Public Transport Authority

Yanchep Rail Extension Part 1

Biological Assessment of Additional Areas

March 2020

Executive summary

The Yanchep Rail Extension (YRE) forms part of METRONET, a State government program of projects to increase the size of Perth's railway network. The project aims to support the planning of integrated station precincts and the growth of the Perth metropolitan region. The YRE project is an extension to the Northern Suburbs Railway (also known as the Joondalup line) to support existing communities with improved transport connections and create new communities through integrated station precincts.

The YRE was split into two parts during the environmental approvals assessment, Part 1: Butler Station to Eglinton Station and Part 2: Eglinton Station to Yanchep Station. Part 1 of the project includes approximately 7.3 km of track (from Clarkson to just north of the proposed Eglinton Station).

The Public Transport Authority (PTA) has commissioned a number of biological surveys for the YRE project, including a reconnaissance and detailed flora and vegetation surveys, fauna surveys, black cockatoo habitat assessment and targeted flora surveys (GHD 2018, 2019). During the environmental assessment process, additional areas have been identified as requiring assessment. Consequently, further ecological surveys of these additional areas are required to support environmental approvals.

The PTA commissioned GHD Pty Ltd (GHD) to undertake a targeted biological assessment for the additional areas (21.48 ha). The purpose of the assessment was to delineate key flora, vegetation and fauna values within the YRE Part 1 survey area (hereon referred to as the 'survey area'). This report is subject to, and must be read in conjunction with, the limitations and assumptions contained throughout the report.

Survey results

Vegetation

Nine vegetation types as well as cleared area and planted (non-native) vegetation (VT12) were identified in the survey area. Eight of the vegetation types comprised remnant native vegetation and one vegetation type comprised a mix of degraded native remnant vegetation and native regrowth (>10 years). The majority of vegetation areas in the survey area were rated Very Good or Excellent in condition. In these areas, the vegetation structure had been slightly altered and disturbances from geotechnical surveys, grazing and weed invasion. Areas rated as Good, Degraded or Completely Degraded had been historically cleared or impacted by grazing and were lacking in structural levels or dominated by introduced species.

Assessing the vegetation types described at a broad level, based on dominant species, landform features and field observations, four conservation significant ecological communities were identified:

- *Banksia* Woodlands of the Swan Coastal Plain (SCP) Endangered Threatened Ecological Community (TEC) (3.70 ha)
- *Melaleuca huegelii – M. acerosa* (*M. systena*) shrublands on limestone ridges (TEC) (SCP26a) (0.30 ha)
- Northern Spearwood shrublands and woodlands (FCT 24) Priority 3 Priority Ecological Community (PEC) (5.59 ha)
- *Banksia* dominated woodlands of the SCP IBRA region Priority 3 PEC (7.26 ha).

Flora

One hundred and thirty (130) flora taxa (including subspecies and varieties) were recorded from the survey area during the field survey. This total comprised of 106 native taxa and 24 introduced flora taxa. Of the introduced taxa, one is listed as Declared Pests under the *Biosecurity and Management Act* 2007. No EPBC Act or *Biodiversity Conservation Act 2016* (BC Act) listed flora were recorded within the survey area.

One DBCA Priority-listed flora taxa was recorded in one area, *Conostylis bracteata*, Priority 3. The taxon was recorded in small numbers within a *Banksia sessilis* vegetation type (VT02).

Fauna

The fauna assessment was focussed on black cockatoo habitat values, as well as the potential for any other conservation significant fauna.

Six broad fauna habitats were identified within the survey area, including two woodland types, three shrubland types, one herbland/sedgeland type as well as highly disturbed areas. The habitat types have been classified with regard to their value as foraging and/or breeding and roosting habitat for black cockatoos, specifically Carnaby's Cockatoo.

The majority of the vegetation provides high value foraging habitat for Carnaby's Cockatoo, due to the density of Proteaceous trees and shrubs, primarily *Banksia* species.

The black cockatoo habitat assessment identified 13.15 ha of high value foraging habitat and 0.69 ha of medium value foraging habitat. There is no potential breeding habitat, with no mature, suitable Eucalypt tree species within the survey area. Low value black cockatoo habitat value has been assigned to low shrubland and *Acacia* vegetation types as well as cleared and highly degraded, weedy areas.

Apart from evidence of the use of the vegetation as black cockatoo foraging habitat, one other fauna species of conservation significance was recorded during the field survey. Evidence of the Quenda, a Priority 4 species was recorded in a number of locations. This species has burrows in dense shrubland and is relatively widespread and common in the SCP bushland.

A further five conservation significant fauna: The Western Brush Wallaby and Graceful Sunmoth (listed as Priority 4 by DBCA), Jewelled South west Ctenotus and Black Striped Snake (listed as Priority 3 by DBCA) are considered likely to occur in the survey area, based on the habitat types available and bushland linkages present across the area. Also possible is the Peregrine Falcon, listed as Other specially protected fauna by DBCA.

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1. Introduction

1.1 Background

The Yanchep Rail Extension (YRE) forms part of METRONET, a State government program of projects to increase the size of Perth's railway network. The project aims to support the planning of integrated station precincts and the growth of the Perth metropolitan region. The YRE project is an extension to the Northern Suburbs Railway (also known as the Joondalup line) to support existing communities with improved transport connections and create new communities through integrated station precincts.

The YRE was split into two parts during the environmental approvals assessment, Part 1: Butler Station to Eglinton Station and Part 2: Eglinton Station to Yanchep Station. Part 1 of the project includes approximately 7.3 km of track (from Clarkson to just north of the proposed Eglinton Station) and includes two new intermodal (rail, bus, 'park and ride', 'kiss and ride', walk and cycle) transit stations at Alkimos and Eglinton.

The Public Transport Authority (PTA) has commissioned a number of biological surveys for the YRE project, including a reconnaissance and detailed flora and vegetation surveys, fauna surveys, black cockatoo habitat assessment and targeted flora surveys (GHD 2018, 2019). During the environmental assessment process, additional areas have been identified as requiring assessment. Consequently, further ecological surveys of these additional areas are required to support environmental approvals.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was engaged by the PTA to undertake an ecological survey of additional areas for the YRE Part 1 project. The purpose of the survey was to delineate key flora, vegetation and fauna values within the additional areas. This report summarises the ecological survey results. The results will be used to identify and assess the ecological impacts of the projects and inform the environmental assessment approvals process.

1.3 Project location

The additional areas are located adjacent to the YRE Part 1 development envelope (DE), which extends from north of the proposed Eglinton Station (Romeo Road) to Pipidinny Road, south of Yanchep. The additional areas include six separate areas (labelled A to F), with five adjacent to the previously surveyed rail corridor and one to the west of Marmion Avenue. These areas are collectively referred to as the survey area and cover 21.48 hectares (ha). The survey area is mapped in Figure 1, Appendix A.

The study area was defined for the desktop based searches of the assessment and include a 5 kilometre (km) buffer of the survey area for the purpose of flora and fauna database searches.

1.4 Scope of works

The scope of works for the ecological survey included:

- A desktop review of publically available databases and relevant reports provided by the PTA to determine the ecological values of the survey area
- An ecological survey of the survey area to identify and map:
  - Vegetation community types present in the survey area, including presence of any Threatened or Priority Ecological Communities (TECs and PECs).

  - Vegetation condition, including the locations of any Weeds of National Significance (WoNS) or Declared Weeds
  - Vegetation that would be classified as foraging habitat for Carnaby's Cockatoo
  - Threatened and/or Priority Flora, and potential (or confirmed) breeding trees for Carnaby's Cockatoo
  - Vegetation growing in association with wetlands or watercourses
- Preparation of an ecological survey report (this document) that includes the results and findings of the survey, including a justification of the survey methodology, and supporting maps and figures
- Provision of spatial data in GIS format.

1.5 Relevant legislation, conservation codes and background information

In Western Australia (WA) significant communities, and flora and fauna are protected under both Federal and State Government legislation. In addition, regulatory bodies also provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this project and provided in Appendix B.

1.6 Limitation and assumptions

This report has been prepared by GHD for PTA and may only be used and relied on by PTA for the purpose agreed between GHD and the PTA as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than PTA arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed the flora and fauna values within the survey area, as shown in Figure 1, Appendix A. Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

Prior to the commencement of the field survey, a desktop assessment was undertaken to identify relevant ecological information pertaining to the study area and to assist in survey design. The desktop assessment involved a review of:

- Previous reports and memorandums relevant to the project, including *Yanchep Rail Extension, Biological Assessment* (GHD 2018) and *Yanchep Rail Extension, Targeted FCT [Floristic Community Type] 26a Survey* (GHD 2019)
- The Department of the Environment and Energy (DEE) (now Department of Agriculture, Water and the Environment) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the study area
- The Department of Biodiversity, Conservation and Attractions (DBCA) TEC and PEC database to determine conservation significant ecological communities previously recorded within the study area (as provided by PTA)
- The DBCA *NatureMap* database for conservation significant flora and fauna species previously recorded within the study area
- The DBCA Threatened (Declared Rare) and Priority Flora database (TPFL) and the WA herbarium database (WAHERB) for Threatened and Priority flora species listed under the *Biodiversity Conservation Act 2016* (BC Act) and or as Priority by DBCA, previously recorded within the study area (as provided by PTA).

2.2 Field survey

2.2.1 Vegetation and flora

GHD botanist Anna Napier (flora licence no. SL012292) completed a vegetation and flora assessment, a targeted flora survey of the survey area on 15-16 October 2019. The field survey was undertaken to verify the results of the desktop assessment, identify and describe the dominant vegetation units, assess vegetation condition, and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant flora taxa were also undertaken during the survey.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a).

Data collection

Field survey methods involved a combination of sampling quadrats and relevés located in identified vegetation units and traversing the survey area by foot. Non-permanent quadrats (measuring 10 m x 10 m – area of 100 m^2) were located within identified vegetation units and throughout the survey area to cover geographic range. The quadrat and relevé data was supplemented by previous survey effort in adjacent areas (as part of the YRE project) to achieve three quadrats per vegetation unit. Field data at each quadrat was recorded on a pro-forma data sheet and included the parameters detailed in Table 1.

Table 1 Quadrat data collection

Aspect	Measurement
Collection attributes	Site code, personnel/recorder, quadrat dimensions and photograph of the quadrat
Physical features	Landform, slope, aspect, soil attributes, ground surface cover, leaf and wood litter
Location	Coordinate recorded in GDA94 using a hand-held Global Positioning System (GPS) tool to an accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition using the condition rating scale adapted by EPA (2016a) for the South West Botanical Province.
Disturbance	Level and nature of disturbance (e.g. weed presence, fire and time since last fire, impacts from grazing, anthropogenic impacts)
Flora	List of dominant flora from each structural layer, list of all species within the quadrat including stratum, average height and cover (using National Vegetation Information System (NVIS))

A flora inventory was compiled from taxa listed in described quadrats, relevés and from opportunistic floristic records throughout the survey area.

Vegetation units and mapping

Vegetation units were identified and boundaries mapped using a combination of aerial photography, field data/ observations and previous vegetation mapping. The vegetation units were aligned to previously described vegetation units (e.g. GHD 2018) where possible. The vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat data and field observations. Vegetation unit descriptions followed NVIS and were consistent with NVIS level V (Association) (NVIS Technical Working Group 2017).

Identification of vegetation growing in association with wetlands or watercourses

Vegetation growing in association with wetlands or watercourses was identified based on field observations (e.g. vegetation structure, typical and common species, soils and landforms).

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces of WA (devised by Keighery (1994) and adapted by EPA (2016a)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is outlined in Appendix B.

Targeted flora searches

Targeted searches for conservation significant flora were undertake during the field survey. Within the survey area, potential habitats and locations of previous records were searched by opportunistic sampling. Where individuals were identified, the location and number of plants present was recorded using a handheld GPS. Additional data was also recorded to support the lodgement of a Threatened and Priority Flora Report Form.

Flora identification and nomenclature

Species well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. All specimens collected during the field assessment were dried and processed in accordance with the requirements of the WA Herbarium. Species were identified by the use of taxonomic literature, electronic keys and online electronic databases.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DEE. Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase*.

2.2.2 Fauna

GHD zoologist Robert Browne-Cooper undertook a black cockatoo habitat assessment of the survey area from 15-16 October 2019. The survey area was traversed on foot to identify and map suitable black cockatoo habitat. An assessment of the likelihood of occurrence of conservation significant fauna was also undertaken based on the database searches and previous local studies in consideration of fauna habitats occurring within the survey area.

The survey methodology employed by GHD was undertaken with reference to the EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2016b).

Black cockatoo assessment

The black cockatoo habitat assessment was undertaken in accordance with the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (vulnerable) *Calyptorhynchus baundinii*, Forest Red Tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksii naso* (Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) 2012). The assessment included:

- The identification and recording (via GPS) of the locations of potential and actual breeding habitat within the survey area (relevant tree species with a diameter at breast height (DBH) of >500 millimetres (mm) for Jarrah, Marri and Tuart or DBH of >300 mm for Wandoo or Salmon Gum)
- Identifying, describing and recording the size of existing tree hollows and any evidence of use by black cockatoos within the survey area
- Identifying, recording and describing the locations of potential night roosting habitat
- Identifying, recording and describing the locations of potential foraging habitat.

The survey distinguished between actual and potential breeding habitat as per the following:

- Actual nest trees: Evidenced as currently being used or have been used in the past
- Potential breeding habitat: trees with available hollows that do not show evidence of use now or in the past. Trees with hollows that do not show evidence of use now or in the past where the hollow is not available (e.g. hollows are occupied by bees or galahs); and those trees without hollows but which have the potential to develop hollows in the future, and which have DBH >500 mm or 300 mm for different species. This was a ground based assessment using binoculars to identify potential and/or actual breeding hollows.

Fauna species identification

Identification of fauna species was made in the field using available field guides and electronic guides. Nomenclature used in this report follows that used by the WA Museum and the DBCA *NatureMap* database (DBCA 2007–) with the exception of birds, where by Christidis and Boles (2008) was used.

2.3 Limitations

2.3.1 Desktop limitations

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DBCA searches of threatened flora and fauna provide more accurate information for the general area. However, some records of collections, sightings or trappings cannot be dated and often misrepresent the current range of threatened species.

2.3.2 Field survey limitations

The EPA (2016a) Technical Guide states flora and vegetation survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2. Based on this assessment, the present survey effort has not been subject to any constraints which affect the thoroughness of the assessment and the conclusions which have been formed.

Table 2 Field survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area, which included *Yanchep Rail Extension, Biological Assessment* (GHD 2018) and *Yanchep Rail Extension, Targeted FCT 26a Survey* (GHD 2019).
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Minor	The vegetation and flora survey and targeted flora searches were undertaken in spring 2019. The flora recorded from the field survey is detailed in 4.4 and a full flora species list is provided in Appendix D. The portion of flora collected and identified was considered high. As with any biological survey, ephemeral species such as orchids are not always present in each year/season or at the particular time a single botanical survey is conducted. The black cockatoo habitat assessment was undertaken in spring 2019. The assessment was limited to identifying habitat types for black cockatoos and other conservation significant fauna utilising the survey area. No sampling for invertebrates or aquatic species occurred.
Flora determination	Minor	Flora determination was undertaken by the GHD botanist in the field and at the WA Herbarium. Six taxa could be identified to genus level only due to lack of flowering and/or fruiting material required for identification. These collections showed no similarity with known, likely or possibly occurring conservation significant flora identified in the desktop searches. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time report development, but it should be noted this may change in response to ongoing research and review of International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	All areas were adequately surveyed during the field survey.
Mapping reliability	Minor	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (GHD 2018) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung S2 Tablets and Garmin GPS). Certain atmospheric factors and other sources can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ±5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/ season/cycle	Minor	The flora and vegetation field survey and the black cockatoo habitat assessment were conducted during spring (15-16 October 2019).

Aspect	Constraint	Comment
		In the three months prior to the ecological survey (July - September), the Gingin Aero weather recording station recorded a total of 233.6 mm of rainfall. This total is lower than the average for this period, which is 311.9 mm (BoM 2019). The weather conditions recorded during the survey periods are considered unlikely to have impacted upon the flora and fauna survey. The survey timings were considered appropriate for the flora and fauna field survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Parts of the survey area has been subjected to historical disturbances (e.g. anthropogenic); however, these disturbances did not impact the survey.
Intensity (in retrospect, was the intensity adequate)	Minor	The vascular flora of the survey area was sampled based on EPA (2016a); where possible a minimum of two quadrats per vegetation type were established along with relevés to supplement the data. The quadrat and relevé data was supplemented by previous survey effort in adjacent areas (as part of the YRE project) to achieve three quadrats per vegetation unit. However, due to the linear nature of the survey areas, and where vegetation units were restricted, less than three quadrats per vegetation unit were described. The survey area was sufficiently covered by the GHD botanist and zoologist during the survey.
Resources	Nil	Adequate resources were employed during the field survey: 4 person days were spent undertaking the surveys using a dedicated botanist and zoologist.
Access restrictions	Nil	The survey area was accessed on foot and traversed by vehicle. No access issues were encountered during the field survey.
Experience levels	Nil	The botanist and zoologist who executed the survey are practitioners suitably qualified and experienced in their respective fields. Anna Napier (Principal botanist) has over 30 years' experience undertaking flora surveys within WA. Robert Browne-Cooper (Senior zoologist) has over 20 years' experience undertaking fauna surveys within WA.

3. Desktop assessment

3.1 Literature review

A biological assessment (GHD 2018) has been previously completed for the YRE project, which included both Part 1 and Part 2, as part of this assessment. The document is a combination of reporting on field surveys from 2016 to 2017. A targeted vegetation survey for FCT 26a was also completed for the YRE project (GHD 2019). A summary of the methods and results from both scopes of work are provided below.

Yanchep Rail Extension Biological Assessment (GHD 2018)

GHD completed detailed and targeted flora and vegetation surveys and survey, Level 1 fauna surveys (reconnaissance survey) and black cockatoo habitat assessment of the YRE survey area. The survey area was approximately 16 km long and covered 165 hectares (ha), in addition to some previously surveyed areas. Multiple surveys were undertaken with survey effort in November 2016, and May, July and December 2017. The survey area was extensively traversed on foot during the surveys.

Vegetation and flora

Fifteen vegetation types were identified within the survey area; thirteen of these were remnant native vegetation, and two were dominated by planted taxa and opportunistic non-native species. The majority of the survey area was rated Excellent to Very Good in condition with the vegetation structure largely intact with some herbaceous and grassy weeds present (35.13 % of the survey area). Areas rated Degraded and Completely Degraded have been historically cleared or impacted by grazing and are dominated by introduced species.

Based on statistical analysis, key diagnostic characteristics and field observations it was determined that seven vegetation types align with five conservation significant communities within the survey area:

1. *Banksia* Woodlands of the SCP TEC
   – Listed as Endangered under the EPBC Act and listed as a Priority 3 PEC by DBCA
   – Identified through field observations and key diagnostic characteristics
2. *Melaleuca huegelii – M. acerosa [M. systena]* shrublands on limestone ridges (26a) Endangered TEC
   – Listed as Endangered by DBCA
   – Identified through field observations and statistical analysis
3. *Banksia* dominated woodlands of the SCP IBRA region Priority Ecological Community (PEC)
   – Listed as a Priority 3 by DBCA
   – Identified through field observations and key diagnostic characteristics
4. Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain PEC
   – Listed as a Priority 3 by DBCA
   – Identified through field observations and key diagnostic characteristics
5. Northern Spearwood shrublands and woodlands (24) PEC
   – Listed as a Priority 3 by DBCA
   – Identified through field observations and statistical analysis

Two hundred and forty flora taxa (including subspecies and varieties) were recorded during the field assessments. This comprised of 179 native taxa, 61 introduced flora taxa. No EPBC Act or *Biodiversity Conservation Act 2016* (BC Act) listed flora were recorded within the survey area. One DBCA Priority-listed flora taxon was recorded; *Hibbertia spicata* subsp. *leptotheca* (P3), it was recorded in quadrat 8, in VT08. The known habitat for this taxon is limestone outcrops and cliffs (WA Herbarium 1998–). Vegetation types VT02 and VT03 had occasional limestone outcroppings, so these vegetation types may also provide suitable a habitat for this taxon.

Of the introduced taxa, four are listed as Declared Pests under the *Biosecurity and Management Act 2007* (BAM Act) and/or as a WoNS.

Fauna

Nine main fauna habitat types are present within the survey area (*Eucalyptus* woodland, *Banksia sessilis* over low mixed shrubland, mixed *Banksia* woodland, mixed tall shrubland, Lomandra herb lands on secondary dunes, planted *Eucalyptus* woodland, *Acacia* shrubland, limestone ridgelines and highly disturbed areas. Four of these habitat types provide high value habitat for fauna. These four habit types cover approximately 75% of the total survey area demonstrating the overall high value of the area. The remaining 25% includes medium to low value habitat for fauna.

The fauna surveys recorded 68 vertebrate fauna species, including 51 birds, eight reptiles and nine mammals. Three species of conservation significance were recorded during the survey, Carnaby's Cockatoo – listed as Endangered under EPBC Act and BC Act, Western Brush Wallaby (*Macropus Irma*) listed as Priority 4 by DBCA and Rainbow Bee-eater (*Merops ornatus*) listed as IA under the BC Act.

A black cockatoo assessment identified 128.39 ha of suitable foraging habitat and 67 potential breeding trees were recorded, three with hollows. Of these, none had evidence of being previously used for nesting and one had hollows of suitable size to support breeding. The 67 potential breeding trees had a DBH of >500 mm which means they may be suitable for breeding in the future.

Targeted FCT 26a Survey (GHD 2019)

GHD completed a targeted survey to map occurrences of FCT 26a within or intersecting the YRE Part 1 DE. The survey was undertaken in January 2019 and involved mapping the boundaries of each FCT 26a occurrence using a handheld GPS device.

Eight FCT 26a patches were mapped during the survey, with the boundaries of each occurrence determined based on the presence of typical species including *Melaleuca huegelii, M. systena, Banksia sessilis* over *Grevillea preissii, Acacia lasiocarpa* and *Spyridium globulosum*, and landform characteristics (e.g. skeletal soil on limestone ridge slopes and ridge tops) as outlined by Gibson et al. (1994). Details of each patch (including total area) and a representative photograph was reported.

3.2 Conservation significant ecological communities

A search of the EPBC Act PMST identified four EPBC Act-listed TECs potentially occurring within the study area. In addition to these TECs, a further TEC and three PECs were also identified in a search of the DBCA TEC/PEC database. The previous biological surveys identified one additional PEC within YRE Part 1, which was not identified via the database searches (GHD 2018).

Details for these communities are provided in Table 3. The DBCA TEC/PEC database search results are shown on Figure 2, Appendix A.

Table 3 Threatened and Priority Ecological Communities identified in the desktop searches

Community type	EPBC Act	DBCA	Description	Location
Aquatic Root Mat Community in Caves of the SCP (TEC) (Caves SCP01)	Endangered	Critically Endangered	At Yanchep and on the Leeuwin Naturaliste Ridge, permanent streams and pools occur in caves and some support dense growths of root mats (from living Tuart trees). The root mats provide a constant and abundant primary food source for some of the richest aquatic cave communities known. Caves containing the aquatic root mat community at Yanchep occur where sandy soils underlie superficial limestone and where the waters of the Gnangara Mound seep through the sand to form a system of subterranean pools and streams.	Four buffers of this community intersect the survey area
Melaleuca huegelii – M. acerosa (*M. systena*) shrublands on limestone ridges (TEC) (SCP26a)		Endangered	Species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii*, *M. systena* (previously *M. acerosa*), *Banksia sessilis* over *Grevillea preissii, Acacia lasiocarpa* and *Spyridium globulosum*, occurring on skeletal soil on ridge slopes and ridge tops. Broadly occurs on Spearwood Sands (Tamala Limestone) on large limestone ridges.	Known to occur immediately adjacent to the survey area (GHD 2018) and with a location buffer area across most of the survey area.
Sedgelands in Holocene dune swales of the southern SCP (TEC) (SCP19)	Endangered	Critically Endangered	The community occurs in linear damplands and occasionally sumplands, between Holocene dunes. Typical and common native species are the shrubs *Acacia rostellifera, A.saligna, Xanthorrhoea preissii*, the sedges *Baumea juncea, Ficinia nodosa, Lepidosperma gladiatum*, and the grass *Poa porphyroclados*. Several exotic weeds are found in this community but generally at low cover values. Two sub-groups identified: • Community type 19a is termed 'sedgelands in Holocene dune swales' and generally occurs in the younger swales. Community type 19b is termed 'woodlands over sedgelands in Holocene dune swales' and tends to occur in older swales. This subgroup has an overstorey of woodlands including *Eucalyptus gomphocephala, Melaleuca rhaphiophylla* and *Banksia littoralis*.	SCP19b buffer intersects the majority of the Part 1 additional areas survey.
Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands (PEC) (SCP30b)		Priority 3	This community is dominated by either *Eucalyptus gomphocephala* or *Agonis flexuosa*. The presence of *Hibbertia cuneiformis, Geranium retrorsum* and *Dichondra repens* differentiate this group from other Quindalup community types. The type is found from the Leschenault Peninsula south to Busselton.	Occurs approximately 900 m north east of the survey area

Community type	EPBC Act	DBCA	Description	Location
Banksia woodlands of the Swan Coastal Plain (TEC) *Banksia* dominated woodlands of the Swan Coastal Plain IBRA region (PEC)	Endangered	Priority 3	The ecological community is a woodland associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of *Banksia*, with scattered eucalypts and other tree species often present among or emerging above the *Banksia* canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range.	Identified in the EPBC Act Protected Matters search
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (TEC) Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain IBRA region (PEC)	Critically Endangered	Priority 3	Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien Bay to the Sabina River, with outliers along some rivers. Tuart is the key dominant canopy species however Tuart communities comprise a variety of flora and fauna assemblages. Flora commonly occurring with Tuart include Peppermint (*Agonis flexuosa*), *Banksia attenuata, Banksia grandis, Allocasuarina fraseriana, Xylomelum occidentale, Macrozamia riedlei, Xanthorrhoea preissii, Spyridium globulosum, Templetonia retusa* and *Diplolaena dampieri*.	Identified in the EPBC Act Protected Matters search
Banksia ilicifolia woodlands –SCP22 (PEC)*	Endangered TEC (part)	Priority 2	Low lying sites generally consisting of *Banksia ilicifolia – B. attenuata* woodlands, but *Melaleuca preissiana* woodlands and scrubs are also recorded. Occurs on Bassendean and Spearwood systems in the central Swan Coastal Plain north of Rockingham. Typically has very open understorey, and sites are likely to be seasonally waterlogged.	Two occurrences of this community; the closest is 3800 m south of the survey area
Northern Spearwood shrublands and woodlands – SCP24 (PEC)*	Endangered TEC (part)	Priority 3	Heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodman Point. Most sites occur on the Cottesloe unit of the Spearwood system. The heathlands in this group typically include *Dryandra sessilis, Calothamnus quadrifidus* and *Schoenus grandiflorus.*	Known to occur in the Part 1 area (GHD 2018)
Low lying *Banksia attenuata* woodlands or shrublands – SCP21c (PEC)*	Endangered TEC (part)	Priority 3	This type occurs sporadically between Gingin and Bunbury, and is largely restricted to the Bassendean system. The type tends to occupy lower lying wetter sites and is variously dominated by *Melaleuca preissiana, Banksia attenuata, B. menziesii, Regelia ciliata, Eucalyptus marginata* or *Corymbia calophylla*. Structurally, this community type may be either a woodland or occasionally shrubland.	Three occurrences of this community; the closest is 3700 m south of the survey area

* Can be a component of the Endangered Banksia woodlands of the SCP EPBC listed TEC

3.3 Conservation significant flora

Desktop searches of the EPBC Act PMST database, *NatureMap* database and DBCA TPFL and WAHERB databases identified the presence/potential presence of 18 conservation significant flora taxa within the study area. The desktop searches recorded:

- Seven taxa listed under the EPBC Act and/or as Threatened under the BC Act
- Two Priority 1 taxa
- One Priority 2 taxon
- Five Priority 3 taxa
- Three Priority 4 taxa.

The locations of conservation significant flora registered on the DBCA databases are mapped in Figure 2, Appendix A.

3.4 Conservation significant fauna

The EPBC Act PMST and *NatureMap* database identified the presence, or potential presence of 30 conservation significant fauna species, excluding those species that are exclusively marine or migratory/marine, as no marine habitat was present within the survey area. The desktop searches recorded:

- Nine species listed under the EPBC Act and/or as Threatened under the BC Act
- Eleven species listed as Migratory under the EPBC Act and BC Act
- One species listed as Other specially protected fauna under the BC Act
- Nine species listed as Priority by DBCA.

4. Field survey results

4.1 Vegetation and flora

Nine vegetation types as well as cleared areas and planted (non-native) vegetation (VT12) were identified from the survey area (Table 4 and Figure 3, Appendix A). Eight of the vegetation types comprised remnant native vegetation and one vegetation type (VT13) comprised a mix of degraded native remnant vegetation and native regrowth (>10 years). The vegetation types primarily aligned with those previously described in GHD (2018).

The vegetation types were distributed in a broad mosaic pattern within the survey area as the soil landscapes and dune landforms changed. Three vegetation types (VT02, VT03 and VT04) described *Banksia* shrubland/woodland, which comprised approximately 60% of the survey area. *Acacia* and *Xanthorrhoea preissii* tall shrublands (VT10 and VT14) and *Lomandra maritima* herbland (VT05) occurred in small patches within the survey area, and scattered natives (VT13) occurred in previously disturbed areas. *Eucalyptus decipiens* woodlands (VT11) occurred at a single locations adjacent to the existing YRE Part 1 DE.

Many of the vegetation types formed mosaics across the landscape and transitioned from one to another with boundaries blurred. This was observed in the northern part of the survey area where VT02, VT03 and VT05 were difficult to map.

No vegetation growing in association with wetlands or watercourses was identified during the field survey.

4.2 Vegetation condition

The vegetation within the survey area was rated from Excellent to Completely Degraded in condition. The extents of the vegetation condition ratings mapped within the survey area are detailed in Table 5 and mapped in Figure 4, Appendix A.

Cleared areas associated with roads, tracks etc. comprise approximately (5 %) of the survey area. The majority of the vegetated areas within the survey area are in Good or better condition. A number of areas were rated Excellent and comprised *Banksia* shrubland and *Banksia* woodland. These areas contained thick *Banksia* vegetation, the thickness of the vegetation inhibiting weed growth and vehicle and grazing animal access. Areas rated as Good – Degraded or worse had been historically cleared or impacted by grazing or soil /geotechnical investigations and were dominated by introduced species.

Table 4 Vegetation types recorded within the survey area

Vegetation type	Vegetation type description	Landform and Substrate	Extent (ha)	Notes and sample locations	Representative photograph
Banksia sessilis and *Melaleuca systena* mid-shrubland (VT02)	*Banksia sessilis*, *Melaleuca systena, Calothamnus quadrifidus, Hakea lissocarpha* mid-shrubland over *Hibbertia hypericoides* low open shrubland over mixed sparse herbland	Slopes of dunes with yellow sandy soils	3.90	Likely to represent Northern Spearwood shrublands and woodlands (FCT 24) (PEC) R2	
Banksia sessilis and *Spyridium globulosum* tall shrubland (VT03)	*Banksia sessilis*, *Spyridium globulosum* tall shrubland over *Calothamnus quadrifidus*, *Melaleuca systena* low shrubland over open sedgeland *Mesomelaena pseudostygia*, *Desmocladus flexuosus*	Dune swales with brown sandy soils	1.69	Likely to represent Northern Spearwood shrublands and woodlands (FCT 24) (PEC)	
Banksia attenuata, *B. menziesii* low woodland (VT04)	*Banksia attenuata*, *B. menziesii* low woodland over shrubland *Calothamnus quadrifidus*, *Hakea trifurcata*, *Hibbertia hypericoides*, *Xanthorrhoea preissii* over sparse sedgeland *Mesomelaena pseudostygia*, *Desmocladus flexuosus*	Undulating plain with brown-yellow sandy soils	7.26	Q1 Association 949 Represents *Banksia* woodlands (TEC) / *Banksia* dominated woodlands (PEC)	
Lomandra maritima herbland (VT05)	*Melaleuca systena*, *Hibbertia hypericoides* isolated shrubs over *Lomandra maritima*, *Conostylis candicans*, *Kennedia prostrata* herbland	Dunes ridges with white to brown sandy soils	2.39	R1	

Vegetation type	Vegetation type description	Landform and Substrate	Extent (ha)	Notes and sample locations	Representative photograph
Melaleuca huegelii and *M. systena* shrubland (VT08)	*Melaleuca huegelii*, *M. systena Grevillea preissii* shrubland over sparse herbland *Hardenbergia comptoniana*	Upper slopes and ridge of dunes with brown to yellow sandy soils and numerous limestone outcroppping.	0.30	Represents *Melaleuca huegelii – M. acerosa* (*M. systena*) shrublands on limestone ridges (TEC) (SCP26a)	
Xanthorrhoea preissii shrubland (VT10)	*Xanthorrhoea preissii* tall shrubland over *Jacksonia* calcicola, *Hakea prostrata*, *Banksia dallanneyi* low open shrubland over *Lomandra* sp., *Conostylis* spp. open herbland	Slopes of dunes with brown sandy soils.	0.67		
Eucalyptus decipiens woodland (VT11)	*Eucalyptus decipiens* woodland over *Banksia sessilis, Hibbertia hypericoides, Xanthorrhoea preissii* shrubland over *Conostylis aculeata, Mesomelaena pseudostygia, Desmocladus flexuosus* sparse herbland	Undulating plain with brown sandy soils.	0.02		No photograph.
Acacia rostellifera tall shrubland (VT14)	Occasional *Spyridium globulosum* with *Acacia rostellifera, A. cochlearis* tall shrubland over *Melaleuca systena* low isolated heath shrub with *Acanthocarpus preissii and Conostylis candicans*low open shrubland over **Lagurus ovatus* and **Vulpia myuros* open grassland	Undulating plain and dune slopes, swales with sandy soils.	0.18	Q3, R5 Patches of *Lepidosperma gladiatum* in low areas.	

Vegetation type	Vegetation type description	Landform and Substrate	Extent (ha)	Notes and sample locations	Representative photograph
Scattered Natives (VT13)	Areas with isolated native shrubs, normally *Acacia* spp., over mixed introduced grasses and herbs	Undulating plain and dune slopes with sandy soils	3.87	-	
Planted (VT12)	Planted non-native trees		0.18		
Cleared	Cleared areas, tracks etc.	-	1.03	-	

Table 5 Extent of vegetation condition ratings mapped within the survey area

Condition rating	Extent (ha)
Excellent	8.25
Very Good	1.84
Good	2.04
Good – Degraded	0.14
Degraded	4.05
Completely Degraded	4.13
Cleared	1.03
Total	**21.48**

4.3 Conservation significant ecological communities

By assessing the vegetation types described at a broad level, based on dominant species, landform features and field observations four conservation significant ecological communities were identified to occur within the survey area. These conservation significant ecological communities are:

- *Banksia* Woodlands of the SCP Endangered TEC
- *Melaleuca huegelii – M. acerosa* (*M. systena*) shrublands on limestone ridges TEC (SCP26a)
- Northern Spearwood shrublands and woodlands (FCT 24) Priority 3 PEC
- *Banksia* dominated woodlands of the SCP IBRA region Priority 3 PEC.

The spatial distributions of these conservation significant ecological communities are presented in Figure 5, Appendix A.

Banksia Woodlands of the SCP TEC

The *Banksia* Woodlands of the SCP TEC is restricted to the SCP IBRA bioregion and immediately adjacent areas, including the Dandaragan Plateau, from Jurien Bay in the north, to Dunsborough in the south, and northwest on the Whicher and Darling escarpments (DEE 2016). The ecological community typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands (DEE 2016).

During the field survey one vegetation type, VT04 was assessed as meeting the key diagnostic characteristics for the *Banksia* Woodlands of the SCP TEC, as outlined in DEE (2016). Specifically:

- The survey area occurs in the SCP IBRA bioregion
- The survey area occurs on sandplain landform, notably Bassendean sands
- The vegetation type has a low woodland structure and the upper sclerophyllous layer dominated or co-dominated by *Banksia attenuata* and/or *B. menziesii*. The understorey consists of a mid-ground sclerophyllous shrub layer and/or a herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs that sometimes includes grasses.

Further assessment of this vegetation type identified five patches within the survey area that meets the minimum condition criteria outlined in DEE (2016). The patches within the survey area are part of larger patches that were previously described by GHD (2018). A breakdown of

the mapped TEC patches (by vegetation type, condition and extent) is detailed in Table 6 and mapped in Figure 5, Appendix A. Patch numbering follows that previously reported in GHD (2018) and other environmental approval documents. There is 3.70 ha of vegetation in the survey area representative of the *Banksia* Woodlands of the SCP TEC.

Table 6 Extent of *Banksia* Woodlands of the SCP TEC within the survey area

Patch ID	Vegetation type	Vegetation condition and extent (ha)	Comments
Patch 7	VT04	Very Good: 0.64 Good: 0.12 Total: 0.76	Areas mapped as the TEC are part of a larger patch that extends east and west of the survey area and includes areas within the YRE Part 1 DE. Vegetation mapped within the survey area was in Good to Very Good condition, and it is assumed adjacent vegetation is in similar condition, at least in the immediate vicinity. Aerial imagery indicates this patch is approximately 5 ha. Approximately 0.76 ha of this patch occurs in the YRE Part 1 additional areas.
Patch 8	VT04	Excellent: 0.39 Very Good: 0.34 Total: 0.74	Areas mapped as the TEC are part of a larger, relatively isolated patch that extends east and west of the survey area and includes areas within the YRE Part 1 DE. Vegetation mapped within the survey area was in Good to Very Good condition, and it is assumed adjacent vegetation is in similar condition, at least in the immediate vicinity. Aerial imagery indicates this patch is approximately 2 ha. Approximately 0.74 ha of this patch occurs in the YRE Part 1 additional areas.
Patch 9	VT04	Excellent: 0.70	Areas mapped as the TEC are part of a larger patch that extends east and west of the survey area and includes areas within the YRE Part 1 DE. Vegetation mapped within the survey area was in Excellent condition, and it is assumed adjacent vegetation is in similar condition, at least in the immediate vicinity. Aerial imagery indicates this patch is approximately 4.5 ha. Approximately 0.70 ha of this patch occurs in the YRE Part 1 additional areas.
Patch 10	VT04	Good: 0.36	Areas mapped as the TEC are part of a larger patch that extends primarily to the west of the survey area. The vegetation was mapped as Degraded to Good, due to previous, part clearing and tracks. Patch areas west of the survey area cover approximately 2.3 ha based on aerial imager. It is also possible the patch extends to the north of the survey area covering approximately 5 ha in a similar condition. Approximately 0.36 ha of this patch occurs in the YRE Part 1 additional areas.

Patch ID	Vegetation type	Vegetation condition and extent (ha)	Comments
Patch 12	VT04	Excellent: 1.00 Very Good: 0.14 Total: 1.14	This patch is part of area of vegetation located north of the Alkimos PRR. The patch extends east and west of the survey area and is likely to be in Excellent to Very Good condition (based on aerial imagery). It is estimated the patch covers approximately 8-10 ha. Approximately 1.14 ha of this patch occurs in the YRE Part 1 additional areas.

Melaleuca huegelii – M. acerosa (M. systena) shrublands on limestone ridges (TEC) (SCP26a)

The *Melaleuca huegelii-Melaleuca systena* shrublands of limestone ridges TEC occurs on skeletal soils on ridge slopes and ridge tops with limestone outcropping. The community is described as comprising of species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii, M. systena, Banksia sessilis* over *Grevillea preissii, Acacia lasiocarpa* and *Spyridium globulosum* (community 26a as described by Gibson et al. 1994). The community is highly restricted and known from massive limestone ridges around Yanchep north of Perth, and south of Perth near Lake Clifton.

Vegetation type *Melaleuca huegelii* and *M. systena* shrubland (VT08) aligns with the *Melaleuca huegelii-Melaleuca systena* shrublands of limestone ridges TEC based on landform, vegetation structure and species composition. Three small areas of VT08 occur within the survey area; these areas are part of patches that have been previously mapped by GHD (2019). There is 0.30 ha of the *Melaleuca huegelii-Melaleuca systena* shrublands of limestone ridges TEC within the survey area in Excellent and Very Good condition.

Northern Spearwood shrublands and woodlands PEC

The Northern Spearwood shrublands and woodlands (FCT24) PEC occurs as heaths or heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodman Point. *Banksias* found in this community include *Banksia attenuata* and *B. menziesii.* The heathlands in this group typically include *Banksia sessilis*, *Calothamnus quadrifidus* and *Schoenus grandiflorus*, with other common species including *Hardenbergia comptoniana, Melaleuca systena* and *Xanthorrhoea preissii*.

The key characteristics of Northern Spearwood shrublands and woodlands PEC met by VT02 and VT03 were:

- Occurs on the western SCP on the Cottesloe units of the Spearwood system
- Vegetation structure of mid to tall shrubland
- Typical and common species including *Banksia menziesii*, *B. sessilis, Melaleuca systena, Calothamnus quadrifidus, Xanthorrhoea preissii, Lepidosperma squamatum, Hardenbergia comptoniana, Phyllanthus calycinus, Conostylis aculeata, Dianella revoluta, Lomandra maritima, Schoenus grandiflorus, Desmocladus flexuosa* and *Austrostipa flavescens*.

There is 5.59 ha of the Northern Spearwood shrublands and woodlands PEC within the survey area, represented by GHD vegetation types VT02 (3.90 ha) and VT03 (1.69 ha).

Banksia dominated woodlands of the SCP IBRA region PEC

Banksia dominated woodlands of the SCP IBRA region is a Priority 3 PEC listed by DBCA. DBCA (2019) describes the *Banksia* PEC as having a canopy that is most commonly dominated

or co-dominated by *Banksia attenuata* and/or *B. menziesii*. Other *Banksia* species that can dominate in the community are *B. prionotes* or *B. ilicifolia*. The PEC differs from the EPBC Act listed *Banksia* woodlands of the Swan Coastal Plain TEC in that it has no minimum condition and patch size thresholds.

Vegetation type VT04 is representative of the *Banksia* dominated woodlands of the SCP IBRA region PEC. There is 7.26 ha of the *Banksia* dominated woodlands of the SCP IBRA region PEC present within the survey area, ranging from Excellent to Completely Degraded in condition (this total includes 3.70 ha which also aligns with the *Banksia* Woodlands of the SCP TEC).

4.4 Flora diversity

One hundred and thirty (130) flora taxa (including subspecies and varieties) representing 40 families and 92 genera were recorded from the survey area during the field survey. This total comprised of 106 native taxa and 24 introduced flora taxa. Flora species recorded are provided in Appendix D.

Dominant families recorded from the survey area included:

- Proteaceae - 15 taxa
- Asteraceae – 8 taxa
- Fabaceae - 6 taxa.

The number of native species typically recorded in 100 m^2 within the Quindalup and Spearwood Dune systems ranges from 9-35 and 37-55 respectively (GoWA 2000). Based on described quadrats from the current and previous surveys for YRE in the area, species diversity ranged from 17 to 23 (average 19.3) taxa per 100 m^2. The survey area is considered representative of the floristic diversity in the area.

4.5 Conservation significant flora

No flora listed under the EPBC Act, BC Act were recorded in the survey area. One species, *Conostylis bracteata* (P3) listed as a Priority by DBCA was recorded in survey area (Area F), on the upper part of a dune in brown sand. This species occurred with *Conostylis aculeata* and can intergrade with this taxon (WA Herbarium 1998–). As the species was not initially identified as a Priority, the number of plants was not recorded.

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field surveys for all conservation significant flora taxa identified in the desktop assessment (Appendix D). This assessment took into account previous and closest records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of species.

The likelihood of occurrence assessment post-field survey concluded that nine taxa may possibly occur in the survey area and the remaining nine taxa are considered unlikely to occur within the survey area. For the nine taxa considered possible, there is suitable habitat present within the survey area. Furthermore, three DBCA Priority-listed flora species were recorded in the local area during the 2012 flora and vegetation survey (GHD 2012). These records were not relocated during the 2016-2017 field surveys (GHD 2018), nor the species located during the current survey.

4.6 Introduced flora

Twenty-four (24) introduced flora taxa were recorded in the survey area. Much of the survey area has been impacted to some degree by previous geotechnical and/or grazing activities and this has resulted in the introduction of a number of weed species. Of the introduced taxa, one is listed as a Declared Pest under the BAM Act, *Moraea flaccida* (One-leaf Cape Tulip). Cape Tulip was recorded from one location immediately adjacent to the survey area, spread along a low-lying track section (Figure 4, Appendix A).

4.7 Black cockatoo habitat

4.7.1 Carnaby's Cockatoo

Recent activity of Carnaby's Cockatoo (e.g. foraging residue, namely chewed *Banksia sessilis* flowers and *B. attenuata* cones) was recorded within the survey area.

Foraging habitat

The survey area is located within the modelled feeding and breeding distribution for Carnaby's Cockatoo (DSEWPaC 2012). There are numerous records of this species occurring within and around the survey area. Foraging and roosting behaviour of this species is well known and documented extensively across the northern SCP.

The mixed *Banksia* woodlands, and *Banksia sessilis* shrublands provide high value foraging habitat in the form of seeds, nectar and invertebrates. These two habitat types support high densities of a variety of proteaceous species that are well known to be primary or important foraging plant species.

Table 7 and Table 8 provide a summary of the quantity and value of habitat types for black cockatoos within the survey area. Foraging habitat value is calculated based on the Revised Draft Referral Guidelines (Commonwealth of Australia 2017).

All fauna habitat types contained species known to support foraging (noting in some habitat types these are scattered, isolated species). Those habitat types considered to have a low foraging value have been excluded from foraging calculations. Foraging habitat and locations of evidence are shown in Figure 6, Appendix A and Plates 1 and 2.

Breeding and roosting habitat

No large, potential breeding (suitable species having a DBH greater than 500 mm) or roosting trees were recorded during the field survey. A small number of planted, non-local trees were present in the northern part of the survey area, but these were not suitable habitat for black cockatoos (DSEWPaC 2012).

The closest known Carnaby's Cockatoo roosts are three sites located in the Yanchep area approximately 3.5 km north to north east of the survey area. A further known roost is listed for Carabooda approximately 4 km southeast of the survey area.

Table 7 Extent of black cockatoo habitat within the survey area

Habitat type	Details
Foraging habitat	There is 13.15 ha of high value foraging habitat for black cockatoos within the survey area, consisting of the following: • *Banksia sessilis* over low mixed shrubland – 5.88 ha • Mixed *Banksia* woodland – 7.26 ha
Actual breeding habitat	No breeding events of any species of black cockatoo were recorded within the survey area during the surveys.
Potential breeding habitat	No potential breeding habitat trees (suitable Eucalypts species with a DBH >500 mm were recorded.
Roosting habitat	No suitable roosting trees or evidence noted.

Table 8 Black cockatoo habitat values

Habitat type	Area (ha)	Foraging value	Breeding value	Roosting value
Banksia sessilis over low mixed shrubland (VT2, VT3, VT8)	5.88	High		
Mixed *Banksia* woodland (VT4)	7.26	High		
Xanthorrhoea shrubland (VT10)	0.67	Medium		
Planted *Eucalyptus* woodland (VT11)	0.02	Medium		
Acacia shrubland (VT14)	0.18	Low		
Low herbland/shrubland (VT5)	2.39	Low		
Scattered natives/mostly cleared (VT13)	3.87	Low		

4.8 Other conservation significant fauna

One other fauna species of conservation significance was recorded during the survey – the Quenda (*Isoodon obsesulus* subsp*. fusciventer*) listed as Priority 4 by DBCA. Evidence in the form of diggings and burrow entrances was found in a number of locations, particularly in dense shrubland. Priority 4 fauna are 'Taxa 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.' (DBCA 2019).

A further five conservation significant fauna are considered likely to occur in the survey area, based on the habitat types available and bushland linkages present across the area:

- Western Brush Wallaby (listed as Priority 4 by DBCA)
- Graceful Sun moth (listed as Priority 4 by DBCA)
- Jewelled South West Ctenotus (listed as Priority 3 by DBCA)
- Black Striped Snake (listed as Priority 3 by DBCA).

The Peregrine Falcon (listed as Other specially protected fauna by DBCA) is also considered as possibly occurring within the survey area.

Plate 1 Black cockatoo feeding evidence (*Banksia attenuata*)

Plate 2 Black cockatoo feeding evidence (*Banksia sessilis*)

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Appendices

Appendix A – Figures

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

Project Location

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 1

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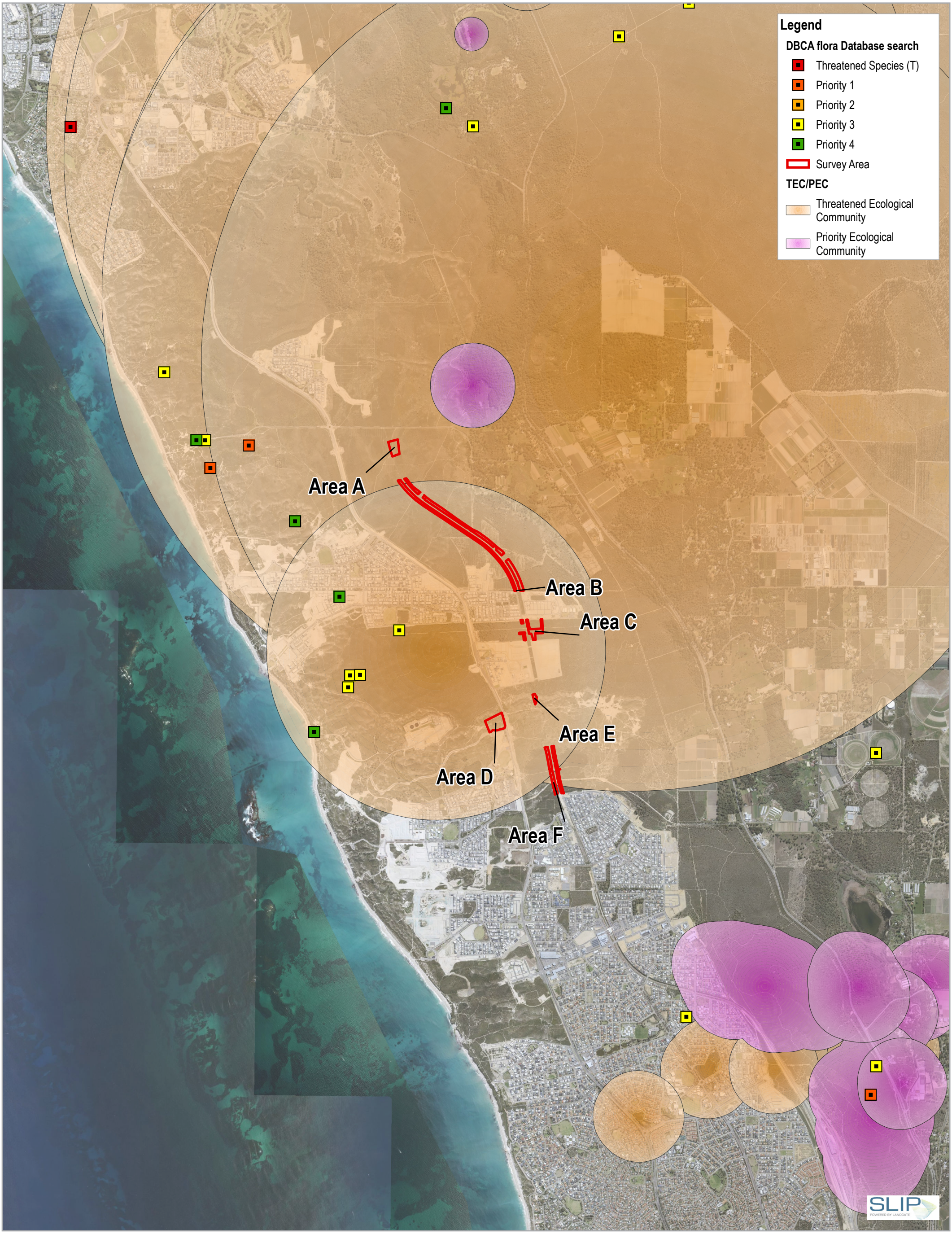
Print date: 10 Mar 2020 - 15:19

Data source: GHD: Survey Area - 20190808; Landgate: Roads - 20191210, Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

GHD

PTA
Yanchep Rail Extension Part 1

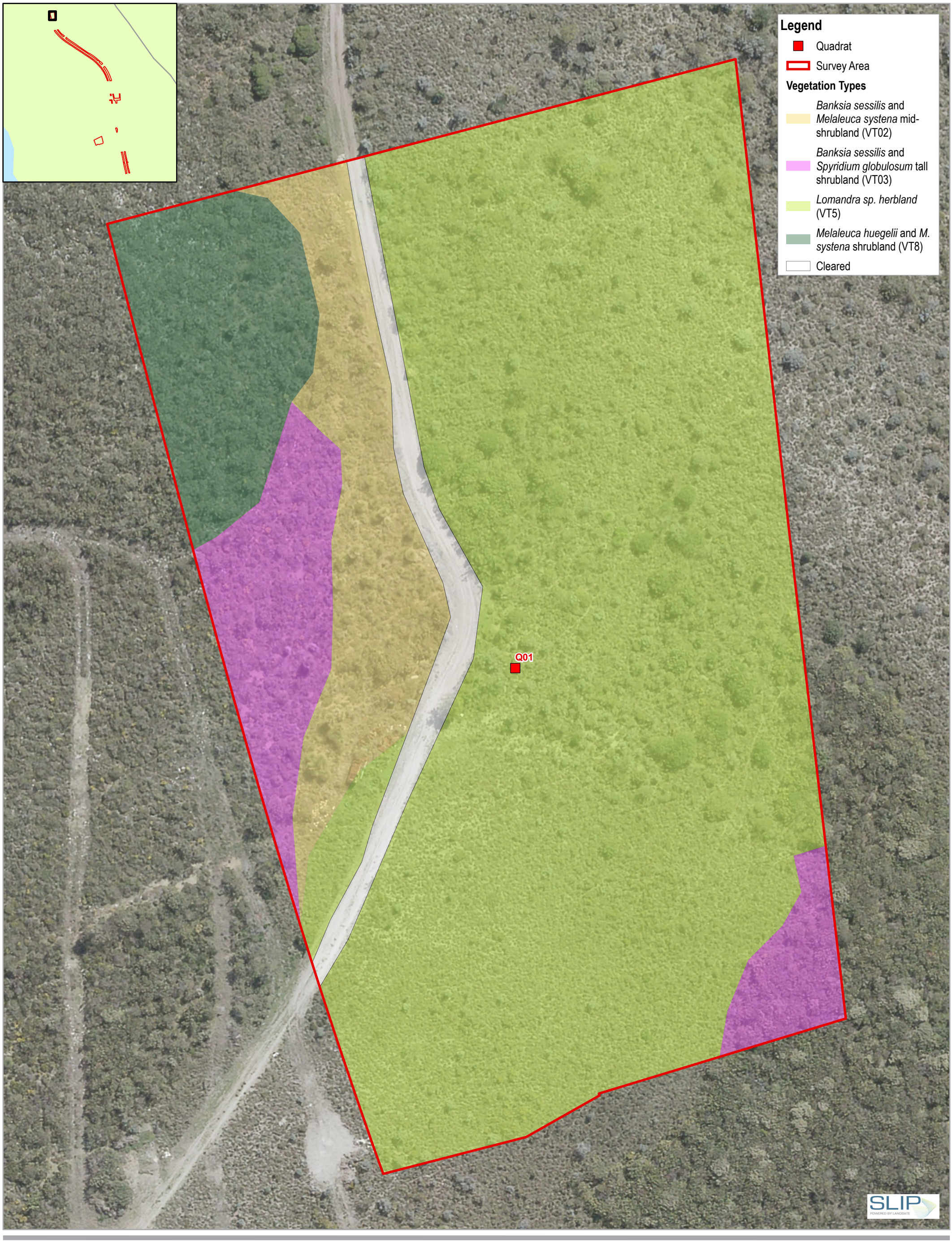
Biological Constraints

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 2

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_002_BiologicalConstraints_YREPart1_RevA
Print date: 10 Mar 2020 - 15:21

Data source: GHD: Survey Area - 20190808; DBCA: TEC/PEC, Priority Flora - 20161111; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

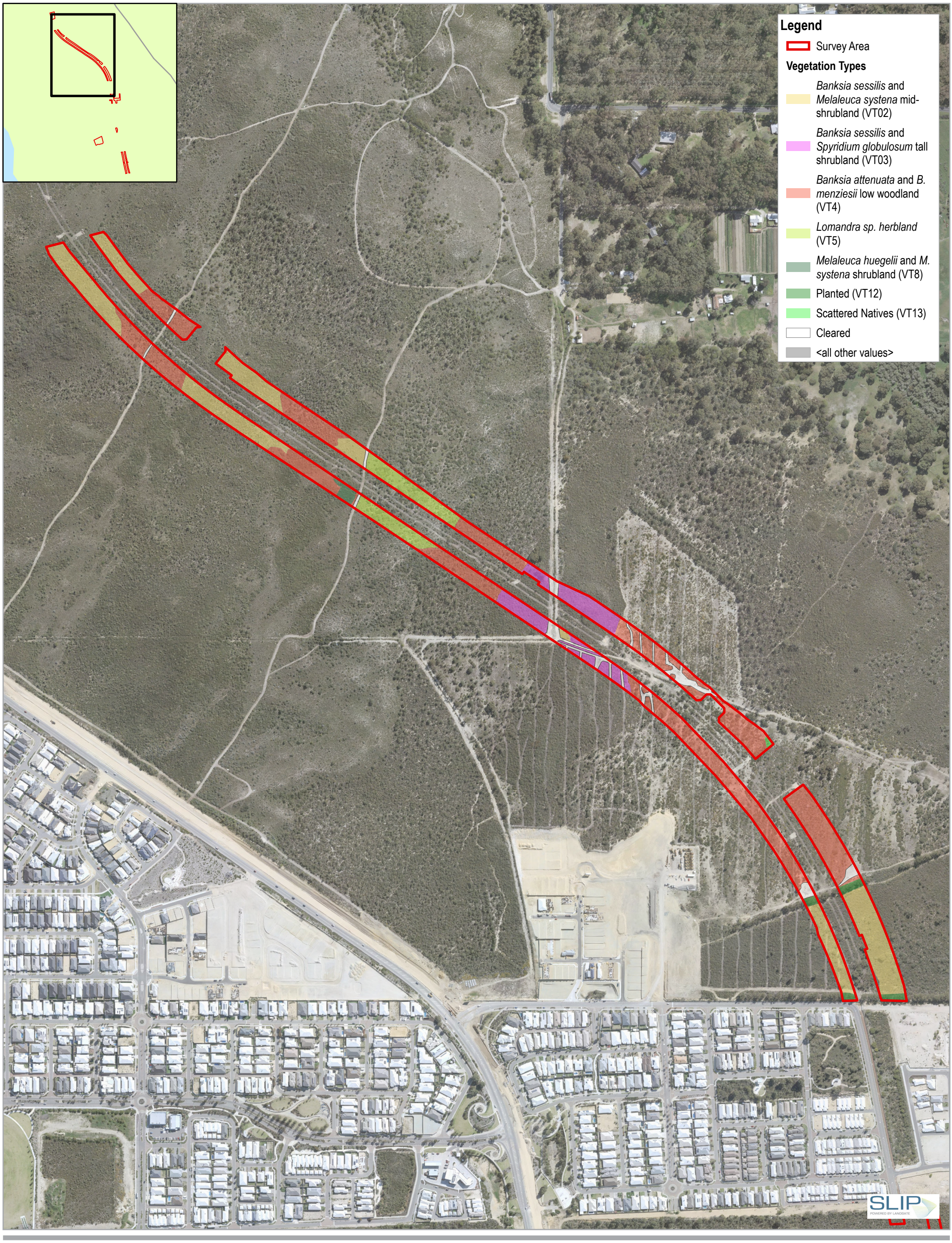
Vegetation types and sample locations - Area A

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-1

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:24

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60 80 100 120 140 160 180 200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

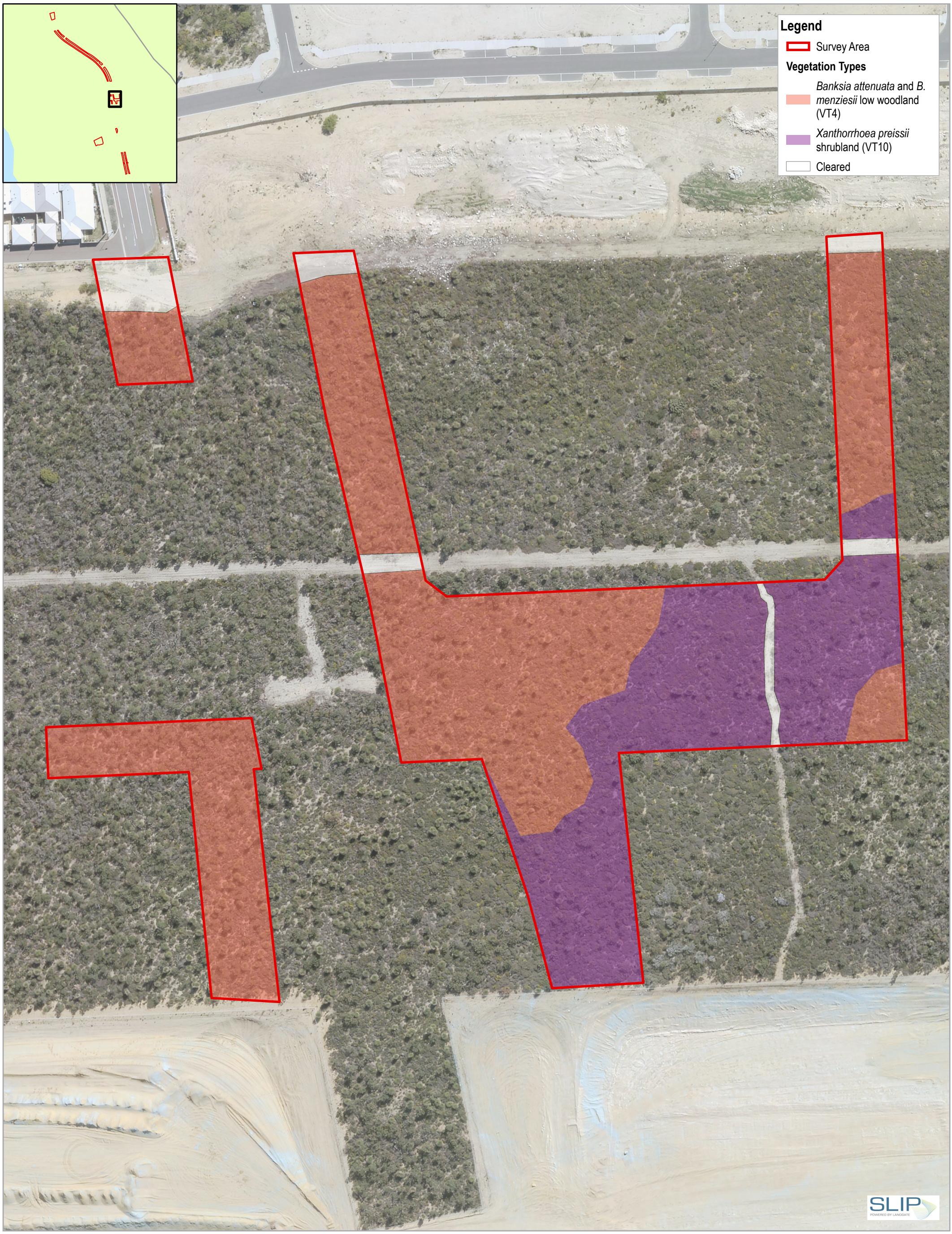
Vegetation types and sample locations - Area B

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-2

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:24

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

PTA
Yanchep Rail Extension Part 1

Vegetation types and sample locations - Area C

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-3

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:24

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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GHD

PTA
Yanchep Rail Extension Part 1

Vegetation types and sample locations - Area D

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-4

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:25

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20 N

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

GHD

PTA
Yanchep Rail Extension Part 1

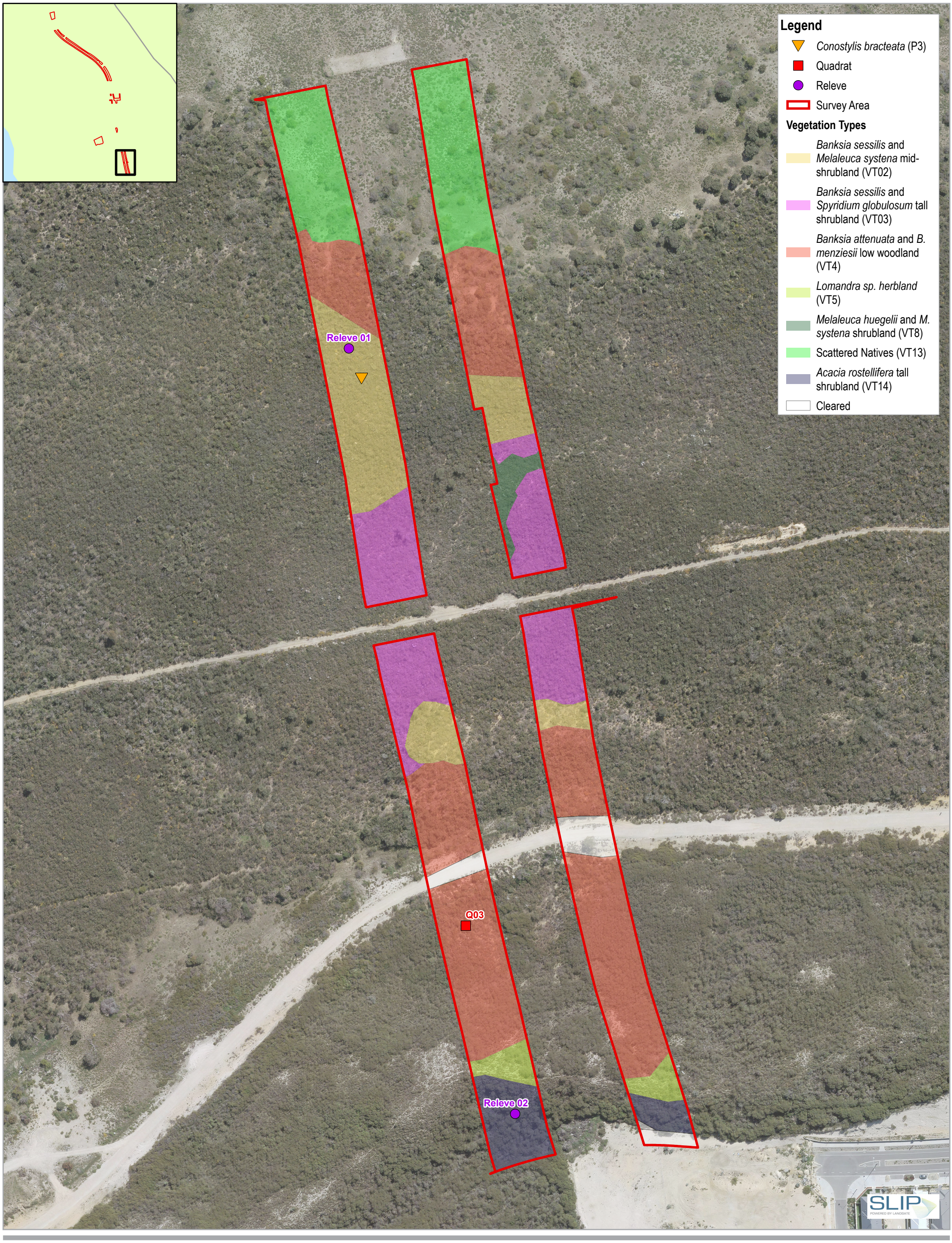
Vegetation types and sample locations - Area E

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-5

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:25

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Vegetation types and sample locations - Area F

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 3-6

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_003_VegTypes_YREPart1_RevB
Print date: 10 Mar 2020 - 15:26

Data source: GHD: Survey Area - 20190808, Vegetation Types, Sample Sites, Priority Flora - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Vegetation condition - Area A

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 4-1

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
Print date: 10 Mar 2020 - 15:28

Data source: GHD: Survey Area - 20190808, Vegetation Condition, Significant Weeds - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20 40 60 80 100 120 140 160 180 200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

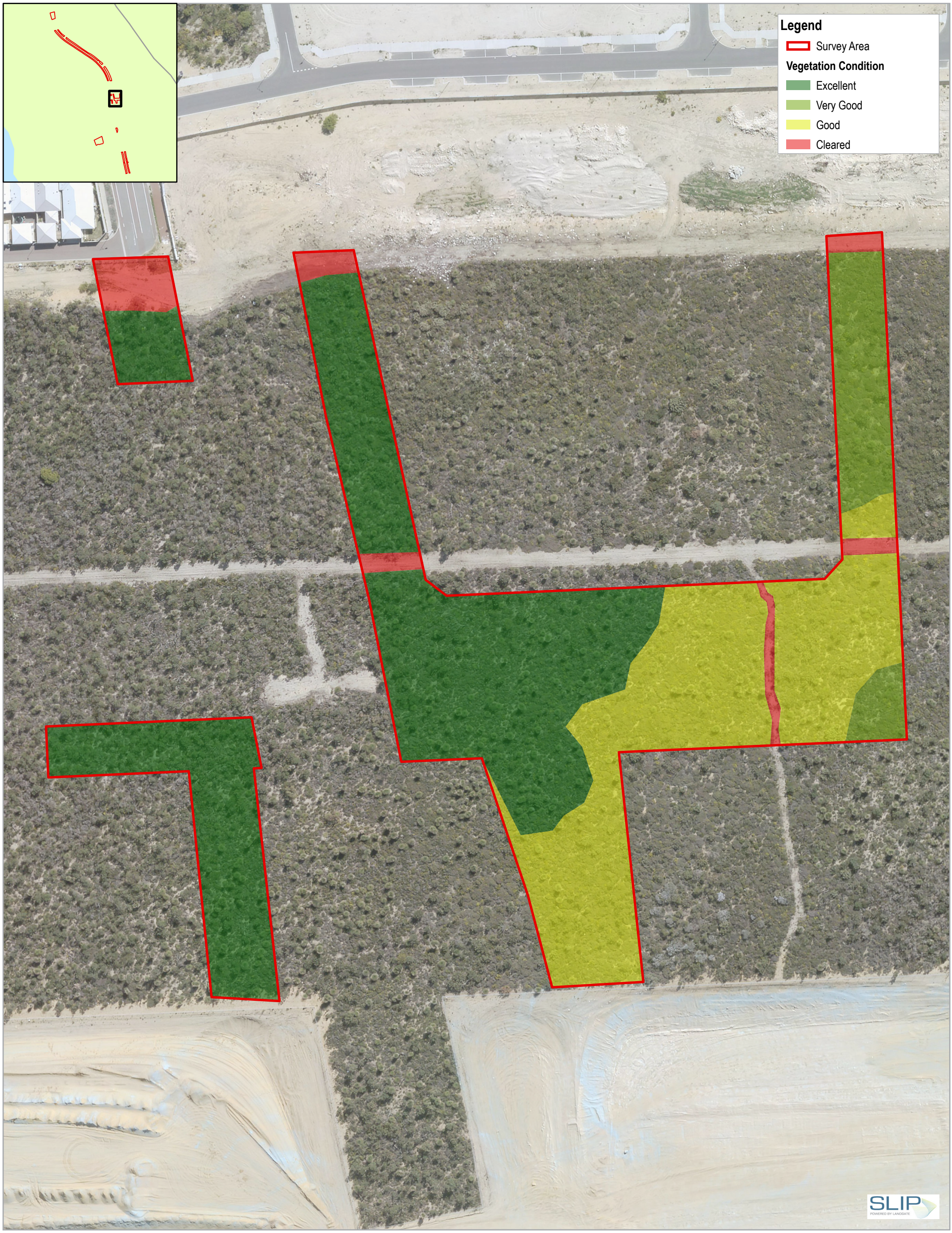
Vegetation condition - Area B

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 4-2

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
Print date: 10 Mar 2020 - 15:28

Data source: GHD: Survey Area - 20190808, Vegetation Condition, Significant Weeds - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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GHD

PTA
Yanchep Rail Extension Part 1

Vegetation condition - Area C

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 4-3

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
Print date: 10 Mar 2020 - 15:29

Data source: GHD: Survey Area - 20190808, Vegetation Condition, Significant Weeds - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Vegetation condition - Area D

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 4-4

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
Print date: 10 Mar 2020 - 15:29

Data source: GHD: Survey Area - 20190808, Vegetation Condition, Significant Weeds - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20 N

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

GHD

PTA
Yanchep Rail Extension Part 1

Vegetation condition - Area E

Project No. 12514413
Revision No. 0
Date 10/03/2020

FIGURE 4-5

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
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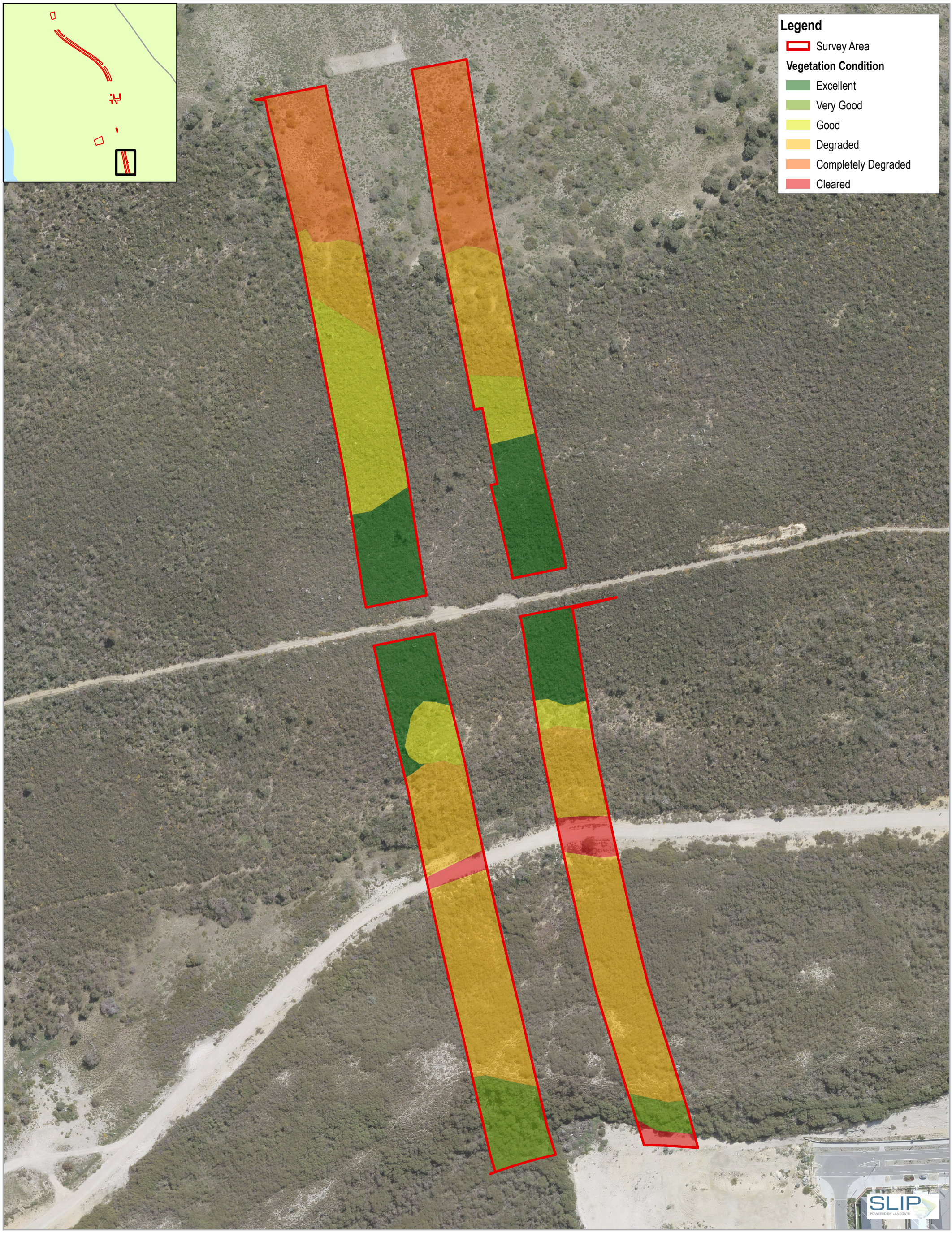


Paper Size ISO A3

0 20 40 60

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

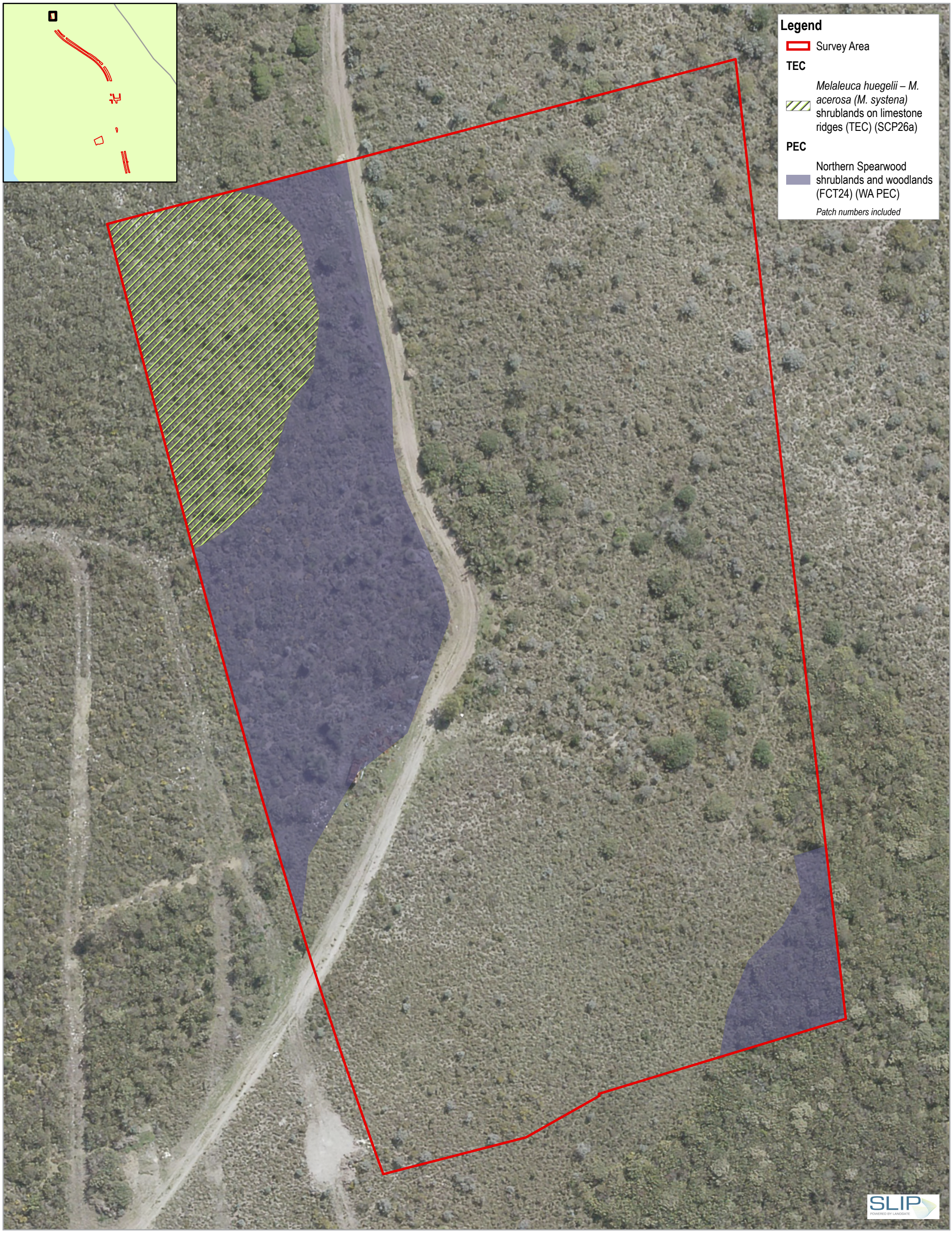
Vegetation condition - Area F

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 4-6

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_004_VegCondition_YREPart1_RevB
Print date: 10 Mar 2020 - 15:30

Data source: GHD: Survey Area - 20190808, Vegetation Condition, Significant Weeds - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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GHD

PTA
Yanchep Rail Extension Part 1

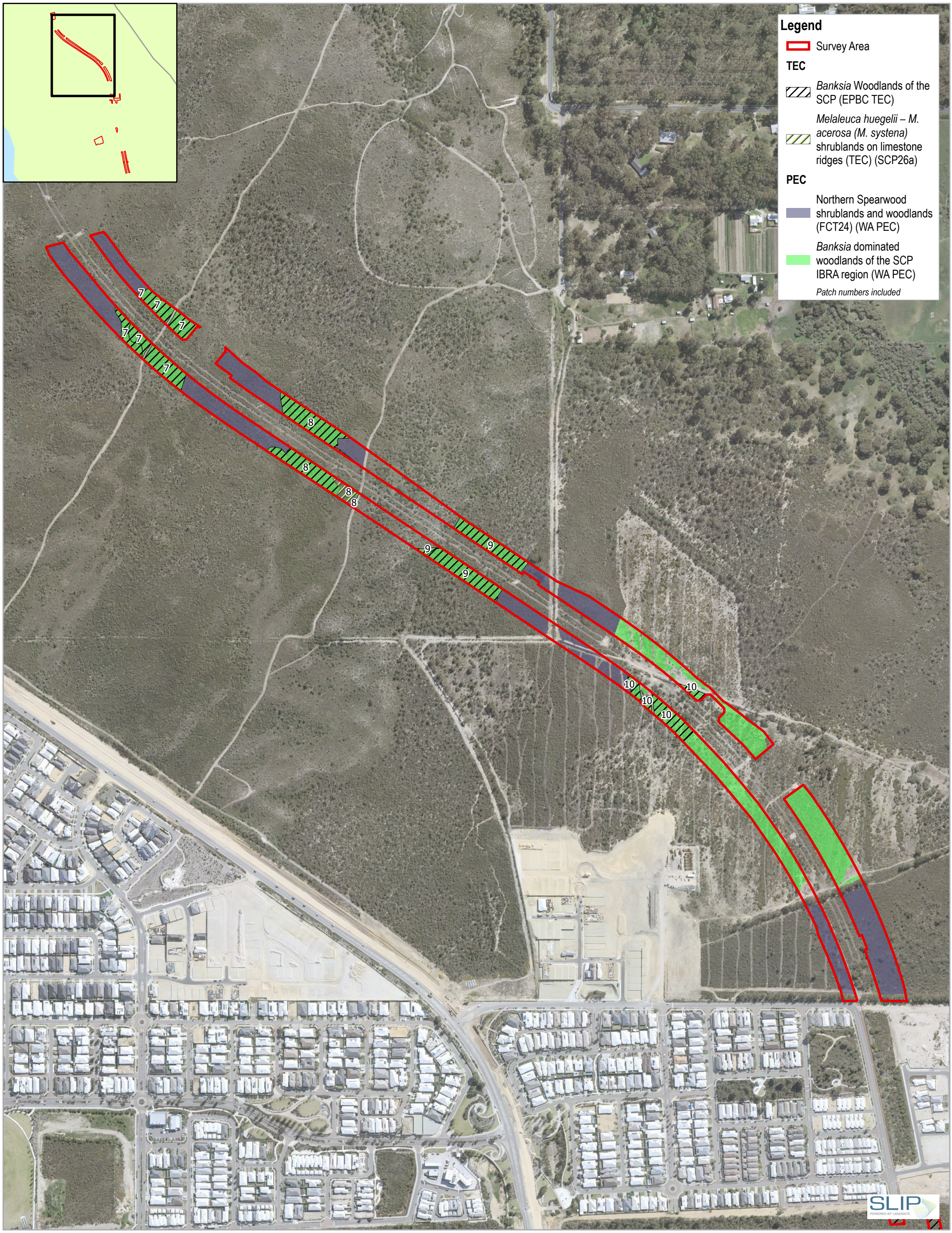
Conservation Significant Ecological Communities - Area A

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 5-1

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
Print date: 10 Mar 2020 - 15:33

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60 80 100 120 140 160 180 200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

GHD

PTA
Yanchep Rail Extension Part 1

Conservation Significant Ecological Communities - Area B

Project No.	**12514413**
Revision No.	**0**
Date	**10/03/2020**

FIGURE 5-2

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
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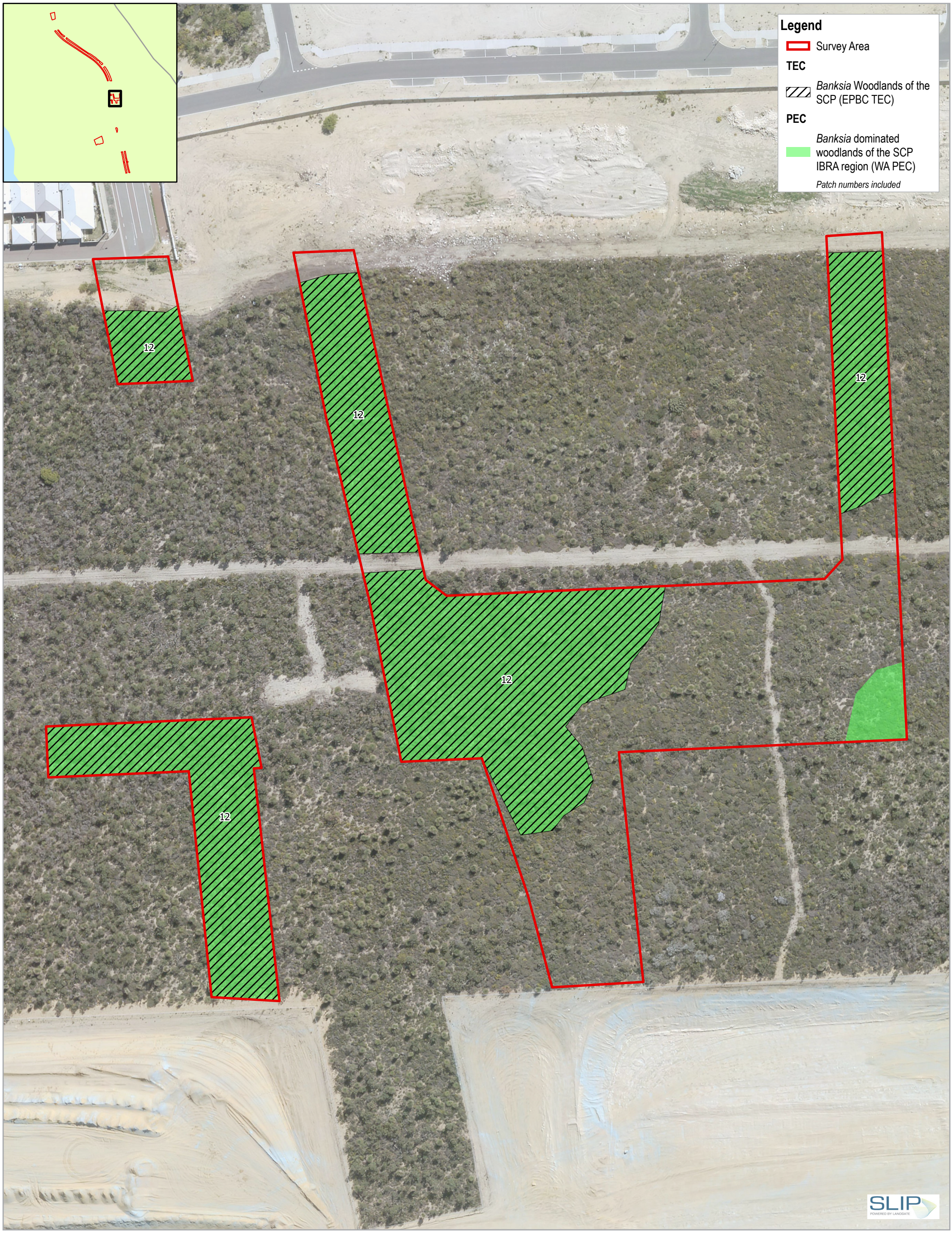


Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Conservation Significant Ecological Communities - Area C

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 5-3

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
Print date: 10 Mar 2020 - 15:34

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Conservation Significant Ecological Communities - Area D

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 5-4

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
Print date: 10 Mar 2020 - 15:34

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20 N

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

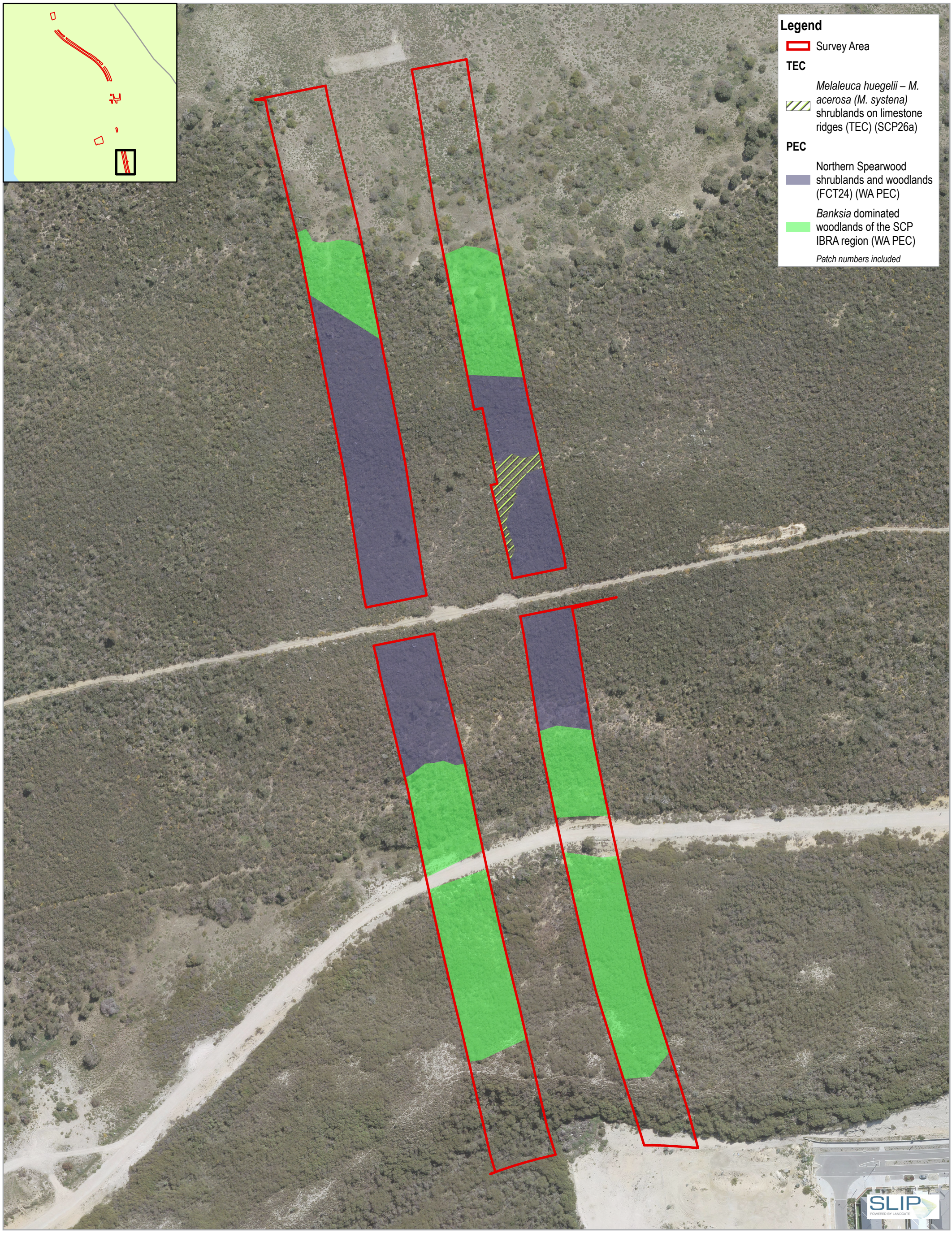
Conservation Significant Ecological Communities - Area E

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 5-5

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
Print date: 10 Mar 2020 - 15:34

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

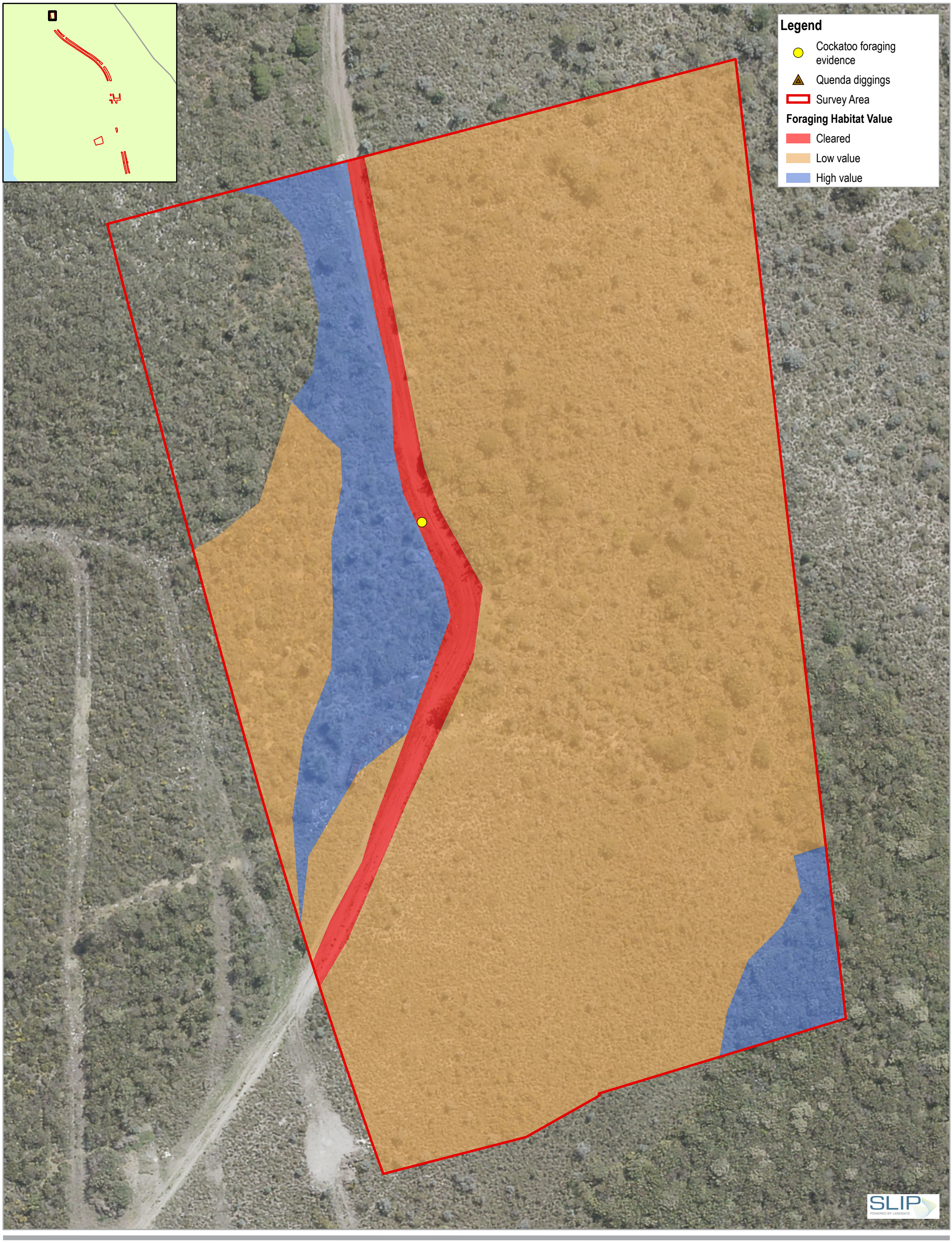
Conservation Significant Ecological Communities - Area F

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 5-6

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_005_ConsigCommunities_YREPart1_RevD
Print date: 10 Mar 2020 - 15:35

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

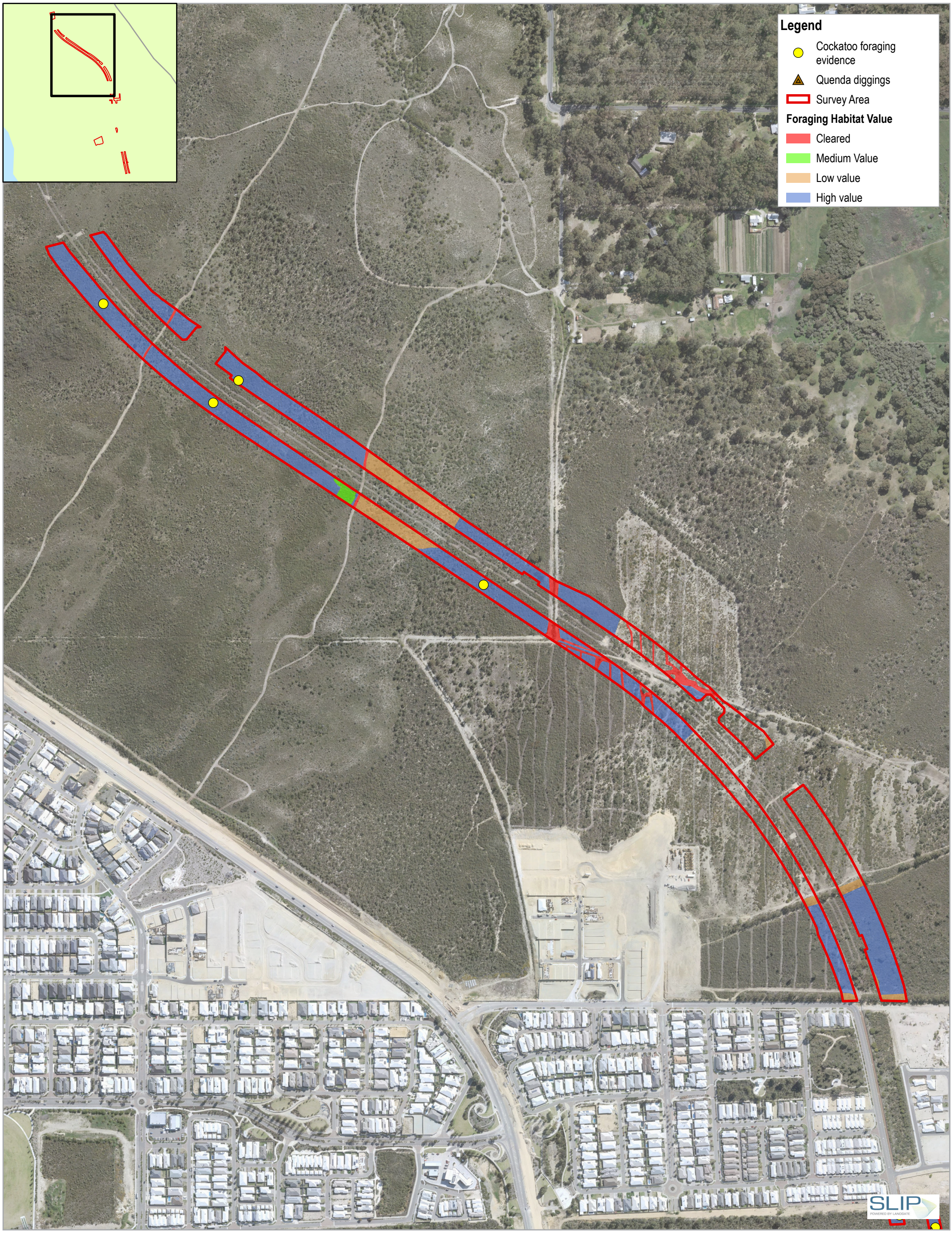
Black Cockatoo Habitat Value - Area A

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-1

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:42

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60 80 100 120 140 160 180 200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

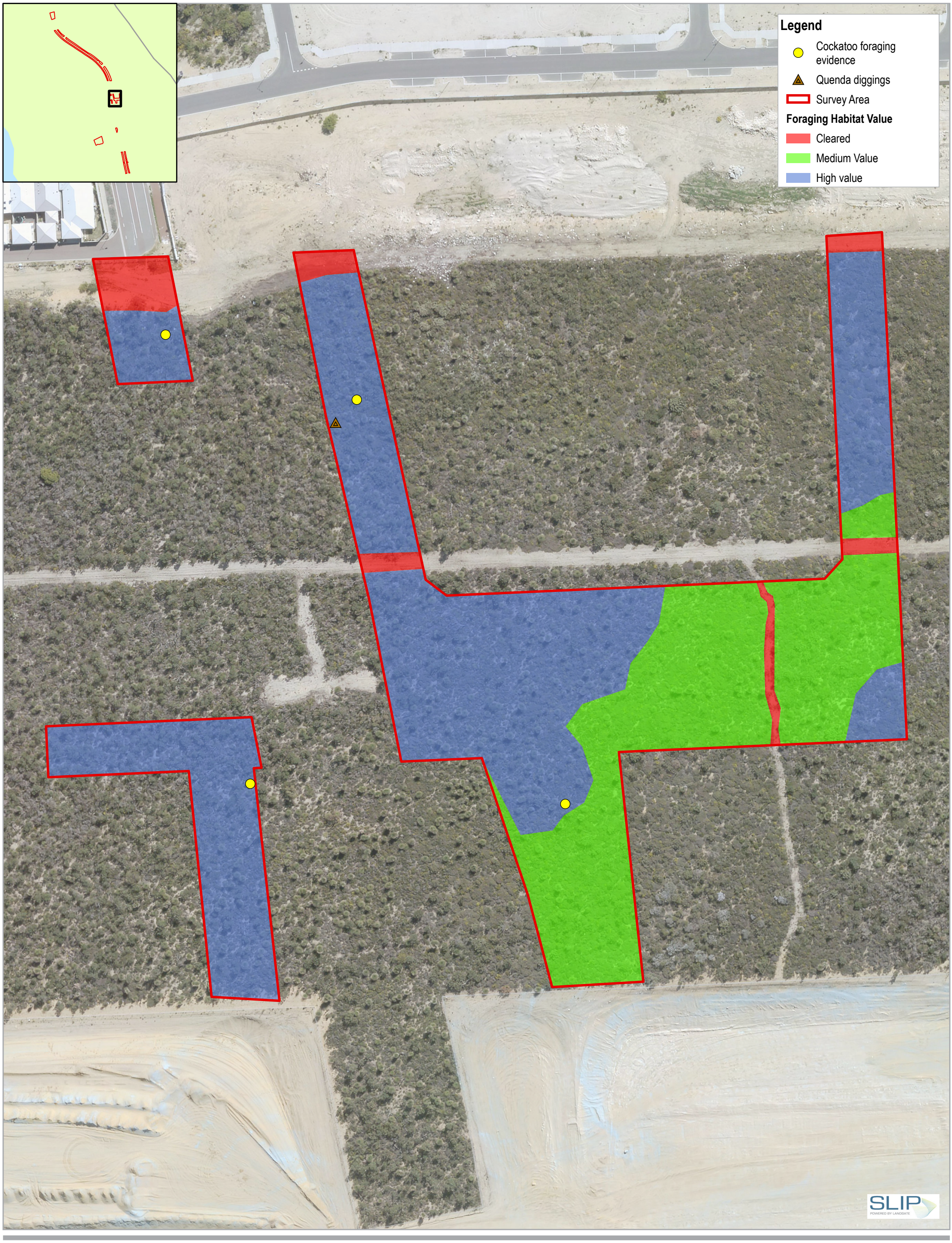
Black Cockatoo Habitat Value - Area B

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-2

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:42

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

GHD

PTA
Yanchep Rail Extension Part 1

Black Cockatoo Habitat Value - Area C

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-3

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:43

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Paper Size ISO A3

0 20

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

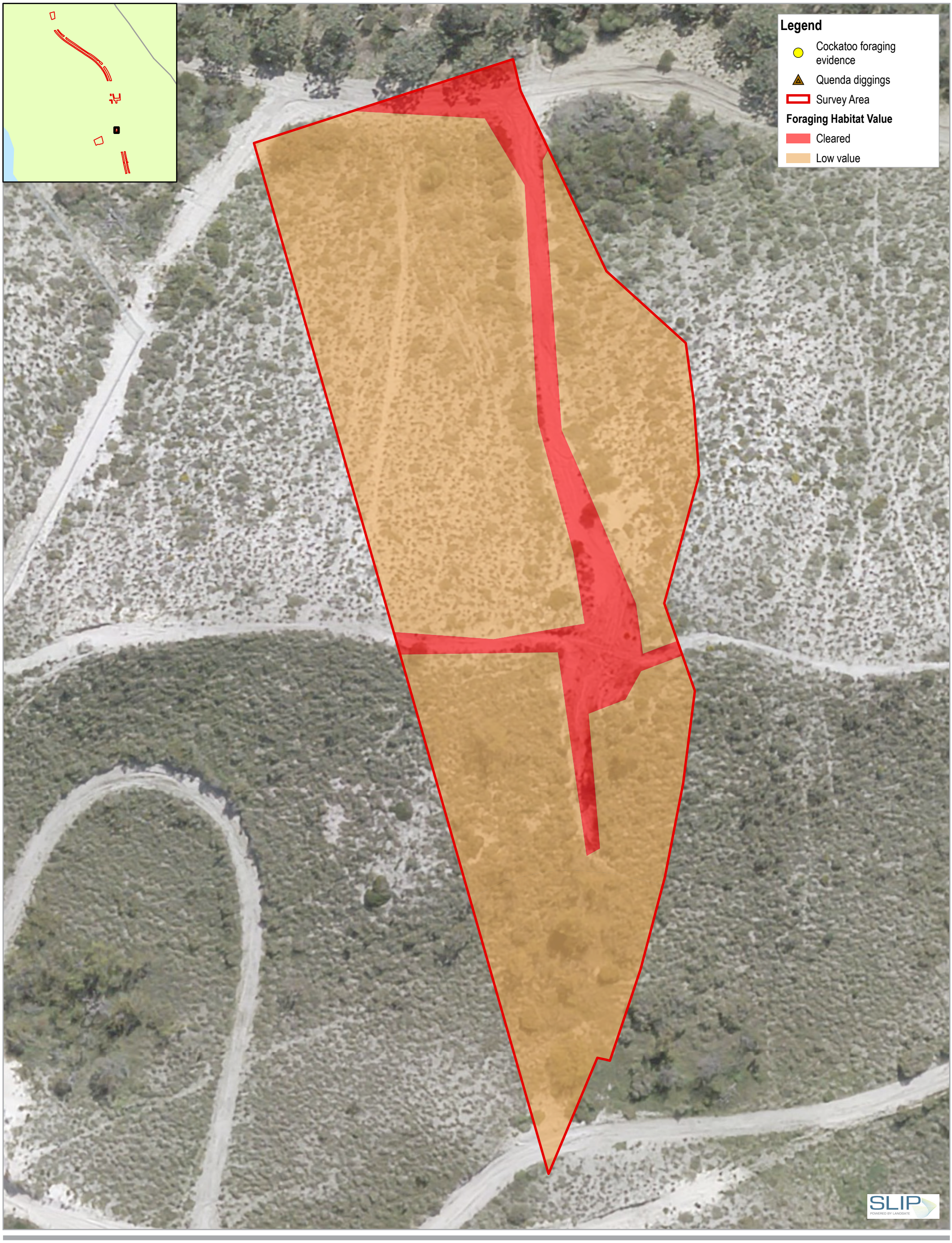
Black Cockatoo Habitat Value - Area D

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-4

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:43

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 N

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

PTA
Yanchep Rail Extension Part 1

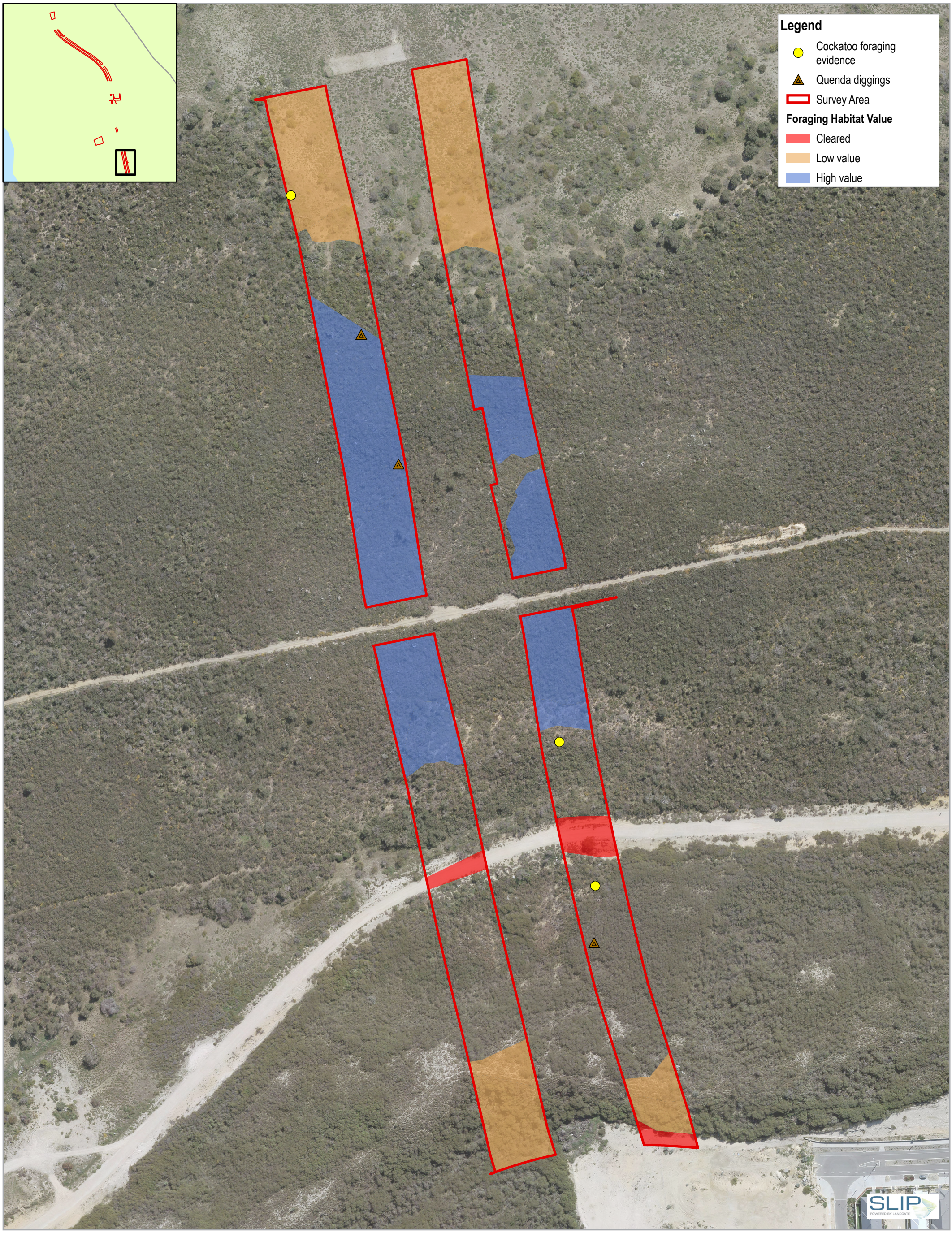
Black Cockatoo Habitat Value - Area E

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-5

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:43

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan



Paper Size ISO A3

0 20 40 60

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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GHD

PTA
Yanchep Rail Extension Part 1

Black Cockatoo Habitat Value - Area F

Project No. **12514413**
Revision No. **0**
Date **10/03/2020**

FIGURE 6-6

\\ghdnet\ghd\AU\Perth\Projects\61\12514413\GIS\Maps\Working\12514413_YRE Part1\12514413_YRE Part1.aprx\12514413_006_FaunaHabitats_YREPart1_RevC
Print date: 10 Mar 2020 - 15:44

Data source: GHD: Survey Area - 20190808, TEC/PEC - 20191211; Landgate: Imagery - August 2019. Created by: bmorgan

Appendix B – Relevant legislation, conservation codes

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of Agriculture, Water and Environment (DAWE).

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

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.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

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.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State *Biodiversity and Conservation Act 2016*

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation and protection of biodiversity and biodiversity components, as well as the promotion of the ecologically sustainable use of biodiversity components in Western Australia. The BC Act replaces both the repealed *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act), as well as their associated regulations. To attain the objectives of the BC Act, principles of ecological sustainable development have been established:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- The conservation of biodiversity and ecological integrity should be a fundamental consideration indecision-making
- Improved valuation, pricing and incentive mechanisms should be promoted.

The BC Act is administered by the Department of Biodiversity Conservation and Attractions (DBCA).

State *Biosecurity and Agriculture Management Act 2007*

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976.* The main purposes of the BAM Act and its regulations are to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- Manage the impact and spread of those pests already present in the state
- Safely manage the use of agricultural and veterinary chemicals
- Increased control over the sale of agricultural products that contain violative chemical residues.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State BC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act. The BC Act provides for the statutory listing of State TECs by the Minister. The legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs. Prior to the BC Act, the DBCA has be identifying and listing TECs to one of four categories (Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable) through a non-statutory process.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act.

Conservation codes and definitions for TECs listed under the EPBC Act and/ or BC Act

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories (BC Act)	
Threatened Ecological Communities	

Categories	Definition
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.
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.
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.
Collapsed ecological communities	
An ecological community is eligible for listing as a collapsed ecological community at a particular time if, at that time – (a) there is no reasonable doubt that the last occurrence of the ecological community has collapsed); or (b) the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover – (i) its species composition or structure; or (ii) its species composition and structure. Section 33 of the BC Act provides for a collapsed ecological community to be regarded as a threatened ecological community if it is discovered in a state that no longer makes it eligible for listing as a collapsed ecological community.	

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	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 ≤100 ha). 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.
Priority 2	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). 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.

Category	Description
Priority 3	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 with 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 may 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 4	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. (i) 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. (ii) 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. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority 5	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.

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in ‘pristine’ condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)
- Being poorly reserved.

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Flora and fauna

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the BC Act can warrant referral to the DAWE and/or the EPA.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for flora and fauna used in the EPBC Act align with the International Union for Conservation of Nature (IUCN) Red List criteria, which are internationally recognised as providing best practice for assigning the conservation status of species. The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

The State conservation level of flora and fauna species and their significance status also follows the IUCN Red List criteria. Under the BC Act flora and fauna can be listed as Threatened, Extinct and as Specially Protected species.

Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such. The assessment of the conservation status of Threatened species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria. Specially protected species meet one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as Threatened or Extinct species under the BC Act cannot also be listed as Specially Protected 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.

For the purposes of this assessment, all species listed under the EPBC Act, BC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act and BC Act listed flora and fauna species

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines
Vulnerable (VU)	Threatened species considered to be "facing a high risk of extinction in the wild in the medium term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.
Extinct species	
Extinct (EX)	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
Extinct in the Wild (EW)	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Specially protected species	
Migratory (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes 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 fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species

Conservation category	Definition
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	Poorly-known taxa 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.
Priority 2	Poorly-known taxa 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.
Priority 3	Poorly-known taxa 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.
Priority 4	Rare, Near Threatened and other taxa in need of monitoring A. Rare: Taxa 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 taxa are usually represented on conservation lands. B. Near Threatened. Taxa 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. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016a, b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty-two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

References

English, V and Blyth, J 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Perth, Department of Conservation and Land Management.

EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA.

EPA 2016a, *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Perth, WA.

EPA 2016b, *Environmental Factor Guideline - Flora and Vegetation*, EPA, Perth, WA.

Appendix C – Desktop searches

EPBC Act PMST Report (5 km buffer)

NatureMap Flora Report (5 km buffer)

NatureMap Fauna Report (5 km buffer)

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.

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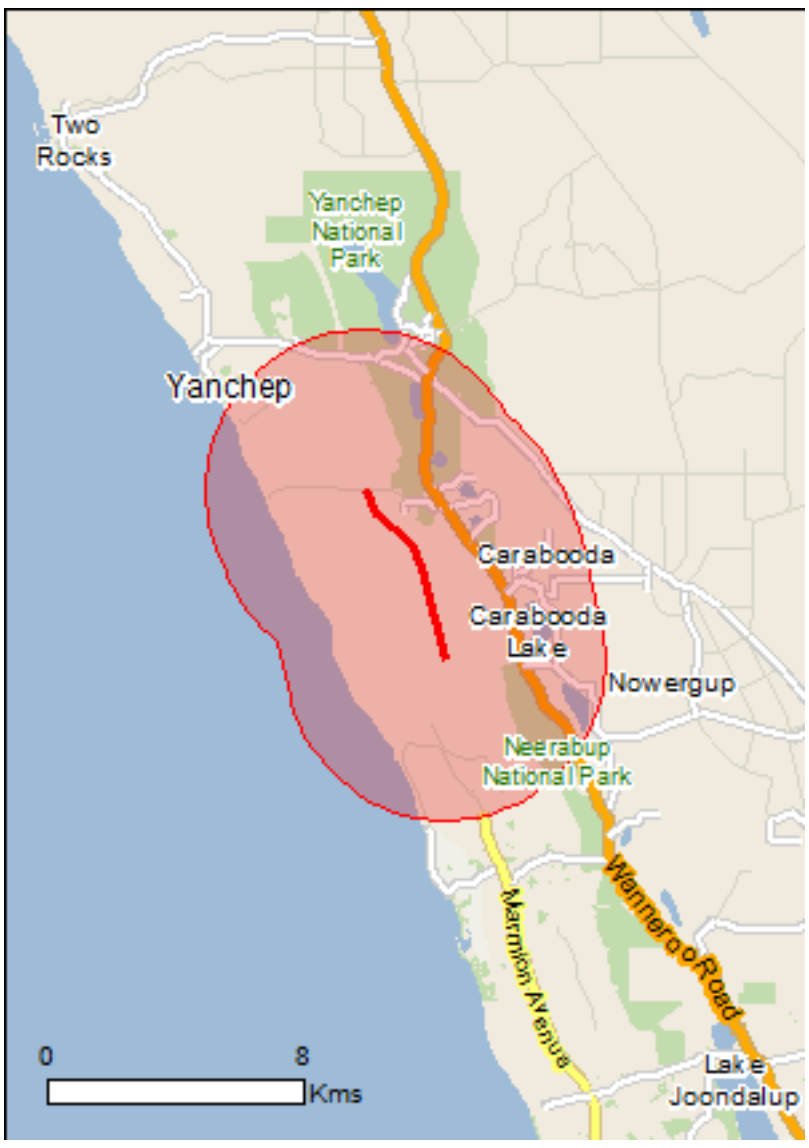

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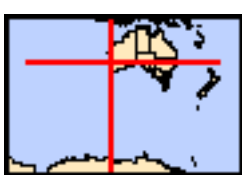

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	46
Listed Migratory Species:	43

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:	71
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	3
Regional Forest Agreements:	None
Invasive Species:	33
Nationally Important Wetlands:	1
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
Aquatic Root Mat Community in Caves of the Swan Coastal Plain	Endangered	Community known to occur within area
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Insects		
Hesperocolletes douglasi Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Plants		
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	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 likely to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat likely to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Melaleuca sp. Wanneroo (G.J. Keighery 16705) [89456]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may 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		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
[Motacilla cinerea](#)		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#)		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Limosa lapponica](#)		
Bar-tailed Godwit [844]		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 known to occur within area
[Tringa nebularia](#)		
Common Greenshank, Greenshank [832]		Species or species habitat likely to 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		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
[Anous stolidus](#)		
Common Noddy [825]		Species or species habitat may occur within area
[Anous tenuirostris melanops](#)		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
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 acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat may 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
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Stigmatopora nigra		
Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus		
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris		
Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus pooleorum		
Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Neerabup	WA
Neerabup	WA
Yanchep	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		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		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
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		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
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		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 aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
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

Name	Status	Type of Presence
		area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to 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
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to 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
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Loch McNess System	WA

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

-31.582134 115.672275,-31.588129 115.675021,-31.595001 115.685149,-31.600411 115.688411,-31.622925 115.694934,-31.622925 115.694934

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
-Department of Land and Resource Management, Northern Territory
-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, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-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.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

NatureMap
Mapping Western Australia's biodiversity

NatureMap YRE P1 CS Flora Species Report

Created By Guest user on 06/11/2019

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	31° 34' 47" S,115° 40' 18" E 31° 35' 15" S,115° 40' 30" E 31° 35' 48" S,115° 41' 14" E 31° 35' 59" S,115° 41' 22" E 31° 37' 12" S,115° 41' 38" E
Group By	Family

Family	Species	Records
Brassicaceae	1	1
Dasypogonaceae	1	2
Dilleniaceae	1	5
Ericaceae	2	6
Fabaceae	2	2
Haemodoraceae	2	7
Myrtaceae	2	2
Stylidiaceae	1	10
TOTAL	**12**	**35**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Brassicaceae					
1.	3042	*Lepidium pseudotasmanicum*		P4	
Dasypogonaceae					
2.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
Dilleniaceae					
3.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
Ericaceae					
4.	40801	*Leucopogon maritimus*		P1	
5.	19460	*Leucopogon sp. Yanchep (M. Hislop 1986)*		P3	
Fabaceae					
6.	3237	*Acacia benthamii*		P2	
7.	20348	*Sphaerolobium calcicola*		P3	
Haemodoraceae					
8.	11388	*Conostylis pauciflora subsp. euryrhipis*		P4	
9.	11657	*Conostylis pauciflora subsp. pauciflora*		P4	
Myrtaceae					
10.	34161	*Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)*		P1	
11.	13091	*Eucalyptus argutifolia (Wabling Hill Mallee)*		T	
Stylidiaceae					
12.	13127	*Stylidium maritimum*		P3	

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.

NatureMap
Mapping Western Australia's biodiversity

NatureMap YRE P1 CS Fauna Species Report

Created By Guest user on 06/11/2019

Kingdom	Animalia
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	31° 34' 47" S,115° 40' 18" E 31° 35' 15" S,115° 40' 30" E 31° 35' 48" S,115° 41' 14" E 31° 35' 59" S,115° 41' 22" E 31° 37' 12" S,115° 41' 38" E
Group By	Species Group

Species Group	Species	Records
Bird	19	369
Invertebrate	4	472
Mammal	5	35
Reptile	2	3
TOTAL	**30**	**879**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Bird					
1.	24506	*Anous tenuirostris subsp. melanops (Australian Lesser Noddy)*		T	
2.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
3.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
4.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
5.	25738	*Calidris canutus (Red Knot, knot)*		IA	
6.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
7.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
8.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
9.	24790	*Calidris tenuirostris (Great Knot)*		T	
10.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
11.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
12.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
13.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
14.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
15.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
16.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
17.	48597	*Thalasseus bergii (Crested Tern)*		IA	
18.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
19.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
Invertebrate					
20.	33971	*Austroconops mcmillani (McMillan's biting midge (Swan Coastal Plain), biting midge (southwest))*		P2	
21.	48582	*Hurleya sp. (WAM C23193) (Crystal Cave Crangonyctoid, cave shrimp)*		T	Y
22.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
23.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Mammal					
24.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
25.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
26.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
27.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
28.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
Reptile					
29.	25346	*Dermochelys coriacea (Leatherback Turtle)*		T	
30.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement

Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area

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.

Appendix D – Flora Data

Flora species list

Quadrat data

Flora likelihood of occurrence assessment

Flora species list – Part 1

Family	*Species*	Status
Aizoaceae	*Carpobrotus edulis*	*
Amaranthaceae	*Ptilotus sericostachyus* subsp. *sericostachyus*	
Apiaceae	*Daucus glochidiatus*	
Apiaceae	*Eryngium pinnatifidum*	
Asparagaceae	*Acanthocarpus preissii*	
Asparagaceae	*Lomandra maritima*	
Asparagaceae	*Sowerbaea laxiflora*	
Asparagaceae	*Thysanotus thyrsoides*	
Asphodelaceae	*Trachyandra divaricata*	*
Asteraceae	*Arctotheca calendula*	*
Asteraceae	*Lagenophora huegelii*	
Asteraceae	*Millotia myosotidifolia*	
Asteraceae	*Olearia axillaris*	
Asteraceae	*Podolepis gracile*	
Asteraceae	*Podotheca chrysantha*	
Asteraceae	*Podotheca gnaphalioides*	
Asteraceae	*Senecio pinnatifolius* var. *latilobus*	
Asteraceae	*Sonchus* sp.	*
Asteraceae	*Ursinia anthemoides*	*
Asteraceae	*Waitzia suaveolens*	
Brassicaceae	*Brassica* sp.	*
Brassicaceae	*Heliophila pusilla*	*
Brassicaceae	*Stenopetalum gracile*	
Campanulaceae	*Isotoma hypocrateriformis*	
Campanulaceae	*Lobelia tenuior*	
Caryophyllaceae	*Petrorhagia dubia*	*
Casuarinaceae	*Allocasuarina humilis*	
Chenopodiaceae	*Rhagodia baccata*	
Cyperaceae	*Lepidosperma calcicola*	
Cyperaceae	*Lepidosperma gladiatum*	
Cyperaceae	*Mesomelaena pseudostygia*	
Cyperaceae	*Tetraria octandra*	
Dilleniaceae	*Hibbertia ?spicata*	
Dilleniaceae	*Hibbertia hypericoides*	
Dilleniaceae	*Hibbertia subvaginata*	
Ericaceae	*Conostephium pendulum*	
Ericaceae	*Leucopogon australis*	
Ericaceae	*Leucopogon polymorphus*	
Ericaceae	*Leucopogon propinquus*	
Ericaceae	*Lysinema ciliatum*	
Euphorbiaceae	*Euphorbia peplus*	*
Euphorbiaceae	*Euphorbia terracina*	*

Family	*Species*	Status
Fabaceae	*Acacia cochlearis*	
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*	
Fabaceae	*Acacia pulchella* var. *glaberrima*	
Fabaceae	*Acacia rostellifera*	
Fabaceae	*Acacia saligna*	
Fabaceae	*Bossiaea eriocarpa*	
Fabaceae	*Daviesia divaricata*	
Fabaceae	*Gastrolobium capitatum*	
Fabaceae	*Gompholobium tomentosum*	
Fabaceae	*Hardenbergia comptoniana*	
Fabaceae	*Jacksonia calcicola*	
Fabaceae	*Jacksonia furcellata*	
Fabaceae	*Jacksonia sternbergiana*	
Fabaceae	*Kennedia prostrata*	
Fabaceae	*Lupinus cosentinii*	*
Fabaceae	*Trifolium arvense*	*
Geraniaceae	*Pelargonium capitatum*	*
Goodeniaceae	*Lechenaultia linarioides*	
Goodeniaceae	*Scaevola canescens*	
Goodeniaceae	*Scaevola thesioides*	
Haemodoraceae	*Anigozanthos manglesii*	
Haemodoraceae	*Conostylis aculeata* subsp. *cygnorum*	
Haemodoraceae	*Conostylis bracteata*	P3
Haemodoraceae	*Conostylis candicans* subsp. *candicans*	
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*	
Haemodoraceae	*Conostylis setigera*	
Hemerocallidaceae	*Dianella revoluta*	
Hemerocallidaceae	*Tricoryne tenella*	
Hemerocallidaceae	*Tricoryne elatior*	
Iridaceae	*Gladiolus caryophyllaceus*	*
Iridaceae	*Moraea flaccida*	* DP
Iridaceae	*Orthrosanthus laxus*	
Iridaceae	*Romulea rosea*	*
Lamiaceae	*Hemiandra pungens*	
Lauraceae	*Cassytha flava*	
Lauraceae	*Cassytha racemosa forma racemosa*	
Loranthaceae	*Nuytsia floribunda*	
Montiaceae	*Calandrinia ?liniflora*	
Myrtaceae	*Calothamnus quadrifidus*	
Myrtaceae	*Eucalyptus decipiens*	
Myrtaceae	*Eucalyptus* sp.	Planted
Myrtaceae	*Leptospermum* sp.	
Myrtaceae	*Melaleuca huegelii*	
Myrtaceae	*Melaleuca systena*	

Family	*Species*	Status
Phyllanthaceae	*Phyllanthus calycinus*	
Poaceae	*Austrostipa flavescens*	
Poaceae	*Avena barbata*	*
Poaceae	*Briza maxima*	*
Poaceae	*Bromus diandrus*	*
Poaceae	*Ehrharta calycina*	*
Poaceae	*Lagurus ovatus*	*
Poaceae	*Lolium* sp.	*
Poaceae	*Poa poiformis*	
Poaceae	*Rytidosperma* sp.	
Primulaceae	*Lysimachia arvensis*	*
Proteaceae	*Banksia attenuata*	
Proteaceae	*Banksia dallanneyi* var. *dallanneyi*	
Proteaceae	*Banksia menziesii*	
Proteaceae	*Banksia sessilis* var. *cygnorum*	
Proteaceae	*Conospermum triplinervium*	
Proteaceae	*Grevillea preissii*	
Proteaceae	*Hakea costata*	
Proteaceae	*Hakea lissocarpha*	
Proteaceae	*Hakea prostrata*	
Proteaceae	*Hakea ruscifolia*	
Proteaceae	*Hakea trifurcata*	
Proteaceae	*Petrophile axillaris*	
Proteaceae	*Petrophile brevifolia* subsp. *brevifolia*	
Proteaceae	*Petrophile macrostachya*	
Proteaceae	*Stirlingia latifolia*	
Ranunculaceae	*Clematis linearifolia*	
Restionaceae	*Desmocladus asper*	
Restionaceae	*Desmocladus fasciculatus*	
Restionaceae	*Desmocladus flexuosus*	
Rhamnaceae	*Cryptandra* sp.	
Rhamnaceae	*Spyridium globulosum*	
Rubiaceae	*Opercularia vaginata*	
Scrophulariaceae	*Dischisma arenarium*	*
Stylidiaceae	*Stylidium brunonianum*	
Stylidiaceae	*Stylidium calcaratum*	
Stylidiaceae	*Stylidium repens*	
Stylidiaceae	*Stylidium schoenoides*	
Thymelaeaceae	*Pimelea ferruginea*	
Thymelaeaceae	*Pimelea rosea*	
Violaceae	*Hybanthus calycinus*	
Xanthorrhoeaceae	*Xanthorrhoea preissii*	
Zamiaceae	*Macrozamia riedlei*	

* indicates introduced species; DP Declared Plant; P3 Priority 3 species

Quadrat and Releve data – Additional areas only

Site ID:	01	Project:	12514413
Type:	Quadrat	**Size:**	10 x 10 m
Date:	15/10/19	**Described by:**	GHD
Co-ordinates:			
Landform and slope:	Upper slope		
Drainage:	Good		
Soil colour & type:	Grey sand		
Surface Component	Humus/litter 20%		
Vegetation type:	*Lomandra maritima* herbland		
Vegetation condition:	Excellent		
Fire age & intensity:	Old (>5 yr), no damage		
Disturbances:	Weeds (minor)		
Leaf litter:	Moderate		
Wood litter:	Moderate		

Species List:

Family	Taxon	Status	Stratum	Cover (%)
Asparagaceae	*Lomandra maritima*		G	30-70
Myrtaceae	*Melaleuca systena*		G	10-30
Haemodoraceae	*Conostylis candicans*		G	10-30
Dilleniaceae	*Hibbertia spicata* subsp. *spicata*		G	10-30
Restionaceae	*Desmocladus flexuosus*		G	<10
Lamiaceae	*Hemiandra pungens*		G	<10
Apiaceae	*Daucus glochidiatus*		G	<10
Asteraceae	*Podotheca gnaphalioides*		G	<2N
Asteraceae	*Senecio pinnatifolius* var. *latilobus*		G	<2N
Poaceae	*Austrostipa flavescens*		G	<2N
Iridaceae	*Romulea rosea*	*	G	<2N
Hemerocallidaceae	*Tricoryne elatior*		G	<2N
Brassicaceae	*Heliophila pusilla*	*	G	<2N
Poaceae	*Rytidosperma sp.*		G	<2N
Restionaceae	*Desmocladus fasciculatus*		G	<2N
Asteraceae	*Millotia myosotidifolia*		G	<2N
Geraniaceae	*Pelargonium capitatum*	*	G	<2T
Lauraceae	*Cassytha racemosa forma racemosa*		G	<2T
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*		G	<2T
Phyllanthaceae	*Phyllanthus*		G	<2T
Violaceae	*Hybanthus calycinus*		G	<2T
Fabaceae	*Hardenbergia comptoniana*		G	<2T
Primulaceae	*Lysimachia arvensis*	*	G	<2T

Photo – Quadrat 1

Site ID:	Q02	Project:	12514413
Type:	Quadrat	**Size:**	10 x 10 m
Date:	16/10/19	**Described by:**	GHD
Co-ordinates:			
Landform and slope:	Ridge, steep slope		
Drainage:	Very good		
Soil colour & type:	Grey/white sand		
Surface Component	Loose soil 50%, Humus/litter sparse		
Vegetation type:	Low shrubland		
Vegetation condition:	Very Good		
Fire age & intensity:	Old (>5 yr)		
Disturbances:	Weeds, tracks		
Leaf litter:	Sparse		
Wood litter:	Negligible		

Species list

Family	Taxon	Status	Stratum	Cover (%)
Myrtaceae	*Melaleuca systena*		M1	2-10
Asparagaceae	*Lomandra maritima*		G	10-30
Restionaceae	*Desmocladus flexuosus*		G	<10
Rubiaceae	*Opercularia vaginata*		G	2-10
Phyllanthaceae	*Phyllanthus calycinus*		G	<2T
Poaceae	*Ehrharta calycinus*	*	G	<2N
Primulaceae	*Lolium* sp.	*	G	<2N
Poaceae	*Hardenbergia comptoniana*		G	<2T
Brassicaceae	*Heliophila pusilla*	*	G	<2T
Brassicaceae	*Brassica* sp.	*	G	<2T
Asteraceae	*Podolepis gracilis*		G	<2N
Poaceae	*Lagurus obovatus*	*	G	<2N
Euphorbiaceae	*Euphorbia terracina*	*	G	<2N
Haemodoraceae	*Conostylis candicans* subsp. *candicans*		G	<2N
Asparagaceae	*Acanthocarpus preissii*		G	<2T
Poaceae	*Bromus* sp.	*	G	<2N
Fabaceae	*Gompholobium tomentosum*		G	<2T
Dilleniaceae	*Hibbertia subvaginata*		G	<2T

Photo – Quadrat 2

Site ID:	Q03	Project:	12514413
Type:	Quadrat	**Size:**	10 x 10 m
Date:	16/10/19	**Described by:**	GHD
Co-ordinates:			
Landform and slope:	Ridge/Mid-slope, moderate slope		
Drainage:	Good		
Soil colour & type:	Grey sand		
Surface Component	Loose soil 5%, Humus/litter 20%		
Vegetation type:	Acacia tall shrubland		
Vegetation condition:	Good		
Fire age & intensity:	Old (>5 yr)		
Disturbances:	Weeds		
Leaf litter:	Moderate		
Wood litter:	Sparse		

Species List:

Family	Taxon	Status	Stratum	Cover (%)
Fabaceae	*Acacia rostellifera*		M1	70-100
Asparagaceae	*Acanthocarpus preissii*		G	30-70
Asteraceae	*Sonchus* sp.	*	G	30-70
Poaceae	*Bromus diandrus*	*	G	10-30
Poaceae	*Avena barbata*	*	G	<10
Haemodoraceae	*Conostylis candicans* subsp. *candicans*		G	<2N
Primulaceae	*Lysimachia arvensis*	*	G	<2N
Poaceae	*Lagurus ovatus*	*	G	<2N
Euphorbiaceae	*Euphorbia terracina*	*	G	<2N
Asparagaceae	*Lomandra maritima*		G	<2T
Ranunculaceae	*Clematis linearifolia*		G	<2T
Cyperaceae	*Lepidosperma calcicola*		G	<2T
Myrtaceae	*Melaleuca systena*		G	<2T
Restionaceae	*Desmocladus flexuosus*		G	<2T
Phyllanthaceae	*Phyllanthus calycinus*		G	<2T
Asteraceae	*Sonchus* sp.	*	G	<2N
Brassicaceae	*Heliophila pusilla*	*	G	<2T

Photo – Quadrat 3

Releve data

No.	Description
1	Vegetation code: VT03 Vegetation description: *Banksia sessilis* tall open shrubland over *Calothamnus quadrifidus* shrubland over mixed low shrubs. Soil and landform: High white sandy dune with limestone outcropping Cover: *Banksia sessilis* <30% to 1.8 m over *Calothamnus quadrifidus* <60% over *Hibbertia hypericoides* <30% Excellent. 
2	Vegetation code: VT14 Vegetation description: *Acacia* tall shrubland over mixed shrubs and sedges Soil and landform: Lower slope with in white/ grey sand Cover: *Acacia cochlearis, A. saligna* to 3 m and <20% cover with *Acanthocarpus preissii* <60% cover and patches of *Lepidosperma gladiatum.* Very Good

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within study area from field survey results.
Likely	Species previously recorded within 5 km and large areas of suitable habitat occur in the study area.
Possible	Species previously recorded within 5 km and areas of suitable habitat occur/may occur in the study area.
Unlikely	Species previously recorded within 5 km, but suitable habitat does not occur in the study area.
Highly unlikely	Species not previously recorded within 5 km, suitable habitat does not occur in the study area and/or the study area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Source information - desktop searches

PMST – DEE Protected Matters Search Tool (PMST) to identify flora listed under the EPBC Act potentially occurring within the study area

NM – DBCA *NatureMap* (accessed November 2019)

Flora likelihood of occurrence assessment for conservation significant flora

Family	Taxon	Status		Description and closest record information (if available) (WA Herbarium 1998–)	Likelihood of Occurrence	Source
		BC Act/ DBCA	EPBC Act			
Brassicaceae	*Lepidium pseudotasmanicum*	P4	-	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Fl. white-green, Feb, July or Dec. Loam, sand. Herbarium records indicates the species often grows in association with granite or damp locations (e.g. near creeks). There are two records within 5 km of the survey area, one dated 1953 (location Yanchep) and the other from Pipidinny Swamp, c. 3.4 km east of the survey area.	**Unlikely** – there is limited to no suitable habitat within the survey area, however this species can be cryptic.	NM, WAHERB
Cyperaceae	*Eleocharis keigheryi*	T	V	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green, Aug to Nov. Keighery's Eleocharis grows in small clumps in a substrate of clay or sandy loam. This species is emergent in freshwater creeks, and transient waterbodies such as drainage lines and claypans in water to approximately 15 cm deep (DEE 2018).	**Unlikely** – no suitable habitat is present within the survey area. This species can be cryptic however the survey was undertaken during the reported flowering period.	PMST

Family	Taxon	Status		Description and closest record information (if available) (WA Herbarium 1998–)	Likelihood of Occurrence	Source
		BC Act/ DBCA	EPBC Act			
				The closest record is c. 22 km east of the survey area.		
Cyperaceae	*Lepidosperma rostratum*	T	E	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Flowers brown. The species grows in peaty sand and clay amongst low heath, in winter-wet swamps (DEE 2018). Flowering May to June and the distinctive fruits are beaked toward the base of the style, and generally appear between late June and August. The closest record is c. 18 km northeast of the survey area.	**Unlikely** – no suitable habitat is present within the survey area. It is unlikely there is suitable habitat adjacent to the survey area.	PMST
Dilleniaceae	*Hibbertia spicata* subsp. *leptotheca*	P3	-	Erect or spreading shrub, 0.2-0.5 m high. Fl. yellow, Jul to Oct. Sand. Near-coastal limestone ridges, outcrops & cliffs. Herbarium records indicates the species often grows in sands over limestone and in association with *Melaleuca, Acacia and Banksia* spp. There are two records within 5 km of the survey area, one dated 1953 (location Yanchep) and the other from Pipdinny Swamp, c. 3.4 km east of the survey area.	**Possible –** this species was recorded during the previous surveys south of the survey area. There is suitable habitat within the survey area (VT02, VT03, VT04). It is likely there is suitable habitat adjacent to the survey area.	NM, TPFL, WAHERB GHD
Ericaceae	*Leucopogon maritimus*	P1	-	Low, spreading shrub to 0.4 m high, to 0.6 m wide. Fl. Pink. Mar-May. Deep, calcareous sands on the mid to upper slopes of dunes or in shallows and over limestone. Often grows in association with *Melaleuca, Acacia, Spyridium, Leucopogon, Acanthocarpus, Lomandra and Olearia* spp. There are a number of records within 5 km of the survey area, the closest, c. 2 km northwest of the survey area.	**Possible** – there is suitable habitat present within the survey area (VT02, VT03, VT04, VT05). This species is not cryptic. It is likely there is suitable habitat adjacent to the survey area.	NM, WAHERB
Ericaceae	*Leucopogon* sp. Yanchep (M. Hislop 1986)	P3	-	Erect shrub, 0.15-1 m high, to 0.6 m wide. Fl. white/pink, Apr to Jun or Sep. Light grey-yellow sand, brown loam, limestone,	**Possible** – there is suitable habitat present within the survey area (VT02, VT03, VT04, VT05). This species is not cryptic. It is	NM, WAHERB

Family	Taxon	Status		Description and closest record information (if available) (WA Herbarium 1998–)	Likelihood of Occurrence	Source
		BC Act/ DBCA	EPBC Act			
				laterite, granite. Coastal plain, breakaways, valley slopes, low hills. There are a number of records within 5 km of the survey area, the closest, c. 2.5 km north-west of the survey area.	likely there is suitable habitat adjacent to the survey area.	
Euphorbiaceae	*Beyeria cinerea* subsp. *cinerea*	P3		Woody perennial shrub to 1 m. Fl. yellow, dioecious and without petals. Grows on sand over limestone, on slopes, hill crests and ridges.	**Possible** – this species was recorded during the 2012 survey. There is suitable habitat present within the survey area (VT02, VT03, VT05). This species is not cryptic, but was not re-located during the 2016-2018 surveys.	GHD
Fabaceae	*Acacia benthamii*	P2	-	Shrub, ca 1 m high. Fl. yellow, Aug to Sep. Sand. Typically on limestone breakaways. There are a number of records c. 6.5 km north of the survey area. There is one record within 5 km of the survey area, dated 1953 (location Yanchep).	**Unlikely** – there is no suitable habitat present within the survey area. This species is not cryptic, but the survey was outside of the reported flowering period.	NM, WAHERB
Fabaceae	*Sphaerolobium calcicola*	P3	-	Slender, multi-stemmed, scandent or erect shrub, to 1.5 m high. Fl. -orange-red, Jun or Sep to Nov. White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas. There are two records within 5 km of the survey area, one dated 1953 (location Yanchep) and the other c. 3.5 km east of the survey area.	**Unlikely** – there is limited to no suitable habitat within the survey area. This species is not cryptic and there was survey effort during the reported flowering period.	NM, WAHERB
Haemodoraceae	*Conostylis bracteata*	P3	-	Rhizomatous, tufted or shortly proliferous perennial, grass-like or herb, 0.2-0.45 m high. Fl. yellow, Aug to Sep. Sand, limestone. Consolidated sand dunes. There is one record within 5 km of the survey area, c. 3.0 km east.	**Known** – The species was found in Area F on sand over limestone. There is suitable habitat present within the survey area (VT02, VT03, VT05).	NM, WAHERB
Haemodoraceae	*Conostylis pauciflora* subsp. *euryrhipis*	P4	-	Rhizomatous, stoloniferous perennial herb, 0.06-0.18 m high. Flowers yellow from	**Possible** – this species was recorded during the 2012 survey from VT03. There is suitable	NM, TPFL, WAHERB

Family	Taxon	Status		Description and closest record information (if available) (WA Herbarium 1998–)	Likelihood of Occurrence	Source
		BC Act/ DBCA	EPBC Act			
				August to October. White, grey or yellow sand. Consolidated dunes. There are a number of records within 5 km of the survey area. There is a GHD record within the survey area.	habitat present within the survey area (VT02, VT03, VT05,). This species is not cryptic, but was not re-located during the 2016-2018 surveys.	
Haemodoraceae	*Conostylis pauciflora subsp. pauciflora*	P4	-	Rhizomatous, stoloniferous perennial, grass-like or herb, 0.1-0.35 m high. Fl. yellow, Aug to Oct. Grey sand, limestone. Hillslopes, consolidated dunes. There are several records within 5 km of the survey area. There is a GHD record adjacent to the survey area.	**Possible** – this species was recorded during the 2012 survey. There is suitable habitat present within the survey area (VT02, VT03, VT05). This species is not cryptic, but was not re-located during the 2016-2018 surveys.	NM, TPFL, WAHERB
Malvaceae	*Lasiopetalum membranaceum*	P3	-	Multi-stemmed shrub, 0.2-1 m high. Fl. pink-blue-purple, Sep to Dec. Sand over limestone. There are two records within 5 km of the survey area, the closest is c. 3.5 km east of the survey area.	**Possible** – there is suitable habitat present within the survey area (VT02, VT03, VT05). Survey effort was undertaken during the reported flowering period and this species is not cryptic.	TPFL, WAHERB
Myrtaceae	*Eucalyptus argutifolia*	T	Vu	Mallee, 1.5-4 m high, bark smooth. Fl. white, Mar to Apr. The Yanchep Mallee occurs on slopes or gullies near the coast and, to a lesser extent, close to the summits of limestone ridges. Soils at these sites are shallow, well drained and grey with outcrops of limestone. It is commonly associated with heath and thicket species including *Banksia sessilis, Melaleuca huegelii, Grevillea thelemanniana, Hardenbergia comptoniana* and *Acacia* spp. (DEE 2018).	**Unlikely** – There is suitable habitat within the survey area (VT02, VT03, VT04). However, this species is distinctive and it is unlikely to have been overlooked during the surveys. There is suitable habitat immediately adjacent to the survey area.	NM, TPFL, WAHERB
Orchidaceae	*Diuris micrantha*	T	V	Tuberous, perennial, herb, 0.3- 0.6 m high. Fl. yellow & brown, Sep to Oct. Brown loamy clay. Winter-wet swamps, in shallow water. This species is known from seven populations, from east of Kwinana and south towards the Frankland area, WA. It is	**Highly unlikely** – there is no suitable habitat within the survey area and the closest record of this species is >40 km from the survey area.	PMST

Family	Taxon	Status		Description and closest record information (if available) (WA Herbarium 1998–)	Likelihood of Occurrence	Source
		BC Act/ DBCA	EPBC Act			
				found in small populations, on dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps. The bases of the flowering plants are often covered with shallow water (DEE 2018).		
Orchidaceae	*Drakaea elastica*	T	E	Tuberous, perennial, herb, 0.12- 0.3 m high. Flowers red and green and yellow. Flowers are first seen in late September and continue flowering until late October or more rarely early November. Individual plants may not flower every year. The plant dies back to a dormant underground tuber over summer. The best time to look for the plant is in July and August when the leaves are relatively conspicuous (DEE 2018). Occurs on bare patches of white or grey sand in low-lying situations adjoining winter-wet swamps.	**Highly unlikely** – there is no suitable habitat within the survey area and the closest record of this species is >40 km from the survey area.	PMST
Stylidiaceae	*Stylidium maritimum*	P3	-	Caespitose perennial, herb, 0.3-0.7 m high, Leaves tufted, linear to narrowly oblanceolate, 10-40 cm long, 1-5.5 mm wide, apex acute to mucronate, margin involute, glabrous. Membraneous scale leaves present at base of mature leaves. Scape glandular throughout. Inflorescence paniculate. Fl. white/purple, Sep to Nov. Sand over limestone. Dune slopes and flats. Coastal heath and shrubland, open Banksia woodland. There are a number of records within 5 km of the survey area.	**Possible** – there is suitable habitat present within the survey area (VT02, VT03, VT04, VT05). Survey effort was undertaken during the reported flowering period, but this species can be cryptic.	NM, TPFL, WAHERB
Thymelaeaceae	*Pimelea calcicola*	P3	-	Erect to spreading shrub, 0.2-1 m high. Fl. pink, Sep to Nov. Sand. Coastal limestone ridges. There are several records within 5 km of the survey area.	**.**	WAHERB

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Appendix E – Fauna Data

Fauna likelihood of occurrence assessment

Parameters of fauna likelihood of occurrence assessment

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within or close proximity to the survey area.
Likely	Species are **likely** to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area. OR Species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
Unlikely	Species assessed as **unlikely** include those species previously recorded within 10 km of the survey area however: • There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area. • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area. OR Those species that have a known distribution overlapping with the survey area however: • There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). • The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
Highly unlikely	Species that are considered **highly unlikely** to occur in the survey area include: • Those species that have no suitable habitat within the survey area. • Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.

Definitions

Term	Description
study area	a 5 km buffer around the length of the survey area
survey area	the area subject to the current survey
locality	the area within an approximate 20 km radius of the survey area

Fauna likelihood of occurrence assessment

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Apus pacificus (Fork-tailed Swift)	IA	IA	X	X	The fork-tailed Swift is a migratory species that follows large storm fronts and are almost exclusively areal species. In WA, there are sparsely scattered records of the Fork-tailed Swift along the south coast, ranging from near the Eyre Bird Observatory and west to Denmark. They are widespread in coastal and subcoastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands. Scattered records are present in the Perth region. Records are scattered throughout WA including the Pilbara, Kimberley, Wheatbelt, Gascoyne and Isolated records occur at Neale Junction in the Great Victoria Desert and on the Nullarbor Plain (Higgins 1999).	**Unlikely**. Although this species may periodically occur in the region the species is exclusively areal in nature and not utilise terrestrial habitats.
Botaurus poiciloptilus (Australiasian Bittern)	En	En		X	The Australasian Bittern prefers densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. In the southwest of WA, the Bittern is found in beds of tall rush mixed with or near short fine sedge or open pools. It also occurs around swamps, lakes, pools, rivers and channels fringed with *Lignum Muehlenbeckia*, Canegrass (*Eragrostis spp*.) or other dense vegetation. It occasionally ventures into areas of open water or onto banks (DEE 2018).	**Highly unlikely**, there is no suitable wetland habitat within the survey area.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Calidris ferruginea (Curlew Sandpiper)	MiWCr	Vu, IA		X	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (DEE 2018).	**Highly unlikely**, there is no suitable habitat within the survey area.
Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)	Vu	Vu	X	X	Forest Red-tailed Black Cockatoo typically occurs in dense Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*) forests, however the species also occurs in a range of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt, Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (DSEWPaC 2012). Habitats also tend to have an understorey of *Banksia spp., Persoonia spp., Allocasuarina* spp. The Forest red-tailed Black Cockatoo generally nests in hollows in live or dead trees of Marri, Karri, Wandoo, Bullich, Blackbutt, Tuart and Jarrah (DSEWPaC 2012).	**Unlikely**, the habitat within the survey area is not the preferred habitat for this species i.e. there is a lack or Jarrah and Marri based on the habitat assessment, however they may occasionally enter the general area to forage on planted *Eucalyptus*. The nearest record is located approximately 20 km to the south. Frequently occurs further south within inner metropolitan Perth.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Calyptorhynchus baudinii (Baudin's Cockatoo)	En	En			Baudin's Black Cockatoo occurs in high-rainfall areas, usually at sites that are heavily forested and dominated by Marri (*Corymbia calophylla*) and Eucalyptus species, especially Karri (*E. diversicolor*) and Jarrah (*E. marginata*). The species also occurs in woodlands of Wandoo (*E. wandoo*), Blackbutt (*E. patens*), Flooded Gum (*E. rudis*), and Yate (*E. cornuta*). Baudin's Black Cockatoo breeds in the Jarrah, Marri and Karri forests of the deep south-west in areas averaging more than 750 mm of rainfall annually. The range of the species extends from Albany to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Boyup Brook. Preferred roosts are in areas with a dense canopy close to permanent water sources that provide the birds with protection from weather conditions (DSEWPaC 2012).	**Unlikely**, this species generally occurs in forest and woodland east and south of Perth. Occasionally recorded eastern edge of Perth such as Muchea and Perth Air. It rarely recorded on the Northern Swan Coastal Plain. The study area is marginal as it is beyond the northern limit of the species current geographic range. The study area lacks preferred foraging plant species such as Marri and Jarrah Some potential foraging plants within occur such as *Banksia* species, however given the study area location, and the lack of local occurrences, Baudin's Cockatoo is unlikely to occur. The nearest record is located approximately 10 km to the south of the survey area.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Calyptorhynchus latirostris (Carnaby's Black Cockatoo)	En	En	X	X	This species mainly occurs in uncleared or remnant native Eucalyptus woodlands and in shrubland or kwongan heathland dominated by *Hakea*, *Banksia* and *Grevillea* species. The species also occurs in forests containing Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) or Karri (*E. diversicolor*). Breeding usually occurs in the western Wheatbelt region of WA, with flocks moving to the higher rainfall coastal area to forage after the breeding season. Feeds on the seeds of a variety of native plants, including *Allocasuarina*, *Banksia*, *Eucalyptus*, *Grevillea* and *Hakea*, and some introduced plants (DSEWPaC 2012).	**Present**, evidence of foraging by the species recorded within survey area.
Falco peregrinus (Peregrine Falcon)		S			The Peregrine Falcon is seen occasionally anywhere in the south-west of WA. It is found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. The species nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	**Likely**, the nearest record is within 10 km of the survey area.
Leipoa ocellata (Malleefowl)	Vu	Vu		X	The Malleefowl generally occurs in semi-arid areas of WA, from Carnarvon to south east of the Eyre Bird Observatory (south-east WA). It occupies shrublands and low woodlands that are dominated by mallee vegetation, as well as native pine (*Callitris* spp.) woodlands, *Acacia* shrublands, Broombush (*Melaleuca uncinata*) vegetation or coastal heathlands. The nest is a large mound of sand or soil and organic matter (Jones and Goth 2008; Morcombe 2004). Few records are present on the SCP and are historical observations.	**Highly unlikely**, the nearest record is located over 40 km away and was recorded in 1972. This species no longer occurs within the Swan Coastal Plain bioregion.
Motacilla cinerea (Grey Wagtail)	IA, T	IA		X	The non-breeding habitat for the Grey Wagtail is strongly associated with water, particularly rocky substrates along water courses but also lakes and marshes (DEE 2018)	**Unlikely**, some habitat is present for this species however they are migratory and rarely found on the SCP. Use maybe periodic and opportunistic.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Numenius madagascariensis (Eastern Curlew)	IA, Cr	IA, Cr		X	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Marchant & Higgins 1993).	**Highly unlikely**, there is no suitable habitat within the survey area.
Pandion haliaetus (Osprey)	MiW	IA	x	X	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging (DEE 2018)	**Highly unlikely**, there is no suitable habitat within the survey area. The nearest record is located approximately 20 km away on the coast.
Tringa nebularia (Common Greenshank)	IA	IA		X	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetland and has the widest distribution of any shorebird in Australia. The Common Greenshank is generally absent from the Western Deserts although there are a few records from the Great Sandy Desert and the Nullarbor Plain. It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberley's it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago (DEE 2018).	**Highly unlikely**, there is no suitable habitat within the survey area. The nearest records are from Carabooda Lake and Lake Nowergup to the east of the survey area.
Tyto novaehollandiae subsp. novaehollandiae		P3	X		The Masked Owl is found across a range of habitats from wet sclerophyll forest, dry sclerophyll forest, non-eucalypt dominated forest, scrub and cleared land with remnant old growth trees. There are however several aspects of habitat preference which appear to be common: the Masked Owl requires large hollows in old growth	**Unlikely**, the habitat within the survey area is not the preferred habitat for this species. The nearest record is just north

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
(Masked Owl southern subsp.)					eucalypts for nesting; it often favours areas with dense understorey or ecotones comprising dense and sparse ground cover, they are often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney 2002).	of Yanchep Beach Road in the Yanchep National Park.
Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)	En	Cr	X		Preferred habitat for the Woylie includes dense undergrowth, logs and rock-cavities and occasionally in burrows (Burbidge 2004). Scattered Woylie populations may be found throughout the Jarrah forest in the south-west corner of WA. Extant naturally occurring populations of the species are restricted to three small wheatbelt reserves in WA – Dryandra Woodland, Tutanning Nature Reserve and Perup Forest. All are characterised by the presence of thickets of the plant Gastrolobium (Van Dyke and Strahan 2008). The species historically occurred in a wide variety of habits, however is now restricted to areas where predation has been controlled (or excluded).	**Highly unlikely**, the species is no longer known from the area. There are records within 10 km of the survey area however the specimens collected were bones and likely represent historic occurrence in the area. The species is likely extinct in the region.
Dasyurus geoffroii (Western Quoll, Chuditch)	Vu	Vu	X	X	The Chuditch inhabits eucalypt forest (especially Jarrah), dry woodland and mallee shrublands. In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. Most diurnal resting sites in sclerophyll forest consist of hollow logs or earth burrows (Van Dyke and Strahan 2008). The species can travel large distances, has a large home range and is sparsely populated through a large portion of its range.	**Unlikely**, there are historical records present within 5 km of the study area including Yanchep National Park and Eglinton. This species persists in forests and extensive woodlands within the Darling Range and further east, but is considered locally extinct within the Northern Swan Coastal Plain.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Hydromys chrysogaster (Water Rat)		P4	X		Water-rats live primarily in a wide variety of freshwater habitats, from sub-alpine streams and other inland waterways to lakes, swamps, farm dams and irrigation channels and are thought to be one of the few native species to have at least partially benefited from human encroachment (Gardner and Serena 1995).	**Highly unlikely**, there is no suitable habitat (creeks or rivers) within the survey area. The nearest record is located approximately 2 km away.
Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)		P4	X		The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyke and Strahan 2008).	**Present**, evidence of diggings and burrows was recorded in the study area during the survey. The areas of dense shrubland provide suitable shelter. The species is known to occur locally with two records within 4 km to the northwest and south east of the study area.
Macropus irma (Western Brush Wallaby)		P4	X		The Western Brush Wallaby is a grazer found primarily in open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest. This species was once very common in the south-west of WA but has undergone a reduction in range and a significant decline in abundance in its current habitat. (Van Dyke and Strahan 2008).	**Likely**, recorded within te Part 2 survey area to the north and known to be present in good quality bushland in the general area.
Phascogale tapoatafa subsp. (WAM M434) (South western Brush-tailed Phascogale)		CD	X		The South western Brush-tailed Phascogale prefers dry sclerophyll forests and open woodlands with a generally sparse ground-storey, which contain suitable nesting resources such as tree hollows, rotted stumps and tree cavities (Van Dyke and Strahan 2008). The species range extends from just north of Perth and into the south west (Van Dyke and Strahan 2008).	**Unlikely**, local records are very limited and tend to be historical. The northern Swan Coastal Plain represents the northern limit if distribution.

Species Name	Status		Desktop Search			
	EPBC Act Status	WA Status	NM	PMST	Description and habitat requirements	Likelihood
Ctenotus gemmula (SCP subpop.) (Jewelled south-west Ctenotus)		P3	X		The Jewelled South-West Ctenotus occurs on pale sandplains supporting heaths in association with *Banksia* or mallee woodlands (Wilson and Swan, 2013, Kay and Keogh 2012). The species is known from the Ellenbrook area to Pearce airbase and Melaleuca Park to the east of the survey area.	**Likely**, the habitat within the survey area (Banksia woodlands, and shrubland are suitable for this species. There are no records from the survey area however this species tends to be cryptic and difficult to confirm presence /absence, although it is known to occur on the northern Swan Coastal Plain.
Neelaps calonotos (Black-striped Snake)		P3	X		This Black-striped Snake is restricted to the sandy coastal strip near Perth, between Mandurah and Lancelin. It occurs on dunes and sand-plains vegetated with heaths and *Eucalyptus*/*Banksia* woodlands. This species is seriously threatened by increasing development within its restricted distribution (Wilson and Swan 2013).	**Likely**, the habitat within the survey area is suitable for this species. There are multiple records within 5 km of the survey area.
Synemon gratiosa (Graceful Sunmoth)		P4	X		This moth occurs from the coastal peel area north to the Murchison in coastal and near coastal sandplains where there is an abundance of host plant. The primary host plant species is *Lomandra maritima* in which moth larvae feed. Moths metamorphose and emerge in Autumn, usually early March for a few weeks at which time they are active and readily detectably during warm weather. Other species of Lomandra may also be important breeding habitat.	**Likely**, recorded during a target survey within the study area (GHD 2012), moderately extensive breeding habitat (*Lomandra maritima)* herblands on dunes occur within the study area.

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GHD

Level 10
999 Hay Street
T: 61 8 6222 8222 F: 61 8 9463 6012 E: permail@ghd.com

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