



Department of
Environment and Conservation

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Preliminary Survey

Black Point Vegetation Survey



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Prepared for:

DEC, Donnelly District, Nature Conservation & Parks and Visitor Services

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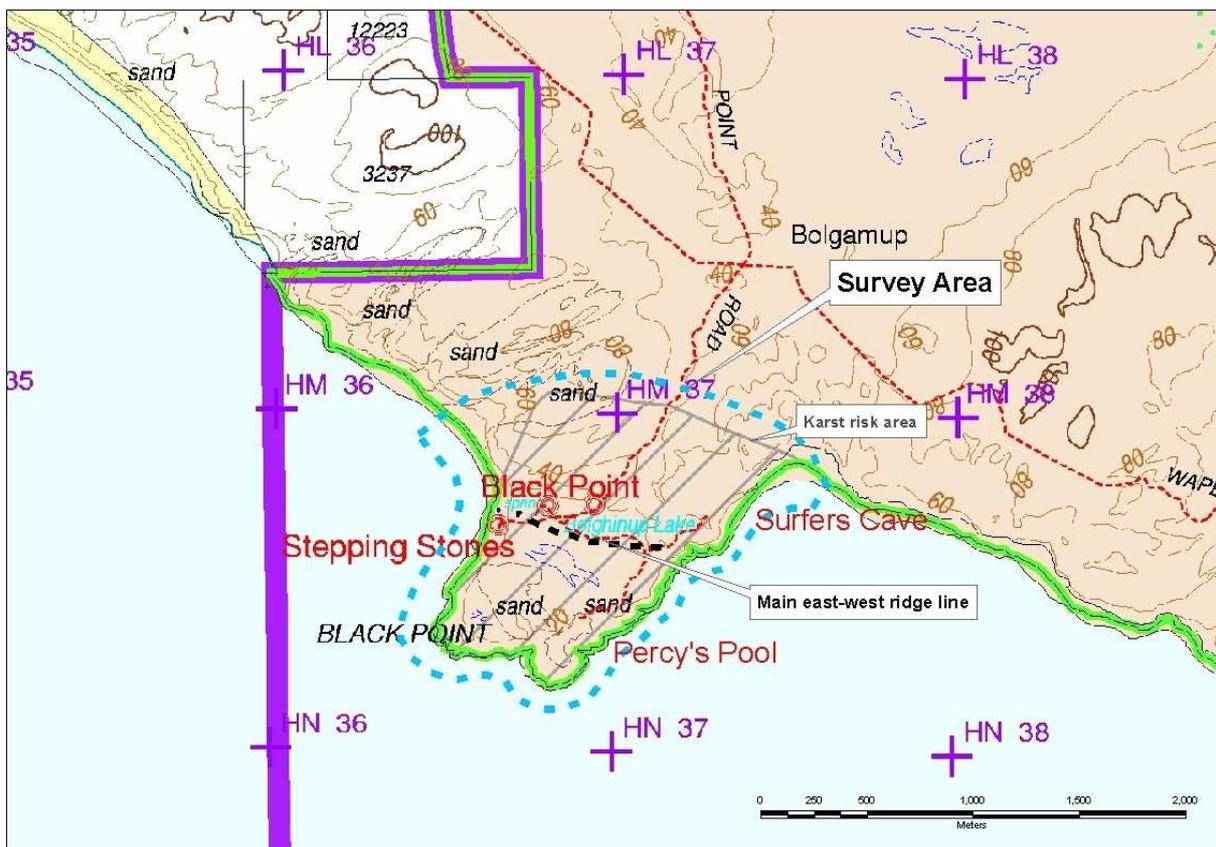
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1 Purpose

The purpose of this survey is to improve the understanding of the Black Point vegetation, to provide more detailed mapping of vegetation communities beyond the available broader scale vegetation complex mapping and to provide some biodiversity information to assist future planning. It is also an aim of this report to progress towards a firm definition for the Priority Ecological Community associated with the Bunbury Basalt and basalt soils of Black Point.

2 Introduction

Black Point can only be accessible by four wheel drive. It is a relatively popular recreation spot, especially for fishing and surfing; with its' natural beauty also attracting nature pursuits. Past uncontrolled vehicle access has seen the creation of a number of tracks in sensitive areas, which has led to degradation of the coastal vegetation communities and wetlands. This report aims to provide information for the planning of the proposed redevelopment of the Black Point recreation sites that will assist in minimising recreational impacts in these sensitive areas. Map 1 shows the focus area for the Black Point Vegetation Survey.



Map 1. Location of Black Point vegetation survey area.

3 Background and Objectives

3.1 Background

Location

Black Point is located on the south coast of the Scott Coastal Plain approximately 40km south east of Augusta, within the D'Entrecasteaux National Park.

Land Use

Black Point and the immediate surrounding lands fall within the D'Entrecasteaux National Park which is vested in the Conservation Commission and Managed by the Department of Environment and Conservation's Donnelly District in the Warren Region. Black Point is a popular recreation site used for fishing, surfing and nature observation and is only accessible by four wheel drive. Previously, much of the surrounding coastal country was leased for stock. With the exception of private property to the west most of the coast is now National Park.

Climate

Black Point experiences a high rainfall, Mediterranean-type climate with warm dry summers and cool, wet winters (Baddock, 1995). Annually Black Point receives an average rainfall of 1100 mm, with approximately 70% of this falling over the winter months (Bureau of Meteorology).

Geology

The geology of Black Point consists of black columnar formations of Bunbury Basalt which is exposed around the shoreline as either cliffs or platforms and as a tall columnar cliff to the western end of the beach on the western side of the point, all of which were formed during the Early Cretaceous Period, approximately 140 million years ago. Overlying the Bunbury Basalt are younger formations of Tamala Limestone formed in the Late Pleistocene and Safety Bay Sands dune formations of the Holocene (Baddock, 1995).

Vegetation

Under the *Mapping of Vegetation Complexes of the South West Forest Region* (DEC, 2006) the study area is mapped under the DE5 D'Entrecasteaux vegetation complex which includes the vegetation communities described in Table 1.

Table 1. Vegetation communities listed for the DE5 D'Entrecasteaux complex (DEC, 2006).

Vegetation Complex	Description	Landform Description	Soils
D' Entrecasteaux DE5	Coastal Complex and Heath of <i>Acacia pulchella</i> , <i>Hibbertia amplexicaulis</i> , <i>Hypolaena pubescens</i> , <i>Baumea juncea</i> , <i>Villarsia parnassifolia</i> , <i>Hakea varia</i> , <i>Melaleuca pauciflora</i> , <i>Xanthorrhoea preissii</i> , <i>Gahnia trifida</i> , <i>Melaleuca incana</i> subsp. <i>incana</i> and <i>Cassutha racemosa</i> with emergents of <i>Acacia saligna</i> and <i>Melaleuca cuticularis</i>	Basaltic outcrop with thin overlay of sandy soil	Shallow red brown sandy loam, relatively fertile
D' Entrecasteaux DE5	<i>Largely bare</i>	Outcrop of basaltic rocks on the seashore	No soil development
D' Entrecasteaux DE5	Coastal Complex of <i>Ficinia nodosa</i> , <i>Muehlenbeckia adpressa</i> , <i>Apium prostratum</i> , <i>Villarsia violifolia</i> , <i>Samolus repens</i> , <i>Sporobolus virginicus</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> and <i>Baumea juncea</i>	Shallow depression developed over coastal outcrop of basalt	Solonetz
D' Entrecasteaux DE5	Dense shrubland of <i>Olearia axillaris</i> , <i>Jacksonia horrida</i> , <i>Spyridium globulosum</i> , <i>Lepidosperma gladiatum</i> , <i>Acacia littorea</i> , <i>Scaevola crassifolia</i> and <i>Rhagodia baccata</i>	Exposed seaward dune very recently stabilized	Undifferentiated beach sand, excess calcium
D' Entrecasteaux DE5	Coastal Complex of <i>*Ammophila arenaria</i> with some mat plants such as <i>Carpobrotus</i> sp. and <i>*Arctotheca populifolia</i> , herbs such as <i>Senecio lautus</i> and scattered shrubs of <i>Olearia axillaris</i>	Recently stabilised mobile sand dunes	Pale yellow to light yellow brown sands

3.2 Objectives

1. Survey, map and describe the vegetation communities of Black Point.
2. Survey for threatened and priority flora
3. Establish an interim definition for the Black Point Basalt Associated Priority Ecological Community
4. Identify sensitive environmentally sensitive areas
5. Identify threats

4 Methods

4.1 Survey and Mapping of Vegetation Communities

Prior to undertaking field work a brief desktop exercise was undertaken to identify potential survey locations within different vegetation types to ensure the field work surveyed an adequate representation of the variety of vegetation communities.

Field work for the initial survey was carried out from the 25th to the 29th of May 2009 in order to allow the identification of vegetation communities and develop a preliminary species list. As this survey was undertaken out of season the decision was made not to establish formal survey sites but rather to collect the representative species of each community type identified in the field, recording the collected information to a fixed point location within each identified vegetation type, with the intention of returning during spring to undertake a comprehensive survey and establish long term monitoring sites.

Field survey consisted of: locating the proposed survey locations using aerial photography and GPS; defining the vegetation communities, landforms, soils, drainage, vegetation condition and collecting specimens representative of the species in each of the defined communities.

Vegetation communities were described using Muir's Vegetation Classification shown in Table 2 and the condition of the vegetation was ranked using the 1994 Keighery Vegetation Condition Scale shown in Table 3.

Table 2. Vegetation Classification System (Muir, 1977)

Life Form/ Height Class	Canopy Cover			
	DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat Plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock grass	Dense Hummock Grass	Mid-Dense Hummock	Hummock Grass	Open Hummock Grass
Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverworts	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Table 3. Vegetation Condition Scale (Keighery, 1994)

Condition	Description
Pristine	Pristine or nearly so with no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered with obvious signs of disturbance.
Good	Vegetation structure significantly altered with very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

Approximately 30 minutes was allocated to surveying each sample site. During this time 2 people collected specimens of all species observed at the time of collection for identification, information recorded on field forms, locations of sites recorded using a GPS and photos taken of vegetation community types using a Ricoh camera with an inbuilt GPS.

Following the completion of field work all site summary sheets were compiled into a single spreadsheet and in conjunction with the recorded GPS points and photographs were used as reference locations to identify and map vegetation communities on digital aerial photography, using ArcGIS.

Due to a delay in the acquisition of suitable aerial imagery, mapping was initially undertaken using Department orthophotos. Due to their low resolution it was difficult to distinguish and map the vegetation types, and additional field visits were required to discern community boundaries.

5 Results and Discussion

5.1 Declared Rare and Priority Flora

The desktop survey undertaken prior to the field survey identified two species of Priority flora; the Priority 3 species *Andersonia amabile* and the Priority 4 species *Hypocalymma cordifolium* subsp. *minus*. The records were accessed using the Department of Environment and Conservation (DEC) online Nature Map spatial database. Both species are recorded in the WA Herbarium's Florabase but only the population of *Andersonia amabile* appears in DEC's Declared Endangered Flora Database. Both species have not been relocated or verified by staff from the Donnelly District.

During the field surveys these populations were not located and a return visit will be required during their flowering periods to confirm their location. A population of the Priority 4 species *Banksia sessilis* var. *cordata* located on the sand dune near surfers cave; shown on Map 2 in Appendix 1 has been recorded by Donnelly District staff.

Included in the specimens collected is a species of *Lepidosperma* believed to be as yet undescribed and may qualify for future listing as a priority species. The initial collection has been given the name *Lepidosperma* sp. 'Black Point' and further study of the distribution of the species is warranted.

Table 3. Threatened and Priority Flora

Species Name	Listing
<i>Andersonia amabile</i>	P3
<i>Banksia sessilis</i> var. <i>cordata</i>	P4
<i>Hypocalymma cordifolium</i> subsp. <i>minus</i>	P4

5.2 Threatened and Priority Ecological Communities

The desktop survey undertaken prior to the field survey identified two Priority Ecological Communities (PECs) being the Black Point Microbial Tufa Ecological Community and the Black Point Basalt Associated Ecological Community. No significant work has previously been undertaken on either PEC, however the Black Point Microbial Tufa PEC is expected to be similar to the Augusta Microbial Tufa Threatened Ecological Community (TEC). The second community; the Black Point Bunbury Basalt Associated PEC which was initially nominated as a PEC due to the very limited occurrence of outcropping basalt and basalt soils in Western Australia, with the other significant occurrences of Bunbury Basalt on the beach below the Bunbury light house and some small exposures near the mouth of the Donnelly River. With no prior work having been carried out to describe the Bunbury Basalt associated PEC at Black Point, this survey has aimed to provide an interim description of the floristic community associated with the basalt which can be used to define the PEC. However further investigation will be required to define additional aspects that may comprise the PEC, including possible fauna and microbial associations.

Table 4. Threatened and Priority Ecological Communities

Community Name	Listing
Black Point Microbial Tufa Ecological Community	PEC
Black Point Bunbury Basalt Associated Ecological Community	PEC

5.2.1 Black Point Microbial Tufa Priority Ecological Community

The Black Point Microbial Tufa PEC was surveyed during the field work and all occurrences were mapped and photographed with the results of the survey being available in the separate report 'Microbialite Survey of Black Point, Including summary of Black Point Sea Cave' (Newland, 2009).

5.2.2 Bunbury Basalt Vegetation Associations Priority Ecological Community

During the initial survey of Black Point, the Bunbury Basalt exposures and associated soils were surveyed to identify all associated floristic communities in an effort to define the PEC and whilst further work is required to distinguish the final definition of the PEC, the community types listed in Tables 6&7 which have been separated into the following two groups will be used in the interim:

- Communities growing on basalt outcrops and on basalt soils (Table 6); &
- Communities growing on shallow sands mixed with basalt sediment over basalt (Table 7).

Whilst further study is required to determine the significance of the basalt association of the communities occurring on shallow sands over basalt before an acceptable description of the community can be completed, the following general description in Table 5 of the first group of communities described in Table 6, captures the strongest association between the basalt landforms and the vegetation communities identified at Black Point.

Table 6. Preliminary description of the Black Point Bunbury Basalt Associated PEC

Community Description	Soil and Landform Description
Dwarf Scrub D <i>Leucophyta brownii</i> , <i>Sarcocornia quinquefolia</i> and <i>Olearia axillaris</i> with Open Low Sedges of <i>Juncus pauciflorus</i> and Herbs of <i>Sarcocornia quinquefolia</i> , <i>Isolepis sp.</i> , <i>Samolus repens</i> and Very Open Low Grass of <i>Sporobolus virginicus</i> .	Bunbury Basalt outcrops, flats over Bunbury Basalt with reddish brown sandy clay loam basaltic soils and basaltic saprolite outcrops with light yellowish brown clays.

5.3 Vegetation Communities by landform association

This survey has provided preliminary mapping of vegetation communities at Black Point however this initial mapping has limitations and further field work will be required to ground truth and improve the accuracy of mapping. The key limitations of note are:

- the initial mapping focused on the study area identified in Map 1;
- following examination of aerial photography field survey was focused on the southern section

of the study area as the northern section appeared more uniform.

- Some communities identified in the field could not be identified in the aerial photography available and have not been distinctly mapped, these include small areas of *Eucalyptus marginata* Thickets immediately north of Lake Bolghinup and some *Agonis flexuosa* Thicket/ Heath A, directly north of the *Melaleuca cuticularis* Low Forest B fringing Lake Bolghinup.

Vegetation was individual described for each survey site as listed in Appendix 2 and in recognition of the limitations of mapping was latter grouped into a smaller number of vegetation units listed in Tables: 6 to 9. The communities in these tables relate directly to the communities mapped in Maps 4 and 5 in Appendix 1.

Table 6. Communities on Bunbury Basalt outcrops and basalt soils

Description	Species
Open Dwarf Scrub D of <i>Leucophyta brownii</i> and <i>Sarcocornia quinqueflora</i> and Very Open Low Grass of <i>Sporobolus virginicus</i> on basalt outcrops	<i>Carpobrotus virescens</i> , <i>Leucophyta brownii</i> , <i>Olearia axillaris</i> , <i>Sarcocornia quinqueflora</i> , <i>Ficinia nodosa</i> , <i>Sporobolus virginicus</i> , <i>Samolus sp.</i>
Open Dwarf Scrub D of <i>Leucophyta brownii</i> , <i>Sarcocornia quinqueflora</i> and <i>Olearia axillaris</i> with Very Open Low Sedges of <i>Ficinia nodosa</i> , <i>Baumea juncea</i> and <i>Juncus pauciflorus</i> on shallow soils over basalt	<i>Carpobrotus virescens</i> , <i>Apium prostratum</i> , <i>Centella asiatica</i> , <i>Xanthosia candida</i> , <i>Brachyscome ?iberidifolia</i> , <i>Hydrocotyle sp.</i> , <i>Leucophyta brownii</i> , <i>Olearia axillaris</i> , <i>Senecio ?latus</i> , <i>Sarcocornia quinqueflora</i> , <i>Threlkeldia diffusa</i> , <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Hibbertia grossulariifolia</i> , <i>Leucopogon parviflorus</i> , <i>Scaevola crassifolia</i> , <i>Lobelia alata</i> , <i>*Lotus sp.</i> , <i>Sporobolus virginicus</i> , <i>Acacia cyclops</i> , <i>Jacksonia horrida</i> , <i>Austrostipa sp.</i> , <i>Samolus junceus</i> , <i>Spyridium globulosum</i> , <i>Dodonaea ceratocarpa</i>
Dwarf Scrub D of <i>Olearia axillaris</i> , <i>Scaevola crassifolia</i> , <i>Leucophyta brownii</i> and <i>Rhagodia baccata</i> Open Tall Sedges of <i>Lepidosperma effusum</i> and <i>Ficinia nodosa</i>	<i>Carpobrotus virescens</i> , <i>Xanthosia candida</i> , <i>Leucophyta brownii</i> , <i>Olearia axillaris</i> , <i>Senecio lautus</i> , <i>Rhagodia baccata</i> , <i>Threlkeldia diffusa</i> , <i>Lepidosperma effusum</i> , <i>Hibbertia cuneiformis</i> , <i>Hibbertia grossulariifolia</i> , <i>Acrotriche cordata</i> , <i>Leucopogon parviflorus</i> , <i>Jacksonia horrida</i> ,
Herbs of <i>Sarcocornia quinqueflora</i> , <i>Samolus repens</i> and <i>Isolepis sp.</i>	<i>Carpobrotus virescens</i> , <i>Hydrocotyle sp.</i> , <i>Leucophyta brownii</i> , <i>Olearia axillaris</i> , <i>Sarcocornia quinqueflora</i> , <i>Isolepis sp.</i> dwarf <i>Samolus repens</i>

Table 7. Communities on basalt influenced shallow sands over Bunbury Basalt outcrops

Description	Species
Coastal Complex of <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Sporobolus virginicus</i> , <i>Samolus repens</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> and <i>Muehlenbeckia adpressa</i>	<i>Baumea juncea</i> , <i>Ficinia nodosa</i> <i>Sporobolus virginicus</i> , <i>Samolus repens</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Muehlenbeckia adpressa</i> , <i>Olearia axillaris</i> , <i>Scaevola crassifolia</i> , <i>Leucophyta brownii</i> , <i>Carpobrotus virescens</i>
Dense Low Heath C of <i>Melaleuca cuticularis</i> verged by Dwarf Scrub D of <i>Olearia axillaris</i> , <i>Leucophyta brownii</i> and <i>Jacksonia horrida</i> .	<i>Melaleuca cuticularis</i> , <i>Olearia axillaris</i> , <i>Leucophyta brownii</i> , <i>Jacksonia horrida</i> and <i>Ficinia nodosa</i>
Low Heath C of <i>Acacia cyclops</i> , <i>Olearia axillaris</i> , <i>Leucopogon parviflorus</i> and <i>Spyridium globulosum</i> with Open Tall Sedges of <i>Ficinia nodosa</i>	<i>Acacia cyclops</i> , <i>Olearia axillaris</i> , <i>Leucopogon parviflorus</i> , <i>Spyridium globulosum</i> , <i>Ficinia nodosa</i>
Dwarf Scrub D of <i>Olearia axillaris</i> , <i>Scaevola crassifolia</i> , <i>Leucophyta brownii</i> and <i>Rhagodia baccata</i> Open Tall Sedges of <i>Lepidosperma effusum</i> and <i>Ficinia nodosa</i>	<i>Carpobrotus virescens</i> , <i>Olearia axillaris</i> , <i>Rhagodia baccata</i> , <i>Sarcocornia quinqueflora</i> , <i>Ficinia nodosa</i> , <i>Scaevola crassifolia</i> , <i>Austrostipa sp.</i> , <i>Samolus repens</i>
Low Heath C of <i>Olearia axillaris</i> , <i>Spyridium globulosum</i> and <i>Rhagodia baccata</i> , Open Low Sedges of <i>Ficinia nodosa</i> and Low Grass of <i>Sporobolus virginicus</i>	<i>Carpobrotus virescens</i> , <i>Apium prostratum</i> , <i>Xanthosia candida</i> , <i>Leucophyta brownii</i> , <i>Olearia axillaris</i> , <i>*Cakile maritima</i> , <i>Rhagodia baccata</i> , <i>Threlkeldia diffusa</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma effusum</i> , <i>Leucopogon parviflorus</i> , <i>Scaevola crassifolia</i> , <i>Austrostipa sp.</i> , <i>Sporobolus virginicus</i> , <i>Samolus repens</i> , <i>Ranunculus sp</i>

Table 8. Communities associated with wet depressions

Group	Description	Species
Baumea sedgelands		
	Dense Low Sedges of <i>Baumea juncea</i>	<i>Baumea juncea</i> , <i>Baumea articulata</i> , <i>Acacia saligna</i> , <i>Centella asiatica</i> , <i>Villarsia sp.</i> , <i>Melaleuca cuticularis</i> , <i>Melaleuca ?viminea</i> , <i>?Schoenus sp.</i>
	Dense Tall Sedges of <i>Baumea articulata</i> , <i>Juncus pallidus</i> and <i>Baumea juncea</i>	<i>Baumea juncea</i> , <i>Baumea articulata</i> , <i>Juncus pallidus</i> , <i>Centella asiatica</i> , <i>Acacia saligna</i> , <i>Villarsia sp.</i> , <i>Melaleuca cuticularis</i> , <i>Gahnia trifida</i> , <i>Cassytha racemosa</i> , <i>Rhadinothermus anceps</i> , <i>Melaleuca ?viminea</i> , <i>?Schoenus sp.</i>

Juncus sedgelands	
Dense Tall Sedges of <i>Juncus kraussii</i> subsp. <i>australiensis</i> and <i>Ficinia nodosa</i> with Dwarf Scrub C of <i>Spyridium globulosum</i> and <i>Olearia axillaris</i>	<i>Apium prostratum</i> , <i>Centella asiatica</i> , <i>Olearia axillaris</i> , <i>Senecio lautus</i> , * <i>Sonchus oleraceus</i> , <i>Rhagodia baccata</i> , <i>Ficinia nodosa</i> , <i>Hibbertia cuneiformis</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon revolutus</i> , <i>Gyrostemon sheathii</i> , <i>Patersonia occidentalis</i> , <i>Juncus ?pauciflorus</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Cassytha racemosa</i> , <i>Lobelia alata</i> , <i>Villarsia</i> sp., <i>Acacia cyclops</i> , <i>Agonis flexuosa</i> , <i>Melaleuca cuticularis</i> , <i>Olax phyllanthi</i> , <i>Bossiaea praetermissa</i> , <i>Callistachys lanceolata</i> , <i>Jacksonia horrida</i> , <i>Briza maxima</i> , <i>Muehlenbeckia adpressa</i> , <i>Hakea oleifolia</i> , <i>Hakea varia</i> , <i>Samolus repens</i> , <i>Desmocladius flexuosus</i> , <i>Rhadinothermus anceps</i> , <i>Spyridium globulosum</i> , * <i>Solanum nigrum</i> , <i>Loxocarya</i> sp.
Dense Tall Sedges of <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Ficinia nodosa</i> and <i>Baumea juncea</i>	<i>Olearia axillaris</i> , <i>Senecio lautus</i> , <i>Rhagodia baccata</i> , <i>Ficinia nodosa</i> , <i>Hibbertia cuneiformis</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon revolutus</i> , <i>Juncus ?pauciflorus</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Cassytha racemosa</i> , <i>Villarsia</i> sp., <i>Bossiaea praetermissa</i> , <i>Callistachys lanceolata</i> , <i>Jacksonia horrida</i> , <i>Muehlenbeckia adpressa</i> , <i>Rhadinothermus anceps</i> , <i>Spyridium globulosum</i>
Low Sedges of <i>Juncus pauciflorus</i> and <i>Ficinia nodosa</i>	<i>Hydrocotyle</i> sp, <i>Olearia axillaris</i> , <i>Ficinia nodosa</i> , <i>Hibbertia cuneiformis</i> , <i>Patersonia occidentalis</i> , <i>Juncus pauciflorus</i> , <i>Juncus</i> sp. Dwarf, <i>Lobelia alata</i> , <i>Bossiaea praetermissa</i> , <i>Sporobolus virginicus</i> , <i>Samolus junceus</i> ,
Low Sedges of <i>Juncus pauciflorus</i> , <i>Baumea juncea</i> and <i>Ficinia nodosa</i> with patches of Dwarf Scrub C of <i>Bossiaea rufa</i> , <i>Olearia axillaris</i> , and <i>Leucopogon parviflorus</i> .	<i>Carpobrotus virescens</i> , <i>Xanthosia candida</i> , * <i>Gamochaeta falcata</i> , <i>Olearia axillaris</i> , <i>Ficinia nodosa</i> , <i>Isolepis</i> sp. Dwarf 1, <i>Isolepis</i> sp. Dwarf 2, <i>Baumea juncea</i> , <i>Hibbertia cuneiformis</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon</i> sp., <i>Juncus pauciflorus</i> , <i>Lobelia alata</i> , <i>Acacia cyclops</i> , <i>Melaleuca cuticularis</i> , <i>Melaleuca pauciflora</i> , <i>Bossiaea ?praetermissa</i> or <i>?rufa</i> , <i>Banksia occidentalis</i> , <i>Samolus repens</i> , <i>Spyridium globulosum</i> , <i>Stylidium</i> sp.,
Melaleuca forest	
Low Forest B of <i>Melaleuca cuticularis</i>	<i>Melaleuca cuticularis</i> , <i>Banksia occidentalis</i> , <i>Acacia cyclops</i> , <i>Acacia saligna</i> , <i>Rhadinothermus anceps</i> , <i>Cassytha racemosa</i> , <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> , <i>Olax phyllanthi</i> , <i>Agonis flexuosa</i> , <i>Baumea articulata</i> , <i>Baumea juncea</i> , <i>Muehlenbeckia adpressa</i>
Callistachys shrublands	
Dense Heath B of <i>Callistachys lanceolata</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> and <i>Taxandria inundata</i>	<i>Olearia axillaris</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , <i>Leucopogon parviflorus</i> , <i>Juncus pauciflorus</i> , <i>Agonis flexuosa</i> , <i>Melaleuca lanceolata</i> , <i>Taxandria juniperina</i> , <i>Taxandria inundata</i> or <i>fragrans</i> , <i>Callistachys lanceolata</i> , <i>Jacksonia horrida</i> ,
Dense Thicket of <i>Callistachys lanceolata</i> with <i>Melaleuca cuticularis</i> and <i>Spyridium globulosum</i>	<i>Callistachys lanceolata</i> , <i>Melaleuca cuticularis</i> , <i>Spyridium globulosum</i> , <i>Hakea oleifolia</i> , <i>Rhadinothermus anceps</i>
Melaleuca heath	
Heath B of <i>Melaleuca viminea</i> over Open Tall Sedges of <i>Baumea juncea</i> , <i>Baumea articulata</i> and <i>Gahnia trifida</i>	<i>Melaleuca ?viminea</i> , <i>Baumea juncea</i> , <i>Baumea articulata</i> , <i>Gahnia trifida</i> , <i>Isolepis</i> sp., <i>Acacia saligna</i>
Banksia occidentalis shrublands	
Dense Heath A of <i>Agonis flexuosa</i> , <i>Banksia occidentalis</i> and <i>Spyridium globulosum</i>	<i>Agonis flexuosa</i> , <i>Banksia occidentalis</i> , <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> , <i>Xanthorrhoea preissii</i> , <i>Acacia saligna</i> , <i>Jacksonia horrida</i>
Heath B of <i>Spyridium globulosum</i> , <i>Banksia occidentalis</i> , <i>Olearia axillaris</i> , <i>Melaleuca pauciflora</i> , <i>Pericalymma spongiocaula</i> and <i>Jacksonia horrida</i> , with Open Tall Sedges of <i>Ficinia nodosa</i>	<i>Agonis flexuosa</i> , <i>Jacksonia horrida</i> , <i>Adenanthos meisneri</i> , <i>Pericalymma crassipes</i> , <i>Hibbertia subvaginata</i> , <i>Xanthorrhoea preissii</i> , <i>Acacia pulchella</i> var. <i>pulchella</i> , <i>Anarthria prolifera</i> , <i>Leucopogon cordatus</i> , <i>Lepidosperma</i> sp. 'Black Point', <i>Acacia myrtifolia</i> , <i>Spyridium globulosum</i> , <i>Banksia occidentalis</i> , <i>Banksia littoralis</i> , <i>Baumea juncea</i> , <i>Melaleuca pauciflora</i> , <i>Hakea varia</i> , <i>Dodonaea ceratocarpa</i> , <i>Hibbertia stellaris</i> , <i>Patersonia occidentalis</i> , <i>Cassytha racemosa</i> , <i>Pericalymma spongiocaula</i>

Table 9. Communities of sand dunes forming part of the Safety Bay Sands landform unit

Group	Description	Species
Coastal Heaths and Thicket		
	Dense Heath A of <i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> and <i>Olearia axillaris</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i>
	Dense Heath A of <i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Leucopogon parviflorus</i> and <i>Banksia sessilis</i> var <i>cordata</i>	<i>Carpobrotus virescens</i> , <i>Olearia axillaris</i> , <i>Senecio lautus</i> , * <i>Sonchus oleraceus</i> , <i>Rhagodia baccata</i> , <i>Ficinia nodosa</i> , <i>Acanthocarpus preissii</i> , <i>Hibbertia cuneiformis</i> , <i>Hibbertia grossulariifolia</i> , <i>Hibbertia racemosa</i> , <i>Acrotriche cordata</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon</i> sp., <i>Scaevola crassifolia</i> , <i>Conostylis candicans</i> , <i>Cassytha racemosa</i> , <i>Acacia divergens</i> , <i>Agonis flexuosa</i> , <i>Dianella revoluta</i> , <i>Billardiera heterophylla</i> , <i>Austrostipa</i> sp., * <i>Lagurus ovatus</i> , <i>Muehlenbeckia adpressa</i> , <i>Banksia sessilis</i> var <i>cordata</i> P4, <i>Hakea oleifolia</i> , <i>Samolus repens</i> , <i>Clematis pubescens</i> , <i>Desmocladius flexuosus</i> , <i>Boronia alata</i> , <i>Chorilaena quercifolia</i> , <i>Spyridium globulosum</i> , <i>Veronica</i> sp ? <i>calycina/distans?</i>
	Dense Heath B of <i>Agonis flexuosa</i> , <i>Olearia axillaris</i> , <i>Spyridium globulosum</i> and <i>Rhagodia baccata</i> over Open Low Sedges of <i>Ficinia nodosa</i> and <i>Lepidosperma effusum</i> and Low Grass of <i>Austrostipa</i> sp.	<i>Xanthosia candida</i> , <i>Olearia axillaris</i> , <i>Ozothamnus cordatus</i> , <i>Rhagodia baccata</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma effusum</i> , <i>Hibbertia cuneiformis</i> , <i>Hibbertia grossulariifolia</i> , <i>Leucopogon parviflorus</i> , <i>Geranium solanderi</i> , <i>Scaevola crassifolia</i> , <i>Conostylis candicans</i> , <i>Cassytha racemosa</i> , <i>Acacia divergens</i> , <i>Agonis flexuosa</i> , <i>Billardiera heterophylla</i> , <i>Austrostipa</i> sp., <i>Briza maxima</i> , * <i>Lagurus ovatus</i> , <i>Banksia sessilis</i> var <i>cordata</i> P4, <i>Hakea oleifolia</i> , <i>Clematis linearifolia</i> , <i>Desmocladius flexuosus</i> , <i>Boronia alata</i> , <i>Chorilaena quercifolia</i> , <i>Spyridium globulosum</i> , <i>Pimelea clavata</i> ,
	Dense Heath B of <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> and <i>Jacksonia horrida</i> with Open Tall Sedges of <i>Ficinia nodosa</i>	<i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Ficinia nodosa</i> ,
	Heath Complex of <i>Agonis flexuosa</i> , <i>Olearia axillaris</i> , <i>Spyridium globulosum</i> and <i>Jacksonia horrida</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , <i>Scaevola crassifolia</i> , <i>Rhagodia baccata</i>
	Low Heath C of <i>Acacia cyclops</i> , <i>Olearia axillaris</i> , <i>Leucopogon parviflorus</i> and <i>Spyridium globulosum</i> with Open Tall Sedges <i>Ficinia nodosa</i>	<i>Acacia cyclops</i> , <i>Olearia axillaris</i> , <i>Leucopogon parviflorus</i> , <i>Spyridium globulosum</i> , <i>Ficinia nodosa</i>
	Low Heath C of <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Spyridium globulosum</i> and <i>Rhadinthamnus anceps</i> with Low Sedges <i>Baumea juncea</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Rhadinthamnus anceps</i> , <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , <i>Scaevola crassifolia</i> , <i>Rhagodia baccata</i>
	Low Heath C of <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> and <i>Jacksonia horrida</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Rhadinthamnus anceps</i> , <i>Baumea juncea</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , <i>Scaevola crassifolia</i> , <i>Rhagodia baccata</i>
	Low Scrub B of <i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> and <i>Jacksonia horrida</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Jacksonia horrida</i> , <i>Olearia axillaris</i> , <i>Adenanthos meisneri</i> , <i>Ficinia nodosa</i> , <i>Lepidosperma gladiatum</i> , <i>Scaevola crassifolia</i> , <i>Rhagodia baccata</i>
	Low Woodland A of <i>Agonis flexuosa</i> and Dense Heath A of <i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> and <i>Olearia axillaris</i>	<i>Agonis flexuosa</i> , <i>Spyridium globulosum</i> , <i>Rhagodia baccata</i> , <i>Olearia axillaris</i> , <i>Desmocladius flexuosus</i> , <i>Hardenbergia comptoniana</i> , <i>Jacksonia horrida</i> , <i>Lepidosperma ?gladiatum</i>
	Thicket of <i>Allocasuarina fraseriana</i>	<i>Allocasuarina fraseriana</i> , <i>Adenanthos meisneri</i> , <i>Lepidosperma</i> sp. 'Black Point', <i>Persoonia longifolia</i> , <i>Bossiaea linophylla</i> , <i>Hibbertia hypericoides</i> , <i>Anarthria prolifera</i> , <i>Macrozamia riedlei</i> , <i>Brachyloma preissii</i>
Lepidosperma Sedgeland		
	Tall Sedges of <i>Gahnia trifida</i> and <i>Lepidosperma effusum</i> with Low Scrub B of <i>Rhadinthamnus anceps</i>	<i>Gahnia trifida</i> , <i>Lepidosperma effusum</i> , <i>Rhadinthamnus anceps</i> , <i>Ficinia nodosa</i> , <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Olearia axillaris</i>
	Dense Tall Sedges of <i>Lepidosperma effusum</i> and <i>Gahnia trifida</i>	
	Dense Tall Sedges of <i>Lepidosperma gladiatum</i> with Low Scrub A of <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> , <i>Acacia littorea</i> , <i>Rhadinthamnus anceps</i> and <i>Muehlenbeckia adpressa</i>	<i>Lepidosperma gladiatum</i> , <i>Spyridium globulosum</i> , <i>Olearia axillaris</i> , <i>Acacia littorea</i> , <i>Gahnia trifida</i> , <i>Rhadinthamnus anceps</i> , <i>Muehlenbeckia adpressa</i>
Grassland		
	Dense Low Grass of <i>Sporobolus virginicus</i>	<i>Sporobolus virginicus</i> , <i>Olearia axillaris</i> , * <i>Euphorbia paralias</i> , <i>Dichondra repens</i>

5.4 Wetlands

Examination of DEC's 2008 hydrography of the Black Point area revealed three wetlands on the point including Bolghinup Lake which was the largest of the three, (Ref. Map 1). Further examination of aerial photography identified an additional 3 possible wetlands and during the survey all 6 of these areas were targeted to determine the vegetation communities and confirm the presence of wetlands.

During the field survey all of the areas identified in the desktop survey were visited and confirmed to be wetlands and two additional areas were determined to be wetlands as well. All of the wetlands visited were later mapped as shown in Map 6 in Appendix 1 with a description of the vegetation within each wetland listed in Table 10.

During the field survey varying degrees of either trampling and grazing or a combination of both were observed in wetlands 1,6 and 8. In particular, wetland 1, Bolghinup Lake was significantly impacted by the trampling of the *Baumea* sedgeland, primarily by kangaroos, which has left the sedge lands vulnerable to grazing by rabbits to the degree that rabbits are preventing the re-establishment of the sedge-land species. Kangaroo activity appears to be higher than it has been in the past due to increased accessibility provided by both an old vehicle track and drier climatic conditions reducing the seasonal flooding period of the lake.

Table 10. Wetland vegetation descriptions relating to Map 6

No	Vegetation Description
1 Bolghinup Lake	Dense Tall sedges of <i>Baumea articulata</i> , <i>Baumea juncea</i> and <i>Juncus pallidus</i> ; Dense Low Sedges of <i>Baumea juncea</i> ; Low Forest B of <i>Melaleuca cuticularis</i> ; and Low Heath C of <i>Melaleuca viminea</i> .
2	Dense Tall Sedges of <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Ficinia nodosa</i> and <i>Baumea juncea</i>
3	Dense Tall Sedges of <i>Baumea articulata</i> , <i>Juncus pallidus</i> and <i>Baumea juncea</i>
4	Dense Tall Sedges of <i>Baumea articulata</i> , <i>Juncus pallidus</i> and <i>Baumea juncea</i>
5	Dense Tall Sedges of <i>Juncus kraussii</i> subsp. <i>australiensis</i> , <i>Ficinia nodosa</i> and <i>Baumea juncea</i>
6	Dense Tall Sedges of <i>Juncus kraussii</i> subsp. <i>australiensis</i> and <i>Ficinia nodosa</i> with Dwarf Scrub C of <i>Spyridium globulosum</i> and <i>Olearia axillaris</i>
7	Low Sedges of <i>Juncus pauciflorus</i> and <i>Ficinia nodosa</i>
8	Low Sedges of <i>Juncus pauciflorus</i> , <i>Baumea juncea</i> and <i>Ficinia nodosa</i> with patches of Dwarf Scrub C of <i>Bossiaea rufa</i> , <i>Olearia axillaris</i> , and <i>Leucopogon parviflorus</i> .

5.5 Acid Sulphate Soils

Whilst not originally intended to be covered by this survey a number of areas were observed in the field which were suspected to have either actual or potential Acid Sulphate Soils (ASS). These were mapped as ASS risk areas in Map 8 in Appendix 1. Further survey is required to confirm the finer distribution of ASS, however the map is expected to have covered the primary risk areas.

5.6 Threats

Threats such as uncontrolled vehicle access have in the past lead to some significant impacts on vegetation communities of Black Point and whilst many of these tracks have since been closed, the high visitation of Black Point continues to place its vegetation communities under a variety of threats as well as trampling, grazing, altered hydrology and acid sulphate soils. However with good management practices the impacts of most of the threats listed below can be minimised.

5.6.1 Trampling by visitors

Whilst much of the vegetation around Black Point is relatively resilient to visitors exploring on foot off tracks, the low vegetation types of generally less than half a metre tend to be more sensitive to the impacts of wandering visitors, especially in areas exposed to coastal winds.

Key sensitive areas include:

- Vegetation types between the edge of the basalt and the main dune formations where vegetation is highly exposed to coastal wind and visitor use is high.
- *Juncus* sedgeland, especially those which occur on the clay soils immediately above and on

the basalt.

- *Baumea* sedgelandes whilst generally receiving few visitors are easily damaged by trampling which also opens areas to rabbit grazing hampering vegetation and leading to flow on decline.

In order to minimise the impact of trampling by visitors, access should be reduced around sensitive areas or formalised into more sustainable access tracks or board walks. The provision of interpretation stressing the sensitive nature of certain areas should also be provided.

5.6.2 Vehicle tracks

A number of vehicle tracks which are now closed have caused significant damage to vegetation communities resulting in dune destabilisation and the decline of a number of wetlands.

Two of the old tracks pass through wetlands, which whilst now closed to vehicles are likely to have provided easier access into these areas by animals and people on foot contributing to further damage of these wetlands.

Vehicle tracks which are officially open at the present were not seen to be causing significant impacts and are not considered to be threats in the short or medium term however, a number of tracks primarily near crests are beginning to erode the dune and therefore would be considered to become an issue in the long term if measures are not taken to stabilise or improve them from their current condition.

One track is an exception to the above which is the track which traverses down from the main east west ridge line to the low lying area on the south east of Black Point known by some as Percy's Pool. The Dieback disease, *Phytophthora cinnamomi* has been reported (Moore, 2009) in this area and on this track. This is a significant issue as the soils near the end of this track and the surrounding area tend to have a significant clay content, this area the most likely location for infected soil to be picked up by both vehicles and pedestrians and carried elsewhere into the landscape. This is a significant issue locally to this site as the immediate surrounds contain a number of species including *Banksia occidentalis* which are considered to be sensitive to *Phytophthora*.

In order to minimise the threat of vehicle access in environmentally sensitive areas no new tracks should be created and consideration should be given to either closing tracks currently being used in and around these areas or to formalising them in a way which will minimise the impact of their continued use such as raising their surface above the water table and using surfacing materials which will minimise the transfer of *Phytophthora*. All old tracks in environmentally sensitive areas should remain closed and be rehabilitated where needed.

5.6.3 Acid Sulphate Soils

During the survey a number of acid sulphate soil risk areas were identified at Black Point in wetland areas of *Baumea/Juncea* sedgelandes and in the *Melaleuca cuticularis* Low Forest areas. Acid sulphate soils remain in reducing conditions whilst they are kept wet, however disturbance of the hydrology both on site and in the surrounding landscape and drying climatic conditions can lead to oxidation of sediments. This can result in acidification at a local level and may mobilise into other areas of the landscape causing the death and decline of vegetation. An interim map of potential risk areas has been provided in Appendix 1 Map 8.

5.6.4 Altered hydrology

Current tracks or the creation of new tracks have the potential to alter the hydrology at a local level threatening the wetland areas and the oxidation of acid sulphate soils.

There are two old tracks which traverse from one side of the point to the other. The first runs around the coast and through *Juncus* sedgeland and was observed to have altered the hydrology by directing water flow down the track rather than throughout the surrounding vegetation. The second track runs

through Bolghinup Lake, however at the time of the survey there was insufficient water around to determine if this track had altered the hydrology. The first track did not appear to be a threat at present, however the second track was considered to require further investigation to determine whether it may be contributing to the decline of the Bolghinup wetland.

Further investigation is required into the impact of existing tracks and consideration given to the impacts of any proposed tracks.

5.6.5 Drying climate

Comparison of aerial photography from 1966 and 2008 shows that the wetlands of Black Point have contracted in size, which is expected to have resulted from a change in climatic conditions experienced at Black Point. If a drying trend continues, it is expected that the wetlands will continue to contract resulting in a change in the distribution and composition of these vegetation communities and can be expected to lead to increased oxidisation of potentially acid sulphate soils associated with many of these wetlands.

5.6.6 Kangaroo activity

Kangaroos, whilst indigenous to the area appear to have increased their activity in a number of wetlands, especially Bolghinup Lake and appear to have caused damage due to trampling of sedgeland areas. Increased activity is likely to have resulted from the reduced period in which these wetlands are flooded as a result of drying climatic conditions, as well as greater accessibility provided by the disused vehicle track which passes through Bolghinup Lake. The initial disturbance by kangaroos is also providing an opportunity for rabbits to get a hold in these areas and rabbit grazing of new growth is preventing the site from recovering from kangaroo traffic. Measures to reduce kangaroo traffic and rabbit grazing are required to prevent further damage.

5.6.7 Grazing pressures

Rabbit grazing is a significant threat which is already expressing impacts at Black Point and causing the loss of vegetation, which in some areas is then followed by soil erosion. Generally the areas most vulnerable to rabbits were low shrublands low sedgelands and herblands, where it was easy for rabbits to significantly alter the community structure, however rabbits were also observed to be a significant impact in the taller *Baumea* sedgelands where disturbance of mature sedges by kangaroo trampling opened up these areas allowing rabbits to get a foot hold and grazing on re-sprouting sedges was observed to be preventing the re-establishment of these areas following trampling disturbance.

5.6.8 Dune destabilisation

Comparison of 1996 and 2008 aerial photography shows that past dune destabilisation in some areas appears to be slowly re-establishing vegetation cover. Dune destabilisation is expected to be of greatest threat around these areas following fire when the vegetation cover is removed and measures may need to be undertaken in susceptible areas to prevent further degradation following wildfire and prescribed fire and possibly to exclude these areas during prescribed fire.

A wind fence has been established to reduce further erosion of the largest blow out and facilitate re-establishment of vegetation and whilst it is in poor condition, it is an option which could be considered for other areas.

5.6.9 *Phytophthora* spread

Much of the lower lying area south of the main east west ridge has been reported to be infected with *Phytophthora cinnamomi* although during the survey for this report the impact of the pathogen in the infected area appears to be low with small localised scatterings of deaths or declines of some *Banksia occidentalis* and *Adenanthos meisneri*. Measures should be put in place to minimise the threat of *Phytophthora* including investigating the possible application of phosphite on stands of *Banksia*

occidentalis and track management to prevent further spread of *Phytophthora* via the track to Percy's Pool mentioned in Section 5.6.2.

5.6.10 Inappropriate fire regimes

Inappropriate fire regimes are a potential threat which result in the decline of vegetation communities and wetland and may exacerbate the impacts of other threats such as dune destabilisation, trampling and grazing. In order to minimise inappropriate fire regimes the prescribing of planned fire in the Black Point area should give consideration to these threats and the impacts different fire regimes may have on these threats and the vegetation communities described in this report and where necessary should proactively plan for follow up actions to be undertaken to minimise the impacts following prescribed fire.

5.7 Environmentally Sensitive Areas

Through the assessment of vegetation types and identification of threats and other values such as wetlands and PECs a number of areas have been recognised as being environmentally sensitive and mapped in red in Map 7 in Appendix 1. Areas which have been previously affected by vegetation loss have also been identified as important and in need of protection from further disturbance if they are to recover and have been mapped in yellow on Map 7.

6 Recommendations

6.1 Threat minimisation

The following recommendations are proposed to minimise the impacts of threats on vegetation communities with the redevelopment of recreational sites at Black Point.

It is recommended that:

- no roads are created below the main east-west ridge line or through the environmentally sensitive areas shown on Map 7 of Appendix 1;
- visitor access, by both vehicles and pedestrians, into and around sensitive areas should be restricted or formalised in a manner which minimises the impact of visitor access;
- access into the degraded areas shown in Map 7 of Appendix 1, should be restricted to allow these areas to recover and that these areas are assessed to determine appropriate actions to aid their recovery;
- a rabbit management program be developed to minimise rabbit impacts on the vegetation communities of Black Point;
- measures to reduce kangaroo traffic and rabbit grazing in Bolghinup Lake should be investigated to allow facilitate the recovery of *Baumea* sedgelands;
- only low impact development should be considered below the main east west ridge line;
- all roads south of the east west ridge line currently closed, remain closed and work undertaken to facilitate their revegetation;
- access to 'Percy's Pool' is closed to vehicle traffic with access ideally via a walk trail from a car park situated up-slope in dry soil and with the route of the walk trail similarly being located in dry sandy soils to reduce the spread of *Phytophthora*;
- maintenance is carried out on the existing wind fence in the main blow out on the south of the point and that options to protect or revegetate other wind eroded degraded areas shown in Map 7 of Appendix 1 should be investigated;
- further investigation is undertaken of the old track running through Bolghinup Lake to determine whether the track is having an adverse impact on the hydrology of the Lake.

6.2 Research recommendations

- Further study of the Black Point Bunbury Basalt Associated PEC is required to provide a firm description of the community and a review of its conservation status should be completed to determine the whether the PEC should be nominated as a Threatened Ecological Community.
- Further survey of the Black Point vegetation communities is also required during the peak flowing season to provide a more accurate species composition list and set up fixed quadrats to confirm the initial vegetation mapping and vegetation units chosen.

6.3 Monitoring recommendations

- It is recommended that through the additional survey in spring that a number of permanent monitoring sites are established to monitor the impacts of threats and management of the Black Point area and that this is inline with a wider project proposed for monitoring of coastal ecological communities in the Warren Region.

7 Conclusion

The diversity of vegetation types was found to be greater than previously described with the main complexities occurring below the east-west ridge line shown in Map 4 in Appendix 1. Likewise the majority of the environmentally sensitive areas including the basalt community associations and the wetland complexes occur south of this ridge line. Most communities occurring away from the coast line were in excellent condition, and it tended to be the coastal communities in high visitation areas and some of the wetland complexes which had suffered from disturbance, but most still fell within the very good condition rating.

No declared rare flora were recorded or located in the study area however three species of priority flora are recorded as shown on Map 2 in Appendix 1. Two Priority Ecological Communities are located at Black Point, namely: the Black Point Microbial Tufa PEC and the Black Point Bunbury Basalt Associations PEC, both of these communities are restricted to the main Bunbury Basalt land form which occurs between the watermark and the dune systems of the point itself. During the field work both PECs were surveyed however this report only deals with the Black Point Bunbury Basalt Associations PEC, information for the Black Point Microbial Tufa PEC is available in the separate report "*Microbialite Survey of Black Point, Including summary of Black Point Sea Cave*" (Newland, 2009). A preliminary description for the primary

8 References

- Baddock, L.J. (1995). *Geology and Hydrogeology of the Scott Coastal Plain, Perth Basin*. Geological Survey of Western Australia, Department of Minerals and Energy. Perth, WA.
- Bureau of Meteorology. (1994). *Average Annual Rainfall of Western Australia*. Department of Environment and Conservation. Kensington Western Australia.
- Bureau of Meteorology. (2009). *Seasonal Rainfall for Australia*. Bureau of Meteorology. Australia
- Dept. of Environment and Conservation (DEC). (2008). *CALM Operation Graphics (COG) Hydrography Digital Acquisition Program (DAP)*. DEC, Kensington WA
- Dept. of Environment and Conservation (DEC). (2009). *Nature Map* [on-line] Available WWW: <http://naturemap.dec.wa.gov.au>. DEC, Kensington WA
- Dept. of Environment and Conservation (DEC). (2009). *Florabase* [on-line] Available WWW: <http://florabase.dec.wa.gov.au>. DEC, Kensington WA
- Dept. of Environment and Conservation (DEC). (2006). *Mapping of Vegetation Complexes in the South West forest region of Western Australia*. DEC, Kensington WA
- Environmental Protection Authority. (2004). *Guidance for the Assessment of Environmental Factors, Terrestrial flora and vegetation surveys for environmental impact assessment in Western Australia. No51*. Draft. EPA, Perth WA
- Keighery, B.J. (1994). *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc), Nedlands WA.
- Moore, I. (2009) *Black Point Phytophthora cinnamomi Protectable Areas Map*. Moore Mapping, Manjimup WA
- Muir, B.G. (1977). *Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve*. Records of the Western Australian Museum, Supplement No. 3
- Newland, C.J. (2009). *Microbialite Survey of Black Point, Including summary of Black Point Sea Cave*. DEC, Manjimup

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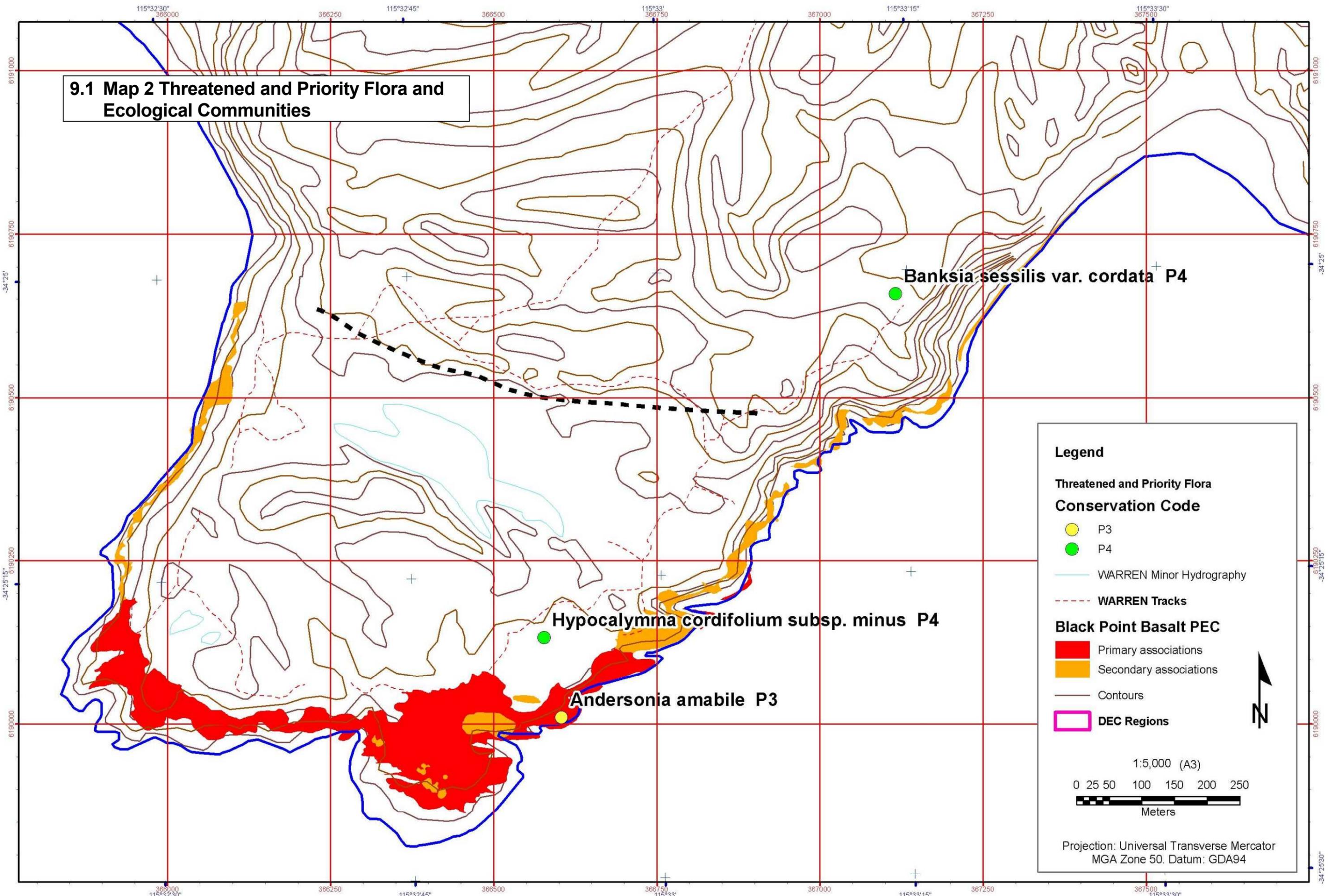
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9.1 Map 2 Threatened and Priority Flora and Ecological Communities



Legend

Threatened and Priority Flora Conservation Code

- P3
- P4

— WARREN Minor Hydrography

- - - WARREN Tracks

Black Point Basalt PEC

- Primary associations
- Secondary associations

— Contours

DEC Regions

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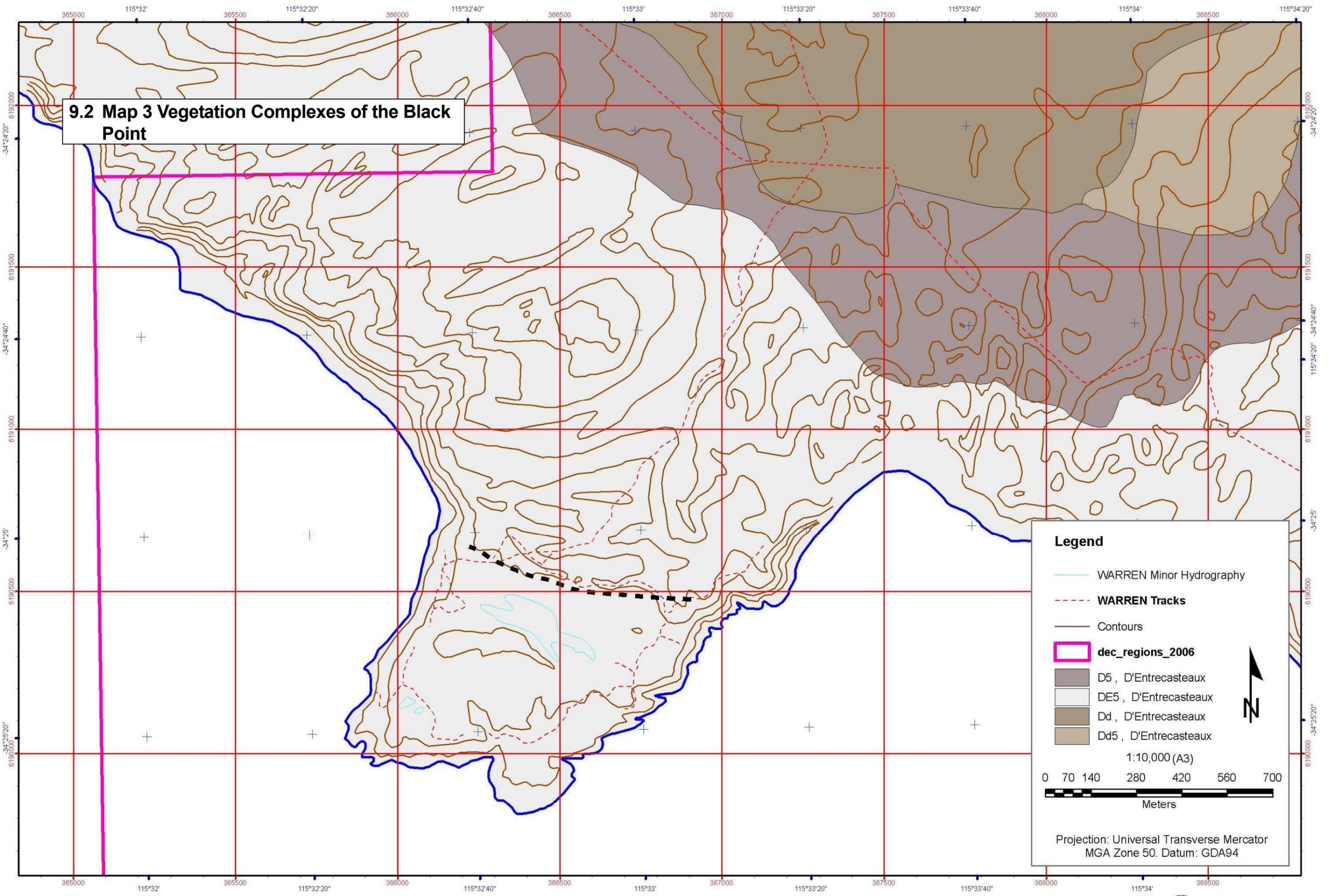
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Graticule shown at 15 seconds intervals
Grid shown at 500 metre intervals

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9.2 Map 3 Vegetation Complexes of the Black Point



Legend

- WARREN Minor Hydrography
- WARREN Tracks
- Contours
- dec_regions_2006
- D5, D'Entrecasteaux
- DE5, D'Entrecasteaux
- Dd, D'Entrecasteaux
- Dd5, D'Entrecasteaux

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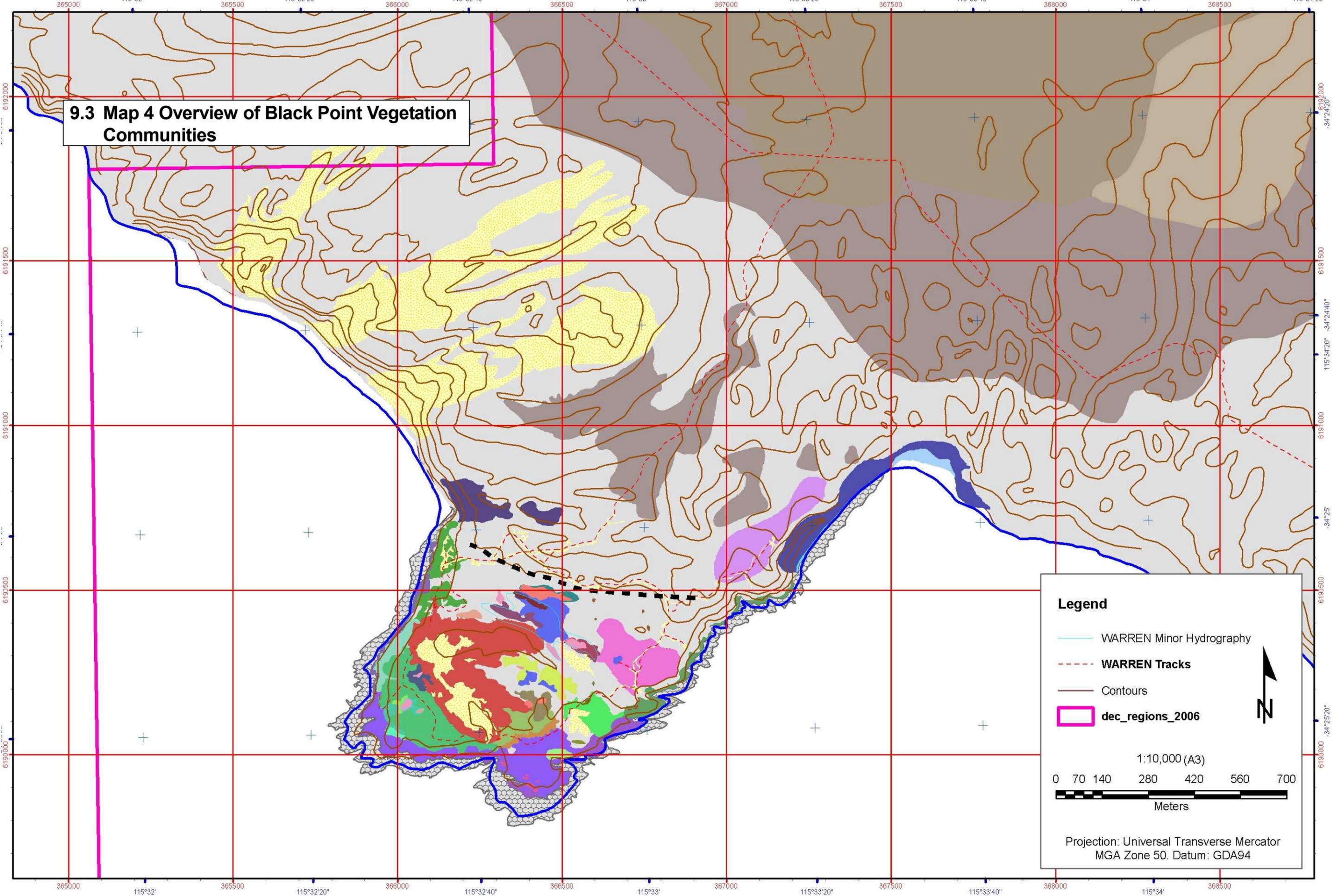
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Grid shown at 500 metre intervals

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9.3 Map 4 Overview of Black Point Vegetation Communities



Graticule shown at 15 seconds intervals
Grid shown at 500 metre intervals

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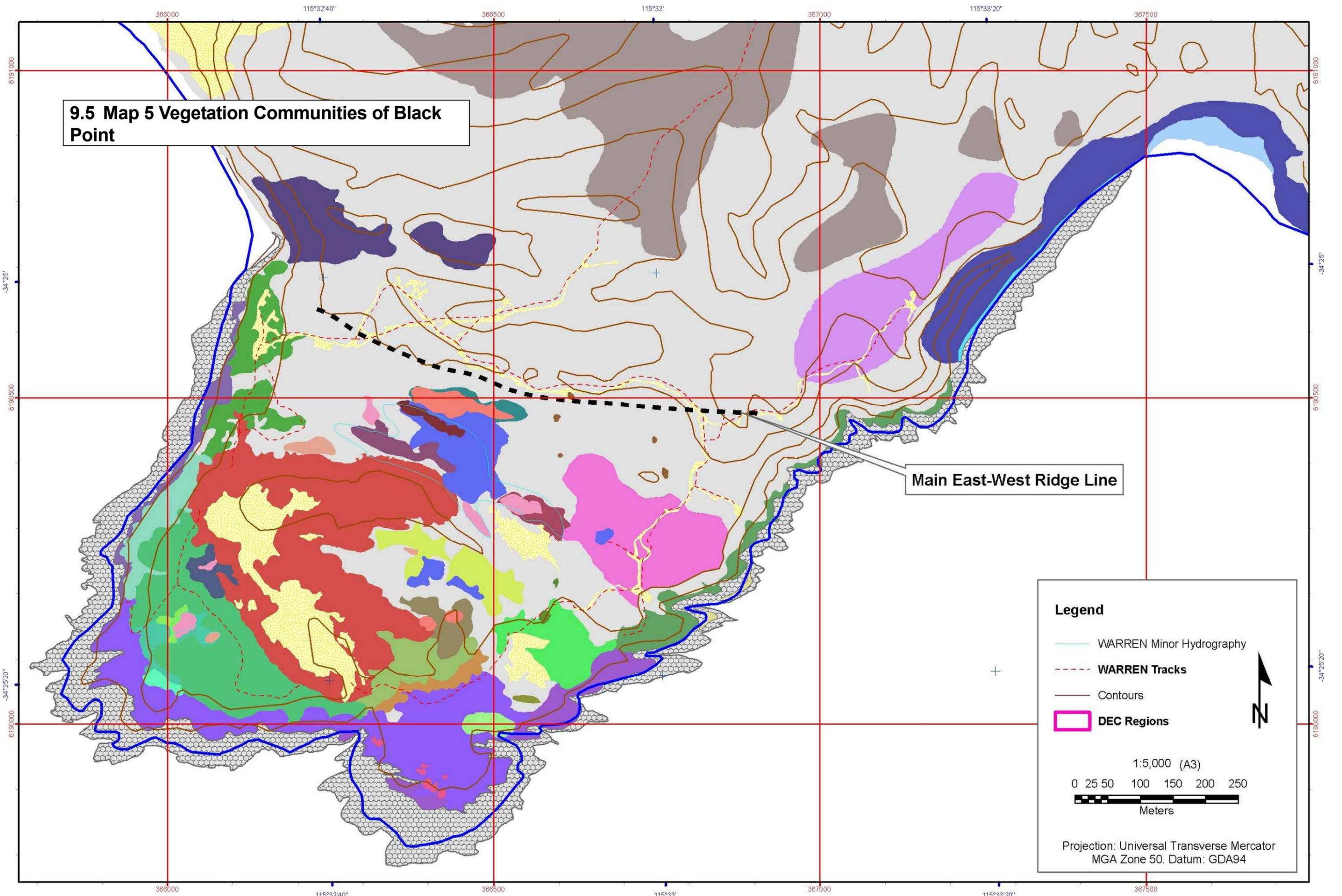
9.4 Legend for Black Point Vegetation Communities

Black Point Vegetation Communities

Description

-  Basalt Outcrop
-  Coastal Complex of *Baumea juncea*, *Ficinia nodosa*, *Sporobolus virginicus*, *Samolus repens*, *Juncus kraussii* subsp. *australiensis*, *Lepidosperma* sp. 'Black Point' and *Muehlenbeckia adpressa*
-  Dense Heath A of *Agonis flexuosa*, *Banksia Occidentalis* and *Spyridium globulosum*
-  Dense Heath A of *Agonis flexuosa*, *Spyridium globulosum*, *Jacksonia horrida* and *Olearia axillaris*
-  Dense Heath A of *Agonis flexuosa*, *Spyridium globulosum*, *Leucopogon parviflorus* and *Banksia sessilis* var *cordata*
-  Dense Heath B of *Agonis flexuosa*, *Olearia axillaris*, *Spyridium globulosum* and *Rhagodia baccata* over Open Low Sedges of *Ficinia nodosa* and *Lepidosperma effusum* and Low Grass of *Austrostipa* sp.
-  Dense Heath B of *Callistachys lanceolata*, *Jacksonia horrida*, *Olearia axillaris*, *Agonis flexuosus* and *Spyridium globulosum* and *Taxandria inundata*
-  Dense Heath B of *Spyridium globulosum*, *Olearia axillaris* and *Jacksonia horrida* with Open Tall Sedges of *Ficinia nodosa*
-  Dense Low Grass of *Sphorobolus virginicus*
-  Dense Low Heath C of *Melaleuca cuticularis* verged by Dwarf Scrub D of *Olearia axillaris*, *Leucophyta brownii* and *Jacksonia horrida*
-  Dense Low Heath C of *Melaleuca cuticularis* verged by Dwarf Scrub D of *Olearia axillaris*, *Leucophyta brownii* and *Jacksonia horrida*.
-  Dense Low Sedges of *Baumea juncea*
-  Dense Tall Sedges of *Baumea articulata*, *Juncus pallidus* and *Baumea juncea*
-  Dense Tall Sedges of *Juncus kraussii* subsp. *australiensis* and *Ficinia nodosa* with Dwarf Scrub C of *Spyridium globulosum* and *Olearia axillaris*
-  Dense Tall Sedges of *Juncus kraussii* subsp. *australiensis*, *Ficinia nodosa* and *Baumea juncea*
-  Dense Tall Sedges of *Lepidosperma effusum* and *Ghania trifida*
-  Dense Tall Sedges of *Lepidosperma gladiatum* with Low Scrub A of *Spyridium globulosum*, *Olearia axillaris*, *Accacia littorea*, *Rhadinothamnus anceps* and *Muehlenbeckia adpressa*
-  Dense Thicket of *Callistachys lanceolata* with *Melaleuca cuticularis* and *Spyridium globulosum*
-  Dwarf Scrub C of *Spyridium globulosum*, *Olearia axillaris* and *Jacksonia horrida* with Open Tall Sedges of *Ficinia nodosa* and *Juncus* sp.
-  Low Scrub B of *Spyridium globulosum*, *Olearia axillaris* and *Jacksonia horrida* with Open Tall Sedges of *Ficinia nodosa*
-  Dwarf Scrub D of *Olearia axillaris*, *Scaevola crassifolia*, *Leucophyta brownii* and *Rhagodia baccata* Open Tall Sedges of *Lepidosperma effusum* and *Ficinia nodosa*
-  Heath B of *Melaleuca viminea* over Open Tall Sedges of *Baumea juncea*, *Baumea articulata* and *Gahnia trifida*
-  Heath B of *Spyridium globulosum*, *Banksia occidentalis*, *Olearia axillaris*, *Melaleuca pauciflora*, *Pericalyma spongiocaula* and *Jacksonia horrida*, with Open Tall Sedges of *Ficinia nodosa*
-  Heath Complex of *Agonis flexuosa*, *Olearia axillaris*, *Spyridium globulosum*, *Jacksonia horrida*
-  Herbs of *Sarcocornia quinquefolra* and *Samolus repens*
-  Low Forest B of *Melaleuca cuticularis*
-  Low Heath C of *Acacia cyclops*, *Olearia axillaris*, *Leucopogon parviflorus* and *Spyridium globulosum* with Open Tall Sedges of *Ficinia nodosa*
-  Low Heath C of *Olearia axillaris*, *Adenanthos meisneri*, *Spyridium globulosum* and *Rhadinothamnus anceps* with Low Sedges of *Baumea juncea*
-  Low Heath C of *Olearia axillaris*, *Spyridium globulosum* and *Jacksonia horrida*
-  Low Heath C of *Olearia axillaris*, *Spyridium globulosum* and *Rhagodia baccata*, Open Low Sedges of *Ficinia nodosa* and Low Grass of *Sporobolus virginicus*
-  Low Heath C of *Scaevola crassifolia*, *Olearia axillaris*, *Spyridium globulosum* and *Acacia littorea* with Open Tall Sedges of *Lepidosperma gladiatum*, *Ficinia nodosa* and *Juncus pauciflorus*
-  Low Scrub B of *Agonis flexuosa*, *Spyridium globulosum*, *Olearia axillaris* and *Jacksonia horrida*
-  Low Sedges of *Juncus pauciflorus* and *Ficinia nodosa*
-  Low Sedges of *Juncus pauciflorus*, *Baumea juncea* and *Ficinia nodosa* with patches of Dwarf Scrub C of *Bossiaea rufa*, *Olearia axillaris*, and *Leucopogon parviflorus*
-  Low Woodland B of *Agonis flexuosa* and Dense Heath A of *Agonis flexuosa*, *Spyridium globulosum* and *Olearia axillaris*
-  Open Dwarf Scrub D of *Leucophyta brownii* and *Sarcocornia quinqueflora* and Very Open Low Grass of *Sphorobolus virginicus*
-  Open Dwarf Scrub D of *Leucophyta brownii* and *Sarcocornia quinqueflora* and Very Open Low Grass of *Sphorobolus virginicus* on basalt outcrops
-  Open Dwarf Scrub D of *Leucophyta brownii*, *Sarcocornia quinqueflora* and *Olearia axillaris* with Very Open Low Sedges of *Ficinia nodosa*, *Baumea juncea* and *Juncus pauciflorus* on shallow soils over basalt
-  Open Forest of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* and Low Woodland of *Banksia attenuata* and *Nuysia florabunda*
-  Open Forest/Woodland of *Eucalyptus marginata* subsp. *marginata*, *Eucalyptus megacarpa* and *Corymbia calophylla*
-  Sand
-  Tall Sedges of *Baumea articulata*, *Juncus pallidus* and *B. juncea*
-  Tall Sedges of *Gahnia trifida* and *Lepidosperma effusum* with Low Scurb B of *Rhadinothamnus anceps*
-  Thicket of *Allocasrina fraseriana*
-  Tracks

9.5 Map 5 Vegetation Communities of Black Point



Main East-West Ridge Line

Legend

- WARREN Minor Hydrography
- WARREN Tracks
- Contours
- DEC Regions

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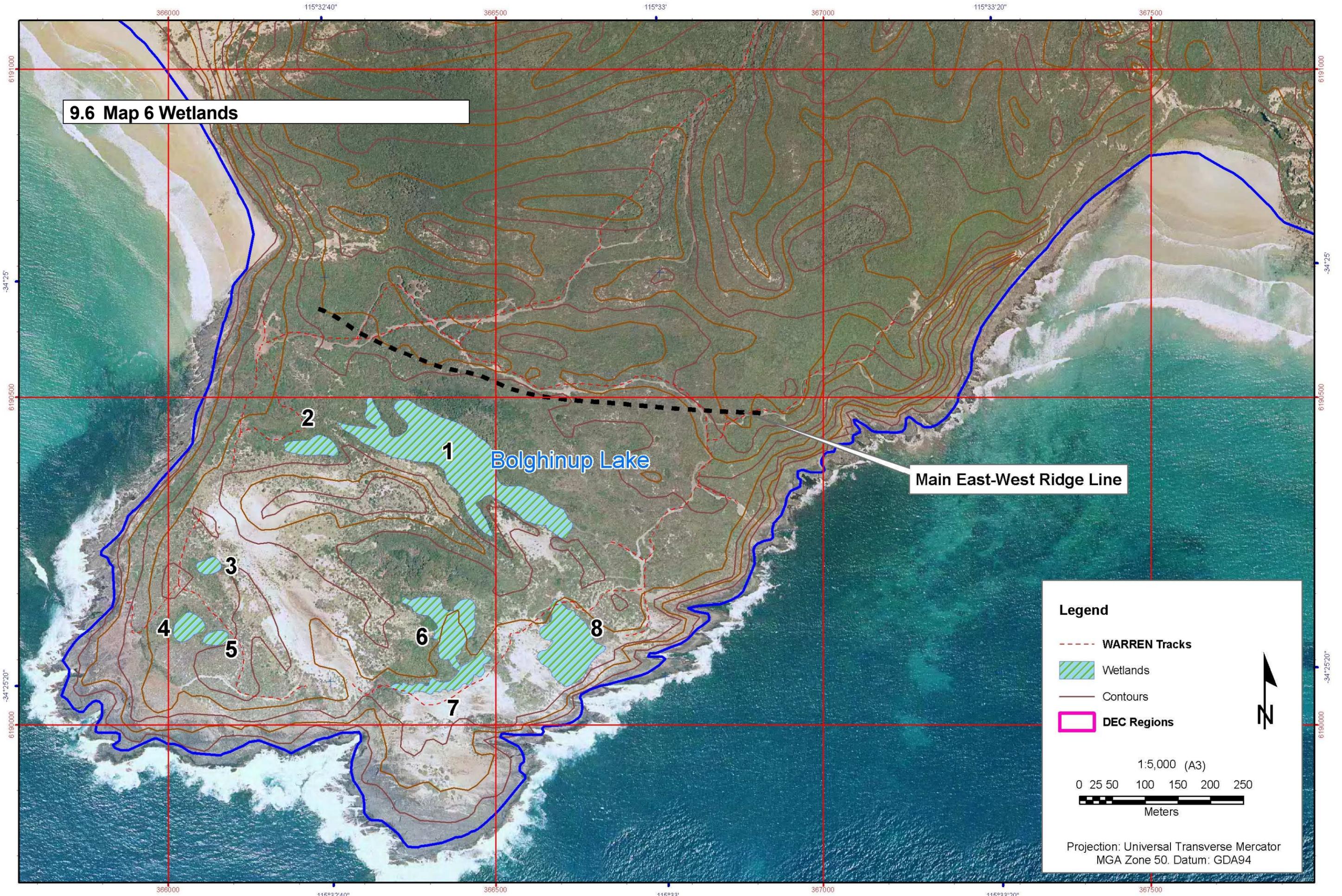
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9.6 Map 6 Wetlands



Main East-West Ridge Line

Legend

- WARREN Tracks
- Wetlands
- Contours
- DEC Regions

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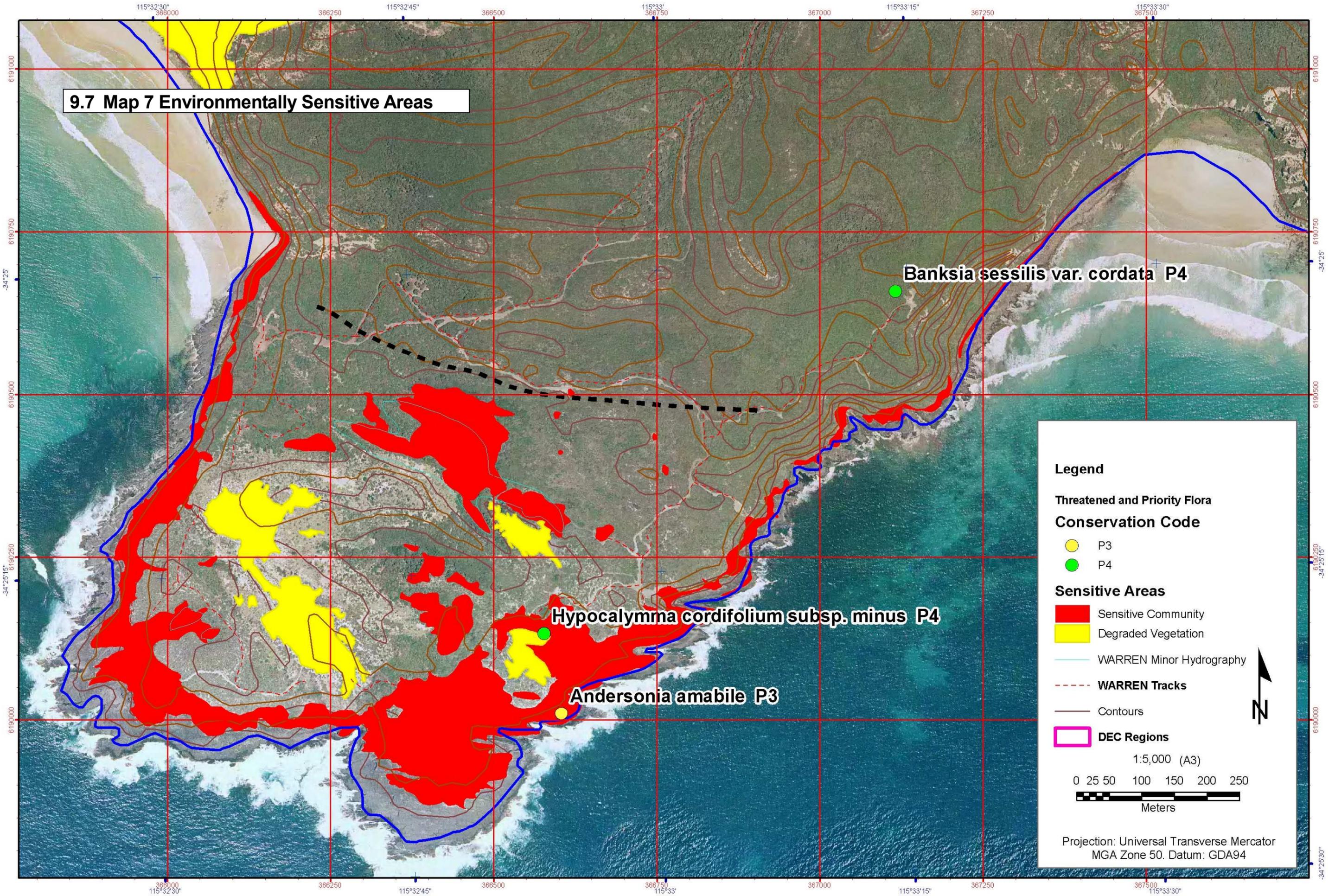
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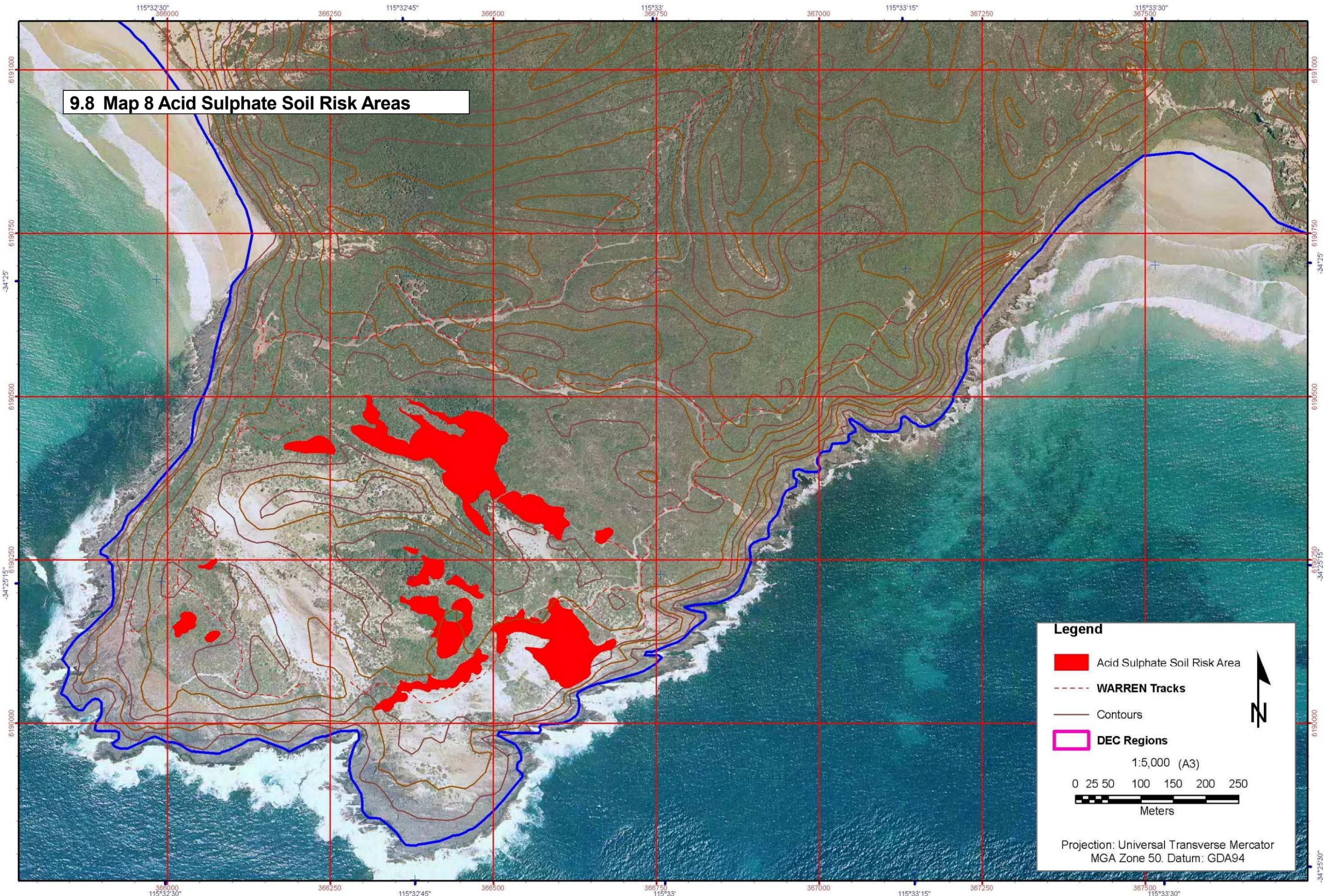
9.7 Map 7 Environmentally Sensitive Areas



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9.8 Map 8 Acid Sulphate Soil Risk Areas



Legend

- Acid Sulphate Soil Risk Area
- - - WARREN Tracks
- Contours
- DEC Regions

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Meters

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

Graticule shown at 15 seconds intervals
Grid shown at 500 metre intervals

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10 Appendix 2 Site Survey Summaries

Site: 1

Topographic position: Flat/swale leeward side of primary dune

Landform: Flat

Slope: Level 0°

Soil Type: Dark Gray Peaty Sand

Rock:

Bare Ground: 2-10% **Litter:** 70-100% **Drainage:** Moderate

Vegetation: Low Forest B of *Melaleuca cuticularis*, Open Dwarf scrub D of *Hibbertia stellaris*

Vegetation Condition: Very Good

Species: *Hibbertia cuneiformis*, *Hibbertia stellaris*, *Lobelia alata*, *Melaleuca cuticularis*, *Oxalys phyllanthi*, *Desmodium flexuosus*,

Comment:



Site: 2

Topographic position: Leeward slope of Primary Dune

Landform: Leeward Dune Slope

Slope: Moderately inclined 10°

Soil Type: Gray Sand

Rock:

Bare Ground: 2-10% **Litter:** 10-30% **Drainage:** Well

Vegetation: Scrub B of *Agonis flexuosa*, Dense Low Heath C of *Jacksonia horrida*, *Spyridium globulosum* and *Adenanthos meisnerii*, Very Open Low Sedges of *Lepidosperma* sp. 'Black Point'

Vegetation Condition: Excellent

Species: *Lepidosperma* sp "Black Point", *Hibbertia racemosa*, *Hibbertia* sp., *Leucopogon* sp., *Jacksonia horrida*, *Adenanthos meisnerii*, *Hakea varia*, *Spyridium globulosum*, *Dodonaea ceratocarpa*, *Agonis flexuosa*

Comment:



Site: 3

Topographic position: Swale on leeward side of primary dune

Landform: Open depression - swale

Slope: Gently inclined 3°

Soil Type: Gray Loamy Sand

Rock:

Bare Ground: 2-10% **Litter:** 70-100% **Drainage:** Moderate

Vegetation: , Dense Heath B of *Spyridium globulosum*, *Banksia occidentalis*, and *Olearia axillaris*

Vegetation Condition: Excellent

Species: *Anarthria prolifera*, *Ficinia nodosa*, *Baumea juncea*, *Hibbertia stellaris*, *Patersonia occidentalis*, *Cassutha racemosa*, *Melaleuca pauciflora*, *Melaleuca sp.*, *Pericalymma spongiocaula*, *Banksia occidentalis*, *Hakea varia*, *Spyridium globulosum*, *Dodonaea ceratocarpa*,

Comment:



Site: 4

Topographic position: Swale on leeward side of primary dune

Landform: Flat

Slope: Very gently inclined 1°

Soil Type: Brown Peaty Sandy Clay Loam

Rock:

Bare Ground: 30-70% **Litter:** 2-10% **Drainage:** Poor

Vegetation: , Open Dwarf Scrub C of *Bossiaea ?rufa*, *Olearia axillaris* and *Leucopogon parviflorus*, Low Sedges of *Juncus pauciflorus*, *Baumea juncea* and *Ficinia nodosa*

Vegetation Condition: Very Good

Species: *Carpobrotus virescens*, *Xanthosia candida*, **Gamochaeta falcata*, *Olearia axillaris*, *Ficinia nodosa*, *Isolepis sp. Dwarf 1*, *Isolepis sp. Dwarf 2*, *Baumea juncea*, *Hibbertia cuneiformis*, *Leucopogon parviflorus*, *Leucopogon sp.*, *Juncus pauciflorus*, *Lobelia alata*, *Acacia cyclops*, *Melaleuca cuticularis*, *Melaleuca pauciflora*, *Bossiaea ?praetermissa* or *?rufa*, *Banksia occidentalis*, *Samolus repens*, *Spyridium globulosum*, *Stylidium sp.*,

Comment:



Site: 5

Topographic position: Seaward dune slope

Landform: Slope

Slope: Gently inclined 3°

Soil Type: Gray Sand

Rock:

Bare Ground: 2-10% **Litter:** 10-30% **Drainage:** Well

Vegetation: , Dense Heath B of *Callistachys lanceolata*, *Jacksonia horrida*, *Olearia axillaris*, *Agonis flexuosa* and *Taxandria innundata*, Very Open Tall Sedges of *Lepidosperma gladiatum* and *Ficinia nodosa*

Vegetation Condition: Excellent

Species: *Olearia axillaris*, *Ficinia nodosa*, *Lepidosperma gladiatum*, *Leucopogon parviflorus*, *Juncus pauciflorus*, *Agonis flexuosa*, *Melaleuca lanceolata*, *Taxandria juniperina*, *Taxandria inundata* or *fragrans*, *Callistachys lanceolata*, *Jacksonia horrida*,

Comment:

Site: 6

Topographic position:

Landform: Flat

Slope: Gently inclined 3°

Soil Type: Light Grey Sand

Rock: Sandstone saprolite

Bare Ground: 70-100% **Litter:** 2-10% **Drainage:** Moderate

Vegetation: , Very Open Low Sedges of *Juncus pauciflorus*, Very Open Herbs

Vegetation Condition: Completely Degraded

Species: *Carpobrotus virescens*, *Centella asiatica*, **Gamochaeta falcata*, *Leucophyta brownii*, *Olearia axillaris*, **Romulea rosea*, *Juncus sp.*, *Lobelia alata*, *Sporobolus virginicus*, *Samolus repens*,

Comment: Very degraded area, expected combined effects of rabbits and wind erosion, resulting in removal of vegetation and soil, exposing rock below.



Site: 7

Topographic position: Seaward outcrop

Landform: Slope

Slope: Very gently inclined 1°

Soil Type: Light Yellowish Brown Clay loam, sandy

Rock:

Bare Ground: 30-70% **Litter:** 0-2% **Drainage:** Moderate

Vegetation: , Open Dwarf Scrub D *Leucophyta brownii* and *Olearia axillaris*, Very Open Low Sedges of *Ficinia nodosa*, Open Herbs

Vegetation Condition: Very Good

Species: *Carpobrotus virescens*, *Hydrocotyle sp.*, *Leucophyta brownii*, *Olearia axillaris*, *Ficinia nodosa*, *Leucopogon parviflorus*, *Lobelia alata*, **Lotus sp.*, *Sporobolus virginicus*, *Muehlenbeckia adpressa*, **Anagallis arvensis*, *Samolus repens*,

Comment:



Site: 8

Topographic position:

Landform: Slope - Drainage line

Slope: Moderately inclined 10°

Soil Type: Reddish Black Clayey Sand

Rock: Basalt and Coffee Rock

Bare Ground: 30-70% **Litter:** 0-2% **Drainage:** Moderate

Vegetation: , Low Sedges of *Juncus pauciflorus*, *Ficinia nodosa*

Vegetation Condition: Excellent

Species: *Hydrocotyle* sp, *Olearia axillaris*, *Ficinia nodosa*, *Hibbertia cuneiformis*, *Patersonia occidentalis*, *Juncus pauciflorus*, *Juncus* sp. Dwarf, *Lobelia alata*, *Bossiaea praetermissa*, *Sporobolus virginicus*, *Samolus junceus*,

Comment:



Site: 9

Topographic position: Basalt outcrop with very shallow soils from recently weathered basalt including basaltic saprolite

Landform: Basalt Outcrop

Slope:

Soil Type: White Sand

Rock: Basalt, Basaltic saprolite and Coffee Rock

Bare Ground: 30-70% **Litter:** 0-2% **Drainage:** Moderate

Vegetation: , Dwarf Scrub D of *Leucophyta brownii*, *Sarcocornia quinqueflora*, *Olearia axillaris* and *Leucopogon parviflorus*, Very Open Low Sedges of *Ficinia nodosa*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Xanthosia candida*, *Brachyscome ?iberidifolia*, *Leucophyta brownii*, *Olearia axillaris*, *Senecio ?lautus*, *Sarcocornia quinqueflora*, *Threlkeldia diffusa*, *Ficinia nodosa*, *Hibbertia grossulariifolia*, *Leucopogon parviflorus*, *Scaevola crassifolia*, *Lobelia alata*, *Acacia cyclops*, *Jacksonia horrida*, *Austrostipa sp.*, *Samolus junceus*, *Spyridium globulosum*,

Comment:



Site: 9a

Topographic position: Shallow soils (primarily aeolian sands) over basalt

Landform: Dune - outcrop interface

Slope:

Soil Type: White Sand

Rock: Basalt

Bare Ground: 10-30% **Litter:** 10-30% **Drainage:** Well

Vegetation: , Low Heath C of *Olearia axillaris*, *Jacksonia horrida*, *Leucophyta brownii* and *Scaevola crassifolia*, Open Low Sedges of *Baumea juncea*

Vegetation Condition: Very Good

Species: *Carpobrotus virescens*, *Xanthosia candida*, *Brachyscome ?iberidifolia*, *Leucophyta brownii*, *Olearia axillaris*, *Senecio ?lautus*, *Sarcocornia quinqueflora*, *Threlkeldia diffusa*, *Ficinia nodosa*, *Hibbertia grossulariifolia*, *Leucopogon parviflorus*, *Scaevola crassifolia*, *Lobelia alata*, *Acacia cyclops*, *Jacksonia horrida*, *Austrostipa sp.*, *Samolus junceus*, *Spyridium globulosum*, *Baumea juncea*, *Scaevola crassifolia*

Comment:



Site: 10

Topographic position: Dune

Landform: Dune slope

Slope: Steep 23°

Soil Type: White Sand

Rock: Basalt 2-10%

Bare Ground: 10-30% **Litter:** 2-10% **Drainage:** Well

Vegetation: , Dense Low Heath C of *Melaleuca cuticularis*, *Olearia axillaris*, *Leucophyta* and *Jacksonia horrida*

Vegetation Condition: Very Good

Species: *Xanthosia candida*, *Leucophyta brownii*, *Olearia axillaris*, *Senecio ?lautus*, *Rhagodia baccata*, *Sarcocornia quinqueflora*, *Threlkeldia diffusa*, *Ficinia nodosa*, *Lepidosperma effusum*, *Scaevola crassifolia*, *Melaleuca cuticularis*, *Jacksonia horrida*, *Sporobolus virginicus*,

Comment:



Site: 11

Topographic position: Seaward basalt outcrop slopes with minor soil development

Landform: Basalt outcrop slope

Slope: Very steep 37°

Soil Type: Reddish Brown Loamy Sand

Rock: Basalt

Bare Ground: 10-30% **Litter:** **Drainage:** Well

Vegetation: , Low Heath C of *Olearia axillaris*, *Scaevola crassifolia*, *Leucophyta brownii* and *Rhagodia baccata*, Low Grass of *Austrostipa* sp.

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Olearia axillaris*, *Rhagodia baccata*, *Sarcocornia quinqueflora*, *Ficinia nodosa*, *Scaevola crassifolia*, *Austrostipa* sp., *Samolus repens*,

Comment:



Site: 12

Topographic position: Seaward lower slope of primary dune

Landform: Lower slope

Slope: Moderately inclined 10°

Soil Type: Pinkish Gray Loamy Sand

Rock: Basalt

Bare Ground: 2-10% **Litter:** 30-70% **Drainage:** Well

Vegetation: , Low Heath C of *Olearia axillaris*, *Spyridium globulosum* and *Rhagodia baccata*, Open Low Sedges of *Ficinia nodosa*, Low Grass of *Sporobolus virginicus*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Apium prostratum*, *Xanthosia candida*, *Leucophyta brownii*, *Olearia axillaris*, **Cakile maritima*, *Rhagodia baccata*, *Threlkeldia diffusa*, *Ficinia nodosa*, *Lepidosperma effusum*, *Leucopogon parviflorus*, *Scaevola crassifolia*, *Austrostipa sp.*, *Sporobolus virginicus*, *Samolus repens*, *Ranunculus sp.*

Comment: Excellent to Pristine except in vicinity of track



Site: 13

Topographic position: Seaward mid slope of primary dune

Landform: Mid slope

Slope: Moderately inclined 10°

Soil Type: Pale Brown Sand

Rock: ?Limestone

Bare Ground: 0-2% **Litter:** 70-100% **Drainage:** Well

Vegetation: , Dense Heath B of *Agonis flexuosa*, *Olearia axillaris*, *Spyridium globulosum* and *Rhagodia baccata*, Open Low Sedges of *Ficinia nodosa* and *Lepidosperma effusum*, Low Grass of *Austrostipa* sp., *Briza maxima* and **Lagurus ovatus*

Vegetation Condition: Pristine

Species: *Xanthosia candida*, *Olearia axillaris*, *Ozothamnus cordatus*, *Rhagodia baccata*, *Ficinia nodosa*, *Lepidosperma effusum*, *Hibbertia cuneiformis*, *Hibbertia grossulariifolia*, *Leucopogon parviflorus*, *Geranium solanderi*, *Scaevola crassifolia*, *Conostylis candicans*, *Cassytha racemosa*, *Acacia divergens*, *Agonis flexuosa*, *Billardiera heterophylla*, *Austrostipa* sp., *Briza maxima*, **Lagurus ovatus*, *Banksia sessilis* var *cordata* P4, *Hakea oleifolia*, *Clematis linearifolia*, *Desmocladius flexuosus*, *Boronia alata*, *Chorilaena quercifolia*, *Spyridium globulosum*, *Pimelea clavata*,

Comment: Pristine except in vicinity of track



Site: 14

Topographic position: Seaward upper slope and crest of primary dune

Landform: Upper slope and crest

Slope: Gently inclined 3°

Soil Type: Pale Brown Sand

Rock: Exposed Limestone

Bare Ground: 0-2% **Litter:** 30-70% **Drainage:** Well

Vegetation: , Dense Heath A of *Agonis flexuosa*, *Spyridium globulosum*, *Leucopogon parviflorus* and *Banksia sessilis* var *cordata*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Olearia axillaris*, *Senecio lautus*, **Sonchus oleraceus*, *Rhagodia baccata*, *Ficinia nodosa*, *Acanthocarpus preissii*, *Hibbertia cuneiformis*, *Hibbertia grossulariifolia*, *Hibbertia racemosa*, *Acrotriche cordata*, *Leucopogon parviflorus*, *Leucopogon* sp., *Scaevola crassifolia*, *Conostylis candidans*, *Cassyltha racemosa*, *Acacia divergens*, *Agonis flexuosa*, *Dianella revoluta*, *Billardiera heterophylla*, *Austrostipa* sp., **Lagurus ovatus*, *Muehlenbeckia adpressa*, *Banksia sessilis* var *cordata* P4, *Hakea oleifolia*, *Samolus repens*, *Clematis pubescens*, *Desmocladus flexuosus*, *Boronia alata*, *Chorilaena quercifolia*, *Spyridium globulosum*, *Veronica* sp ?*calycina/distans?*,

Comment: Some degerdation around carpark and tracks



Site: 15

Topographic position: Wetland

Landform: Semi-closed depression

Slope: Very gently inclined 1°

Soil Type: Dark Brown Peaty Sand

Rock:

Bare Ground: 0-2%

Litter:

Drainage: Moderate

Vegetation: , Dense Tall Sedges of *Juncus pauciflorus* and *Ficini nodosa*

Vegetation Condition: Very Good

Species: *Apium prostratum*, *Centella asiatica*, *Olearia axillaris*, *Senecio lautus*, **Sonchus oleraceus*, *Rhagodia baccata*, *Ficinia nodosa*, *Hibbertia cuneiformis*, *Leucopogon parviflorus*, *Leucopogon revolutus*, *Gyrostemon sheathii*, *Patersonia occidentalis*, *Juncus ?pauciflorus*, *Juncus kraussii* subsp. *australiensis*, *Cassutha racemosa*, *Lobelia alata*, *Villarsia sp.*, *Acacia cyclops*, *Agonis flexuosa*, *Melaleuca cuticularis*, *Olax phyllanthi*, *Bossiaea praetermissa*, *Callistachys lanceolata*, *Jacksonia horrida*, *Briza maxima*, *Muehlenbeckia adpressa*, *Hakea oleifolia*, *Hakea varia*, *Samolus repens*, *Desmodcladus flexuosus*, *Rhadinothamnus anceps*, *Spyridium globulosum*, **Solanum nigrum*, *Loxocarya sp.*

Comment: Roo tracks and some weeds



Site: 15a

Topographic position: Wetland

Landform: Small hillock

Slope:

Soil Type: Light Gray Sand

Rock:

Bare Ground: 10-30% **Litter:** 30-70% **Drainage:** Moderate

Vegetation: Low Woodland B of *Melaleuca cuticularis*

Vegetation Condition: Excellent

Species: *Melaleuca cuticularis*

Comment:



Site: 15b

Topographic position: Wetland

Landform: Semi closed depression

Slope:

Soil Type: Sand

Rock:

Bare Ground: **Litter:** 70-100% **Drainage:** Moderate

Vegetation: , Thicket of *Callistachys lanceolata*, *Melaleuca cuticularis* and *Spyridium globulosum*

Vegetation Condition:

Species: *Callistachys lanceolata*, *Melaleuca cuticularis*, *Spyridium globulosum*, *Hakea oleifolia*, *Rhadinothamnus anceps*

Comment:



Site: 15c

Topographic position: Wetland

Landform: Semi closed depression

Slope:

Soil Type: White Sand

Rock:

Bare Ground:

Litter:

Drainage: Well

Vegetation: , Low Heath D *Spyridium globulosum*, *Olearia axillaris* and *Jacksonia horrida*

Vegetation Condition: Very Good

Species: *Olearia axillaris*, *Rhagodia baccata*, *Ficinia nodosa*, *Hibbertia cuneiformis*, *Leucopogon parviflorus*, *Leucopogon revolutus*, *Patersonia occidentalis*, *Cassyltha racemosa*, *Lobelia alata*, *Acacia cyclops*, *Agonis flexuosa*, *Bossiaea praetermissa*, *Callistachys lanceolata*, *Jacksonia horrida*, *Briza maxima*, *Hakea oleifolia*, *Hakea varia*, *Samolus repens*, *Desmocladius flexuosus*, *Rhadinothermus anceps*, *Spyridium globulosum*, **Solanum nigrum*,

Comment: Rabbit digging and grazing and trampling by visitors/roos



Site: 16

Topographic position: Seaward side of primary dune

Landform: Dune slope and crest

Slope: Moderately inclined 10°

Soil Type: White Sand

Rock: Over Basalt

Bare Ground: 10-30% **Litter:** 30-70% **Drainage:** Well

Vegetation: , Low Heath D of *Olearia axillaris*, *Jacksonia horrida*, *Leucophyta brownii* and *Rhagodia baccata*, Very Open Low Sedges of *Ficinia nodosa* and *Lepidosperma effusum*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Xanthosia candida*, *Leucophyta brownii*, *Olearia axillaris*, *Senecio lautus*, *Rhagodia baccata*, *Threlkeldia diffusa*, *Lepidosperma effusum*, *Hibbertia cuneiformis*, *Hibbertia grossulariifolia*, *Acrotriche cordata*, *Leucopogon parviflorus*, *Jacksonia horrida*,

Comment: trampling by visitors causing degradation and erosion



Site: 16b

Topographic position: Plateau above basalt formation

Landform: Plateau

Slope: Level 0°

Soil Type: Dark Brown Sandy Clay Loam

Rock: Over Basalt

Bare Ground: 30-70% **Litter:** 2-10% **Drainage:** Poor

Vegetation: , Open Dwarf Scrub D of *Leucophyta brownii*, Herbs of *Isolepis* sp.

Vegetation Condition: Very Good

Species: *Leucophyta brownii*, *Sarcocornia quinqueflora*, *Isolepis* sp.

Comment: Rabbit grazing



Site: 16c

Topographic position:

Landform:

Slope: Moderately inclined 10°

Soil Type: Dark Reddish Brown Sandy Clay Loam

Rock: Over Basalt

Bare Ground: 2-10% **Litter:** 30-70% **Drainage:**

Vegetation: , Dwarf Scrub D of *Leucophyta brownii* and *Olearia axillaris*, Low Sedges of *Baumea juncea*, *Ficinia nodosa* and *Juncus krausii* subsp. *australiensis*

Vegetation Condition: Very Good

Species: *Leucophyta brownii*, *Sarcocornia quinqueflora*, *Isolepis* sp., *Baumea juncea*, *Ficinia nodosa* and *Juncus krausii* subsp. *australiensis*

Comment:



Site: 16d

Topographic position:

Landform:

Slope:

Soil Type: Gray Sand

Rock: Exposed Basalt

Bare Ground: 10-30% **Litter:** 2-10% **Drainage:** Well

Vegetation: , Low Heath D of *Leucophyta brownii*

Vegetation Condition: Very Good

Species: *Leucophyta brownii*, *Sarcocornia quinqueflora*, *Isolepis* sp.

Comment:



Site: 17

Topographic position: Swale between primary and secondary dunes

Landform: Closed depression

Slope: Moderately inclined 10°

Soil Type: White Calcerous Sand

Rock:

Bare Ground: 10-30% **Litter:** 30-70% **Drainage:** Well

Vegetation: , Heath C of *Olearia axillaris*, *Jacksonia horrida*, *Spyridium globulosum* and *Leucopogon parviflorus*, Very Open Tall Sedges of *Lepidosperma gladiatum* and *Ficinia nodosa*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Xanthosia candida*, *Olearia axillaris*, *Rhagodia baccata*, *Threlkeldia diffusa*, *Ficinia nodosa*, *Lepidosperma gladiatum*, *Lepidosperma* sp. "Black Point", *Hibbertia grossularifolia*, *Leucopogon parviflorus*, *Lobelia alata*, *Jacksonia horrida*, *Muehlenbeckia adpressa*, *Boronia alata*, *Spyridium globulosum*,

Comment: Rabbit grazing



Site: 18

Topographic position: Small flat with shallow soils on Basalt outcrop

Landform: Flat

Slope: Level 0°

Soil Type: Dark Brown Sandy Clay Loam

Rock: Exposed Basalt

Bare Ground: 30-70% **Litter:** 2-10% **Drainage:** Poor

Vegetation: , Open Dwarf Scrub D of *Leucophyta brownii*, *Olearia axillaris*, *Carpobrotus virescens* and *Sarcocornia quinqueflora*, Herbs of *Isolepis* sp. *Samolus repens* and *Sarcocornia quinqueflora*

Vegetation Condition: Very Good

Species: *Carpobrotus virescens*, *Hydrocotyle* sp., *Leucophyta brownii*, *Olearia axillaris*, *Sarcocornia quinqueflora*, *Isolepis* sp. dwarf , *Samolus repens*,

Comment: Rabbit grazing



Site: 19

Topographic position:

Landform: Slope

Slope: Moderately inclined 10°

Soil Type: Dark Reddish brown Sandy Clay Loam

Rock: Exposed Basalt

Bare Ground: 10-30% **Litter:** 10-30% **Drainage:** Moderate

Vegetation: , Low Scrub D of *Olearia axillaris* and *Leucophyta brownii*, Low Sedges of *Baumea juncea* and *Ficinia nodosa*

Vegetation Condition: Excellent

Species: *Carpobrotus virescens*, *Apium prostratum*, *Centella asiatica*, *Xanthosia candida*, **Hypochaeris glabra*, *Leucophyta brownii*, *Olearia axillaris*, *Sarcocornia quinqueflora*, *Lepidosperma effusum*, *Baumea juncea*, **Centaurium erythraea*, *Lobelia alata*, *Samolus repens*, *Dodonaea ceratocarpa*,

Comment:



Site: 20

Topographic position: Wetland

Landform: Semi closed depression

Slope: Level 0°

Soil Type: Dark Brown Peat

Rock:

Bare Ground: 0-2% **Litter:** 70-100% **Drainage:** Poor

Vegetation: , Open Low Scrub C of *Rhadionthamnus anceps* and pockets of *Callistachys lanceolata* thicket, Dense Tall Sedges of *Baumea articulata*, *Baumea juncea* and *Juncus pauciflorus*

Vegetation Condition: Excellent

Species: *Gharnia trifida*, *Lepidosperma effusum*, *Baumea articulata*, *Baumea juncea*, *Juncus ?pauciflorus*, *Triglochin lineare*, *Cassytha racemosa*, *Callistachys lanceolata*, *Rhadionthamnus anceps*

Comment: Trampling by animals and visitors and weed invasion



Site: 22

Topographic position: Wetland

Landform: Open depression - swale

Slope: Level 0°

Soil Type: Black Peat

Rock:

Bare Ground: 2-10% **Litter:** 70-100% **Drainage:** Poor

Vegetation: , Open Dwarf Scrub D of *Acacia saligna*, Dense Low Sedges of *Baumea juncea*

Vegetation Condition: Excellent

Species: *Acacia saligna*, *Villarsia sp.*, *Baumea juncea*, *Baumea articulata*, ?*Scheonus sp.*

Comment: Old vehicle track and grazing in vicinity of vehicle track



Site: 23

Topographic position: Wetland

Landform: Open depression - swale

Slope: Level 0°

Soil Type: Black Peat

Rock:

Bare Ground: 2-10% **Litter:** 70-100% **Drainage:** Poor

Vegetation: , Dense Tall Sedges of *Baumea articulata*

Vegetation Condition: Excellent

Species: *Acacia saligna*, *Villarsia sp.*, *Baumea juncea*, *Baumea articulata*, *?Scheonus sp.*, *Melaleuca viminea*, *Melaleuca cuticularis*

Comment: Old vehicle track and grazing in vicinity of vehicle track. Increased animal activity through drying climate leading to increased trampling by kangaroos leaving areas vulnerable to grazing by rabbits and roos, preventing regeneration.



Site: 24

Topographic position: Riparian Vegetation surrounding wetland of SITE 22 & 23

Landform: Slope

Slope: Moderately inclined 10°

Soil Type: Dark Brown Sandy Peat

Rock: Coffee rock

Bare Ground: **Litter:** **Drainage:** Moderate

Vegetation: Low Forest B of *Melaleuca cuticularis* and *Banksia occidentalis*, Low Scrub B of *Acacia saligna* and *Rhadinothamnus anceps*

Vegetation Condition: Excellent

Species: *Melaleuca cuticularis*, *Banksia occidentalis*, *Acacia saligna*, *Rhadinothamnus anceps*, *Cassyltha racemosa*, *Spyridium globulosum*, *Olearia axillaris*, *Olax phyllanthii*, *Agonis flexuosa*, *Xanthorrhoea preissii*, *Muehlenbeckia adpressa*,

Comment:



Site: 25

Topographic position:

Landform:

Slope:

Soil Type:

Rock:

Bare Ground: 30-70% **Litter:** 30-70% **Drainage:**

Vegetation: Low Forest B of *Melaleuca cuticularis*, Open Low Sedges of *Baumea juncea*

Vegetation Condition: Excellent

Species: *Melaleuca cuticularis*, *Baumea juncea*

Comment: Rabbit grazing of understorey



Site: 25a

Topographic position:

Landform:

Slope:

Soil Type:

Rock:

Bare Ground: **Litter:** 30-70% **Drainage:** Poor

Vegetation: Low Forest B of *Melaleuca cuticularis*, Open Scrub of *Acacia cyclops* and Open Low Scrub of *Leucopogon parviflorus* and *Oxalys phyllanthii*

Vegetation Condition: Excellent

Species: *Melaleuca cuticularis*, *Acacia cyclops*, *Leucopogon parviflorus*, *Oxalys phyllanthii*

Comment:

Site: 26

Topographic position:

Landform: Depression

Slope: Level 0°

Soil Type: Black Peat

Rock:

Bare Ground: 30-70% **Litter:** 30-70% **Drainage:** Poor

Vegetation: Heath B of *Melaleuca viminea*, Open Low Sedges of *Baumea juncea*, *Baumea articulata* and *Gahnia trifida*

Vegetation Condition: Excellent

Species: *Melaleuca ?viminea*, *Baumea juncea*, *Baumea articulata*, *Gahnia trifida*

Comment: Trampling by animals



Site: 27

Topographic position:

Landform: Open depression

Slope:

Soil Type: Brown Peaty Sand

Rock:

Bare Ground: 0-2% **Litter:** 70-100% **Drainage:**

Vegetation: , Thicket of *Callistachys lanceolata* and *Agonis flexuosa*, Low Scrub of *Spyridium globulosum* and *Hibbertia ?cunifformis*

Vegetation Condition:

Species: *Callistachys lanceolata*, *Agonis flexuosa*, *Hibbertia cunifformis*, *Hibbertia sp. 2*, *Hibbertia sp. 3*, *Hibbertia sp. 4*, *Leucopogon parviflorus*, *Leucopogon capitellatus*, *Melaleuca ?viminea*, *Melaleuca sp.*, *Cassythia racemosa*, *Muehlenbeckia adpressa*, *Billardiera sp.*

Comment:

Site: 28

Topographic position:

Landform:

Slope:

Soil Type: Gray Loamy sand

Rock:

Bare Ground: 0-2% **Litter:** 70-100% **Drainage:** Well

Vegetation: Dense Low Forest B / Dense Thicket of *Eucalyptus marginata* subsp. and *Agonis flexuosa*, Thicket of *Agonis flexuosa*, *Hakea oleifolia*, *Acacia cyclops*

Vegetation Condition: Excellent

Species: *Eucalyptus marginata* subsp. ?, *Hakea oleifolia*, *Pesoonia longifolia*, *Acacia pulchella*, *Agonis flexuosa*, *Desmocladius flexuosus*, *Hibbertia ?cuneiformis*, *Hibbertia ?furfuracea*, *Billardiera* sp. *Acacia myrtifolia*, *Lepidosperma gladiatum*, *Dianella ?revolta*, *Patersonia ?umbrosa*, *Xanthorrhoea preissii*, *Lepidosperma ?squamatum*, *Lepidosperma ?striatum*, *Anathria prolifera*, *Leucopogon parviflorus*, *Macrozamia riedlei*

Comment:



Site: 29

Topographic position:

Landform:

Slope:

Soil Type: Brown Sand

Rock: Exposed Basalt

Bare Ground: 10-30% **Litter:** 10-30% **Drainage:** Well

Vegetation: , Low Heath D of *Dodonaea certocarpa*, *Scaevola crassifolia*, *Jacksonia horrida*, *Olearia axillaris*, Open Low Sedges of *Baumea juncea* and *Lepidosperma gladdiatum*

Vegetation Condition:

Species: *Hakea oleifolia*, *Hakea prostrata*, *Muehlenbeckia adpressa*, *Scaevola crassifolia*, *Olearia axillaris*, *Jacksonia horrida*, *Spyridium globulosum*, *Dodonaea ceratocarpa*, *Baumea juncea*

Comment: Trampling leading to plant deaths and soil destabilisation



Site: 30

Topographic position:

Landform:

Slope:

Soil Type: White Sand

Rock:

Bare Ground: 30-70% **Litter:** 10-30% **Drainage:** Well

Vegetation: , Low Scrub B of *Agonis flexuosa* and *Jacksonia horrida* over Dwarf Scrub C of *Adenanthos meisnerii*, *Pericalymma crassipes*, *Hibbertia subvaginata* *Xanthorrhoea preissii* and *Acacia pulchella*

Vegetation Condition: Very Good

Species: *Agonis flexuosa*, *Jacksonia horrida*, *Adenanthos meisnerii*, *Pericalymma crassipes*, *Hibbertia subvaginata* *Xanthorrhoea preissii*, *Acacia pulchella* var. *pulchella*, *Anarthia prolifera*, *Leucopogon cordatus*, *Lepidosperma* sp. 'Black Point', *Acacia myrtifolia*, *Spyridium globulosum*, *Banksia occidentalis*, *Banksia littoralis*, *Baumea juncea*

Comment:



Site: 31

Topographic position:

Landform:

Slope:

Soil Type: White Sand

Rock:

Bare Ground: 30-70% **Litter:** 10-30% **Drainage:** Well

Vegetation: , Heath B of *Agonis flexuosa*, *Jacksonia horrida* and *Spyridium globulosum* and Low Heath C of *Jacksonia horrida*, *Adenanthos meisnerii*, *Hibbertia hypericoides*, *Hibbertia racemosa* and *Melaleuca thymodies*

Vegetation Condition: Very Good

Species: *Agonis flexuosa*, *Jacksonia horrida*, *Spyridium globulosum*, *Adenanthos meisnerii*, *Hibbertia hypericoides*, *Hibbertia racemosa*, *Melaleuca thymodies*, *Leucopogon cordatus*, *Desmocladius flexuosus*, *Anarthria prolifera*, *Hakea prostrata*, *Bracyloma preissii*, *Acacia pulchella*, *Conospermum flexuosum*, *Acacia myrtifolia*, *Macrozamia riedlei*, *Conospermum ?confertum*

Comment:



Site: 32

Topographic position:

Landform: Dune crest

Slope:

Soil Type: White Sand

Rock:

Bare Ground: 30-70% **Litter:** 70-100% **Drainage:** Well

Vegetation: Thicket of *Allocasurina fraseriana*

Vegetation Condition: Excellent

Species: *Allocasurina fraseriana*, *Adenathos meisnerii*, *Lepidosperma* sp. 'Black Point', *Persoonia longifolia*, *Bossiaea linophylla*, *Hibbertia hypericoides*, *Anarthria prolifera*, *Macrozamia riedlei*, *Brachyloma preissii*

Comment:



Site: 33

Topographic position: Seaward side of dune above basalt

Landform: Slope

Slope:

Soil Type: Brown Sand

Rock:

Bare Ground: 0-2% **Litter:** 30-70% **Drainage:** Moderate

Vegetation: , Dense Tall Sedges of *Lepidosperma ?gladiatum* with *Muehlenbeckia adpressa* and emergents of *Spyridium globulosum* and *Olearia axillaris*

Vegetation Condition: Excellent

Species: *Lepidosperma ?gladiatum*, *Muehlenbeckia adpressa*, *Spyridium globulosum*, *Olearia axillaris*, *Acacia littorea*

Comment:

