*Xanthosia fruticulosa*			
834.	6289	*Xanthosia huegelii*			
835.	7113	*Zaluzianskya divaricata (Spreading Night Phlox)*	Y		

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

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

Figure A2.2: EPBC Protected Matters Tool Search Results PMST NCQIOY (DotEE, 2016c)

Australian Government
Department of the Environment and Energy

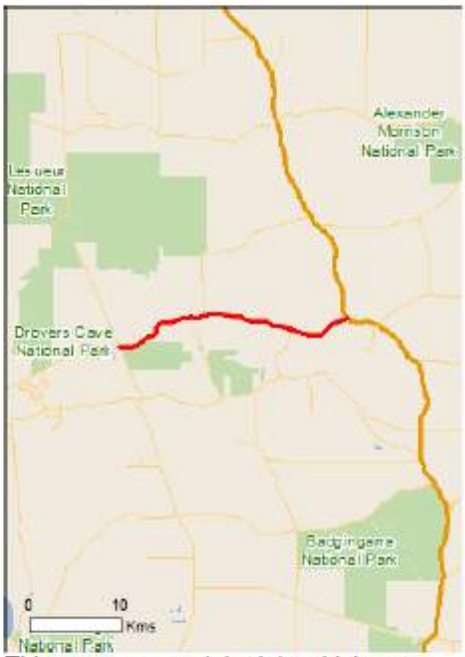
EPBC Act Protected Matters Report

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

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

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

Report created: 13/10/16 16:02:53



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

Coordinates
Buffer: 3.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	31
Listed Migratory Species:	5

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	17
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Acacia forrestiana Forest's Wattle [17235]	Vulnerable	Species or species habitat likely to occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
Anigozanthos viridis subsp. terraspectans Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat likely to occur within area
Banksia serratuloides subsp. perissa Northern Serrate Dryandra [82767]	Critically Endangered	Species or species habitat may occur within area
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat may occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat likely to occur within area
Eucalyptus balanites Cadda Road Mallee, Cadda Mallee [24264]	Endangered	Species or species habitat may occur within area
Eucalyptus crispata Yandanooka Mallee [24268]	Vulnerable	Species or species habitat may occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat likely to occur within area
Eucalyptus johnsoniana Johnson's Mallee [14516]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus lateritica Laterite Mallee [6271]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat known to occur within area
Eucalyptus pruiniramis Midlands Gum, Jingymia Gum [56403]	Endangered	Species or species habitat likely to occur within area
Eucalyptus suberea Cork Mallee, Mount Lesueur Mallee [5529]	Vulnerable	Species or species habitat likely to occur within area
Grevillea batrachioides Mt Lesueur Grevillea [21735]	Endangered	Species or species habitat may occur within area
Grevillea humifusa Spreading Grevillea [61182]	Endangered	Species or species habitat likely to occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat likely to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat likely to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area
Paracaleana dixonii Sandplain Duck Orchid [86882]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Tetratheca nephelioides [83217]	Critically Endangered	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
Reptiles		
Egernia stokesii badia Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Coomallo	WA
Unnamed WA29901	WA

Invasive Species	[Resource Information]

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

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-30.24937 115.17439,-30.248629 115.177995,-30.248629 115.185033,-30.248184 115.190354,-30.247294 115.192929,-30.24596 115.195332,-30.241807 115.200654,-30.239731 115.205632,-30.238396 115.208207,-30.236765 115.209752,-30.233502 115.21061,-30.229943 115.21267,-30.228756 115.216275,-30.228014 115.221597,-30.227866 115.225545,-30.226531 115.231725,-30.2249 115.238076,-30.224158 115.242368,-30.223713 115.244599,-30.224603 115.249577,-30.224603 115.252839,-30.223861 115.255929,-30.221636 115.259705,-30.220747 115.263654,-30.220598 115.267087,-30.220747 115.270177,-30.220747 115.274468,-30.222526 115.27979,-30.222675 115.281506,-30.222971 115.288373,-30.223861 115.293179,-30.225641 115.299016,-30.226828 115.304681,-30.226828 115.317555,-30.227421 115.320473,-30.229498 115.32322,-30.230536 115.325623,-30.231426 115.329228,-30.231722 115.333863,-30.2381 115.353947,-30.238693 115.363217,-30.239138 115.370942,-30.238841 115.372144,-30.237507 115.37489,-30.234392 115.378667,-30.229646 115.384846,-30.228014 115.387421,-30.224306 115.399266

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

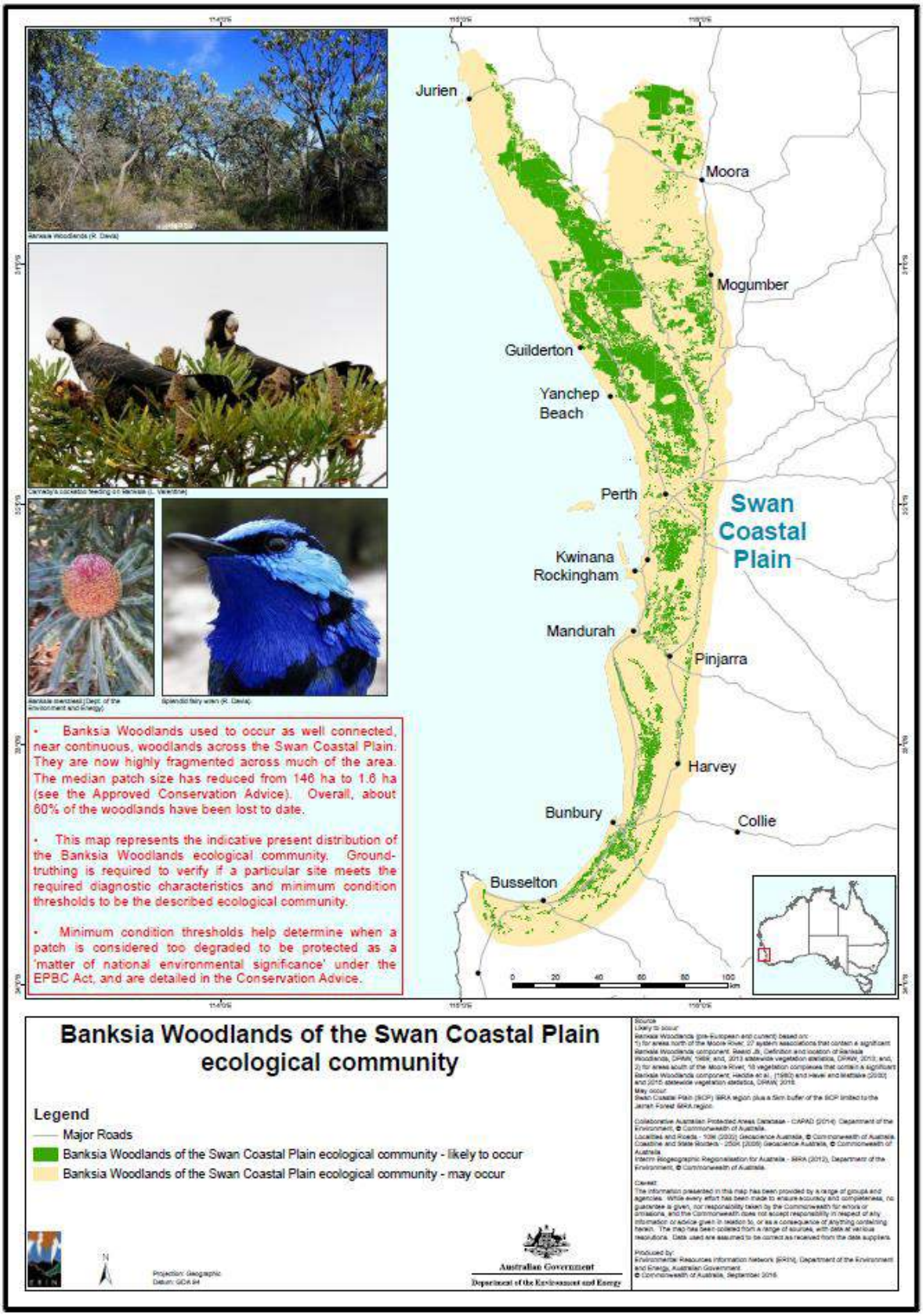


Figure A2.3: Indicative distribution map – Banksia Woodlands of the Swan Coastal Plain Ecological Community (DotEE, 2016e)

APPENDIX 3: NATIONAL VEGETATION INFORMATION SYSTEM VEGETATION CLASSIFICATION

Table A3.1: NVIS growth forms and descriptions

Growth Form	Description
Tree	Woody plants, more than 2m tall with a single stem or branches well above the base.
Tree Mallee	Woody perennial plant usually of the genus *Eucalyptus*. Multi-stemmed with fewer than 5 trunks of which at least 3 exceed 100 mm at breast height (1.3 m). Usually 8 m or more in height.
Shrub	Woody plants multi-stemmed at the base (or within 200 mm from ground level) or if single stemmed, less than 2 m in height.
Mallee Shrub	Commonly less than 8 m tall, usually with 5 or more trunks, of which at least 3 of the largest do not exceed 100 mm at breast height (1.3 m).
Heath Shrub	Shrub usually less than 2 m, with sclerophyllous leaves having high fibre: protein ratios and with an area of nanophyll or smaller (less than 225 sq. m.). Often a member of the following families: Epacridaceae, Myrtaceae, Fabaceae and Proteaceae. Commonly occur in nutrient-poor substrates.
Chenopod Shrub	Single or multi-stemmed, semi-succulent shrub of the family Chenopodiaceae exhibiting drought and salt tolerance.
Samphire Shrub	Genera (of Tribe Salicornioideae, viz: *Halosarcia*, *Pachycornia, Sarcocornia*, *Sclerostegia*, *Tecticornia* and *Tegicornia*) with articulate branches, fleshy stems and reduced flowers within the Chenopodiaceae family, succulent chenopods. Also genus *Suaeda*.
Tussock Grass	Forms discrete but open tussocks usually with distinct individual shoots, or if not, then forming a hummock. These are common agricultural grasses.
Hummock Grass	Coarse xeromorphic grass with a mound-like form often dead in the middle; genera are *Triodia* and *Plectrachne*.
Sedge	Herbaceous, usually perennial erect plant generally with a tufted habit and of the families Cyperaceae (true sedges) or Restionaceae (node sedges).
Rush	Herbaceous, usually perennial erect monocot that is neither a grass nor sedge. For the purposes of NVIS, rushes include the monocotyledon families Juncaceae, Typhaceae, Liliaceae, Iridaceae, Xyridaceae and the genus *Lomandra* (i.e. "graminoid" or grass-like genera).
Forb	Herbaceous or slightly woody, annual or sometimes perennial plant (usually a dicotyledon).
Grass-tree	Australian grass trees. Members of the family Xanthorrhoeaceae.
Cycad	Members of the families Cycadaceae and Zamiaceae.

Table A3.2: Height classes defined for the NVIS

Height Classes	Height Range (m)	Tree	Shrub, Heath Shrub, Chenopod Shrub, Samphire Shrub, Cycad, Grass-tree	Tree Mallee, Mallee Shrub	Tussock Grasses, Sedges, Rushes and Forbs
8	**>30**	tall			
7	**10-30**	mid		tall	
6	**<10**	low		mid	
5	**<3**			low	

Height Classes	Height Range (m)	Tree	Shrub, Heath Shrub, Chenopod Shrub, Samphire Shrub, Cycad, Grass-tree	Tree Mallee, Mallee Shrub	Tussock Grasses, Sedges, Rushes and Forbs
4	**>2**		tall		tall
3	**1-2**		mid		tall
2	**0.5-1**		low		mid
1	**<0.5**		low		low

Table A3.3: NVIS structural formation terminology

Growth Form	Height (m)	Foliage Cover (%)					
		>70	**30-70**	**10-30**	**2-10**	**<2 (isolated)**	**<2 (isolated clump)**
Tree	**<10,10-30, >30**	Closed Forest	Open Forest	Woodland	Open Woodland	Isolated Trees	Isolated Clumps Of Trees
Tree Mallee	**<3, <10, 10-30**	Closed Mallee Forest	Open Mallee Forest	Mallee Woodland	Open Mallee Woodland	Isolated Mallee Trees	Isolated Clumps Of Mallee Trees
Shrub	**<1,1-2,>2**	Closed Shrubland	Shrubland	Open Shrubland	Sparse Shrubland	Isolated Shrubs	Isolated Clumps Of Shrubs
Mallee Shrub	**<3, <10, 10-30**	Closed Mallee Shrubland	Mallee Shrubland	Open Mallee Shrubland	Sparse Mallee Shrubland	Isolated Mallee Shrubs	Isolated Clumps Of Mallee Shrubs
Heath Shrub	**<1,1-2,>2**	Closed Heathland	Heathland	Open Heathland	Sparse Heathland	Isolated Heath Shrubs	Isolated Clumps Of Heath Shrubs
Chenopod Shrub	**<1,1-2,>2**	Closed Chenopod Shrubland	Chenopod Shrubland	Open Chenopod Shrubland	Sparse Chenopod Shrubland	Isolated Chenopod Shrubs	Isolated Clumps Of Chenopod Shrubs
Samphire Shrub	**<0.5,>0.5**	Closed Samphire Shrubland	Samphire Shrubland	Open Samphire Shrubland	Sparse Samphire Shrubland	Isolated Samphire Shrubs	Isolated Clumps Of Samphire Shrubs
Hummock Grass	**<2,>2**	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Sparse Hummock Grassland	Isolated Hummock Grasses	Isolated Clumps Of Hummock Grasses
Tussock Grass	**<0.5,>0.5**	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Sparse Tussock Grassland	Isolated Tussock Grasses	Isolated Clumps Of Tussock Grasses
Sedge	**<0.5,>0.5**	Closed Sedgeland	Sedgeland	Open Sedgeland	Sparse Sedgeland	Isolated Sedges	Isolated Clumps Of Sedges
Rush	**<0.5,>0.5**	Closed Rushland	Rushland	Open Rushland	Sparse Rushland	Isolated Rushes	Isolated Clumps Of Rushes
Forb	**<0.5,>0.5**	Closed Forbland	Forbland	Open Forbland	Sparse Forbland	Isolated Forbs	Isolated Clumps Of Forbs

Source: **Tables A3.1 to A3.3** from ESCAVI (2003).

APPENDIX 4: CONSERVATION SIGNIFICANCE (FLORA AND ECOLOGICAL COMMUNITIES)

Commonwealth *Environment Protection and Biodiversity Act 1999*

Table A4.1: Categories and definitions for threatened species (DotE, 2016d)

Criteria for listing species in the critically endangered, endangered or vulnerable categories			
Criterion	**Critically Endangered**	**Endangered**	**Vulnerable**
1. It has undergone, is suspected to have undergon or is likely to undergo in the immediate future:	a very severe reduction in numbers	a severe reduction in numbers	a substantial reduction in numbers
2. Its geographic distribution is precarious for the survival of the species and is:	very restricted	restricted	limited
3. The estimated total number of individuals is:	very low	low	limited
And either of (a) or (b) is true:			
a) Evidence suggests that the number will continue to decline at: **b) The number is likely to continue to decline and its geographic distribution is:**	A very high rate Precarious for its survival	A high rate Precarious for its survival	A substantial rate Precarious for its survival
4. The estimated total number of mature individuals is:	extremely low	very low	low
5. The probability of its extinction in the wild is at least:	50% in the immediate future	20% in the near future	10% in the medium-term future

Eligibility for listing species in the extinct, extinct in the wild, or conservation dependent categories	
Category	**Definition**
Extinct*	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: a) it is only known to survive in cultivation, in captivity or as a naturalized population well outside its past range; or b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Conservation dependent*	A native species is eligible to be included in the conservation dependent category if, at that time: a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; **or** b) the following subparagraphs are satisfied; I. the species is a species of fish; II. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; III. the plan of management is in force under a law of the Commonwealth or of a State or Territory; IV. cessation of the plan of management would adversely affect the conservation status of the species.
*Note: Species listed as 'conservation dependent' and 'extinct' are not matters of national environmental significance and therefore do not trigger the EPBC Act.	

Western Australian *Wildlife Conservation Act 1950*

Table A4.2: Categories and definitions for threatened (declared rare) flora and fauna (DPaW, 2015)

Code	Definition
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.

Table A4.3: Categories and definitions for priority species (DPaW, 2015)

Code	Definition
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 One: 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 Two: 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 Three: 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 Four: 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 intraspecific category i.e. subspecies or variety, or a distinct population).	

Table A4.4: Criteria for listing threatened ecological communities (TECs) under the EPBC Act (Austlii, 2016)

Criteria for listing species in the critically endangered, endangered or vulnerable categories				
Item	**Criterion**	**Category**		
		Critically Endangered	**Endangered**	**Vulnerable**
1	Its decline in geographic distribution is:	Very severe	severe	substantial
2	Its geographic distribution is: and the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:	Very restricted The immediate future	Restricted The near future	Limited The medium-term future
3	For a population of a native species that is likely to play a major role in the community, there is a: to the extent that restoration of the community is not likely to be possible in:	Very severe decline The immediate future	Severe decline The near future	Substantial decline The medium-term future
4	The reduction in its integrity across most of its geographic distribution is: As indicated by degradation of the community or its habitat, or distruption of important community processes that is:	Very severe Very severe	Severe severe	Substantial substantial
5	Its rate of continuing detrimental change is: As indicated by: a) A rate of continuing decline in its geographic distribution, or a population of a native species that is believed to play a major role in the community, that is: Or b) Intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:	Very severe Very severe Very severe	Severe Severe Severe	Substantial Substantial Serious
6	A quantitative analysis shows that its probability of extinction, or extreme degradation over all of its geographic distribution is:	At least 50% in the immediate future	At least 20% in the near future	At least 10% in the medium-term future

Table A4.1: Categories, definitions and criteria for threatened ecological communities (TECs) in WA (DEC, 2013)

Category	Definition and Criteria
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats; or B) All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii): (i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); (ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
Critically Endangered (CR)	B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): (i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); (ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; (iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B, or C): A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): (i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); (ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

Category	Definition and Criteria
Endangered (EN)	B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): (i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); (ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; (iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Table A4.2: Categories, definitions and criteria for priority ecological communities (PECs) (DEC, 2013)

Category	Definition and Criteria
Priority One: Poorly-known ecological communities	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Category	Definition and Criteria
Priority Two: Poorly-known ecological communities	Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority Three: Poorly-known ecological communities	(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened or that have been recently removed from the threatened list. These communities require regular monitoring.	(a) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority Five: Conservation Dependent ecological communities	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX 5: DECLARED PESTS CATEGORIES AND CONTROLS

Table A5.1: Control categories for declared pests (DAFWA, 2016b)

Category (C)	Definition
C1 (Exclusion)	Organisms which should be excluded from part or all of Western Australia.
C2 (Eradication)	Organisms which should be eradicated from part or all of Western Australia.
C3 (Management)	Organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism.
Unassigned	Unassigned: Declared pests that are recognised as having a harmful impact under certain circumstances, where their subsequent control requirements are determined by a Plan or other legislative arrangements under the Act.

APPENDIX 6: VASCULAR FLORA SPECIES LIST

Table A6.1: Vascular flora species list

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Anarthriaceae	*Lyginia barbata*	•		Fr		•	Fr
Apiaceae	*Eryngium pinnatifidum* subsp. *pinnatifidum*					•	Fl
Apiaceae	*Xanthosia huegelii*	•					
Apiaceae	***Xanthosia tomentosa* (P4)**					•	Fl
Apodanthaceae	*Pilostyles hamiltonii*	•					
Araliaceae	*Trachymene ornata*				•		
Araliaceae	*Trachymene pilosa*					•	Fl
Asparagaceae	*Chamaescilla corymbosa*					•	Fr
Asparagaceae	*Chamaescilla versicolor*					•	Fl
Asparagaceae	*Laxmannia ramosa* subsp. *ramosa*	•		Fl			
Asparagaceae	*Laxmannia sessiliflora* subsp. *drummondii*	•		Fl			
Asparagaceae	*Lomandra caespitosa*	•					
Asparagaceae	*Lomandra hastilis*	•		Fr			
Asparagaceae	*Lomandra micrantha* subsp. *micrantha*				•		Fr
Asparagaceae	*Lomandra preissii*	•		Fl			
Asparagaceae	*Lomandra sericea*	•					
Asparagaceae	*Lomandra* sp. (indeterminate)	•					
Asparagaceae	*Sowerbaea laxiflora*					•	Fl
Asparagaceae	*Thysanotus ?thyrsoideus*					•	
Asparagaceae	*Thysanotus multiflorus*					•	Fl
Asparagaceae	*Thysanotus patersonii*				•	•	Fl
Asparagaceae	*Thysanotus triandrus*					•	Fl
Asparagaceae	***Thysanotus vernalis* (P3)**					•	Fl
Asteraceae	***Arctotheca calendula****					•	Fl
Asteraceae	*Brachyscome iberidifolia*					•	FlFr
Asteraceae	*Brachyscome* sp. (indeterminate)	•					
Asteraceae	*Hyalosperma cotula*					•	Fl
Asteraceae	***Hypochaeris glabra****	•			•		Fl
Asteraceae	***Hypochaeris radicata****				•	•	FlFr
Asteraceae	***Monoculus monstrosus****				•	•	FlFr
Asteraceae	*Podolepis aristata* subsp. *affinis*				•	•	Fl
Asteraceae	*Podolepis lessonii*					•	Fl
Asteraceae	*Podotheca angustifolia*				•		Fl
Asteraceae	*Podotheca gnaphalioides*				•	•	Fl
Asteraceae	*Pterochaeta paniculata*				•	•	Fl
Asteraceae	*Senecio* sp. (indeterminate)	•					
Asteraceae	*Siloxerus humifusus*					•	Fl
Asteraceae	***Sonchus asper****				•		
Asteraceae	***Sonchus oleraceus****				•	•	FlFr
Asteraceae	***Urospermum picroides****					•	FlFr

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Asteraceae	***Ursinia anthemoides* subsp. *anthemoides****					•	Fl
Boraginaceae	***Echium plantagineum* (DPP)**				•	•	
Brassicaceae	***Raphanus raphanistrum****					•	FlFr
Byblidaceae	*Byblis lamellata*					•	Fl
Campanulaceae	*Isotoma hypocrateriformis*				•		Fl
Campanulaceae	*Lobelia rhombifolia*					•	Fl
Campanulaceae	*Wahlenbergia ?preissii*				•		
Campanulaceae	***Wahlenbergia capensis****				•	•	Fl
Caryophyllaceae	***Petrorhagia dubia****					•	Fl
Caryophyllaceae	***Silene gallica****					•	Fl
Casuarinaceae	*Allocasuarina humilis*	•	•	Fr	•		Fr
Casuarinaceae	*Allocasuarina microstachya*	•		Fr		•	Fr
Casuarinaceae	*Allocasuarina* sp. (indeterminate)					•	
Celastraceae	*Stackhousia monogyna*					•	Fl
Celastraceae	*Stackhousia pubescens*				•		Fl
Centrolepidaceae	*Centrolepis aristata*				•	•	Fl
Centrolepidaceae	*Centrolepis drummondiana*				•	•	Fl
Colchicaceae	*Burchardia congesta*	•			•	•	FlFr
Cyperaceae	*Baumea juncea*	•		Fr			
Cyperaceae	*Caustis dioica*	•	•			•	Fl
Cyperaceae	*Chorizandra enodis*	•		Fr			
Cyperaceae	*Cyathochaeta avenacea*	•					
Cyperaceae	*Lepidosperma ?squamatum*	•					
Cyperaceae	*Lepidosperma apricola*	•		Fr		•	Fr
Cyperaceae	*Lepidosperma calcicola*	•		Fr		•	Fr
Cyperaceae	*Lepidosperma tenue*	•		Fr			
Cyperaceae	*Mesomelaena pseudostygia*	•		FlFr		•	FlFr
Cyperaceae	*Mesomelaena tetragona*	•		Fr			
Cyperaceae	*Schoenus brevisetis*	•		FlFr			
Cyperaceae	*Schoenus curvifolius*	•		Fr			
Cyperaceae	*Schoenus nanus*				•	•	Fl
Cyperaceae	*Schoenus pedicellatus*	•		Fr			
Cyperaceae	*Schoenus pleiostemoneus*	•		FlFr			
Cyperaceae	*Tetraria microcarpa*	•		Fr			
Cyperaceae	*Tetraria octandra*	•					
Dasypogonaceae	*Calectasia narragara*	•	•	Fl		•	Fl
Dasypogonaceae	*Dasypogon obliquifolius*	•			•		Fl
Dilleniaceae	*Hibbertia ?rupicola*	•					
Dilleniaceae	*Hibbertia acerosa*	•		Fr		•	Fl
Dilleniaceae	*Hibbertia crassifolia*	•				•	Fl
Dilleniaceae	*Hibbertia huegelii*	•		Fl			
Dilleniaceae	*Hibbertia hypericoides*	•	•	FlFr	•		Fl
Dilleniaceae	*Hibbertia mylnei*	•					
Dilleniaceae	*Hibbertia racemosa*					•	Fl
Dilleniaceae	*Hibbertia subvaginata*	•			•		Fl

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Droseraceae	*Drosera ?pallida*	•					
Droseraceae	*Drosera ?parvula*	•					
Droseraceae	*Drosera barbigera*					•	Fl
Droseraceae	*Drosera eneabba*				•	•	Fl
Droseraceae	*Drosera erythrorhiza*				•		
Droseraceae	*Drosera glanduligera*					•	Fl
Droseraceae	*Drosera humilis*				•		
Droseraceae	*Drosera marchantii* subsp. *marchantii*					•	
Droseraceae	***Drosera marchantii* subsp. *prophylla* (P3)**					•	Fl
Droseraceae	*Drosera menziesii* subsp. *penicillaris*				•	•	Fl
Droseraceae	*Drosera menziesii* subsp. *thysanosepala*					•	Fl
Droseraceae	*Drosera miniata*					•	
Droseraceae	*Drosera stolonifera*				•	•	
Ecdeiocoleaceae	*Ecdeiocolea monostachya*	•		Fr	•		FlFr
Ecdeiocoleaceae	*Georgeantha hexandra*	•		Fr			
Elaeocarpaceae	*Tetratheca confertifolia*					•	Fl
Ericaceae	*Andersonia heterophylla*	•		Fl			
Ericaceae	*Andersonia involucrata*	•		Fl			
Ericaceae	*Andersonia lehmanniana* subsp. *lehmanniana*					•	Fl
Ericaceae	*Astroloma glaucescens*	•		Fl			
Ericaceae	*Astroloma microdonta*	•	•	Fl			
Ericaceae	*Astroloma serratifolium*	•		Fl			
Ericaceae	*Astroloma stomarrhena*	•		Fl			
Ericaceae	*Astroloma xerophyllum*	•		Fl			
Ericaceae	*Conostephium pendulum*	•			•		Fl
Ericaceae	*Conostephium preissii*	•	•				
Ericaceae	*Leucopogon conostephioides*	•	•	Fl	•		Fl
Ericaceae	*Leucopogon oliganthus*	•		Fl			
Ericaceae	*Leucopogon propinquus*	•		Fl			
Ericaceae	*Leucopogon* sp. Lesueur (B. Evans 530)	•	•	Fl			
Ericaceae	*Lysinema pentapetalum*	•		Fr			
Euphorbiaceae	*Monotaxis grandiflora* var. *grandiflora*				•		Fl
Fabaceae	*Acacia ?stenoptera*	•					
Fabaceae	*Acacia alata* var. *tetrantha*	•	•	Fl			
Fabaceae	*Acacia barbinervis* subsp. *borealis*	•	•				
Fabaceae	*Acacia blakelyi*	•					
Fabaceae	*Acacia dilatata*	•	•	Fl			
Fabaceae	*Acacia fagonioides*					•	Fr
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*	•		Fl		•	Fr
Fabaceae	*Acacia latipes* subsp. *latipes*	•					
Fabaceae	*Acacia pulchella*	•	•				
Fabaceae	*Acacia pulchella* var. *glaberrima*	•	•			•	Fr
Fabaceae	*Acacia pulchella* var. *pulchella*	•			•		Fr
Fabaceae	***Acacia retrorsa* (P2)**					•	Fr
Fabaceae	*Acacia saligna*					•	Fl

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Fabaceae	*Acacia stenoptera*	•		FlFr			
Fabaceae	*Bossiaea eriocarpa*	•				•	FlFr
Fabaceae	*Daviesia angulata*	•	•	Fl			
Fabaceae	*Daviesia daphnoides*	•		Fl			
Fabaceae	*Daviesia decurrens*	•					
Fabaceae	*Daviesia epiphyllum*	•					
Fabaceae	*Daviesia nudiflora*	•					
Fabaceae	*Daviesia podophylla*	•					
Fabaceae	*Daviesia polyphylla*	•		Fl			
Fabaceae	*Gastrolobium callistachys*					•	Fl
Fabaceae	*Gastrolobium ilicifolium*					•	Fl
Fabaceae	*Gastrolobium polystachyum*	•					
Fabaceae	*Gastrolobium* sp. (indeterminate)	•					
Fabaceae	*Gastrolobium spinosum*	•					
Fabaceae	*Gompholobium aristatum*					•	Fl
Fabaceae	*Gompholobium knightianum*	•				•	Fl
Fabaceae	*Gompholobium shuttleworthii*				•		Fl
Fabaceae	*Gompholobium tomentosum*	•		Fr	•		Fl
Fabaceae	*Hovea trisperma*	•					
Fabaceae	*Isotropis cuneifolia*	•					
Fabaceae	*Jacksonia ?restioides*	•					
Fabaceae	*Jacksonia condensata*					•	Fl
Fabaceae	*Jacksonia floribunda*	•		Fr			
Fabaceae	*Jacksonia hakeoides*	•	•	Fr			
Fabaceae	*Jacksonia nutans*	•		Fr			
Fabaceae	*Jacksonia* sp. (indeterminate)	•					
Fabaceae	*Jacksonia sternbergiana*	•		FlFr			
Fabaceae	*Kennedia prostrata*					•	FlFr
Fabaceae	*Labichea punctata*	•		Fr			
Fabaceae	*Labichea* sp. (indeterminate)	•					
Fabaceae	***Lotus subbiflorus****					•	FlFr
Fabaceae	***Lupinus cosentinii****	•				•	FlFr
Fabaceae	***Ornithopus compressus****					•	Fr
Fabaceae	*Sphaerolobium drummondii*					•	Fl
Fabaceae	*Sphaerolobium macranthum*					•	Fl
Fabaceae	***Trifolium campestre****					•	Fl
Fabaceae	***Trifolium hirtum****					•	Fl
Fabaceae	*Viminaria juncea*	•					
Gentianaceae	***Centaurium erythraea****					•	Fl
Goodeniaceae	*Dampiera alata*	•			•		Fl
Goodeniaceae	*Dampiera linearis*				•		Fl
Goodeniaceae	*Dampiera spicigera*					•	Fl
Goodeniaceae	*Goodenia affinis*					•	Fl
Goodeniaceae	*Lechenaultia biloba*					•	Fl
Goodeniaceae	*Lechenaultia floribunda*					•	Fl

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Goodeniaceae	*Lechenaultia hirsuta*					•	Fl
Goodeniaceae	***Lechenaultia juncea* (P3)**					•	Fl
Goodeniaceae	*Lechenaultia linarioides*					•	Fl
Goodeniaceae	*Lechenaultia stenosepala*				•		Fl
Goodeniaceae	*Scaevola glandulifera*				•		Fl
Goodeniaceae	*Scaevola phlebopetala*					•	Fl
Goodeniaceae	*Scaevola repens* subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)					•	Fl
Goodeniaceae	*Scaevola repens* var. *repens*	•		Fl			
Goodeniaceae	*Scaevola* sp. (indeterminate)	•					
Goodeniaceae	*Velleia trinervis*	•				•	Fl
Goodeniaceae	*Verreauxia reinwardtii*	•	•	Fl	•		Fl
Haemodoraceae	*Anigozanthos humilis*	•			•	•	Fl
Haemodoraceae	*Anigozanthos manglesii* subsp. *manglesii*					•	Fl
Haemodoraceae	*Blancoa canescens*	•	•	FlFr			
Haemodoraceae	*Conostylis aculeata* subsp. *aculeata*					•	Fl
Haemodoraceae	*Conostylis aculeata* subsp. *preissii*	•		Fr	•		Fl
Haemodoraceae	*Conostylis androstemma*	•					
Haemodoraceae	*Conostylis aurea*	•		Fl	•		FlFr
Haemodoraceae	*Conostylis setigera* subsp. *setigera*	•					
Haemodoraceae	*Haemodorum laxum*	•					
Haemodoraceae	***Haemodorum loratum* (P3)**					•	Fl
Haemodoraceae	*Haemodorum simplex*					•	
Haemodoraceae	*Haemodorum spicatum*	•		Fr	•	•	Fl
Haemodoraceae	*Haemodorum venosum*					•	Fl
Haloragaceae	*Glischrocaryon aureum*				•	•	Fl
Hemerocallidaceae	*Caesia* sp. Wongan (K.F. Kenneally 8820)				•	•	FlFr
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*	•					
Iridaceae	***Gladiolus caryophyllaceus** (RE)**					•	Fl
Iridaceae	*Orthrosanthus laxus*					•	Fl
Iridaceae	***Patersonia argyrea* (P3)**					•	Fl
Iridaceae	*Patersonia juncea*				•		Fl
Iridaceae	*Patersonia occidentalis* var. *occidentalis*	•		FlFr	•	•	Fl
Iridaceae	***Romulea rosea****					•	FlFr
Juncaceae	*Juncus pallidus*	•		Fr	•		Fl
Lamiaceae	*Hemiandra pungens*					•	Fl
Lamiaceae	***Hemiandra* sp. Watheroo (S. Hancocks 4) (P4)**					•	Fl
Lamiaceae	*Hemiphora bartlingii*	•		Fr	•		Fl
Lamiaceae	*Physopsis spicata*					•	Fl
Lauraceae	*Cassytha racemosa*	•		Fr	•		Fr
Loganiaceae	*Orianthera spermacocea*	•		Fl	•		Fl
Loranthaceae	*Nuytsia floribunda*				•		
Malvaceae	*Lasiopetalum drummondii*	•		Fl		•	Fl
Malvaceae	*Thomasia foliosa*	•		Fl		•	Fr
Malvaceae	*Thomasia grandiflora*					•	FlFr

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Myrtaceae	*Babingtonia grandiflora*	•		Fr			
Myrtaceae	*Baeckea grandis*				•	•	FlFr
Myrtaceae	*Beaufortia squarrosa*	•		Fr			
Myrtaceae	*Calothamnus hirsutus*	•		Fr			
Myrtaceae	*Calothamnus quadrifidus* subsp. *quadrifidus*	•	•	Fr		•	Fl
Myrtaceae	*Calothamnus sanguineus*	•	•	FlFr	•		FlFr
Myrtaceae	*Calothamnus torulosus*	•					
Myrtaceae	*Calytrix aurea*	•	•	Fl			
Myrtaceae	*Calytrix fraseri*	•	•	Fl			
Myrtaceae	*Calytrix leschenaultii*	•		FlFr		•	Fl
Myrtaceae	*Calytrix sapphirina*	•		Fl		•	Fl
Myrtaceae	*Calytrix variabilis*	•					
Myrtaceae	*Conothamnus trinervis*	•		Fr			
Myrtaceae	*Corymbia calophylla*	•		Fr	•		Fr
Myrtaceae	*Corynanthera flava*	•					
Myrtaceae	*Darwinia sanguinea*					•	Fl
Myrtaceae	*Darwinia speciosa*				•	•	Fl
Myrtaceae	*Eremaea asterocarpa* subsp. *asterocarpa*	•	•	FlFr			
Myrtaceae	*Eremaea beaufortioides* var. *beaufortioides*	•		Fr			
Myrtaceae	*Eremaea beaufortioides* var. *microphylla*				•		Fr
Myrtaceae	*Eremaea ectadioclada*				•	•	FlFr
Myrtaceae	*Eremaea pauciflora* var. *calyptra*	•		Fr			
Myrtaceae	*Eremaea pauciflora* var. *lonchophylla*	•		Fr			
Myrtaceae	*Eremaea violacea* subsp. *rhaphiophylla*	•		Fr			
Myrtaceae	*Eucalyptus drummondii*					•	FlFr
Myrtaceae	*Eucalyptus gittinsii* subsp. *illucida*	•	•	Fr	•		Fr
Myrtaceae	***Eucalyptus macrocarpa* subsp. *elachantha* (P4)**					•	Fr
Myrtaceae	*Eucalyptus rudis*	•		Fr			
Myrtaceae	*Eucalyptus todtiana*	•		Fr		•	Fr
Myrtaceae	*Eucalyptus wandoo* subsp. *pulverea*	•					
Myrtaceae	*Hypocalymma xanthopetalum*	•		Fr		•	Fl
Myrtaceae	*Kunzea glabrescens*	•			•		Fl
Myrtaceae	*Kunzea micrantha* subsp. *petiolata*					•	Fl
Myrtaceae	***Leptospermum laevigatum****					•	FlFr
Myrtaceae	*Leptospermum oligandrum*	•		Fr			
Myrtaceae	*Leptospermum spinescens*	•		Fr			
Myrtaceae	*Melaleuca eleuterostachya*	•		Fr			
Myrtaceae	*Melaleuca leuropoma*	•		Fr	•		Fr
Myrtaceae	*Melaleuca rhaphiophylla*	•		Fr			
Myrtaceae	*Melaleuca systena*	•		Fr			
Myrtaceae	*Melaleuca trichophylla*	•		Fr	•	•	FlFr
Myrtaceae	*Pileanthus filifolius*	•					
Myrtaceae	*Scholtzia involucrata*	•		Fl			
Myrtaceae	***Scholtzia spatulata* (RE)**				•		
Myrtaceae	*Thryptomene hyporhytis*					•	Fl

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Myrtaceae	*Verticordia chrysantha*					•	Fl
Myrtaceae	*Verticordia densiflora* var. *cespitosa*	•	•	FlFr			
Myrtaceae	*Verticordia grandis*	•			•		Fl
Myrtaceae	*Verticordia nobilis*					•	Fl
Myrtaceae	*Verticordia ovalifolia*					•	Fl
Myrtaceae	*Verticordia pennigera*					•	Fl
Myrtaceae	*Verticordia* sp. (indeterminate)					•	
Orchidaceae	*Caladenia flava* subsp. *flava*					•	Fl
Orchidaceae	*Caladenia hirta* subsp. *hirta*					•	Fl
Orchidaceae	*Caladenia longicauda* subsp. *borealis*					•	Fl
Orchidaceae	*Caladenia lorea*					•	Fl
Orchidaceae	*Caladenia* sp. (indeterminate)					•	
Orchidaceae	*Caladenia vulgata*					•	Fl
Orchidaceae	*Diuris corymbosa*					•	Fl
Orchidaceae	*Diuris corymbosa* x *magnifica*					•	Fl
Orchidaceae	*Elythranthera brunonis*					•	Fl
Orchidaceae	*Elythranthera emarginata*					•	Fl
Orchidaceae	*Eriochilus helonomos*	•	•	Fl			
Orchidaceae	*Microtis media*				•	•	Fl
Orchidaceae	*Pterostylis vittata*					•	Fl
Orchidaceae	*Thelymitra benthamiana*					•	Fl
Orchidaceae	***Thelymitra stellata* (T)**					•	Fl
Orchidaceae	*Thelymitra villosa*					•	Fl
Orobanchaceae	***Orobanche minor****				•	•	Fl
Oxalidaceae	*Oxalis perennans*	•		Fl			
Oxalidaceae	***Oxalis pes-caprae****	•					
Phyllanthaceae	*Phyllanthus calycinus*					•	FlFr
Pittosporaceae	*Marianthus ringens*				•		
Poaceae	***Aira caryophyllea****					•	FlFr
Poaceae	*Amphipogon turbinatus*				•		Fl
Poaceae	*Austrostipa compressa*	•			•		FlFr
Poaceae	*Austrostipa elegantissima*	•				•	Fr
Poaceae	***Avena barbata****				•		
Poaceae	***Briza maxima****				•	•	Fr
Poaceae	***Briza minor****					•	Fr
Poaceae	***Bromus diandrus****					•	Fr
Poaceae	***Ehrharta calycina****	•		Fr			
Poaceae	***Ehrharta longiflora****				•	•	Fr
Poaceae	***Eragrostis curvula****	•			•	•	FlFr
Poaceae	***Hordeum leporinum****				•	•	Fr
Poaceae	***Lolium perenne****				•	•	FlFr
Poaceae	*Neurachne alopecuroidea*				•		Fl
Poaceae	*Rytidosperma caespitosum*	•			•		Fr
Poaceae	***Vulpia muralis****				•		Fr
Polygalaceae	*Comesperma calymega*				•		Fl

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Polygalaceae	*Comesperma scoparium*	•	•	Fl			
Polygonaceae	*Muehlenbeckia adpressa*					•	FlFr
Portulacaceae	*Calandrinia baccata*					•	Fl
Portulacaceae	*Calandrinia corrigioloides*				•		Fl
Portulacaceae	*Calandrinia granulifera*					•	Fl
Primulaceae	***Lysimachia arvensis****				•	•	
Proteaceae	*Adenanthos cygnorum*	•			•		Fl
Proteaceae	*Banksia armata* var. *armata*	•		Fr			
Proteaceae	*Banksia attenuata*	•		Fr	•		FlFr
Proteaceae	*Banksia bipinnatifida* subsp. *multifida*	•					
Proteaceae	*Banksia candolleana*	•					
Proteaceae	*Banksia carlinoides*	•		Fr			
Proteaceae	*Banksia dallanneyi* subsp. *media*	•			•		Fr
Proteaceae	*Banksia glaucifolia*	•					
Proteaceae	*Banksia grossa*	•	•	FlFr			
Proteaceae	*Banksia hewardiana*					•	Fl
Proteaceae	*Banksia incana*	•	•	FlFr			
Proteaceae	*Banksia menziesii*	•		Fl			
Proteaceae	*Banksia nana*	•					
Proteaceae	*Banksia platycarpa*	•	•	Fr			
Proteaceae	*Banksia polycephala*	•		Fr			
Proteaceae	*Banksia prionotes*	•		Fr	•		Fr
Proteaceae	*Banksia shuttleworthiana*	•		FlFr	•		Fr
Proteaceae	*Banksia telmatiaea*	•		Fr			
Proteaceae	*Conospermum incurvum*					•	Fl
Proteaceae	*Conospermum nervosum*					•	Fl
Proteaceae	*Conospermum stoechadis* subsp. *stoechadis*	•		Fl		•	Fl
Proteaceae	*Conospermum wycherleyi* subsp. *glabrum*	•		Fl	•		Fl
Proteaceae	***Grevillea amplexans* subsp. *adpressa* (P1)**					•	FlFr
Proteaceae	*Grevillea synapheae* subsp. *pachyphylla*	•				•	Fr
Proteaceae	*Hakea anadenia*	•					
Proteaceae	*Hakea auriculata*	•					
Proteaceae	*Hakea conchifolia*	•					
Proteaceae	*Hakea costata*	•		Fr	•		Fr
Proteaceae	*Hakea eneabba*	•		Fr			
Proteaceae	*Hakea incrassata*	•		Fr		•	Fr
Proteaceae	*Hakea lissocarpha*	•					
Proteaceae	*Hakea neospathulata*	•					
Proteaceae	*Hakea psilorrhyncha*	•		Fr	•		FlFr
Proteaceae	*Hakea ruscifolia*	•		Fr			
Proteaceae	*Hakea stenocarpa*	•					
Proteaceae	*Hakea trifurcata*	•					
Proteaceae	*Isopogon linearis*	•		Fr			
Proteaceae	*Lambertia multiflora* var. *multiflora*	•				•	Fl
Proteaceae	*Petrophile brevifolia*	•		Fr	•		FlFr

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Proteaceae	*Petrophile chrysantha*	•		Fr			
Proteaceae	*Petrophile linearis*	•		Fr			
Proteaceae	*Petrophile macrostachya*	•		Fr	•		FlFr
Proteaceae	*Petrophile rigida*	•					
Proteaceae	*Stirlingia latifolia*	•			•		Fl
Proteaceae	*Stirlingia simplex*					•	Fl
Proteaceae	*Strangea cynanchicarpa*	•	•	Fr			
Proteaceae	*Synaphea aephynsa*				•	•	FlFr
Proteaceae	***Synaphea endothrix* (P3)**	•				•	FlFr
Proteaceae	*Synaphea interioris*	•					
Proteaceae	***Synaphea lesueurensis* (P2)**					•	Fl
Proteaceae	***Synaphea* sp. (indeterminate, PST)**					•	Fr
Proteaceae	***Synaphea sparsiflora* (P2)**					•	FlFr
Proteaceae	*Synaphea spinulosa* subsp. *spinulosa*	•	•	Fr	•	•	Fl
Pteridaceae	*Cheilanthes austrotenuifolia*	•					
Restionaceae	*Alexgeorgea nitens*	•		FlFr		•	Fr
Restionaceae	*Alexgeorgea subterranea*					•	Fr
Restionaceae	*Chordifex sinuosus*	•		Fr		•	
Restionaceae	*Desmocladus asper*	•	•	FlFr			
Restionaceae	*Desmocladus flexuosus*	•				•	Fl
Restionaceae	*Desmocladus* sp. (indeterminate)	•					
Restionaceae	*Hypolaena pubescens*	•		Fr			
Restionaceae	*Hypolaena* sp. (indeterminate)	•					
Restionaceae	*Lepidobolus preissianus*	•			•		Fl
Restionaceae	***Lepidobolus quadratus* (P3)**	•		Fr	•	•	Fr
Restionaceae	*Leptocarpus coangustatus*	•		Fr			
Rhamnaceae	*Cryptandra intermedia*					•	Fl
Rhamnaceae	*Cryptandra myriantha*	•		Fl			
Rhamnaceae	*Polianthion wichurae*				•		Fl
Rhamnaceae	*Stenanthemum humile*					•	Fl
Rhamnaceae	*Stenanthemum* sp. (indeterminate)	•					
Rhamnaceae	*Trymalium ledifolium*	•					
Rubiaceae	*Opercularia vaginata*	•		Fr	•		Fl
Rutaceae	*Boronia cymosa*					•	Fl
Rutaceae	*Boronia ramosa* subsp. *anethifolia*	•		Fl			
Rutaceae	*Diplolaena ferruginea*					•	Fl
Rutaceae	*Philotheca spicata*					•	Fl
Santalaceae	*Leptomeria ?preissiana*	•					
Sapindaceae	*Diplopeltis huegelii* subsp. *huegelii*					•	Fl
Sapindaceae	*Dodonaea ericoides*	•					
Scrophulariaceae	***Dischisma arenarium****					•	
Solanaceae	***Solanum nigrum****	•		FlFr		•	Fl
Stylidiaceae	*Levenhookia stipitata*				•		Fl
Stylidiaceae	*Stylidium ?diuroides*	•				•	
Stylidiaceae	*Stylidium ?miniatum*					•	

Family	Taxa	April			October		
		Relevé	OC	FlFr	Relevé	OC	FlFr
Stylidiaceae	*Stylidium ?piliferum*					•	
Stylidiaceae	*Stylidium adpressum*	•					
Stylidiaceae	*Stylidium calcaratum*				•	•	Fl
Stylidiaceae	*Stylidium crossocephalum*	•			•	•	Fl
Stylidiaceae	*Stylidium cygnorum*					•	Fl
Stylidiaceae	*Stylidium dichotomum*					•	Fl
Stylidiaceae	*Stylidium diuroides* subsp. *diuroides*	•				•	Fl
Stylidiaceae	*Stylidium diuroides* subsp. *paucifoliatum*					•	Fl
Stylidiaceae	***Stylidium diversifolium* (RE)**					•	Fl
Stylidiaceae	*Stylidium ecorne*				•	•	Fl
Stylidiaceae	*Stylidium emarginatum*					•	Fl
Stylidiaceae	*Stylidium leptophyllum*					•	Fl
Stylidiaceae	*Stylidium maitlandianum*				•	•	Fl
Stylidiaceae	*Stylidium miniatum*					•	Fl
Stylidiaceae	*Stylidium piliferum*					•	Fl
Stylidiaceae	*Stylidium purpureum*				•	•	Fl
Stylidiaceae	*Stylidium pycnostachyum*					•	Fl
Stylidiaceae	*Stylidium repens*	•		Fl	•		Fl
Stylidiaceae	*Stylidium* sp. Bindoon (K.F. Kenneally 11405)					•	Fl
Thymelaeaceae	*Pimelea imbricata* var. *piligera*					•	Fl
Thymelaeaceae	*Pimelea sulphurea*	•					
Violaceae	*Hybanthus calycinus*				•		Fl
Xanthorrhoeaceae	*Xanthorrhoea preissii*	•			•		
Xanthorrhoeaceae	*Xanthorrhoea* sp. Lesueur (G.J. Keighery 16404)	•					
Zamiaceae	*Macrozamia fraseri*	•					

Note: OC = opportunistic collection, * = environmental weed, DPP = Declared Pest Plant, T = Threatened species, P1 – P4 = Priority 1 to Priority 4 species, PST = Potentially Significant Taxon, RE = range extension species, Fl = flowering material, Fr = fruiting material, subsp. = subspecies, var. = variety, sp. = species. Nomenclature based on current WA Herbarium terminology and confirmed on FloraBase (WAH, 1998-).

APPENDIX 7: LOCATIONS OF CONSERVATION SIGNIFICANT FLORA AND CARNABY'S BLACK-COCKATOO TREES, SIGHTINGS AND FORAGING EVIDENCE

Apart from the sixteen trees fitting the DBH criteria to provide breeding habitat (**Table A7.1**), the remainder of this information has been supplied as a separate document to the Shire of Dandaragan, for the use of the Shire.

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Table A7.1: Location of trees fitting diameter at breast height (DBH) criteria to provide breeding habitat for Carnaby's Black-Cockatoo

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Section of road where *Eucalyptus rudis* ER38, ER36, ER24, ER17, ER16, ER14, ER15, ER12 and ER11 located							 https://www.google.com.au/maps/@-30.2314452,115.3300788
Eucalyptus rudis	ER38	339302	6654395	7.26	39.1	No visible hollows; too small	 https://www.google.com.au/maps/@-30.2314452,115.3300788,3a,75y,12.52h,99.79t/data=!3m6!1e1!3m4!1s5xaA-ikiCsOK7OZgnqRRfg!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus rudis	ER36	339296	6654397	7.27	35.4	No visible hollows	 https://www.google.com.au/maps/@-30.2314452,115.3300788,3a,75y,12.52h,99.79t/data=!3m6!1e1!3m4!1s5xaA-ikiCsOK7OZgnqRRfg!2e0!7i13312!8i6656
Eucalyptus rudis	ER24	339232	6654406	7.34	35.2	No visible hollows; too small	 https://www.google.com.au/maps/@-30.2313455,115.3294518,3a,75y,12.27h,92.55t/data=!3m6!1e1!3m4!1s1SRGIJAl3PVuhuQuO8GXgA!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus rudis	ER17	339191	6654401	7.38	37.6	No visible hollows; too small	 https://www.google.com.au/maps/@-30.2312768,115.3290372,3a,75y,194.93h,83.78t/data=!3m6!1e1!3m4!1sowSoPqzbxEtk2dstmHF_EQ!2e0!7i13312!8i6656
Eucalyptus rudis	ER16	339190	6654418	7.39	37.0	No visible hollows	 https://www.google.com.au/maps/@-30.2312435,115.3288309,3a,75y,14.47h,87.43t/data=!3m6!1e1!3m4!1sW05iKE-9I4Cf6GQuquIMMQ!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus rudis	ER15	339190	6654418	7.39	36.8	No visible hollows	 https://www.google.com.au/maps/@-30.2312435,115.3288309,3a,75y,14.47h,87.43t/data=!3m6!1e1!3m4!1sW05iKE-9l4Cf6GQuquIMMQ!2e0!7i13312!8i6656
Eucalyptus rudis	ER14	339190	6654417	7.39	37.6	No visible hollows	 https://www.google.com.au/maps/@-30.2312435,115.3288309,3a,75y,14.47h,87.43t/data=!3m6!1e1!3m4!1sW05iKE-9l4Cf6GQuquIMMQ!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus rudis	ER12	339180	6654416	7.40	38.1	No visible hollows; multi-stemmed tree	 https://www.google.com.au/maps/@-30.2312435,115.3288309,3a,75y,14.47h,87.43t/data=!3m6!1e1!3m4!1sW05iKE-9l4Cf6GQuquIMMQ!2e0!7i13312!8i6656
Eucalyptus rudis	ER11	339178	6654405	7.40	42.5	No visible hollows	 https://www.google.com.au/maps/@-30.2312435,115.3288309,3a,75y,190.45h,80.51t/data=!3m6!1e1!3m4!1sW05iKE-9l4Cf6GQuquIMMQ!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Section of road where *Eucalyptus wandoo* EW21 located	 https://www.google.com.au/maps/@-30.2245775,115.2519223,3a,75y,79.54h,84.42t/data=!3m6!1e1!3m4!1sCP5F1b8Zh5CsQYPqBoSpuA!2e0!7i13312!8i6656						
Eucalyptus wandoo	EW21	331805	6655049	15.47	41.7	No visible hollows	 https://www.google.com.au/maps/@-30.224521,115.2523421,3a,75y,351.74h,87.28t/data=!3m6!1e1!3m4!1s-7zjQHYhIda53yqLInFj9g!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Section of road where *Eucalyptus wandoo* EW32 located	 https://www.google.com.au/maps/@-30.2246464,115.2493845,3a,75y,89.7h,87.67t/data=!3m6!1e1!3m4!1sg8mZ0In369Iqt_as-y3vkA!2e0!7i13312!8i6656						
Eucalyptus wandoo	EW32	331549	6655019	15.75	32.4	No visible hollows; multi-stemmed tree	 https://www.google.com.au/maps/@-30.2246651,115.2497034,3a,75y,186.56h,89.59t/data=!3m6!1e1!3m4!1s6ezhfoIgYXBr_AnpN4dVxw!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Section of road where *Eucalyptus wandoo* EW27, EW26 and EW25 located	 https://www.google.com.au/maps/@-30.2239685,115.2411523,3a,75y,87.64h,99.16t/data=!3m6!1e1!3m4!1sC29MQQPoxalKVpyV1LojmQ!2e0!7i13312!8i6656						
Eucalyptus wandoo	EW27	330765	6655087	16.60	34.2	No visible hollows; multi-stemmed tree	 https://www.google.com.au/maps/@-30.2239282,115.2413638,3a,89.9y,159.07h,90.01t/data=!3m6!1e1!3m4!1sge3bJj2jliu3hpaMSIxcCA!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus wandoo	EW26	330761	6655085	16.61	32.0	No visible hollows	 https://www.google.com.au/maps/@-30.2239282,115.2413638,3a,89.9y,159.07h,90.01t/data=!3m6!1e1!3m4!1sge3bJj2jliu3hpaMSIxcCA!2e0!7i13312!8i6656
Eucalyptus wandoo	EW25	330740	6655083	16.63	42.1	No visible hollows	 https://www.google.com.au/maps/@-30.2239282,115.2413638,3a,89.9y,159.07h,90.01t/data=!3m6!1e1!3m4!1sge3bJj2jliu3hpaMSIxcCA!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Section of road where *Eucalyptus rudis* ER6 and ER4 located	 https://www.google.com.au/maps/@-30.2345444,115.2101826,3a,75y,16.41h,80.87t/data=!3m6!1e1!3m4!1svX37dkX-VzU399djO0rebQ!2e0!7i13312!8i6656						
Eucalyptus rudis	ER6	327793	6653924	19.85	41.0	No visible hollows; too small	 https://www.google.com.au/maps/@-30.2339112,115.2102978,3a,75y,99.54h,83.55t/data=!3m6!1e1!3m4!1s-Ia3tfAIl2gfIggTjDg2-g!2e0!7i13312!8i6656

Species	Tree reference number	Easting (mE)	Northing (mN)	SLK	DBH (cm)	Hollows and comments re potential breeding tree	Photograph
Eucalyptus rudis	ER4	327790	6653927	19.86	62.0	No visible hollows; too small	 https://www.google.com.au/maps/@-30.2339112,115.2102978,3a,75y,99.54h,83.55t/data=!3m6!1e1!3m4!1s-Ia3tfAll2gfIggTjDg2-g!2e0!7i13312!8i6656

Note: images captured in June 2015.

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