



**Biological Surveys of the State Barrier
Fence – Merivale Road Reserve
Realignment – Cape Arid**

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EXECUTIVE SUMMARY

The State Barrier Fence (SBF) currently extends from the Zuytdorp Cliffs, north of Kalbarri, to 25km east of Ravensthorpe, covering a distance of approximately 1170km. In an effort to protect the more recently developed agricultural land east of Ravensthorpe from impacts associated with major emu migration events and wild dogs, the Department of Agriculture and Food Western Australia (DAFWA) proposes to extend the SBF from east of Ravensthorpe to the coast near Cape Arid, east of Esperance.

DAFWA has recently identified that topographic constraints will make the proposed alignment difficult to develop at some locations. One section located north of Merivale Road, Boyatup, approximately 100km east of Esperance, will need to be realigned through approximately 1.6km of vegetated UCL, rather than the private property previously proposed. The realignment is required to avoid steep slopes and creek crossings. Accordingly, DAFWA require the suite of biological surveys previously undertaken for the originally proposed SBF alignment to be performed at the proposed Merivale Rd realignment section.

During the field survey, three vegetation communities were recorded and 145 taxa from 39 families were recorded, including one priority three taxon, *Hibbertia hamata*. No declared rare flora was recorded. *Hibbertia hamata* occurred in 2 sub-populations distributed along an existing telecommunications cable alignment. Agricultural lands with introduced pasture species occur in close vicinity, however no introduced species were present in the study area. No significant range extensions were recorded, however many taxa recorded are at the eastern edge of their range.

Phytophthora dieback was identified on the eastern portion of the elevated ridge, extending into the creek line situated at the eastern end of the study area. The infested area extends northward beyond the study area boundary, however, it can be anticipated that the infestation runs into the series of minor creek lines that form the head of the Thomas River. Current disease expression was very obvious due to high impact. The western area of the site was disease free.

Fauna habitat is generally a function of local differences in structural vegetation types and other factors including substrate (soils, rocky outcrops) and drainage. During the site assessment, two main habitat types were identified, however several micro habitats were also present.

No conservation significant species were positively recorded at the site, however, several target species have potential to occur there including two specially protected species (a reptile and a bird), three (terrestrial) migratory species (birds), four Priority species (four mammals and a reptile) and eight Threatened species (five birds and three mammals).

Twenty-three fauna species (or evidence of) were observed at the site during the site reconnaissance. They included two frogs, 14 birds, one reptile, five mammals and the possible presence of an additional conservation significant species (the Priority 5 listed Southern Brown Bandicoot).

While there will be site specific considerations relating to the construction of the SBF across the study area, the majority of the site impacts will be consistent with previous impacts assessed by Ecoscape in the initial SBF biological surveys project. Additional impacts associated with the Merivale Road section involve the potential for spread of *Phytophthora* dieback, impacting a Priority 3 flora species and minor loss of habitats. These impacts may be mitigated by the adoption of appropriate management actions.

1 INTRODUCTION

1.1 Background

The State Barrier Fence (SBF) currently extends from the Zuytdorp Cliffs, north of Kalbarri, to 25km east of Ravensthorpe, covering a distance of approximately 1170km. In an effort to protect the more recently developed agricultural land east of Ravensthorpe from impacts associated with major emu migration events and wild dogs, the Department of Agriculture and Food Western Australia (DAFWA) proposes to extend the SBF from east of Ravensthorpe to the coast near Cape Arid, east of Esperance.

A scoping study was conducted in 2012 by GHD Pty Ltd to identify project constraints associated with several potential fence alignment options and a preferred alignment for the Esperance extension has since been identified. The majority of the proposed extension follows the boundary between agricultural land and unallocated Crown Land (UCL), with the fence to be sited on public lands in most circumstances. The proposed alignment south of Fisheries Road places the fence on private land.

The construction of the Esperance extension will require the clearing of native vegetation within an approximately 20m wide easement. Detailed biological surveys, including flora, fauna and dieback assessments, were undertaken by Ecoscape in 2013/14 and reported in 2015. These assessments were required to provide baseline data to be submitted by DAFWA to the Western Australian (WA) Environmental Protection Authority (EPA) and the Commonwealth Department of the Environment (DoE) as a part of project reviews and appraisal processes.

DAFWA has recently identified that topographic constraints will make the proposed alignment difficult to develop at some locations. One section located north of Merivale Road, Boyatup, approximately 100km east of Esperance, will need to be realigned through approximately 1.6km of vegetated UCL, rather than the private property previously proposed. The realignment is required to avoid steep slopes and creek crossings.

Accordingly, DAFWA require the suite of biological surveys previously undertaken for the originally proposed SBF alignment to be performed at the proposed Merivale Rd realignment section. Consistent with the Ecoscape survey, the study area includes a 100m buffer extending from Merivale Road northwards into the UCL, to allow flexibility in establishment of the fence to mitigate any environmental constraints identified. The regional location of the study area is shown in Figure 1.

1.2 Objectives

The biological surveys are designed as baseline data collection surveys only. Therefore the objectives of the surveys are to:

- Understand the current status of environmental values within the defined project area; and
- Assess and understand the current threat posed by *Phytophthora* dieback across the defined project area.

1.3 Scope of Works

In order to achieve the project objective identified above the following scope of works was conducted.

- Undertake a Level 1 flora survey within the project corridor to define vegetation complexes and determine the extent of any conservation significant taxa identified. The survey was conducted by a qualified botanist and performed in accordance with 'Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia, Guidance for the Assessment of Environmental Factors No 51 (EPA 2004). Accordingly the Level 1 survey incorporated both desktop and field survey techniques, as required by the guideline document.
- Undertake a *Phytophthora* dieback survey, inclusive of a strategic sampling program within the project corridor. The *Phytophthora* survey performed was consistent with the standards defined in the 'Phytophthora dieback interpreters manual for lands managed by the department' (DPaW 2015). The survey was undertaken by a Department of Parks and Wildlife (DPaW) registered dieback interpreter, as required by the above guideline document.
- Undertake a Level 1 fauna survey, consistent with the general criteria for 'Level 1 fauna surveys' as defined in *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, Guidance for the Assessment of Environmental Factors No 56*, (EPA, 2004). Methods used were based on those detailed in the Environmental Protection Authority Technical Guide *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2010). Accordingly the Level 1 fauna survey incorporated a desktop survey and field survey techniques as required by the guideline document.
- Development of single project report detailing results of biological surveys.

All project components were undertaken by Great Southern Bio Logic staff or associates. Field visits were undertaken during optimum survey periods, specific for purpose, site location and seasonal conditions.

1.4 Site Characteristics

The study area is situated on the northern side of Merivale Road, approximately 100km to the east of the town of Esperance (Figure 1). It extends 100m to the north of Merivale Rd and consists of an elevated ridgeline with a north easterly aspect in the west, while a tributary of the Thomas River is situated at the eastern end. Soil profile excavations were not undertaken as a part of the survey, however, visual field observations identified a waterlogged sandy soil consistent with a duplex horizon of sand over clay.

The study area is situated in an uncleared road reserve and adjoins cleared agricultural land to the west and east, with the Cape Arid National Park situated to the south. Major disease vectors associated with the study area include Merivale Road and a below ground telecommunications cable running parallel to Merivale Road, situated approximately 10m north of the road alignment.

2 METHOD

Survey methodology varied in accordance with the specific survey undertaken. Each survey methodology consisted of a desktop assessment followed by a site visit to both validate the desktop information and conduct tasks in accordance with the relevant guidelines. As defined in Section 1.3, the relevant guideline texts used to define the required project methods include:

- Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia, Guidance for the Assessment of Environmental Factors No 51 (EPA 2004);
- *Phytophthora* dieback interpreters manual for lands managed by the department (DPaW 2015; and
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, Guidance for the Assessment of Environmental Factors No 56 (EPA 2004))

2.1 Desktop Assessments

The SBF re-alignment along Merivale Road study area was subject to a series of initial desktop assessments involving the review of available databases and literature. The desktop assessments were designed to gather existing information relating to environmental values and threats, as well as data relating to the environmental and physical context of the site. The sources of desktop information included:

- Bureau of Meteorology;
- Spatial information and Database searches including:
 - Beard vegetation mapping 'Native vegetation extent' dataset (DAFWA July 2013);
 - Soils mapping datasets (DAFWA 2004);
 - Aerial photography (ESRI and its data providers);
 - Vegetation Health Service, positive *Phytophthora* recovery database (DPaW, 2013);
 - GIS datasets (e.g. drainage lines and wetlands) sourced from the Shared Land Information Platform (SLIP) (2015);
- Previous surveys:
 - GHD (2012) Report for State Barrier Fence Esperance Extension Scoping Study, Unpublished report for DAFWA.
 - Ecoscape (2015) State Barrier Fence Biological Surveys, Draft report prepared for DAFWA.
- Relevant texts and publications

2.2 Field Survey

Field surveys were undertaken across two site visits. The fauna and dieback surveys were conducted on 12 August, 2015 while the vegetation and flora survey was conducted on 4 September 2015. Leading up to the fauna and dieback assessment field visit the weather had been wet and cool, however, on the day of survey conditions were clear and sunny with a

maximum temperature of 17.2°C (BoM, 2015). During the flora survey weather conditions were dry with a maximum daily temperature of 25.2°C recorded from Esperance (BoM, 2015)

2.2.1 Vegetation and Flora

Two previous assessments associated with the SBF extension have been undertaken and were reviewed as part of the desktop assessment. Surveys undertaken by Ecoscape in 2013 and 2014 provided many new records of rare and priority flora. The vegetation and flora survey involved the collation of both existing and new records of rare and priority flora records from within 20km of the study area (Appendix A). The presence of priority ecological communities (PECs) and threatened ecological communities (TECs) by was considered probable, and therefore all potentially significant communities highlighted by Ecoscape (2015) were considered.

The field survey area was assessed via a meandering traverse over a 100m wide corridor adjacent to Merivale Rd. Particular attention was given to an existing Telstra communication cable where the fence construction is most likely to occur. All vegetation boundaries and locations of significant flora were identified using a handheld GPS (Garmin 60). Vegetation communities were defined using relevés (100m²) in which the presence and abundance of all taxa was recorded according to National Vegetation Index Survey (NVIS) (NHT 2003), then compared with descriptions of Priority and Threatened Ecological Communities.

Selected plant specimens were collected for identification or lodgement at the Western Australian Herbarium (Perth).

An inventory of all vascular plant taxa recorded is presented in Appendix B. Criteria and descriptions of significant flora and vegetation are in accordance with DPaW (2013a, 2013a, 2013c, 2013d). All nomenclature is in accordance with the online herbarium database (2013b).

2.2.2 *Phytophthora dieback*

The *Phytophthora dieback* survey was undertaken using the comprehensive transect survey method, as defined in the *Phytophthora dieback interpreters manual for lands managed by the department* (DPaW 2015). The survey was undertaken by a DPaW registered disease interpreter, and involved traversing all potentially uninfested areas within the project area by walking transect lines spaced at a maximum distance of 50m apart. Field data including disease presence and vegetation information was collected using a hand held GPS unit and converted to ArcGIS™ shapefiles. Collected field data included all sample locations, a point file of all identified individual plant deaths attributed to *Phytophthora* and track files of the area covered during survey.

Sampling for *Phytophthora dieback* involves the collection of soil and tissue material from fresh deaths of plants considered to be reliable indicator species of *Phytophthora* expression. Where suspicious deaths were identified, soil and root tissue material was collected into heavy duty plastic bags using a sterilised sample axe. All samples were forwarded to the VHS laboratory for analysis.

The comprehensive transect survey method provides high confidence disease distribution information and hygiene classification data, and is defined in detail in the *Phytophthora dieback interpreters manual for lands managed by the department* (DPaW, Jan 2015).

2.2.3 Fauna Survey

Detailed survey methodology is presented in the attached fauna survey report (Appendix G). In summary, the field survey involved ground coverage of areas noted during the desktop review of aerial photography together with identification of specific ecological attributes including habitat features and physical site characteristics including drainage and topography.

Broad structural fauna habitat types were identified and mapped. Nine habitat assessment plots (each approximately 10 x 10m) were undertaken with at least one plot within each broad structural habitat type, although multiple plots were undertaken in some habitat types. Micro habitat elements that were assessed, where present, included vegetation structure, habitat condition, ground cover, rocky outcrops, ground litter, type of substrate, habitat trees and fallen logs. Habitat attributes with relevance to species of conservation significance were particularly considered.

Fauna observations were recorded and secondary evidence of fauna such as tracks, nests, scat, bones, diggings and characteristic feed signs were also noted. Some active searching was undertaken when suitable microhabitat was encountered during the habitat assessments and broader survey.

Hollow bearing trees (HBT) within the site were mapped and hollow height, size, and tree diameter (where species occur that typically form hollows) were noted into classes. Presence or absence of black cockatoo foraging habitat and roosting evidence was also noted.

Mapping was carried out using ArcGIS 10.0 geographic information system (GIS) software. Field data was captured using a Garmin GPS map 60CSx high sensitivity handheld GPS.

3 RESULTS AND DISCUSSION

3.1 Desktop assessment – Site

Site related desktop assessment data is presented below. Survey specific desktop assessment data is presented in the relevant result discussion sections following, and also in the detailed fauna survey report attached (Appendix C).

3.1.1 Climate

The nearest Bureau of Meteorology station is situated at Thomas River. Data from the Thomas River station shows an annual average rainfall of 557.6mm, which is within the accepted rainfall zone for the presence of *Phytophthora*. June is recorded as being the wettest month with an average of 76.2mm while December is recorded as having the lowest monthly rainfall average of 21.7mm. This data reflects the influence of tropical low pressure systems which often traverse the south west of WA in a south easterly direction, regularly delivering high intensity rain events in summer months.

The climate data for Thomas River from 2015, prior to survey, shows that rainfall was recorded as 40.8mm in June, 67mm in July and 85mm in August which, with the exception of June, can be considered average for the area. There is no temperature data recorded for Thomas River however the BoM station at Esperance recorded average temperatures of 19.2°C in June and 16.7°C in July. There was no recorded average for August, however, these temperatures are again consistent with long term averages for the site.

3.1.2 Interim Biogeographic Regionalisation of Australia (IBRA) values

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies Australia's landscapes into 89 large geographically distinct bioregions based on common climate, geology, landform, native vegetation and species information. IBRA also provides the national and regional planning framework for the systematic development of a comprehensive, adequate and representative (CAR) national reserve system, endorsed by all levels of government as a key tool for identifying land for conservation under the Commonwealth *Australia's Strategy for the National Reserve System*.

According to the latest IBRA update (7), the study area is located within the ESP02 Recherche subregion of the Esperance Plains. The Esperance Plains bioregion is characterised by proteaceous scrub and mallee heaths on sandplain; herbfields and heaths occur on granite and quartzite ranges that rise from the plain. The heaths are rich in endemics. Eucalypt woodlands occur in gullies and alluvial foot-slopes (Comer et al. 2001).

3.1.3 Landforms and Soil

The ESP02 subregion has variable relief, consisting of Quaternary coastal sandplains and dunes overlying Proterozoic gneiss and granite as well as Eocene and more recent coastal limestones. Numerous granitic islands occur just off the coast of the mainland (Comer et al, 2001).

3.1.4 Vegetation

Vegetation at the site has been mapped broadly by Beard (in DAFWA 2013) as vegetation associations Esperance 4801 and Fanny Cove 516. Descriptions are provided below:

- Esperance 4801: Shrublands; heath with scattered *Nuytsia floribunda* on sandplain.

- Fanny Cove 516: Shrublands; mallee scrub, black marlock.

The Cape Arid NP, and the study area, represents an ecotone of changing habitat from the arid zone in the east to the wetter coastal zone in the south west (DEC 2012).

3.2 Level 1 Vegetation and Flora Survey

The Level 1 Flora survey was undertaken by Great Southern Bio Logic associate, South Coast Botanist Damien Rathbone.

During the field survey, 145 taxa from 39 families were recorded, including one priority three taxon as described below. No declared rare flora were recorded. Agricultural lands with introduced pasture species occur in close vicinity, however no introduced species were present in the study area. No significant range extensions were recorded, however many taxa recorded are at the eastern edge of their range.

Forty two species were recorded that were not observed in previous surveys of the Esperance extension of the State Barrier Fence (Ecoscape 2015). This is primarily due to the more coastal location of the present survey area and potentially due to the survey timing, which could account for the high number of previously unrecorded annual taxa.

3.2.1 Conservation Significant Species

Hibbertia hamata (Priority Three)

Two sub-populations comprising 35 individuals of *Hibbertia hamata* were recorded within the proposed clearing area for the fence alignment as indicated in Figure 2. These plants occurred primarily along an existing Telstra communications alignment that has previously been disturbed. No plants were observed outside the proposed clearing area, however, five other populations are known in close proximity (<20km) to the study area.

3.2.2 Vegetation Type, Condition and Status

Three vegetation communities were recorded from the study area. These are described below and presented in Figure 2.

Eucalyptus extrica, *E. flocktoniae* (Map Unit - ExEf)

Description: *Eucalyptus extrica*, *E. leptocalyx* mid open mallee shrubland over *Melaleuca calycina*, *Melaleuca scabra*, *Daviesia lancifolia* shrubland over *Gahnia ancistrophylla* sparse sedgeland. Other common species included *E. flocktoniae*, *E. tumida*, *Banksia media*, *Xanthorrhoea platyphylla* and *Grevillea oligantha*.



Plate1: *Eucalyptus extrica*, *E. flocktoniae* (Map Unit - ExEf)

This highly species rich community occurred over the majority of the survey area on the elevated plains and ridges in grey silt and clay soils. *Eucalyptus flocktoniae* became more dominant on subtle depressions. The majority of the community could be considered to be in excellent condition according to the Bushland Condition Scale (Keighery 1994). *Phytophthora dieback* is present in the eastern section of the community and is significantly impacting susceptible taxa, mainly *Banksia media* and *Xanthorrhoea platyphylla*. The construction of a Telstra communications line adjacent to Merivale Rd has caused only minor disturbance with no encroachment of weeds. This community includes the priority one taxon, *Hibbertia hamata* as shown on Figure 2.

This community is not concordant with any PEC or TEC. It is represented in the adjacent Cape Arid National Park and is floristically similar to the community EsPmHh recorded by Ecoscape (2015) at four other sites on the fence alignment (R077, R079, R083, R085).

Eucalyptus occidentalis (Map Unit - Eo)

Description: *Eucalyptus occidentalis* woodland. Other species included *Calothamnus quadrifidus* subsp. *quadrifidus*, *Melaleuca incana* subsp. *tenella*.



Plate 2: *Eucalyptus occidentalis* (Map Unit - Eo)

This community occurred over an 80m section of study area in a moderately incised tributary flowing north east to the Thomas River. The community could be considered to be in excellent condition according to the Bushland Condition Scale (Keighery 1994). *Eucalyptus occidentalis* woodlands in seasonally inundated clay basins represent a PEC potentially occurring in the study area. This is not concordant with the described community as it does not occur on a clay basin.

Allocasuarina campestris, *Banksia media* (Map Unit - AcBm)

Description: *Allocasuarina campestris*, *Banksia media*, *Acacia cyclops*, *Thryptomene saxicola* mid shrubland. Other common species included *Eucalyptus extrica*, *Acacia cyclops*, *Acacia saligna* and *Muehlenbeckia adpressa*.

This assemblage of taxa represents an ecotone covering approximately 80m between the drainage line and the elevated plain. Diversion of a road drain, the presence of *Phytophthora* dieback and other potential other unknown disturbances have reduced the condition of this vegetation. The vegetation assemblage could be considered to be in very good condition according to the Bushland Condition Scale (Keighery 1994). As this is an ecotonal zone it does not represent a single clearly identifiable community and therefore is not comparable to any PEC or TEC.



Plate 3: *Allocasuarina campestris*, *Banksia media* (Map Unit - AcBm)

Several plant taxa could not be comprehensively identified during the survey due to the absence of reproductive material or because current taxonomic information is inadequate. None of these are likely to be of conservation significance based on comparison with currently known species. However, taxa recorded as “affinities” (eg *Cyathostemon* aff. *tenuifolia*) may become conservation listed in the future as taxonomic knowledge improves. The seasonal timing of the survey was considered adequate to detect the significant taxa with the potential to occur in the study area. The survey recorded a high number of taxa considering the small survey area and the level of survey intensity. A level two survey would be required for a comprehensive inventory of all taxa and would increase the likelihood of detecting conservation listed taxa not highlighted by the desktop assessment.

No vegetation communities were identified as PEC’s of TEC’s. However, the *Eucalyptus extrica*, *E. flocktoniae* community represented in the study site was highly species rich and provided habitat for at least one priority species. Several other taxa usually associated with granite were also recorded from this community, indicating it may have an assemblage of species otherwise uncommon in the region. Due to the paucity of detailed floristic survey conducted in the Esperance region, an accurate assessment of the conservation values of this and other communities recorded from the survey area is not possible.

3.3 *Phytophthora* Dieback Survey

The *Phytophthora* dieback field survey was performed as a comprehensive transect survey. There are six possible disease hygiene categories that may be applied to specific areas of a project site based on certain attributes and conditions. The hygiene categories are defined in detail in the *Phytophthora* dieback interpreters manual for lands managed by the department’ (DPaW 2015), however, a summary of the disease hygiene categories and the associated assessment criteria for each category is presented in Appendix D.

3.3.1 Desktop Assessment

A review of available aerial photography showed a distinct variation in vegetation density, with significantly more vegetation biomass associated with the elevated western ridge area in comparison to the vegetation in the eastern portion of the study area. While this visible pattern may be associated with a variation in soil type, it is also consistent with visual scarring associated with *Phytophthora* dieback infestations.

A review of the VHS positive sample database identified a single positive recovery of *P. cinnamomi* within approximately 120m of the study area. This sample is shown on Figure 3 and is situated on the strategic fire break to the south of Merivale Road. Other previous recoveries of *P. cinnamomi* have been recorded along the Thomas River to the south of the study area and also along Merivale Road to the west of the study area. These, however, are not considered to have direct influence on the study area due to position in the landscape and distance.

3.3.2 Vegetation

As defined in Section 3.2 above, three vegetation complexes were identified. These are described as *Eucalyptus extrica*, *E. leptocalyx* mid open mallee shrubland; *Eucalyptus occidentalis* woodland; and *Allocasuarina campestris*, *Banksia media*, *Acacia cyclops*, *Thryptomene saxicola* mid shrubland.

The predominant indicator species used for detection of the disease included *Banksia media*, and *Xanthorrhoea platyphylla*.

3.3.3 Disease Distribution

The disease distribution information is shown on Figure 3 along with the locations of soil and tissue samples collected during the field survey.

Phytophthora dieback was identified on the eastern portion of the elevated ridge, extending into the creek line situated at the eastern end of the study area. The infested area extends northward beyond the study area boundary, however, it can be anticipated that the infestation runs into the series of minor creek lines that form the head of the Thomas River.

As described above, the disease distribution can be extrapolated, using the accepted mechanisms of disease spread, to include the drainage lines immediately north of the study area. While not included in the survey, these areas are directly influenced by drainage from infested areas and can be considered to be infested also. These drainage lines intersect the proposed SBF alignment to the east of the study area and represent a potential hygiene issue that has not yet been considered.

3.3.4 Disease Expression

Disease expression in the infested area ranged from moderate to high impact, expressed through multiple deaths of all indicator species listed in Section 3.3.2. Most obvious expression was through *B. media* and *X. platyphylla*. Observed deaths ranged in age with a readily observed pattern of disease extending from areas where the majority of indicator species had been removed through historic impact, through to very fresh expression on the disease boundary near the top of the ridge.

There was no disease expression in the creek line at the eastern end of the study area due to the absence of indicator species in this area. While the creek line intersecting the SBF alignment immediately east of the study area was not assessed, extrapolation of disease

distribution suggests that this creek is also likely to be infested. Because of the lack of indicator species, disease expression in the uninterpretable vegetation is not apparent.

3.3.5 Sample Program

The location of soil and tissue sample sites is shown on Figure 3 and the VHS certificate of analysis is presented in Appendix E. A total of 2 soil and tissue samples were collected from fresh deaths within the study area. At the time of reporting sample Merivale Rd 1 had been confirmed as *P. cinnamomi* while sample Merivale Rd 2 had been sent for DNA analysis and reported as subcultured. Subcultured samples may represent another species of *Phytophthora* or it may possibly be classified as negative for *Phytophthora*. However, due to the proximity of both samples to each other, the result of the subculture will not influence the classification of the area as infested based on the field expression and the result of sample Merivale 1.

3.4 Level 1 Fauna Survey

The Level 1 Fauna survey was undertaken by Great Southern Bio Logic associate, Shane Priddle from SW Environmental Pty Ltd. The full SW Environmental report is provided as Appendix C and should be referred to for detailed understanding of the survey, associated results and references. A summary of information, extracted from the SW Environmental report is presented below

3.4.1 Desktop Assessment

3.4.1.1 Important Bird Areas (IBA)

The closest IBA is located over five kilometres south and consists of islands recognised under the Recherche Archipelago IBA. The Recherche is an archipelago of about 300 islands, islets and rocks off the south coast, immediately south of the site.

3.4.1.2 Habitat Connectivity

The UCL lot associated with the project is approximately 230 ha and has value in connecting the vegetation associated with the upper reaches of the Thomas River to Cape Arid NP in the south. It is situated within Strategic Zone A of the South Coast macro corridor network (Wilkins et al 2006) indicating regional nature conservation significance. Existing barriers to connectivity include cleared tracks and Merivale Road between the National Park and the UCL. From a landscape perspective the UCL is overshadowed by the close proximity of Cape Arid NP which has contiguous reserved vegetation and fauna habitat and is of significantly greater extent than the UCL associated with the project.

3.4.1.3 Local Fauna Records

Two hundred and twenty-two terrestrial vertebrate fauna species have been recorded in local survey results and database records. This figure includes eight amphibians, 159 birds, 17 mammals and 38 reptiles. It generally does not include numerous invertebrates or marine or aquatic dependant species (fish, marine turtles, etc). Some records may refer to seasonal visitors or may be associated with coastal or marine environments not typical of the site.

3.4.1.4 Invertebrates and Short Range Endemics

The DPAW Naturemap (2015) and Department of Environment EPBC Projected Matters Search Tool (2015) did not identify any local records of invertebrates or short range endemics

of conservation significance. Short range endemic fauna, which includes species of insects, arachnids myriapods and crustaceans that have highly restricted distributions because of poor dispersal, slow growth, low fecundity or specific habitat preferences, are particularly vulnerable to extinction (Moir et al 2009b). Unfortunately very little is known regarding the abundance or extent of many of these species within the south-west, or which may be most important for conservation.

3.4.1.5 Conservation Significant Fauna

From the desktop assessment a number of conservation significant species may occur locally. These are detailed in the full report (Appendix C) and include:

- Two specially protected species (a reptile and a bird),
- Three (terrestrial) migratory species (birds),
- Four Priority species (four mammals and a reptile),
- Eight threatened species (five birds and three mammals).

3.4.2 Fauna Habitat

Fauna habitat is generally a function of local differences in structural vegetation types and other factors including substrate (soils, rocky outcrops) and drainage. Key habitats at the site include:

Mallee over sandy loams in depressions (Habitat Plot 2); Located in a moderate depression with a northerly aspect, on the eastern edge of the site, this habitat contained little mid or understorey vegetation. There were signs of recent washout, probably exacerbated by the road side drainage, but a creek bed, running or pooling water were absent. Mallee occurred over most of the site, although in other areas it was mostly sporadic or in clumps emerging over the scrub and heath layer. There was an abundant leaf litter with some small fallen timber.

Heath and closed scrub on sandy and gravelly loams (Habitat Plot 1, 3-9); This habitat type represents the majority of the site. Significant areas in the eastern portion of the site were impacted by *Phytophthora* dieback (see Section 3.3) resulting in significant decline in densities of susceptible species. The dieback affected areas contained significantly reduced biomass and constituted an open heath while the disease free areas were a dense, closed heath (up to 2m height). There were significant areas in very good to excellent condition, (e.g. east of the Mallee in the depression). Some pools of water had accumulated near the Merivale Rd culverts. Large fallen timber and leaf litter was generally sparse.

Extensive vegetation extends to the north of the study area and Cape Arid NP is located to the south, while cleared agricultural land lies both east and west. Cape Arid NP and the vegetation to the north of the site remain intact, well connected and also generally in very good condition except for where it is affected by dieback, minor tracks or fire breaks. Habitat within the site itself was continuous.

Ecotones such as those between the road or paddock edge and scrub vegetation, or the heath and woodland, may provide foraging opportunities for predators such as raptors. The site offers a range of habitat opportunities for a variety of fauna and is well connected at a landscape scale.

The mallee species on site were generally not thick enough to develop hollows of sufficient quality to be utilised by hollow dependent fauna. No large trees (greater than 50 cm at breast

height or with hollows) were observed within the site. Further, the site is well outside of the breeding range for black cockatoos (SEWPac, 2012).

3.4.3 Species Recorded

Twenty-three fauna species (or evidence of) were observed at the site during the site reconnaissance. They included two frogs, 14 birds, one reptile, five mammals and the possible presence of an additional conservation significant species (the Priority 5 listed Southern Brown Bandicoot). Possible bandicoot diggings were observed at several locations but weren't clear enough to be confirmed as bandicoot due to the confirmed presence of rabbit (scat and diggings) and Short-beaked Echidna (scat). In addition to rabbits, evidence of introduced cat and fox tracks were also observed.

A small network of runways through the heath created by a species of small mammal were observed approximately 50m north of Merivale Road (51 H 500745 6259706). They were considered too small to be used by rabbits or bandicoots and are likely to be made by *Rattus fuscipes* (Bush Rat), (Pers comm. Dr Kenny Travouillon, Curator - Mammology, WA Museum). Other small mammals that occur locally, but not necessarily at the site, may include:

- *Mus musculus* (House Mouse) (introduced)
- *Notomys michellii* (Mitchells Hopping Mouse)
- *Pseudomys occidentalis* (Western Mouse)
- *Rattus fuscipes* (Bush Rat)
- *Sminthopsis crassicaudata* (Fat-tailed Dunnart)
- *Sminthopsis granulipes* (White-tailed Dunnart)
- *Sminthopsis griseoventer* (Grey-bellied Dunnart)

3.4.4 Conservation Significant Fauna

No conservation significant species were positively recorded at the site, however, several target species have potential to occur there. These are outlined below.

3.4.4.1 Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (T En)

Black cockatoos are long-lived, slow-breeding birds that display strong pair bonds. The species is suffering the effects of population decline and habitat loss. Carnaby's Black Cockatoo breed in hollows that are usually only found in trees that are more than 200 years old and are generally known to breed throughout the southwest, to the west of Ravensthorpe in the higher rainfall areas (SEWPAC, 2012). Suitable breeding habitat does not occur at the site, however, the study location is within the known foraging habitat for the species. A lone male was observed five kilometres west of the site.

3.4.4.2 Malleefowl (*Leipoa ocellata*) (T, Vu, M)

Malleefowl are mostly located to the south and west of a line extending from Cape Farquhar, which lies north of Carnarvon, to the Eyre Bird Observatory in the south-east of Western Australia. They occur in semi-arid and arid zones of temperate Australia, where they occupy shrublands and low woodlands that are dominated by mallee vegetation. They also occur in other habitat types including *Eucalyptus* or native pine *Callitris* woodlands, *Acacia* shrublands, Broombush (*Melaleuca uncinata*) vegetation or coastal heathlands. The breeding habitat of the Malleefowl, within its home range, is characterised by light soil and abundant leaf litter

(DEC 2010). There are no local records from Naturemap (2015), however, suitable habitat does occur at the site, along with marginal breeding habitat within the mallee through the depression. No nesting mounds were observed during the site visit.

3.4.4.3 Western Ground Parrot (*Pezoporus flaviventris*) (T, CE)

The Western Ground Parrot inhabits low, dry or swampy, near-coastal heathlands on sandplains and uplands in areas that receive 400-500 mm of rainfall annually. In recent years, confirmed records of the Western Ground Parrot have only been obtained within Fitzgerald River NP, Cape Arid NP and Nuytsland NR. It is also possible that a small subpopulation could persist in Waychinicup NP (SPRAT 2014).

Western Ground Parrot occur in long unburnt (5 to 40 or more years), floristically diverse, near-coastal dry heath (400 to 500 millimetres rainfall). This vegetation is usually less than 0.5 metres high, but may reach up to one metre, with more than 50 per cent cover. Sedges are generally abundant, making up 40 per cent of total cover. Although Western Ground Parrots are usually found in long unburnt vegetation, they have been observed to feed in habitats two to three years post-fire, provided there is older vegetation nearby (DPaW 2014). In addition Ground Parrots fly mainly at dawn and dusk, covering short distances, low over vegetation, nest on or close to the ground and have good dispersal ability (DPaW 2014).

The South Coast Threatened Birds Recovery Plan identifies that the site is within the Management Area for the species.

Alan Burbidge and Sarah Comer (DPaW) (August 2015), both of which have published numerous articles on the species, indicated that whilst there are no recent records, Ground Parrots have been known to occur further north (near Fisheries Rd). Also, possibly in response to fox and cat control programs, local known populations of Western Ground Parrots may be spreading to other areas, possibly including the site.

3.4.4.4 Southern Brown Bandicoot, Quenda (*Isodon obesulus fusciventer*) (P5)

Quenda habitat consists of dense scrubby, often swampy vegetation with a dense cover up to one metre high, particularly near watercourses and wetlands. Quenda often feed in adjacent forests and woodlands that are burnt on a regular basis. Nests can be concealed, next to or under old logs, shrubs or piles of debris and are made up of ground litter piled up over a shallow depression providing internal chambers. Home ranges vary with population density, and range from 5-8.6ha for males and 1-6ha for females (DEC 2010). They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous fungi. During their search for food, Quenda often create distinctive conical holes in the soil (DECCW 2010). If present at the site, the species would be at the edge of its known distribution (Menkorst and Knight 2013), however, possible Quenda diggings were observed during the field visit. There are no Naturemap records of sightings within the study area (2015).

3.4.4.5 Western Brush Wallaby (*Macropus irma*) (P4)

Optimum habitat for the Western Brush Wallaby includes open Jarrah forest or woodland and seasonally wet flats with low grasses and scrubby thickets, but also areas of mallee and heathland. Common dietary flora includes *Carpobrotus edulis*, *Cynodon dactylon* and *Nuytsia floribunda* (DEC, 2007). The site would be at the edge of the species' distribution if present (Menkorst and Knight 2013). There are no local Naturemap records (2015).

3.4.4.6 Southern Death Adder (*Acanthopis antarcticus*) (P3)

Southern Death Adders inhabit a range of habitats, including rainforest, scrubland, semi arid zones and rocky outcrops. Typically during the day they remain mostly buried beneath sand, soil or debris, with just the tail and top of the head exposed (Pilbara Pythons 2014).

3.4.4.7 Southern Carpet Python (*Morelia spilota imbricata*) (S)

Southern Carpet Python may shelter in burrows made by other animals, hollow tree limbs or logs (especially 150mm diameter hollows extending at least to one metre deep), or rock crevices. The species commonly uses hollow logs for shelter (Wilson and Swan, 2008). This subspecies has been recorded from semi-arid coastal and inland habitats, *Banksia* woodland, *Eucalyptus* woodlands, and grasslands. If present at the site, the species would need to rely on heath due to lack of other good refuge (hollow timber, trees, or rocky areas).

4 SITE SPECIFIC IMPACTS AND MANAGEMENT CONSIDERATIONS

The construction of the SBF extension will require the clearing of approximately 3ha of intact remnant vegetation. It is understood that, where possible, the alignment will be positioned within the 100m wide survey corridor in a manner that will avoid any sensitive environmental values.

As previously discussed, Ecoscape have previously undertaken extensive flora, fauna and dieback surveys along the majority of the alignment, to the north and west of Fisheries Road. As a part of the project reporting, potential impacts of the SBF extension were addressed in the context of the entire extension, which is beyond the scope of this report. Accordingly, the broad landscape and general ecological impacts associated with the SBF extension have not been considered in this report.

The impacts associated with the proposed construction of the SBF within the study area are described below. Some of these can be mitigated through the recommendations included in Section 5:

4.1 Clearing of native vegetation

Typical impacts associated with clearing native vegetation include

- direct loss of habitat;
- loss of mature vegetation (provides more flowers, nectar, fruit, seeds, refuge);
- loss of below ground biomass (such as seed banks);
- changes to faunal assemblages near the fence; and
- fragmentation of habitat connectivity and populations (discussed further below).

Based on a 20 m clearing width, approximately 2.8 ha of heath and closed scrub will require clearing and 0.2 ha of mallee through the drainage depression. The heath and scrub is by the far the most common vegetation locally and is well represented within the adjacent Cape Arid NP. Therefore the clearing required is unlikely to affect the quality and quantity of fauna habitat available locally given the abundance of similar habitat within the remaining UCL and in Cape Arid NP.

4.2 Impact to Conservation Significant Flora and Vegetation

As discussed in Section 3.2.1, the priority 3 species *Hibbertia hamata* was identified within the study area, which represents a previously unknown population of this taxon. According to existing records this species occurs in 16 populations over a narrow range of 61 km, often in the vicinity of granite. At least five populations are known from within 20 km of the study site. A paucity of floristic survey has been conducted in this region, therefore the actual abundance of many priority flora is likely to be greater than existing records indicate.

While Priority flora have no formal legislative protection, authorities expect that appropriate actions to mitigate impacts are undertaken by proponents. Realignment of the fence within the 100m corridor could potentially be undertaken to avoid direct impacts on this species, however, this is not recommended. In this instance it is considered that due to the existing site disturbances including the road and communication cable, and the potential spread of *Phytophthora* dieback which would be associated with a fence location away from the existing disturbances, positioning the fence close to Merivale road will reduce the overall impact to floristic values in the study area and surrounds. In this instance, the occurrence of *Hibbertia hamata* in a site of minor disturbance and its abundance in the vicinity of the study area

indicate the removal of approximately 35 individuals will not have a significant impact on the taxon.

4.3 Introduction/Spread of *Phytophthora* dieback

Phytophthora dieback is present within the site and is having a significant impact in the infested areas. The most common method of disease spread is human vectoring through the movement of infested soil and plant materials. Clearing, construction and maintenance activities present a risk of moving infested soil to currently uninfested areas both within the study area and also external to the study area.

Subsequent impacts through the spread of the pathogen include significant loss of biodiversity and an associated loss of potential habitat and foraging flora species for dependent fauna.

4.4 Construction Environment

Construction, including clearing, would lead to a number of direct impacts such as injury and possibly death of reptiles, small mammals and birds that may occur within nests or hollows. Clearing would have greater impacts during spring, which is the nesting period for most fauna.

Introduction of disease or pathogens as a result of clearing may also have direct impacts, at a community level (*Phytophthora* dieback), or species level (amphibian chytrid fungus). Chytridiomycosis is caused by the amphibian chytrid fungus *Batrachochytrium dendrobatidis* which occurs in waterbodies or in soil (DPaW 2012).

4.5 Collision risk

The fence itself may present a risk of collision, entanglement or entrapment for some fauna species, including birds and large mammals (e.g. Western Grey Kangaroo). This is discussed in more detail in Ecoscape (2015). There may be some risk to Ground Parrots if they do occur near the site.

4.6 Habitat connectivity

Clearing will increase fragmentation of the UCL and the cumulative impact of the gap in habitat already associated with Merivale Rd. The fence may act as a direct barrier to some species, in particular those in the size/weight range that are targeted by the fence (e.g. Emu), but also including Mallee Fowl, Western Grey Kangaroo, Wallabies, etc should they occur). The impacts of the SBF on fauna at a landscape scale are discussed further in Ecoscape (2015).

5 RECOMMENDATIONS

Recommendations to assist in the mitigation of potential impacts associated with the construction of SBF within the study area include

- Construct the fence as close as possible to Merivale Road to minimise the depth of impact into the UCL and associated habitat.
- All clearing and construction activities should be performed in accordance with a project specific operational hygiene plan designed to mitigate the risk of spreading *Phytophthora* dieback.
- Should fence construction occur 12 months or more from the date of the *Phytophthora* dieback field assessment (12 August 2015), disease boundaries will require a re-check survey to be completed before operational activities can be undertaken. Should fence construction occur 36 months or more from the date of the *Phytophthora* dieback field assessment then the entire study area will require a full re-survey due to the potential for disease movement and additional infestation.
- Ensure a licensed and experienced fauna surveyor conducts pre clearance surveys to ensure appropriate management and relocation of injured or displaced fauna.
- Avoid clearing between August and November for Western Ground Parrot (and if possible between August and February to include the breeding range for other species).
- Installation of visual identifiers along the top of the fence at appropriate, defined intervals (e.g. 10m) to decrease the likelihood of accidental collision of wildlife with the fence.
- General controls and mitigation measures should be implemented through an Environmental Management Plan (EMP). The EMP would ensure roles and responsibilities are clearly defined, site audits are conducted and construction staff are inducted to the fauna habitat values of the site. *Phytophthora* dieback management and soil hygiene and fauna preclearance survey requirements. Appropriate reporting would also be addressed through the EMP in line with standard operating procedures.
- Final designs should quantify the amount of native vegetation required to be cleared and this should be assessed against any matters of National Environment Significance (e.g. Carnaby's Black Cockatoo foraging habitat).

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7 LIMITATIONS

This report was prepared for The Department of Agriculture and Food Western Australia, solely for the purposes set out in the scope of works and it is not intended that any other person use or rely on the contents of this report.

Whilst the information contained in the Report is accurate to the best of our knowledge and belief, Great Southern Bio Logic and its agents cannot guarantee the completeness or accuracy of any of the descriptions or conclusions based on the information supplied to it or obtained during the site investigations, site surveys, visits and interviews. Furthermore, field and / or regulatory conditions are subject to change over time, and this should be considered if this report is to be used after any significant time period after its issue.

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Figures

***Biological Surveys of the State Barrier Fence – Merivale Road
Reserve Realignment – Cape Arid***



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Ref: GSBL188
 Date: 23/09/2015
 Image: Landgate Travellers Atlas 2009

Figure 1: Regional Location

Biological surveys of the State Barrier Fence alignment - Merivale Road Reserve Realignment - Cape Arid prepared for the Department of Agriculture and Food Western Australia September, 2015

LEGEND

 Project Study Area

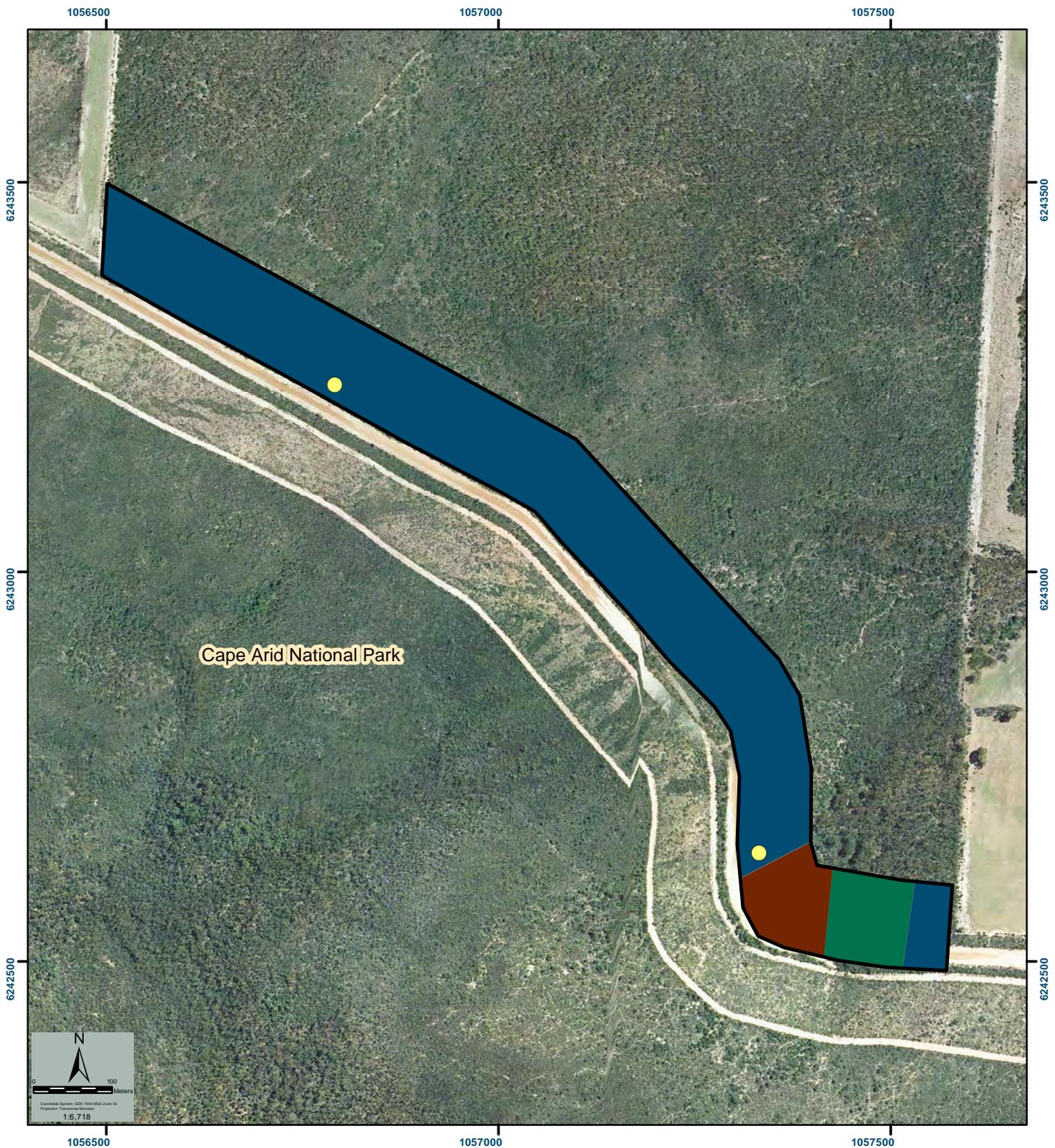


Figure 2: Priority Flora and Vegetation units within the study area



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Ref: GSBL188
Date: 25/09/2015

LEGEND

Vegetation units

- Eucalyptus extrica, E. flocktoniae
- Allocasuaria campestris, Banksia media
- Eucalyptus occidentalis

Conservation flora

- Hibbertia hamata (Priority 3)
- Study Area

Biological surveys of the State Barrier Fence - Merivale Road Reserve Realignment - Cape Arid prepared for the Department of Agriculture and Food Western Australia, September, 2015

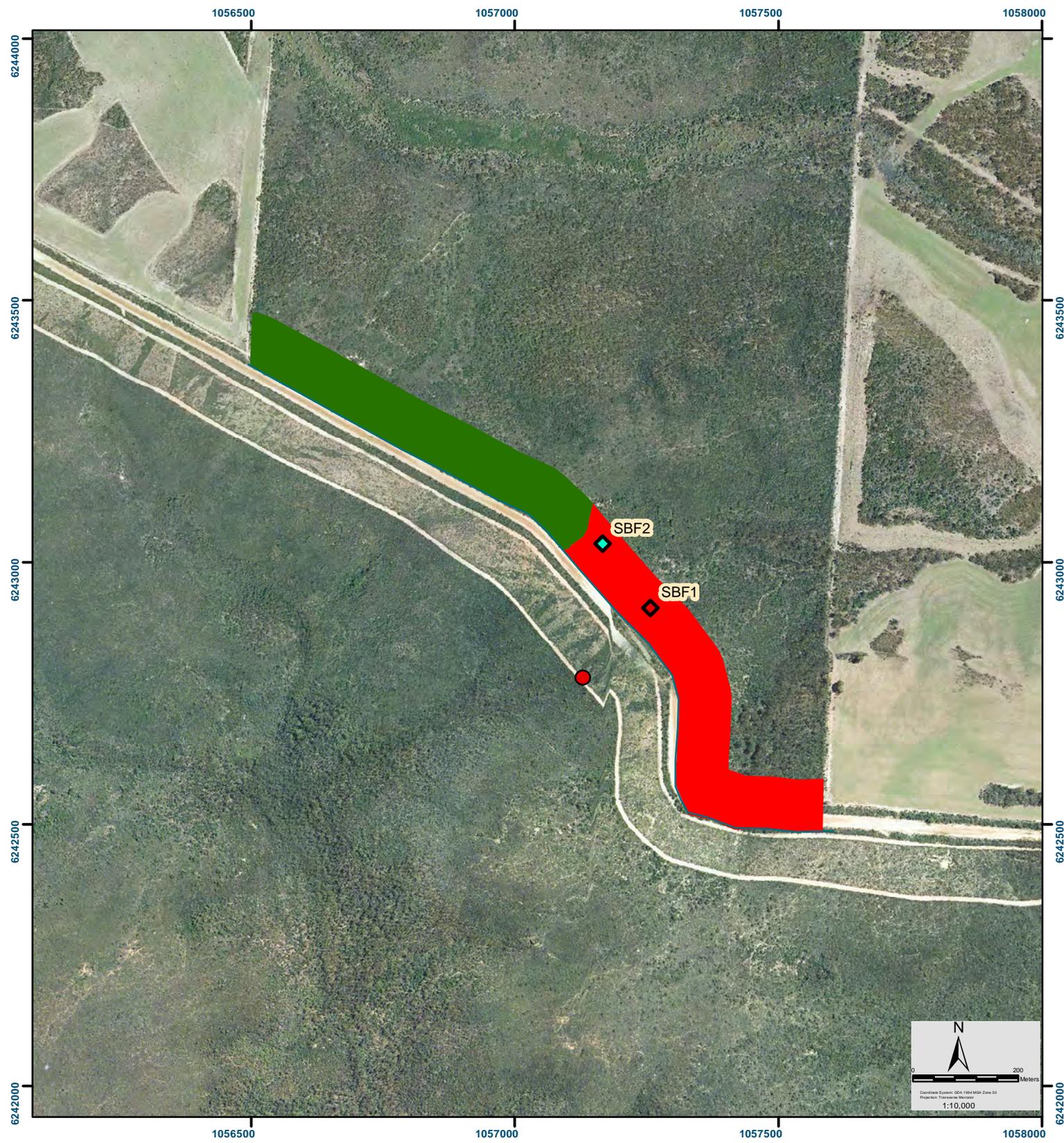


Figure 1: Phytophthora Dieback distribution for the Proposed State Barrier Fence alignment, Merivale Road

LEGEND

- | Disease status | | Sample Result | |
|--------------------------------------|------------|--------------------------------------|------------------------|
| ■ | Infested | ◆ | CINNAMOMI |
| ■ | Uninfested | ◆ | SUB-CULTURED |
| | | ● | VHS Positive Pc (2013) |



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Ref: GSBL188
Date: 17/09/2015

Phytophthora Dieback distribution for the proposed State Barrier Fence alignment Merivale Road prepared for the Department of Parks and Wildlife, September, 2015

