Appendices

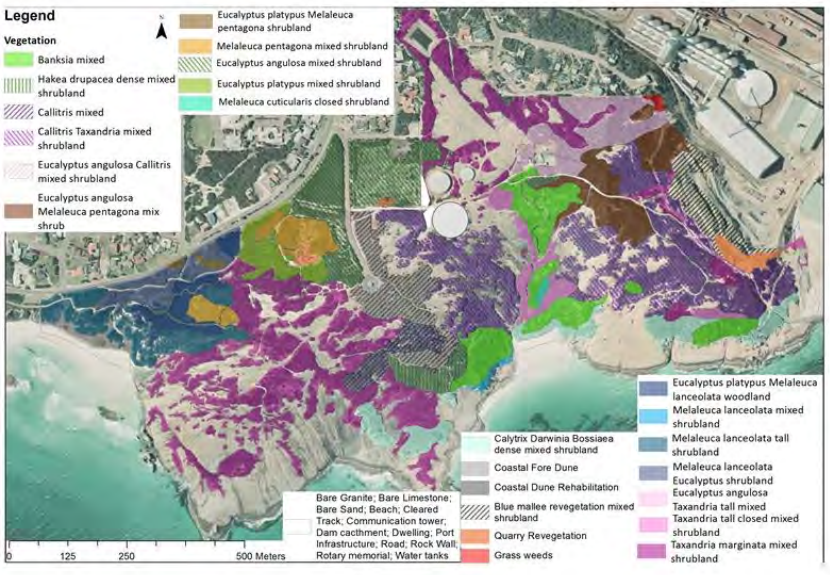
Appendix A Flora and Vegetation Survey

METADATA STATEMENT

Enter text into appropriate fields by selecting and typing directly over Element descriptions or "Click here to enter text" or selecting a date from the drop down calendar.

Date:	**24/01/2018**
Version:	**1**
Completed by:	**Tilo Massenbauer**

Project Name:	**Dempster Head Flora and Vegetation Survey**
Project ID:	**PW085**

Category	Element
Dataset	**Title: Dempster vegetation mapping** **- DH_Rem_veg_Final_20180117; vegetation type, condition, stressor and area mapping** **- Priority_flora; point source Priority Flora sites** **- DH_Weeds_Tilo_20180118: point source woody weed sites** **- Photo_points_DH_Final_20170119; point source photo ID and description of sites**
	Custodian: Esperance Shire Council
	Jurisdiction: Esperance Western Australia
Description	**Abstract:** Technical Synopsis report **Introduction** As part of the Dempster Head Reserves Management plan review a flora survey and vegetation map of the Dempster head area, which is the South eastern part of the Esperance town site was undertaken by South Coast NRM, Spatial Information Officer Tilo Massenbauer. The following GIS datasets were generated as part of the survey: - Polygon shapefile of vegetation type, condition, stressors and area mapping (Figure 1)Spa - Point source Priority Flora sites - Point source woody weed sites - Point source photo ID and description of sites A plant species list, analysis tables, maps, and photos were generated as part of the survey. Figure 1. Dempster Head study area and Vegetation Mapping 

Method

A general transect survey method using existing tracks, trails, open granite areas, vantage points was used to assess vegetation type, condition, and stressors across the site. An ortho-rectified and georeferenced aerial photo of the site taken in July 2017 was provided by the Shire of Esperance to use as a baseline image for the mapping component.

GPS points, GPS track lines, field notes and site photos were collated as evidence to ground truth vegetation types and later attributed into a polygon shapefile.

The vegetation type boundaries were mapped using the high resolution aerial photo base image at a scale of about 1:300 and saved as a polygon shapefile, georeferenced projection GDA 1994, MGA zone 51 UTMs (Projected Eastings and Northings).

Due to the complexity of vegetation mosaics across the 84 hectare site, ranging from deep yellow sand Esperance sandplain communities, intermixed with deep pale coastal sands, coastal limestone, shallow granite, coastal dunes, and a wetland vegetation community, a simplified vegetation mapping method was applied. This method was adapted from the Australian Soil and Land Survey Field Handbook 2009 edition, Speights vegetation classification and Western Australia's Beards vegetation complex classification method.

Structural forms of vegetation in Australia (based on Specht 1970)

	Percentage foliage cover of tallest plant layer			
Life form and height of tallest stratum	**Dense (70-100%)**	**Mid-dense (30-70%)**	**Sparse (10-30%)**	**Very sparse (<10%)**
Trees > 30 m	Tall closed-forest	Tall open-forest	Tall woodland	Tall open-woodland
Trees 10-30 m	Closed-forest	Open -forest	Woodland	Open-woodland
Trees 5-10 m	Low closed-forest	Low open-forest	Low woodland	Low open-woodland
Shrubs 2-8 m	Closed -scrub	Open-scrub	Tall shrubland	Tall open-shrubland
Shrubs 0-2 m	Closed -heath	Open-heath	Low shrubland	Low open-shrubland

Vegetation condition of the area was mapped and assessed generically using the Native Vegetation Condition Assessment and Monitoring Manual for Western Australia (Page 241), which recommends a short scale quick assessment table adapted from Keighery's (1994) condition scale.

	ALIENATED	VERY DEGRADED	DEGRADED	GOOD	VERY GOOD	EXCELLENT	PRISTINE
Keighery Condition Scale (Keighery 1994)	**Completely Degraded** *[completely # is better here & such a split improves alignment]*	**Degraded II** The structure of the vegetation is no longer intact and the area is [completely #] or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	**Degraded I** Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires; the presence of very aggressive weeds; partial clearing; dieback; &grazing.	**Good** Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires; the presence of some very aggressive weeds at high density; partial clearing; dieback; & grazing.	**Very good** Vegetation structure altered; obvious signs of disturbance For example, disturbance to vegetation structure caused by repeated fires; the presence of some more aggressive weeds; dieback; logging; & grazing.	**Excellent** Vegetation structure intact; disturbance affecting individual species; weeds are non-aggressive species	**Pristine** Pristine or nearly so, no obvious signs of disturbance.

Where possible Priority Flora and woody weeds were identified opportunistically along the transect, they were recorded with a site photo and GPS location and stored as separate shapefiles.

Results

The site totals approx. 57 ha in vegetated area which was mapped into 22 different vegetation types (Figure 1). The remaining 27 ha of area comprises primarily bare granite areas, authorised tracks and human infrastructure, and heavily disturbed cleared areas.

Vegetation Type – Grouped	Vegetation Type	Area Ha	%
Banksia mixed shrubland	*Banksia* mixed shrubland	3.73	6.52
Callitris mixed shrubland	*Callitris* mixed shrubland	1.14	1.99
	Callitris Taxandria mixed shrubland	9.42	16.49
Calytrix Darwinia Bossiaea dense mixed shrubland	*Calytrix Darwinia Bossiaea* dense mixed shrubland	2.54	4.45
Eucalyptus shrubland	*Eucalyptus angulosa Callitris* mixed shrubland	2.58	4.52
	Eucalyptus angulosa Taxandria tall mixed shrubland	2.44	4.27
	Eucalyptus angulosa Melaleuca pentagona mix shrub	2.72	4.76
	Eucalyptus platypus Melaleuca pentagona shrubland	0.15	0.27
	Eucalyptus angulosa mixed shrubland	4.28	7.49
	Eucalyptus platypus mixed shrubland	1.22	2.14
Eucalyptus platypus Melaleuca lanceolata woodland	*Eucalyptus platypus Melaleuca lanceolata* woodland	1.40	2.44
Hakea drupacea dense mixed shrubland	*Hakea drupacea* dense mixed shrubland	0.72	1.26
Melaleuca shrubland	*Melaleuca pentagona* mixed shrubland	1.43	2.51
	Melaleuca lanceolata Eucalyptus shrubland	1.25	2.18
	Melaleuca lanceolata mixed shrubland	0.14	0.25
	Melaleuca lanceolata tall shrubland	2.47	4.31
	Melaleuca cuticularis closed shrubland	0.09	0.17
Taxandria mixed shrubland	*Taxandria marginata* mixed shrubland	13.87	24.27
	Taxandria tall closed mixed shrubland	1.39	2.42
Blue mallee revegetation mixed shrubland	Blue mallee revegetation mixed shrubland	1.44	2.52
Coastal Dune Rehabilitation	Coastal Dune Rehabilitation	0.37	0.65
Coastal Fore Dune	Coastal Fore Dune	0.10	0.18
Cleared Track	Cleared Track	2.17	3.79
Grass weeds	Grass weeds	0.09	0.16
	Total	**57.16**	**100.00**

Taxandria marginata mixed shrublands make up about 14 per cent of the vegetated area, with *Callitris Taxandria* mixed shrubland Vegetation about 9 per cent, *Eucalyptus angulosa* mixed shrubland 4 per cent and *Banksia* mixed shrubland about 4 per cent. Vegetation types can be regrouped as *Taxandria* (ie 47%), *Callitris, Eucalypt or Melaleuca* shrublands to further simplify vegetation types if required.

The following table provides expanded descriptions of the vegetation types mapped based on species dominance, foliage density estimate, vegetation height and mixed species composition.

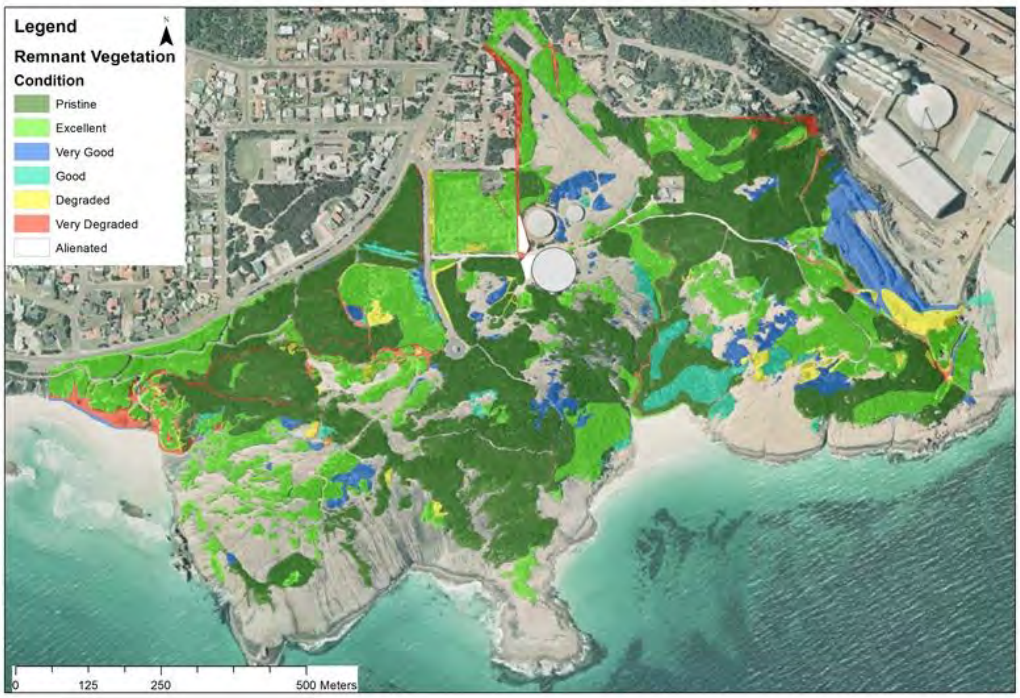
Vegetation Type	Description
Banksia mixed shrubland	Sparse to mid-dense *Banksia speciosa* (1 m - 5 m height) canopy with low shrubland and closed heath ranging from 1.5 m - 5 m in height. Some of the mixed species include *Melaleuca pentagona and M. thymoides*, *Nuytsia floribunda, Hakea trifurcata, corymbosa and drupacea*, *Banksia obovata, Adenanthos cuneatus, Beaufortia micrantha, Calytrix acutifolia* and *Darwina diosmoides*.
Hakea drupacea dense mixed shrubland	Mid-dense to very sparse *Hakea drupacea* scrub (2-3 m) canopy with a mixed closed scrub/heath understory (1-2.5 m). Some species include *Leucopogon parviflorus, Templetonia retusa, Nematolepis phebalioides, Lysinema, ciliatum, Acacia nigricans, Darwina diosmoides, Pimelea ferruginea, Spyridium globulosum, Calthamnus quadrifidus*
Callitris mixed shrubland	Sparse to mid-dense *Callitris preisii* dominated canopy with lesser *Eucalyptus angulosa* and platypus interspersed. Dense understorey shrub mixed layer of *Taxandria marginata, Acacia nigricans, Templetonia retusa, Hakea drupacea, Verticordia minutiflora, Calthamnus quadrifidus*.
Eucalyptus angulosa Callitris mixed shrubland	Sparse to mid-dense canopy dominated by with *Eucalyptus angulosa* and lesser *Callitris preisii* interspersed. Dense understorey shrub mixed layer of *Taxandria marginata, Acacia nigricans, Templetonia retusa, Hakea drupacea, Verticordia minutiflora, Calthamnus quadrifidus*.
Callitris Taxandria mixed shrubland	*Callitris preisii* sparse to mid-dense canopy with understorey of *Taxandria marginata, Platysace compressa, Verticordia minutiflora, Hakea clavata*.
Eucalyptus angulosa Taxandria tall mixed shrubland	*Eucalyptus angulosa* and *Taxandria marginata*
Taxandria marginata mixed shrubland	Canopy of *Taxandria marginata*, with understorey of *Platysace compressa, Verticordia minutiflora, Hakea clavata*.
Taxandria tall closed mixed shrubland	Dense closed canopy of tall *Taxandria marginata* > 5 meters, mixed with sparse tall *Hakea drupacea, Melaleuca pentagona, Melaleuca thymoides* and very sparse *Eucalyptus angulosa*.
Eucalyptus angulosa Melaleuca pentagona mix shrub	Sparse to mid-dense *Eucalyptus angulosa* with dense closed understory of *Melaleuca pentagona*.
Eucalyptus platypus Melaleuca pentagona shrubland	Small pockets of sparse *Eucalyptus platypus* canopy with mid-dense understory of *Melaleuca pentagona*.
Melaleuca pentagona mixed shrubland	Mid-dense *Melaleuca pentagona* shrubland canopy < 3 m with understory mix of *Templetonia retusa, Pultenaea obcordata, Pimelea ferruginea, Banksia media, Hakea nitida*.

Eucalyptus angulosa mixed shrubland	Sparse to mid-dense *Eucalyptus angulosa* canopy with mid-dense understory of *Melaleuca pentagona, Templetonia retusa, Pimelea ferruginea, Pultenaea obcordata, Nematolepis phebalioides* and *Acacia cyclops*.
Eucalyptus platypus mixed shrubland	Sparse to mid-dense Eucalyptus platypus canopy with mid-dense understory of *Melaleuca pentagona, Templetonia retusa, Pimelea ferruginea, Pultenaea obcordata, Nematolepis phebalioides* and *Acacia cyclops*.
Eucalyptus platypus Melaleuca lanceolata woodland	> 5 m Dense closed *Eucalyptus platypus* woodland with sparse *Melaleuca lanceolata* interspersed.
Melaleuca lanceolata Eucalyptus shrubland	<5 m Dense closed *Melaleuca lanceolata* dominated shrubland with sparse Eucalyptus platypus.
Melaleuca lanceolata mixed shrubland	Granite coastal edge of *Melaleuca lanceolata* shrubland interspersed with a mix of *Darwina diosmoides, Bossiaea dentata, Leucopogon parviflorus, Pimelea ferruginea, Scavola crassifolia*.
Melaleuca lanceolata tall shrubland	> 5 m Dense closed *Melaleuca lanceolata* shrubland with very sparse Eucalyptus platypus.
Melaleuca cuticularis closed shrubland	Mid dense canopy of *Melaleuca cuticularis* with a tall shrub layer of *Melaleuca brevifolia* and ground cover of mixed sedges.
Calytrix Darwinia Bossiaea dense mixed shrubland	Closed heath of < 2m of *Calytrix acutifolia, Darwina diosmoides, Bossiaea dentata, Calthamnus quadrifidus, Hakea drupacea, Leucopogon parviflorus, Pimelea ferruginea, Melaleuca pentagona, Scavola crassifolia*.
Blue mallee revegetation mixed shrubland	Mix of Sparse *Eucalyptus pleurocarpa*, with *Acacia cyclops, Melaleuca pentagona, Agonis marginata.*
Coastal Dune Rehabilitation	Primarily brushing and seedlings of *Melaleuca lanceolata, Carpobrotus virescens,*
Coastal Fore Dune	Sparse chenopod grass land with *Spinifex hirsutus, Carpobrotus virescens, *Euphorbia paralias, Atriplex isatidea, Scavola crassifolia*
Cleared Track	
Grass weeds	Meadow of introduced grass weeds

Based on the applied condition assessment method about 50% of the site is Pristine and a third is in Excellent condition.

Condition	Area Ha	%
Pristine	28.13	49.30
Excellent	18.87	33.07
Very Good	4.00	7.01
Good	2.24	3.92
Degraded	1.64	2.88
Very Degraded	2.17	3.81
Total	**57.05**	**100.00**

Figure Vegetation Condition Map



Stressors/threats to vegetation condition identified through the survey include Armillaria, *Phytophthora cinnamomi*, senescence, climate change drought, human activity, wind/water erosion, compaction, and rabbits. As the area is also long unburnt uncontrolled extreme fire conditions would likely exacerbate the risk of expanded human activity, erosion, rabbit grazing and weed introduction

Unmanaged and unapproved track establishment through human activity extends over about 1.3 ha of area but dissects large areas of remnant vegetation providing vector pathways to plant disease, weeds, feral animals, and erosion stressors.

Row Labels	Area ha
Cleared Track	**2.17**
Alienated	0.87
Very Degraded	1.3
Grand Total	**2.17**

Discussion
Biodiversity values associated with the area are that the majority of vegetation (83 %) is in either Excellent or Pristine condition with very little impacts. The EPBC Threatened Ecological Community listing of Proteaceae Dominated Kwongkan Shrublands may apply to the *Banksia* mixed shrublands and pockets of *Hakea drupacea* vegetation types. These values require further detailed assessment against EPBC criteria and very high resolution mapping separate to this report.

The *Banksia* mixed shrublands vegetation are representative of Esperance sandplain vegetation and it is unusual to have such vegetation so close to the coast. This vegetation type may be at its most western coastal point as it is normally found further inland or down to the coast in the Cape Legrand and Cape Arid National Parks.

For such a small area, the vegetation community mosaics and species richness is considered diverse and an important representation of coastal granite, coastal limestone, coastal sand dune, sandplain and wetland community concentrated into the 84 ha site.

There are rich wildflower values associated with the shrublands, heaths including orchids and species flowering all year round at different periods.

There are two possible Priority Flora listed flora species identified but not yet confirmed being the P4 listed *Banksia prolata* subsp. *calcicola* and P3 listed *Persoonia scabra*. These species have been mapped opportunistically as part of the survey.

Figure. Priority flora and Weeds Map

The dense, long unburnt, excellent/pristine condition, diverse vegetation mosaics, high proportion of flowering plants all year round provide excellent habitat potential for fauna. This includes native birds, reptiles, and mammals such as Quenda (Southern brown bandicoot), Western Honey Possum, Western Pygmy possum, and Native Bush rats. Direct threats this native fauna habitat potential are predation and from introduced cats, foxes, and competition from black rat and the common house mouse.

The site also forms part of the South Coast Coastal Macro corridor and is linked with adjacent coastal vegetation through the Esperance Coastal Groundwater Reserves and Tourist drive.

The floristic biodiversity values and native fauna habitat potential provide as excellent education, awareness and economic eco-tourism opportunity for the Shire of Esperance. With careful management the site could provide a “Kings Park” type asset to the community.

Recommendation
It is important that future management balances multiple use demands such as recreation, potable water, communication infrastructure, and biodiversity against fire, plant disease, weeds, feral animals, erosion, senescence, and climate change drought increased risk of environmental impact.

Search Word(s): Esperance, Dempster Head, Management Plan, Flora Survey, Vegetation Mapping.

Geographic Extent Name(s): A pick list of predefined geographic extents such as map sheets, local government areas, and catchments that reasonably indicate the spatial coverage of the dataset OR.

Geographic Extent Polygon(s): An alternate way of describing geographic extent if no pre-defined area is satisfactory.

Date Currency	**Beginning date: 28/07/2017** *Earliest date of data in the dataset.*
	Ending date: 18/01/2018 *Last date of information in the dataset.*
Dataset Status	**Progress:** Complete
	Maintenance and Update Frequency: As required.
Access	**Stored Data Format:** Digital shapefile, digital maps, PDF reports.
	Available Format Type: Digital shapefile, digital maps, PDF reports.
	Access Constraint: To be determined by the Shire of Esperance
Category	**Element**
Data Quality	**Lineage:** A brief history of the source and processing steps used to produce the dataset.
	Positional Accuracy: The base orthophoto imagery is inaccurate by about 20 m to the south of Landgate imagery. GPS data is accurate to +/- 5 m.
	Attribute Accuracy: 1:300 mapping scale screen digitising
	Logical Consistency: Click here to enter text. 1. Arc GIS 10.2 was used to create the shapefiles. 2. Create a project boundary encompassing vegetation areas of Dempster Head on Primarily Shire of Esperance land south of the Esperance Port, down to the high tide water mark and to the (West) first beach access steps. 3. A shapefile was created, overlayed onto imagery, edited using polygon split, merge, tools, attributes added and populated based on field and desktop evidence. 4. Areas and perimeters were calculated for each polygon using the Geomorphometry tool
	Completeness: Complete
	Contact Organisation: Shire Of Esperance
	Contact Position: Environment Officer.
Contact Information	**Mail Address 1:** Windich Street Esperance, WA, 6450.
	Mail Address 2: Click here to enter text.
	Suburb or Place or Locality 1: .
	State or Locality 2:
	Country:
	Postcode: 6450.
	Telephone: (08) 90710666.
	Facsimile: .
	Electronic Mail Address: shire@esperance.wa.gov.au
Metadata Date	**25/01/2018** *Date that the metadata record for the dataset was created.*
Additional Metadata	Click here to enter text.

WALIS Additional Metadata Elements for Data Transfer Purposes	
Category	**Element**
Projection	**Horizontal Co-ordinate System:** GDA 1994, MGA Zone 51 UTMs

	Horizontal Co-ordinate Parameters: Description of parameters used in map projection (AMG zone, false easting, false northing, standard parallels, longitude of central meridian, etc), geographic reference (latitude and longitude resolution, geographic coordinate units).
	Geodetic Model: Click here to enter text.
	Vertical Co-ordinate System: GDA 1994, MGA Zone 51, meters, hectares, meters squared
Raster	**Raster Type:** NA
Entity and Attributes	**Entity Description:** Vegetation type, Vegetation Condition, Stressors, Area, Perimeter.
	Attribute Details: Click here to enter text.

Templates are derived from section 4 of the "South Coast Natural Resource Management Group Regional Spatial Information Toolkit: Natural Resource Management Spatial Information Management Data Collection Standards (2008), published by Department of Agriculture and Food Western Australia."

Appendix B Flora Species List 2003 and 2017

Table 5 List of Flora Identified on Dempster Headland and Esperance Port Authority Land (2003) and Dempster Head (2017)

Family	Species Name	Common Name	Status	'03	'17
Cupressaceae	*Callitris preissii*	Rottnest Island Pine		X	X
Aizoaceae	*Carpobrotus ?pulcher Toelken ms*		P2	X	
	Carpobrotus virescens	Coastal Pigface		X	X
	Tetragonia implexicoma	Bower spinach			X
Anacardiaceae	**Schinus terebinthifolia*	Japanese Pepper			X
Anarthriaceae	*Lyginia barbata*			X	
Apiaceae	*Platysace compressa*	Tapeworm Plant		X	X
Asparagaceae	**Asparagus asparagoides*	Bridal Creeper		X	
	Lomandra micrantha subsp. teretifolia			X	
	Lomandra rigida	Stiff Mat Rush		X	X
	Thysanotus dichotomus	Branching Fringe Lily		X	X
	Thysanotus nudicaulis	Bridal Creeper		X	X
Asphodelaceae	**Asphodelus fistulosus*	Onion Weed		X	
Asteraceae	*Asteridea nivea*			X	
	**Hypochaeris radicata*	Flat Weed		X	
	Myriocephalus appendiculatus ?	White-tip Myriocephalus		X	
	Senecio glossanthus	Slender Groundsel		X	
	Olearia axillaris	Coastal Daisybush		X	X
	Senecio pinnatifolius var. maritimus	Coastal Groundsel		X	X
Celastraceae	*Stackhousia monogyna*			X	
Chenopodiaceae	*Atriplex isatidea*	Coast saltbush			X
	Salsola australis			X	
	Rhagodia baccata	Berry saltbush			X
	Rhagodia sp.			X	
Cyperaceae	*Ghania sp*			X	
	Ficinia nodosa	Knotted Club Rush		X	X
	Isolepis marginata	Coarse Club-rush		X	
	Lepidosperma angustatum			X	
	Lepidosperma drummondii			X	X
	Lepidosperma gladiatum	Coast Sword-sedge		X	X
	Lepidosperma squamatum			X	X
	Mesomelaena graciliceps ??			X	
	Schoenus grandiflorus	Large Flowered Bogrush		X	X

Family	Species Name	Common Name	Status	'03	'17
	Schoenus lanatus	Woolly Bog-rush		X	X
	Schoenus sp			X	
	Schoenus sublaxus			X	X
	Tetraria capillaris	Hair Sedge		X	
	Tricostularia compressa			X	
Dilleniaceae	*Hibbertia racemosa*	Stalked Guinea Flower		X	X
	Hibbertia subvaginata			X	
Ericaceae	*Leucopogon carinatus ?*			X	
	Leucopogon cuneifolius			X	
	Leucopogon obovatus			X	X
	Leucopogon parviflorus	Coast Beard-heath		X	X
	Leucopogon sp			X	
	Leucopogon sp (smooth leaf)			X	
	Leucopogon sp (sharp leaf)			X	
	Leucopogon sp (narrow leaf)			X	
	Lysinema ciliatum	Curry Flower		X	X
Euphorbiaceae	*Adriana quadripartite*	Bitter Bush		X	X
	**Euphorbia paralias*	Sea spurge			X
	**Euphorbia terracina*	Geraldton carnation weed			X
Fabaceae	*Acacia browniana*			X	
	Acacia cochlearis	Rigid Wattle		X	X
	Acacia cyclops	Coastal Wattle		X	X
	Acacia lasiocarpa	Panjang		X	
	Acacia myrtifolia			X	
	Acacia nigricans			X	X
	Acacia saligna	Orange Wattle		X	X
	Acacia subcaerulea			X	X
	**Acacia truncata (not Esperance species)*			X	
	Bossiaea dentata			X	X
	Eutaxia myrtifolia			X	X
	Gastrolobium bilobum	Heart Leaf Poison		X	
	Gompholobium tomentosum	Hairy Yellow Pea		X	X
	Jacksonia spinosa			X	X
	Kennedia prostrata	Scarlet Runner		X	X
	Pultenaea heterochila			X	X
	Pultenaea verruculosa			X	

Family	Species Name	Common Name	Status	'03	'17
	Templetonia retusa	Cockies Tongues		X	X
Gentianaceae	**Centaurium erythraea*	Common Centaury		X	
Geraniaceae	*Pelargonium capitatum*	Rose Pelargonium		X	X
Goodeniaceae	*Dampiera fasciculata*	Bundled-leaf Dampiera		X	
	Dampiera loranthifolia			X	
	Goodenia decursiva ?			X	
	Goodenia scapigera	White Goodenia		X	X
	Lechenaultia tubiflora	Heath Leschenaultia			X
	Scaevola crassifolia	Thick-leaved Fan-flower		X	X
	Velleia trinervis			X	X
Hemerocallidaceae	*Agrostocrinum scabrum*	Blue Grass Lily		X	X
	Dianella brevicaulis			X	
	Stypandra glauca	Blind grass			X
Iridaceae	*Patersonia occidentalis*	Purple Flag		X	X
Lamiaceae	*Westringia dampieri*			X	X
Lauraceae	*Cassytha micrantha*			X	X
	Cassytha racemosa	Dodder Laurel		X	X
Loganiaceae	*Logania fasciculata*			X	X
Loranthaceae	*Nuytsia floribunda*	Christmas Tree		X	X
Malvaceae	*Guichenotia ledifolia*			X	
	Lasiopetalum discolor			X	
Myrtaceae	*Taxandria linearifolia*			X	
	Taxandria marginata			X	X
	Beaufortia micrantha			X	X
	Beaufortia schaueri	Pink Beaufortia		X	
	Calothamnus quadrifidus	One-sided Bottlebrush		X	X
	Calytrix acutifolia			X	X
	Chamelaucium ciliatum ?			X	
	Darwinia diosmoides			X	X
	Darwinia vestita	Pom-pom Darwinia		X	
	Eucalyptus angulosa	Ridge-fruited Mallee		X	X
	Eucalyptus ligulata	Lucky Bay Mallee		X	
	Eucalyptus platypus	Moort		X	X
	Eucalyptus pleurocarpa				X
	Melaleuca brevifolia				X
	Melaleuca cuticularis	Saltwater paperbark			X

Family	Species Name	Common Name	Status	'03	'17
	**Melaleuca huegelii (not Esperance species)*	Chenille Honeymyrtle		X	X
	Melaleuca lanceolata	Rottnest Teatree		X	X
	**Melaleuca nesophila (not Esperance species)*	Mindiyed		X	X
	Melaleuca pentagona var. latifolia			X	
	Melaleuca pentagona var. pentagona				X
	Melaleuca systena			X	
	Melaleuca thymoides			X	X
	Thryptomene saxicola	Rock Thryptomene		X	X
	Verticordia minutiflora			X	X
Onagraceae	*Epilobium billardiereanum*	Glabrous Willow Herb		X	
Orchidaceae	*Caladenia vulgata*			X	
	Caladenia sp			X	
Phyllanthaceae	*Phyllanthus calycinus*	False Boronia		X	
	Phyllanthus scaber			X	X
Pittosporaceae	*Billardiera coriacea*			X	X
	Billardiera heterophylla	Australian Bluebell		X	
Poaceae	*Rytidosperma setaceum*			X	
	Austrostipa acrociliata			X	
	Austrostipa sp			X	
	**Avena fatua*	Wild Oat		X	
	Hemarthria uncinata	Matgrass		X	
	**Hordeum leporinum*	Barley Grass		X	
	**Lagurus ovatus*	Hare's Tail Grass		X	
	Poa sp			X	
	Spinifex hirsutus	Hairy spinifex			X
Polygalaceae	*Comesperma virgatum*	Milkwort		X	
	Comesperma volubilis				X
Polygonaceae	*Muehlenbeckia adpressa*	Climbing Lignum		X	X
Primulaceae	**Lysimachia arvensis*	Pimpernel		X	X
Proteaceae	*Adenanthos cuneatus*	Coastal Jugflower		X	X
	Banksia media	Southern Plains Banksia		X	X
	Banksia speciosa	Showy Banksia		X	X
	Banksia obovata	Wedge-leaved Dryandra		X	X
	Banksia occidentalis	Red Swamp Banksia			X
	Banksia prolata subsp. calcicola		P4	X	X

Family	Species Name	Common Name	Status	'03	'17
	Hakea adnata			X	
	Hakea clavata	Coastal Hakea		X	X
	Hakea corymbosa	Cauliflower Hakea		X	X
	Hakea drupacea			X	X
	Hakea nitida	Frog Hakea		X	X
	Hakea obliqua	Needles and Corks		X	X
	Hakea trifurcata	Two-leaf Hakea		X	X
	Isopogon trilobus	Barrel Coneflower		X	X
	Persoonia scabra		P3		X
	Petrophile teretifolia			X	X
Ranunculaceae	*Clematis linearifolia*			X	
	Clematis pubescens	Common Clematis		X	X
Restionaceae	*Desmocladus fasciculatus*			X	
	Desmocladus flexuosus			X	X
	Lepyrodia sp			X	
Rhamnaceae	*Pomaderris myrtilloides*			X	
	Spyridium globulosum	Basket Bush		X	X
Rubiaceae	*Opercularia hispidula*	Hispid Stinkweed		X	
	Opercularia vaginata	Dog Weed		X	
Rutaceae	*Boronia crassifolia*			X	
	Boronia ramosa			X	X
	Netaolepis phebalioides				X
Santalaceae	*Exocarpos sparteus*	Broom Ballart		X	
Sapindaceae	*Dodonaea ceratocarpa*			X	X
Scrophulariaceae	*Myoporum insulare*	Blueberry Tree		X	
Solanaceae	*Anthocercis littorea*	Yellow Tailflower			X
	**Lycium ferocissimum*	African Boxthorn			X
Stylidiaceae	*Stylidium pilosum*	Silky Triggerplant		X	X
Thymelaeaceae	*Pimelea cracens*			X	
	Pimelea drummondii			X	X
	Pimelea ferruginea			X	X

Appendix C Esperance Bird Watching Group Observations

Table 6 Esperance Bird Watching Group Observations at Dempster Head (1997 to 2016)

Family	Species Name	Common Name	Year Observed	Status
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill	2010	
	Sericornis frontalis	White-browed Scrubwren	1997, 2001, 2006, 2010, 2016	
Accipitridae	*Haliastur sphenurus*	Whistling Kite	2001	
Anatidae	*Cereopsis novaehollandiae grisea*	Cape Barren Goose	2006	Vulnerable (Cmth & State)
	Tadorna tadornoides	Australian Shelduck	2016	
Artamidae	*Cracticus torquatus*	Grey Butcher Bird	2010	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	2006	
Columbidae	**Columba livia*	Rock Dove, feral pigeon	2010	
	**Spilopelia senegalensis*	Laughing Dove	1997, 2010, 2016	
	Ocyphaps lophotes	Crested Pigeon	2010, 2016	
Corvidae	*Corvus coronoides*	Australian Raven	2016	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	2006	
Falconidae	*Falco cenchroides*	Nankeen Kestrel	2010	
	Falco peregrinus	Peregrine Falcon	2006	OS (State)
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	1997, 2001, 2006, 2010, 2016	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	2001, 2006	
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull	1997, 2001, 2006, 2016	
	Hydroprogne caspia	Caspian Tern	2001	
	Larus pacificus	Pacific Gull	1997, 2001, 2006, 2010, 2016	
	Thalasseus bergii	Crested Tern	2016	IA (Cmth)
Maluridae	*Stipiturus malchurus*	Southern Emu-wren	1997, 2006	
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill	2001, 2016	
	Anthochaera lunulata	Western Wattlebird	1997, 2001, 2006, 2016	
	Gavicalis virescens	Singing Honeyeater	2006, 2010	
	Phylidonyris novaehollandiae	New Holland Honeyeater	1997, 2001, 2006, 2010, 2016	
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	2006	

Family	Species Name	Common Name	Year Observed	Status
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	2006	
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	2001	
	Phalacrocorax fuscescens	Black-faced Cormorant	2006	
	Phalacrocorax varius	Pied Cormorant	2010	
Psittacidae	*Neophema petrophila*	Rock Parrot	2010	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	2010	
Sulidae	*Morus serrator*	Australasian Gannet	2006	
Zosteropidae	*Zosterops lateralis*	Silvereye	1997, 2001, 2006, 2010, 2016	
		Large raptor unidentified	2016	

- Vulnerable (Commonwealth EPBC Act):
  - *A native species is eligible to be included in the vulnerable category at a particular time if, at that time:*

    (a) it is not critically endangered or endangered; and

    (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- Vulnerable (WA State):
  - *Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.*
- OS – Other specially protected fauna (WA State):
  - *Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.*

Observation dates:

- 12/10/1997
- 11/11/2001
- 11/06/2006
- 14/11/2010
- 23/11/2010
- 11/09/2016

Appendix D *Phytophthora* Dieback Assessment

Phytophthora Dieback Assessment Report

Dempster Head

Shire of Esperance Reserves

Contents

1 SUMMARY

Assessment objective	Map Phytophthora dieback occurrence within Dempster Head reserves
Client	Shire of Esperance
Project area	69.9 ha
Method of assessment	Modified strip line
Date commenced	22nd November 2017
Date completed	24th November 2017
Interpreters	Peter Batt, Tilo Massenbauer
Project area access	Twilight Beach Road, Doust Street.
Previous assessment	No previous comprehensive assessment known
Past disturbances	Water catchment, rock quarrying, bushwalking, mountain biking, radio and telecommunications facilities, wildfires.
Current disease distribution	Two known areas of infested *Banksia speciosa* community
Disease expression	Obvious in interpretable areas
Predicted impact	High
Sampling strategy	Sampling of representative indicator species deaths in interpretable areas. Also sampling of a suspicious death on Doust Street.
Management recommendations	The majority of the site is mapped as uninterpretable. Determine management of the uninterpretable areas given that at least some of the area is probably unprotectable.
Protectable / unprotectable	Two small areas of obvious infested *Banksia speciosa* community. Two small areas of uninfested *Banksia speciosa* community identified and mapped, possibly unprotectable. The remainder of the assessment is Uninterpretable, and some is possibly unprotectable.
Other key points	A heavily used and disturbed site, particularly in the north and east but with areas of apparently healthy vegetation, primarily of Mallee, *Acacia* and *Melaleuca* scrub.

Products	Protectable Areas map
Map revalidation	24 November 2018

2 INTRODUCTION

2.1 Background

Phytophthora Dieback disease caused by the pathogen *Phytophthora cinnamomi* (*P.c.*) is a major threat to the biodiversity of south-western Australia. The spread of this water mould is facilitated by the movement of soil infested with spores, particularly under warm, moist conditions. Consequently, a major component in the strategy to constrain this disease involves managing access and soil-disturbance activities within native vegetation. Knowledge of the occurrence of the disease in the landscape is therefore an essential prerequisite to formulating suitable hygiene management practices.

Esperance District within the Parks and Wildlife Service has been requested by the Shire of Esperance to map the occurrence of *P.c.* within the proposed study area.

2.2 Location and size of areas

The area is located within the Shire of Esperance, just to the west of the town centre and Port and south of Twilight Beach Road.

The total area assessed is 69.9 ha.

The assessment commenced on 22nd November and was completed on 24th November 2017.

Historical land use and past disturbances

The assessment area is located within an area with a number of crown reserves with various vesting's and purposes as well as freehold locations. Parks and Wildlife records show:

- Previous assessment – Nil previous comprehensive assessments known
- Burn history – unknown. Some areas long unburnt.
- Rainfall isohyet range - 600mm

3 METHODS

3.1 Interpretation

Field interpretation differed slightly from the standard methods and operating procedures described in the document titled "Manual for detecting and mapping Phytophthora dieback disease (Procedures for DPAW-managed estate) 2013" Much of the area was too thick and steep to use strip line techniques so a modified method was adopted, utilizing existing trails, walk paths and bike trails to obtain a representative sample of the project area.

Background information was sought through Parks and Wildlife and South Coast NRM records prior to engaging in field work. In the field the area was interpreted by using a modified strip line survey technique, whereby several available walk tracks, bike tracks and vehicle tracks were walked to check interpretability throughout the area. Most of the area was found to be uninterpretable, precluding a full comprehensive survey throughout the entire area. Satellite imagery was also used to confirm vegetation communities and probable interpretability.

Two uninfested areas were identified during the assessment, both smaller than 4 ha. They were too small to warrant standard strip line survey through them. Rather, representative evidence was gathered around and in them.

The boundary of the project area was tracked by GPS and checked for signs of *P.c.* also.

Much of the vegetation is either too steep or too thick to walk through, which is the reason that many of the available tracks were utilized, rather than the standard strip line survey through the area.

Presence or absence of the pathogen was determined through observation and soil and tissue sampling of recently-dead plant species.

Non-differential, hand-held Global Positioning System (GPS) receivers were used for navigation and to record survey boundaries and waypoints within the areas.

3.2 Demarcation

The infested areas were not demarcated, as this was not required as part of the survey. Rather the actual boundary of the obvious infested areas was tracked and recorded with a GPS unit.

The actual boundaries of the uninfested areas and infested areas were tracked with a GPS unit, but not taped with variable buffer taping in the field. The Uninterpretable areas were the remaining default areas of the assessment and did not require field demarcation.

3.3 Soil and Tissue Sampling

Soil and tissue samples associated with dead or dying plants were taken to confirm the presence or absence of *Phytophthora* sp. These samples were forwarded to the Vegetation Health Service (VHS) laboratory at Kensington, where diagnostic baiting was conducted. The results were used as evidence for the presence of *P.c*. in the area. The sample point locations were recorded with GPS receivers.

Appendix I summarizes the laboratory results, sample location, indicator species sampled and indicator species class.

Additionally, one sample was sent to Murdoch University for DNA analysis. The results are still pending.

3.4 Mapping

The field observations, boundaries, waypoints and survey data were downloaded into a Geographic Information System (GIS) from a GPS to generate a *P.c.* Protectable Areas map for the area.

4 RESULTS

4.1 Hygiene category distribution

Most of the project area was found to support vegetation that is resistant to *P.c.* and as such has been classified as Uninterpretable.

These Uninterpretable areas are dominated by Eucalyptus, Melaleuca and Acacia species predominantly, with too few susceptible understory species to be able to accurately interpret for *Phytophthora dieback disease.* These areas are predominantly growing over relatively shallow soils over a granite or limestone base, with some areas of deep soils.

There are many large and small granite rocks and sheets throughout the area. Most support vegetation to varying degrees, most of which is resistant to *P.c.* These areas have been included within the Uninterpretable category as the vegetation that they carry is naturally occurring, has not been modified and it would be difficult to map all granite outcrops and classify as another category such as excluded.

There are two obvious infested areas within the assessment. They consist of two small areas in the south east of the project area, dominated by or previously dominated by *Banksia speciosa,* growing over deeper sand. There is an active disease edge with dead and dying mature *Banksia speciosa*, as well as older deaths, predominantly stags. It is possible that the vegetation between the two infestations is also infested, however there are no obvious signs of disease, so the vegetation has been classified as Uninterpretable.

There are two small areas of uninfested vegetation mapped in the eastern portion of the project area. These areas are also dominated by *Banksia speciosa* and other *Banksia* and *Hakea* species which are known to be susceptible to *P.c.*

There are no signs of infestation within these two areas, however as they are smaller than 4ha in size, being 1.73 ha and 0.13 ha respectively they are below the minimum recommended size to be considered protectable and it is likely that they will become infested over the next 50 years.

There are two other areas of *Banksia speciosa* community. The first is close to the Port and near the southern beach, while the other is just to the west of Lovers Cove and occupies a steep slope below the Rotary Walk trail. Both communities carry scattered *B. speciosa* interspaced with resistant understory species and both are well under 4ha in size. The *Banksia* is not consistent enough to accurately map them as Uninfested, so they have been included within the surrounding Uninterpretable areas.

The table below outlines the areas of the various hygiene categories.

Table 1: Hygiene Category Area Statement

Primary Categories	Area Ha	Unprotectable	Predicted High Impact	Very High Impact
Infested	0.6			
Uninfested	1.9	1.9		
Uninterpretable	67.5			
Unmappable				
Not Yet Resolved				
Assessed Area	70.0	1.9	0.0	0
Excluded				
Project Area	70.0			

4.2 Disease expression

Disease expression was obvious in the two infested areas, with dead and dying *Banksia speciosa, Petrophile sp. and Adenanthos cuneatus.* There were also older stags of *Banksia speciosa* as well as bare patches amongst healthy vegetation, where *B. speciosa* is likely to have been previously been before succumbing to the pathogen.

Two of the four samples taken in the area returned positive results for *P.c.* confirming the infested interpretation.

Other older deaths were noted primarily within the Uninterpretable areas. These were mostly of *Melaleuca spp*., and *Calothamnus quadrifidus*, which are resistant to *P.c.* The deaths were too old to produce a result, so they were not sampled.

There was little sign of deaths resulting from fire. Much of the area appears to be long unburnt, which would help explain the lack of fire induced deaths. It also helps to explain the thick, mature vegetation throughout the area making walking very difficult through much of the area off the tracks.

Owing to the time of year there was no signs of fruiting bodies from *Armillaria luteobubalina* and very little signs of death caused by this native pathogen.

4.3 Current disease impact

Current disease impact within the two infested areas is high, with the *Banksia speciosa* overstory heavily impacted by *Phytophthora cinnamomi*. The *Banksia speciosa* community grows on deeper, more acidic sands, which are ideal for *P.c.* to thrive during the wetter months of the year.

In all other areas, there is no obvious impact from *P.c.* as most of the area is Uninterpretable, dominated by resistant species, including *Eucalyptus*, *Melaleuca* and *Acacia* species. The soils here are predominantly shallower and overlaying granite and limestone and more alkaline in nature.

The shallow granite soils, while they may pool water during the wetter months, would quickly dry out during dryer periods, which is not conducive to sustaining *P.c.* activity.

The alkaline limestone soils tend to be less favourable to *P.c.* reducing the pathogen's impact to the vegetation growing in these soils.

4.4 Sample results

Four samples were taken during the assessment, of dead and dying indicator species. Two of the four samples returned positive results for *P.c.*

The following species were sampled:

Adenanthos cuneatus – 51 E397788 N6250901

Banksia obovata – 51 E397843 N6250812

Banksia speciosa – 51 397379 N6250924

Hakea trifurcata – 51 E397789 N6250889.

The *Hakea trifurcata* and *Banksia obovata* returned positive results.

The locations of the samples are shown on the accompanying Protectable Areas map.

5 DISCUSSION

5.1 Category distribution

Most of the project area supported vegetation that is resistant to *P.c.* The vegetation is dominated by Mallee Eucalypts, *Melaleuca spp.* and *Acacia spp.* Other areas have very little vegetation, particularly associated with the granite outcrops, however it is also generally resistant to *P.c.* These areas have been categorised as Uninterpretable.

There are two small discrete infested areas in the south east, on sandy rises. These areas are currently or were dominated by *Banksia speciosa*, which is highly susceptible to *P.c.* There is obvious Phytophthora dieback disease within the two stands, with dead and dying individuals noted during the assessment. There are also older stags present, the remains of longer term dead mature plants.

The infested areas are surrounded by vegetation that is resistant to *P.c.* It may be infested with *P.c.* but there is no way of knowing without extensive sampling which is beyond the scope of this assessment.

There are two areas of Uninfested *Banksia speciosa* communities mapped. This is quite surprising given the long-term use and disturbance throughout the area. They possibly exist because vehicle use is restricted in the area, limestone soils surrounding the Uninfested cells may be protecting them slightly from introduction and spread of *P.c.* and more importantly they are also higher in the landscape than the surrounding area, further protecting them from introduction and spread of Phytophthora dieback disease.

As they are both smaller than 4ha in size, normally they would be considered to be unprotectable, however given the rarity of an uninfested coastal *Banksia speciosa* stand so close to Esperance townsite, there may be interest in trying to protect it from infestation.

There are two other *Banksia speciosa* communities. The first is close to the port and beach. It is very small and contains scattered mature *Banksia* interspaced with resistant understory species.

The second larger area is just to the west of Lovers Cove and occupies the lower slope of the hill below part of the Rotary Walk trail and lookout. Again, it contains scattered mature *B speciosa* interspaced with resistant understory and overstory species. It is also under the standard 4 ha in size to be considered protectable and given its location below the walk trail, it would be difficult to protect from phytophthora dieback.

Given their small sizes and scattered nature of the *Banksia speciosa*, they have not been mapped as uninfested but rather included within the Uninterpretable category.

5.2 Disease expression

Disease expression within the infested *Banksia speciosa* stands was generally obvious, with dead and dying individuals and a good chronology of older deaths. *Banksia speciosa* is known to be highly susceptible to the pathogen and the presence of Phytophthora dieback was evidenced by dead and dying individuals and older deaths radiating out from the newer deaths.

Background knowledge of the disease spread within this area by Tilo was invaluable in being able to target the area for mapping.

5.3 Sampling strategies

- The two infested areas were sampled in an effort to “prove up” the infested category. A positive result was obtained from each infested cell.
- No suitable recent deaths were found in the Uninterpretable area and as samples are based on a user pays principle, it was not thought financially expedient to sample where it was unlikely to get an accurate result.
- No suitable recent deaths were found in the Uninfested category, so no samples were taken here either.

5.4 Assessment area access

The assessment area is easily accessed from Twilight Beach Road and the Lions lookout access road, which are both bitumen, not requiring an assessment. All other tracks within the project area are gravel or dirt roads or tracks.

Some of the vehicle tracks have restricted access, with locked gates or chaining to prevent public access. Walking is however encouraged, while currently, mountain biking is not.

6 CONCLUSION

An Occurrence / Protectable Areas Map has been prepared to show disease boundaries. *P.c.* has the ability to spread autonomously and through vectors such as machinery, vehicles and animals therefore assessment area boundaries should be revalidated if the map is more than 1 year old (24 November 2018). A full re-interpretation will be required after three years (24 November 2020) if there is continuing or new disturbance activities within the assessment area.

7 RECOMMENDATION

7.1 Hygiene management

Phytophthora management tactics should be devised with consideration to protectable areas. The Shire of Esperance should formulate tactics in consultation with The Department of Parks and Wildlife, Esperance District and representatives from the South Coast NRM team in Esperance. The Department’s Phytophthora management proforma will identify necessary steps in prescribing effective Phytophthora management strategies and tactics.

The following are specific recommendations, following the assessment of the Dempster head reserves.

- The vast majority of the area supports Uninterpretable vegetation, which is resistant to *P.c.* It may be infested but without comprehensive and expensive sampling, there is little way of knowing. Due to the amount of previous and current use it is likely that at least some of the area is infested or unprotectable, which may influence future management of the area.

- The uninfested areas, while small and below the normally accepted size to remain protectable into the foreseeable future, due to their rarity in the area are worthy of consideration to be protected.

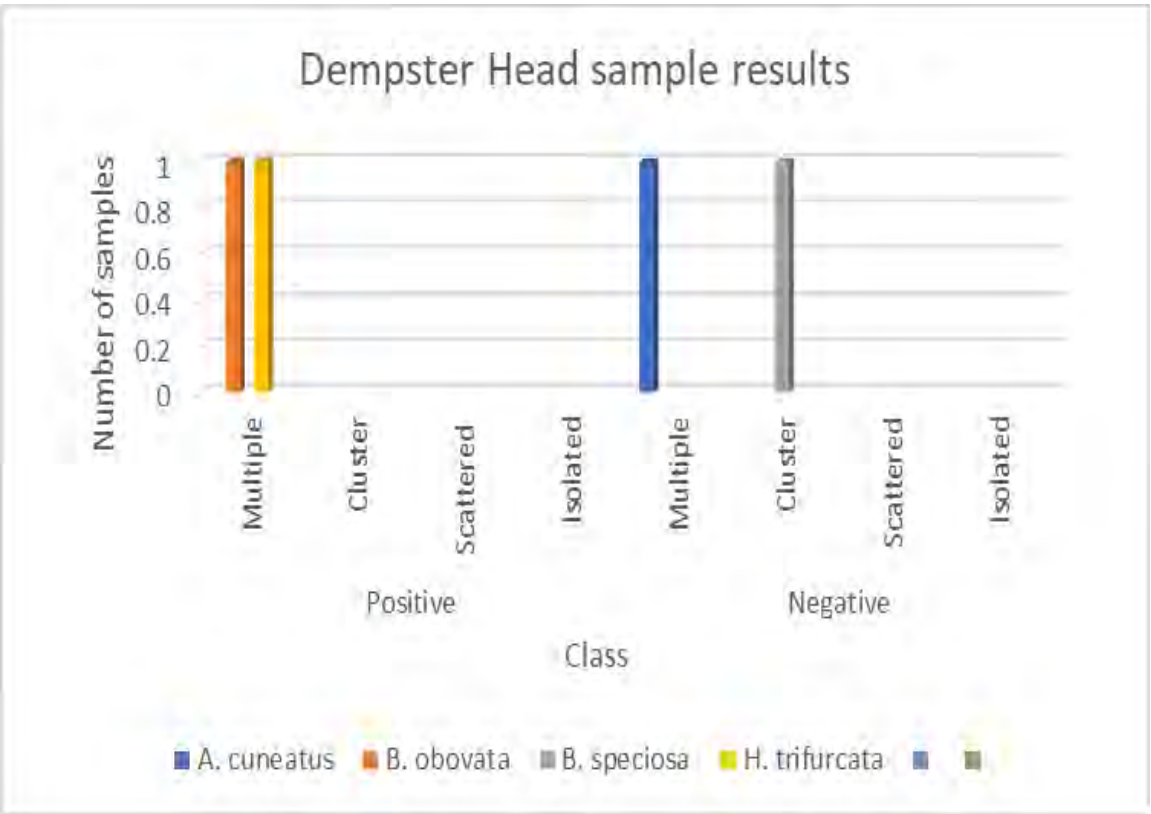
8 REFERENCES

- Havel, J.J. (1975) Site Vegetation Mapping in the Northern Jarrah Forest (Darling Range). 2. Location and Mapping of Site-Vegetation Types.
- Botanic Gardens Trust Sydney NSW. Armillaria root Rot – fact sheet. http://www.rbgsyd.nsw.gov.au/information_about_plants/pests_diseases/fact_sheets/armillaria_root_rot

Peter Batt
Fire Operations Officer / Registered interpreter

15 January 2017

Appendix 1


Dempster Head sample results
Number of samples
1
0.8
0.6
0.4
0.2
0
Multiple
Cluster
Scattered
Isolated
Multiple
Cluster
Scattered
Isolated
Positive
Negative
Class
A. cuneatus
B. obovata
B. speciosa
H. trifurcata

ESPERANCE DISTRICT
DEMPSTER HEAD

Shire of Esperance Reserves

Phytophthora cinnamomi

PROTECTABLE AREAS MAP

397,000.00

398,000.00

6,251,000.00

6,250,000.00

CROWN RESERVE 38805
CROWN RESERVE 41141
CROWN RESERVE 13727
CROWN RESERVE 33636
CROWN RESERVE 33636
CROWN RESERVE 33637
CROWN RESERVE 38798
CROWN RESERVE 38797
CROWN RESERVE 38453
CROWN RESERVE 28207
CROWN RESERVE 49695
CROWN RESERVE 7742
CROWN RESERVE 33163
CROWN RESERVE 41141
CROWN RESERVE 41141
CROWN RESERVE 47992
CROWN RESERVE 41141
CROWN RESERVE 41141
CROWN RESERVE 41141
CROWN RESERVE 41141
CROWN RESERVE 28207
CROWN RESERVE 41141
CROWN RESERVE 41141
CROWN RESERVE 41141
sample 1
sample 2
sample 3
sample 4
60
60
60
60

OCCURRENCE CATEGORIES

INFESTED
Determined by a registered interpreter to have plant disease symptoms consistent with the presence of Phytophthora cinnamomi

UNINFESTED
Determined by a qualified Interpreter to be free of plant disease symptoms which indicates the presence of Phytophthora cinnamomi

UNINTERPRETABLE
Where susceptible plants are absent or too few to enable the interpretation of Phytophthora cinnamomi presence or absence

TEMPORARILY UNINTERPRETABLE (included within assessment area)
Areas of temporary disturbance where natural vegetation is likely to recover

NOT YET RESOLVED (included within assessment area)
Areas where Phytophthora cinnamomi occurrence diagnosis cannot be easily made within the required timeframe because of inconsistent evidence

EXCLUDED (excluded from assessment area)
Areas of long-term high disturbance where natural vegetation has been cleared and is unlikely to recover.

OVERLAYS

HIGH IMPACT (current and predicted-forest areas only)
(Demarcated to include Very High impact areas which may occur within)
Where the overstorey impact from Phytophthora cinnamomi is greater than 10 % or predicted to be greater than 10 % in less than 50 years

VERY HIGH IMPACT (current-forest areas only)
(Delineated but not demarcated within High impact areas)
Where the overstorey impact from Phytophthora cinnamomi is greater than 50%, and including areas where post epidemic recovery of overstorey is occurring

UNPROTECTABLE
Where current Phytophthora cinnamomi symptoms may spread into these areas autonomously.

PROJECT BOUNDARY

DISEASE RISK ROAD

MAP METHOD

Interpreted using stripline survey techniques. Boundaries captured using GPS. Boundaries positioned relative to map features.

MAP LIMITATIONS

The smallest areas of interpretation that can be portrayed on this map are 1 millimetre in diameter, representing 5 metres diameter on the ground. Areas less than this area symbolized to this size.
The management information depicted on this map is positioned relative to mapped features and may not be accurate, consequently the field demarcation should be followed.
This map expires after 1 year. It cannot be used for operations after that date.
Maps may be revalidated using a modified assessment method (Recheck).
Maps may only be revalidated for 3 years after interpretation **24/11/20**

PRODUCT VERSION STATEMENT

Product	Code	Assessment Completion	Interpreters	Map Produced By		Expires
Occurrence	Dempster_Head_2017	24/11/17	PRB	PRB	3/01/18	24/11/18
This Map ID	Dempster_Head_17_Occ_5_A3					

AREA STATEMENT

Primary Categories	Area HA	Overlays		
		Unprotectable	High Impact	Very High Impact
Infested	0.6			
Uninfested	1.9			
Uninterpretable	67.5			
Not Yet Resolved				
Temporarily Uninterpretable	2.0			
Assessed Area	69.9			
Excluded Area				
Project Area	69.9			

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA
PARKS AND WILDLIFE SERVICE

SCALE 1:5,000 @ A2

0 100 200 400 Metres

GDA
PROJECTION: Transverse Mercator C.M, 117 E Zone 50
HORIZONTAL DATUM: Geocentric Datum Australia 1994.
VERTICA DATUM: Australia Height Datum 1971.

LEGEND

- Sealed Roads
- Unsealed Roads
- Tracks
- Relegated Tracks
- Existing road, upgrade to shunt
- Shunt Construction
- Bibbulmun Track
- Munda Biddi Cycle Trail
- Cape To Cape Walk Trail
- Bridle Trail
- Bike Trail
- Walk Trail
- Contour (5 metre intervals)
- Hydrology
- Cadastre
- Powerline
- Stream Reserve
- National Park
- Swamp
- Dam
- Water Point
- Plantations
- Bridge
- Reference tree
- BRM pit construction

Appendix E Heritage Searches

Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

Search Criteria

No Registered Aboriginal Sites in Shapefile - Management Plan Boundary

Disclaimer

The *Aboriginal Heritage Act 1972* preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

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Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

Legend

- Registered Aboriginal Site
- Search Area
- Town
- Road
- River
- Local Government Authority

0.62 kilometres

Map Scale 1 : 18,900

MGA Zone 51 (GDA94)

Aboriginal Heritage Inquiry System

List of Other Heritage Places

Search Criteria

No Other Heritage Places in Shapefile - Management Plan Boundary

Disclaimer

The Aboriginal Heritage Act 1972 preserves all Aboriginal sites in Western Australia whether or not they are registered. Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

Copyright

Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Other Heritage Places

Legend

- Other Heritage Place
- Search Area
- Town
- Road
- River
- Local Government Authority

0.62 kilometres

Map Scale 1 : 18,900

MGA Zone 51 (GDA94)

Aboriginal Heritage Inquiry System

List of Heritage Surveys

Search Criteria

4 Heritage Surveys containing 4 Survey Areas in Shapefile - Management Plan Boundary

Disclaimer

Heritage Surveys have been mapped using information from the reports and / or other relevant data sources. Heritage Surveys consisting of small discrete areas may not be visible except at large scales. Reports shown may not be held at the Department of Planning, Lands and Heritage (DPLH). Please consult report holder for more information. Refer to www.daa.wa.gov.au/heritage for information on requesting reports held by DPLH.

The information provided is made available in good faith and is predominately based on the information provided to the Department of Planning, Lands and Heritage by third parties. The information is provided solely on the basis that readers will be responsible for making their own assessment as to the accuracy of the information. If you find any errors or omissions in our records, including our maps, it would be appreciated if you email the details to the Department at heritageenquiries@daa.wa.gov.au and we will make every effort to rectify it as soon as possible.

Copyright

Access

Some reports are restricted.

Spatial Accuracy

The following legend strictly applies to the spatial accuracy of heritage survey boundaries as captured by DAA.

Very Good	Boundaries captured from surveyed titles, GPS (2001 onwards) submitted maps georeferenced to within 20m accuracy.
Good / Moderate	Boundaries captured from GPS (pre 2001) submitted maps georeferenced to within 250m accuracy.
Unreliable	Boundaries captured from submitted maps georeferenced to an accuracy exceeding 250m.
Indeterminate	Surveys submitted with insufficient information to allow boundary capture.

Basemap Copyright

Aboriginal Heritage Inquiry System

List of Heritage Surveys

Survey Report ID	Report Title	Report Authors	Area Number	Survey Type	Area Description	Spatial Accuracy	Field / Desktop
17221	Recherche a L'Esperance: A Prehistory of the Esperance Region of South-Western Australia. 1993. Phd Thesis.	Smith, Moya Vikki	1	Archaeological & Ethnographic	The survey area comprises the Esperance region, as shown in Figure 6.1.	Unreliable	Field and Desktop
20254	Ethnographic survey of Bullenbuk - Noongar section of Kambalda - Esperance Gas Pipeline Route	O'Connor, R	1	Ethnographic	The survey area consists of a gas pipeline route between Kambalda and Esperance, generally following the existing railway reserve, as per figure 1.	Good	Field and Desktop
20322	Report on an Aboriginal Heritage assessment in the Central West Native Title Claim area (Sambo Family) of the proposed Kambalda (West) to Esperance Gas Pipeline in W A	De Gand, Daniel	1	Ethnographic	The survey area consists of the railway reserve near where the proposed works will commence at the Kambalda Lateral Pipeline near Atriplex Rd in Kambalda West; along the road reserve of the Coolgardie-Esperance Highway; and along the railway reserve of the Coolgardie-Esperance Railway. The survey area width extends between the pegged route and the edge of the existing road on one side; and on the other side, 100m out from the pegged route.	Good	Field and Desktop
20323	Report on an Aboriginal Heritage assessment in the Central West Native Title Claim area (Donaldson Family) of the proposed Kambalda (West) to Esperance Gas Pipeline in W A	De Gand, Daniel	1	Ethnographic	The survey area consists of the railway reserve near where the proposed works will commence at the Kambalda Lateral Pipeline near Atriplex Rd in Kambalda West; along the road reserve of the Coolgardie-Esperance Highway; and along the railway reserve of the Coolgardie-Esperance Railway. The survey area width extends between the pegged route and the edge of the existing road on one side; and on the other side, 100m out from the pegged route.	Good	Field and Desktop

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Heritage Inquiry System

Map of Heritage Survey Areas

Legend

- Heritage Survey Area
- Search Area
- Town
- Road
- River
- Local Government Authority

0.62 kilometres

Map Scale 1 : 18,900

MGA Zone 51 (GDA94)

Map created: 09/10/2017 1:11:38 PM by: GIS_NET_USER

Identifier: 308842

Coastal Wireless Station (fmr), Esperance

AUTHOR Shire of Esperance PLACE NUMBER 05058

LOCATION

Lot 697 Orr St West Beach

LOCATION DETAILS

Cnr Orr & Doust Sts

OTHER NAME(S)

Esperance Wireless Station

OTC Wireless Station

LOCAL GOVERNMENT Esperance REGION Goldfields

CONSTRUCTION DATE

Constructed from 1992, Constructed from 1913

DEMOLITION YEAR N/A

Statutory Heritage Listings

TYPE	STATUS	DATE	DOCUMENTS
(no listings)			

Other Heritage Listings and Surveys

TYPE	STATUS	DATE	GRADING/MANAGEMENT CATEGORY
Municipal Inventory	Adopted	23 Jul 1996	
RHP - To be assessed	Current	30 Aug 2013	

Statement of Significance

Esperance was an important link in telecommunitions between Australia and the outside world in the early part of the twentieth century. The wireless station operated until it was decommissioned in 1992. These buildings represent this important aspect of communication.

Physical Description

Two identical buildings were constructed from stone in 1913. They were simple structures with verandahs front and back and a pitched roof which overhung the walls to form the verandahs. More recent features likea low mesh fencing and landscaping have been added.

Condition

Very Good

Creation Date 19 Nov 1996 Last Update 01 Jan 2017 Publish place record online (inHerit): Approved

Disclaimer

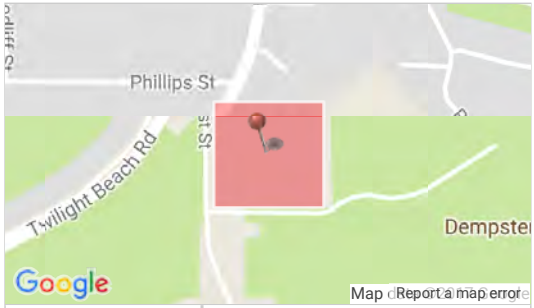
GOVERNMENT OF WESTERN AUSTRALIA

HERITAGE COUNCIL

inHerit Our heritage places

Coastal Wireless Station (fmr), Esperance

AUTHOR Heritage Council PLACE NUMBER 05058



Enlarge Map | Show Property Street View

LOCATION
Lot 697 Orr St West Beach

LOCATION DETAILS
Cnr Orr & Doust Sts

OTHER NAME(S)
Esperance Wireless Station
OTC Wireless Station

LOCAL GOVERNMENT Esperance REGION Goldfields

CONSTRUCTION DATE
Constructed from 1913

DEMOLITION YEAR N/A

Statutory Heritage Listings

TYPE	STATUS	DATE	DOCUMENTS	MORE INFORMATION
(no listings)				

Other Heritage Listings and Surveys

TYPE	STATUS	DATE	GRADING/MANAGEMENT CATEGORY	GRADING/MANAGEMENT DESCRIPTION	MORE INFORMATION
Municipal Inventory	Adopted	23 Jul 1996			Shire of Esperance
RHP - To be assessed	Current	30 Aug 2013			

show categories

Creation Date 19 Nov 1996 Last Update 01 Jan 2017 Publish place record online (inHerit): Approved

Disclaimer

Last Updated:17 May 2017 (ver 1.3.0.76)
Web development by Agile Computing

Tommy Windich's Grave

AUTHOR Shire of Esperance **PLACE NUMBER** 00832

LOCATION

Williamson Rd Esperance

LOCATION DETAILS

LOCAL GOVERNMENT Esperance **REGION** Goldfields

CONSTRUCTION DATE

Constructed from 1876

DEMOLITION YEAR N/A

Statutory Heritage Listings

TYPE	STATUS	DATE	DOCUMENTS
(no listings)			

Other Heritage Listings and Surveys

TYPE	STATUS	DATE	GRADING/MANAGEMENT CATEGORY
Municipal Inventory	Adopted	23 Jul 1996	
Register of the National Estate	Indicative Place		

Statement of Significance

Tommy Windich was a valued member of the exploration parties of H M Lefroy 1863. Surveyor Hunt 1866. Sir John Forrest 1869.1870, 1874 and Alexander Forrest 1871.

Physical Description

For over a century the grave was located in scrub and rush covered coast hills at the foot of Dempster Head. Originally the grave ran north south. but now it is in an east west orientation. The headstone was originally at the southern end of the grave. Although the coast hills have been removed as part of port development the grave site is that of the original grave.

History

Tommy Windich died at Esperance in February 1876 despite the nursing care of Mrs Ben Hannet. Mr B Hannet dug the grave and buried Tommy at the foot of Dempster head. Tommy Windich was a valued member of the e~'Ploration parties of H M Lefroy 1863. Surveyor Hunt 1866. Sir John Forrest 1869.1870, 1874 and Alexander Forrest 1871. Forrest paid for the original headstone and grave fence. In December 1910 Forrest paid Thomas Edwards of Esperance £10.00 to renovate the grave and headstone which had been damaged by fire. Despite many m)1hs which refer to the removal of the remains and resiting of the grave. there is no evidence of any such occurrences. This gravesite. respected by Aboriginal and European pioneers alike. is unique and was once a well known landmark.

Integrity/Authenticity

Integrity: Alterations:

Condition

Fair

References

REF ID NO	REF NAME	REF SOURCE	REF DATE
	H Wood-Wilson;"Exploring in Australia; Lord John Forrest".		
	"Inquirer".	West Australia Times	17/Mar/1876

Creation Date 06 Sep 1988 **Last Update** 01 Jan 2017 **Publish place record online (inHerit):** Approved

Disclaimer

This information is provided voluntarily as a public service. The information provided is made available in good faith and is derived from sources believed to be reliable and accurate. However, the information is provided solely on the basis that readers will be responsible for making their own assessment of the matters discussed herein and are advised to verify all relevant representations, statements and information.

GOVERNMENT OF WESTERN AUSTRALIA

HERITAGE COUNCIL

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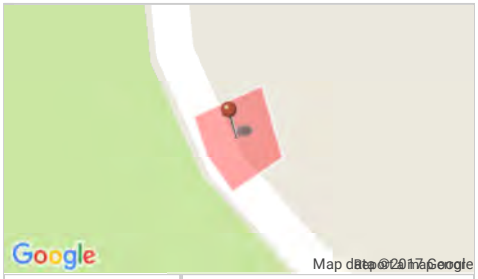
Tommy Windich's Grave

AUTHOR Shire of Esperance **PLACE NUMBER** 00832



Enlarge Map | Show Property Street View

LOCATION
Williamson Rd Esperance

LOCATION DETAILS

LOCAL GOVERNMENT Esperance **REGION** Goldfields

CONSTRUCTION DATE
Constructed from 1876

DEMOLITION YEAR N/A

Statutory Heritage Listings

TYPE	STATUS	DATE	DOCUMENTS	MORE INFORMATION
(no listings)				

Other Heritage Listings and Surveys

TYPE	STATUS	DATE	GRADING/MANAGEMENT CATEGORY	GRADING/MANAGEMENT DESCRIPTION	MORE INFORMATION
Municipal Inventory	Adopted	23 Jul 1996			
Register of the National Estate	Indicative Place				Heritage Council

Statement of Significance
Tommy Windich was a valued member of the exploration parties of H M Lefroy 1863. Surveyor Hunt 1866. Sir John Forrest 1869.1870, 1874 and Alexander Forrest 1871.
more

Physical Description
For over a century the grave was located in scrub and rush covered coast hills at the foot of Dempster Head.
Originally the grave ran north south. but now it is in an east west orientation. The headstone was originally at the southern end of the
more

History
more
Tommy Windich died at Esperance in February 1876 despite the nursing care of Mrs Ben Hannet.
Mr B Hannet dug the grave and buried Tommy at the foot of Dempster head. Tommy Windich was a valued member of the e~'Ploration parties

Integrity/Authenticity
more
Integrity:
Alterations:

Condition
more
Fair

References

REF ID NO	REF NAME	REF SOURCE	REF DATE
	H Wood-Wilson;"Exploring in Australia; Lord John Forrest".		
	"Inquirer".	West Australia Times	17/Mar/1876

hide categories

Place Type
Historic site

Uses

EPOCH	GENERAL	SPECIFIC
Original Use	MONUMENT\CEMETERY	Grave
Present Use	OTHER	Other

Historic Themes

GENERAL	SPECIFIC
DEMOGRAPHIC SETTLEMENT & MOBILITY	Exploration & surveying

Creation Date 06 Sep 1988 **Last Update** 01 Jan 2017 **Publish place record online (inHerit):** Approved

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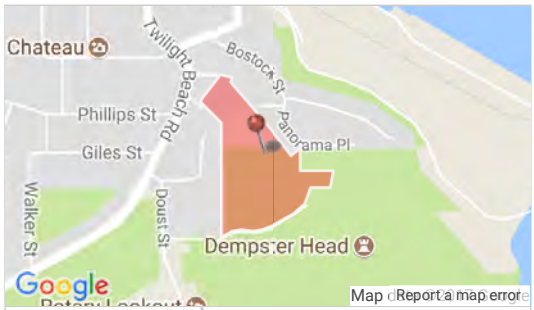
GOVERNMENT OF WESTERN AUSTRALIA

HERITAGE COUNCIL

Railway Water Supply

AUTHOR Shire of Esperance PLACE NUMBER 05061



Enlarge Map | Show Property Street View

LOCATION

Dempster Head Esperance

LOCATION DETAILS

OTHER NAME(S)

Railway Dam & Catchment

LOCAL GOVERNMENT Esperance REGION Goldfields

CONSTRUCTION DATE

Constructed from 1922, Constructed from 1921

DEMOLITION YEAR N/A

Statutory Heritage Listings

TYPE	STATUS	DATE	DOCUMENTS	MORE INFORMATION
(no listings)				

Other Heritage Listings and Surveys

TYPE	STATUS	DATE	GRADING/MANAGEMENT CATEGORY	GRADING/MANAGEMENT DESCRIPTION	MORE INFORMATION
Municipal Inventory	Adopted	23 Jul 1996			

Physical Description

more

Dam: The dam is located at the foot of bare granite rock on Dempster Head. A silt trap is situated at the foot of the rock. Steel gates prevent the entry of large debris. A large overflow drain lead down the hill past Dempsters' Lime Kiln to the camping ground now Port Authority Park.

History

more

This railway dam, completed in 1922, was to service steam trains during the construction and operation of the Esperance Salmon Gums Railway. Members of such families as Doust. Dunn. Eggling. McCarthY, Stowe and Sinclair were employed on the project.

Integrity/Authenticity

more

Integrity: 90%

Condition

more

Good

Associations

NAME	TYPE	YEAR FROM	YEAR TO
Public Works Department	Architect	1921	1922

References

REF ID NO	REF NAME	REF SOURCE	REF DATE
	"Plans and Records".	PWD	

show categories

Creation Date 19 Nov 1996 Last Update 01 Jan 2017 Publish place record online (inHerit): Approved

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Last Updated:17 May 2017 (ver 1.3.0.76)
Web development by Agile Computing

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- Copyright
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Appendix F Historical Aerial Photographs

Dempster Head Management Plan

Historical Aerial Photographs - 1964

N

Legend

Management Plan Boundary

1:7,500

Landgate_WA_Regional_Aerial_Imagery_1964

0 50100 200 300 400

Meters

Author	V. Davies	Data Constraints:
Reviewer	D. Gleave	Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.
Date	7 December 2017	Map has been produced as background information to inform the Dempster Head Management Plan review 2017.
Status	DRAFT	Map does not depict formal mountain bike tracks/ trails.

Dempster Head Management Plan

Historical Aerial Photographs - 1999

N

Legend

Management Plan Boundary

Landgate_WA_Regional_Aerial_Imagery_1999

1:7,500

0 50100 200 300 400 Meters

Author	V. Davies
Reviewer	D. Gleave
Date	7 December 2017
Status	DRAFT

Data Constraints:

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Map has been produced as background information to inform the Dempster Head Management Plan review 2017.

Map does not depict formal mountain bike tracks/ trails.

Dempster Head Management Plan

Historical Aerial Photographs - 2002

N

Legend

Management Plan Boundary

1:7,500

Landgate_WA_Regional_Aerial_Imagery_2002

0 50100 200 300 400

Meters

Author	V. Davies	Data Constraints:
Reviewer	D. Gleave	Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.
Date	7 December 2017	Map has been produced as background information to inform the Dempster Head Management Plan review 2017.
Status	DRAFT	Map does not depict formal mountain bike tracks/ trails.

Dempster Head Management Plan

Historical Aerial Photographs - 2007

N

Legend

Management Plan Boundary

1:7,500

Landgate_WA_Regional_Aerial_Imagery_2007

0 50100 200 300 400

Meters

Author	V. Davies	Data Constraints:
Reviewer	D. Gleave	Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.
Date	7 December 2017	Map has been produced as background information to inform the Dempster Head Management Plan review 2017.
Status	DRAFT	Map does not depict formal mountain bike tracks/ trails.

Dempster Head Management Plan

Historical Aerial Photographs - 2013

N

Legend

Management Plan Boundary

1:7,500

Landgate_WA_Regional_Aerial_Imagery_2013

0 50100 200 300 400

Meters

Author	V. Davies	Data Constraints:
Reviewer	D. Gleave	Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.
Date	7 December 2017	Map has been produced as background information to inform the Dempster Head Management Plan review 2017.
Status	DRAFT	Map does not depict formal mountain bike tracks/ trails.

Dempster Head Management Plan

Historical Aerial Photographs - 2017

N

Legend

Management Plan Boundary

1:7,500

Landgate_WA_Regional_Aerial_Imagery_2017

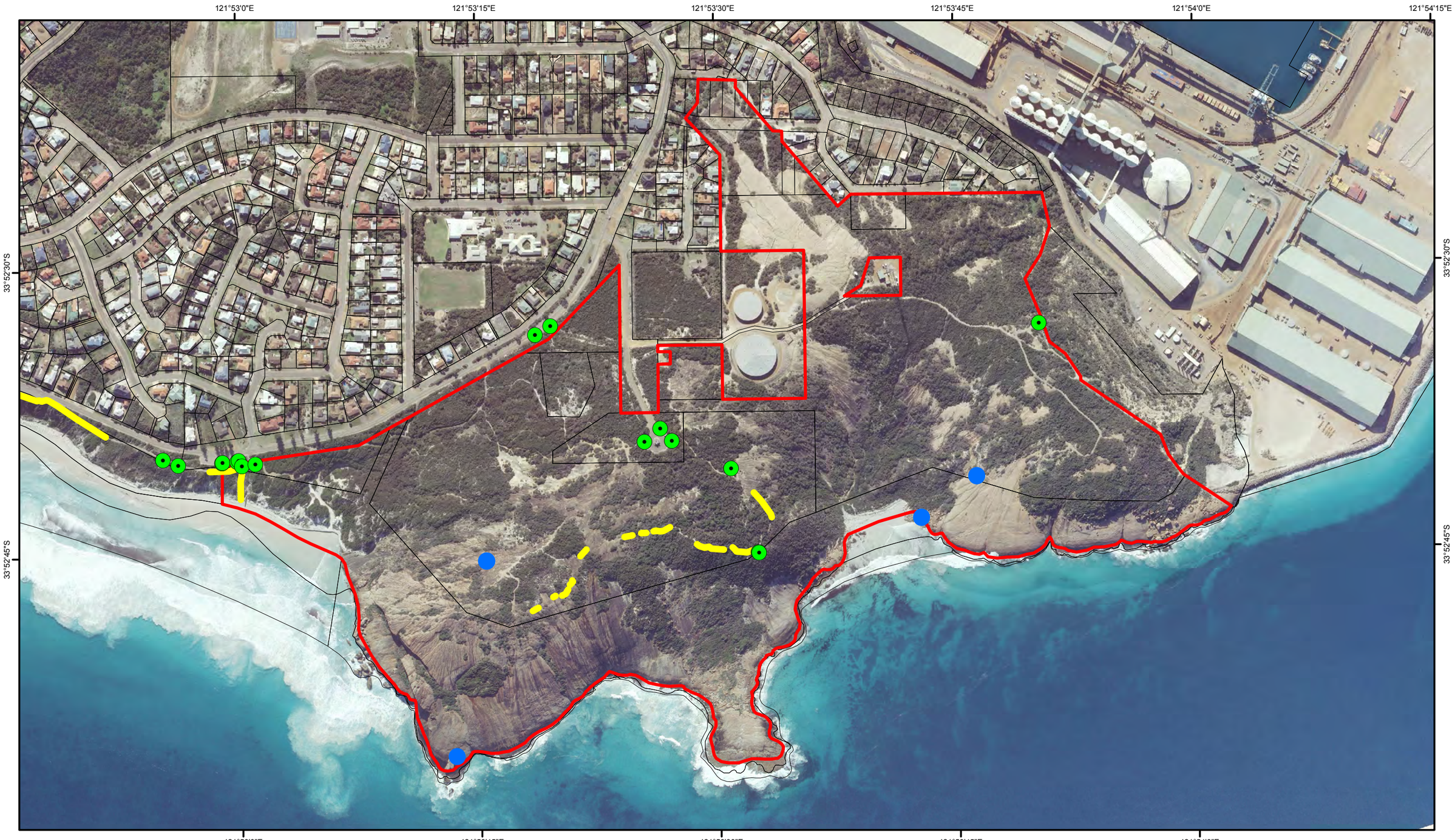
0 50100 200 300 400 Meters

Author	V. Davies	Data Constraints:
Reviewer	D. Gleave	Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.
Date	7 December 2017	Map has been produced as background information to inform the Dempster Head Management Plan review 2017.
Status	DRAFT	Map does not depict formal mountain bike tracks/ trails.

Appendix G Shire of Esperance Assets

Dempster Head Management Plan

Shire of Esperance Assets



N

1:6,000

0 50 100 200 300 400 Meters

Legend

- Angel Rings_Signs_Access
- Coastal Asset Points
- Coastal Asset Line
- Management Plan Boundary
- Local Cadastre

Hopetoun_to_Esperance_Coastline_May_2016_Mosaic.ecw

Author	V. Davies
Reviewer	D. Gleave
Date	3 January 2018
Status	DRAFT

Data Constraints:

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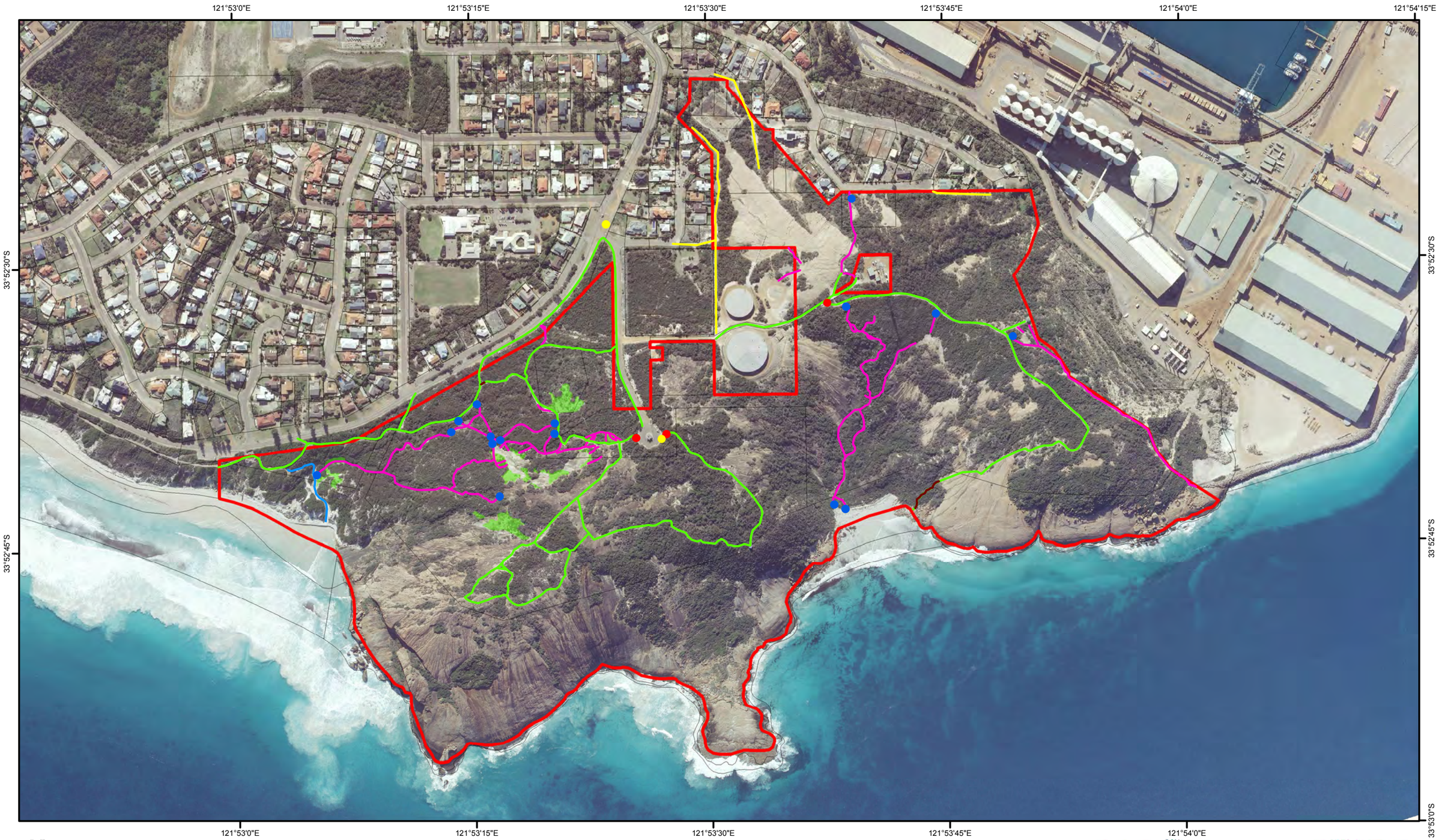
Map has been produced as background information to inform the Dempster Head Management Plan review 2017.

Appendix H Implementation Plan

Dempster Head Management Plan

Implementation Plan



N

1:6,000

0 50 100 200 300 400 Meters

Legend

- Large Information Sign
- Trail Head Signs
- Block Trail Access
- New wooden stairs
- Formal Tracks
- Close Tracks
- Emergency Access
- Revegetate
- Local Cadastre
- Management Plan Boundary
- Fire Break

Hopetoun_to_Esperance_Coastline_May_2016_Mosaic.ecw

Author	V. Davies
Reviewer	D. Gleave
Date	9 February 2018
Status	DRAFT

Data Constraints:

Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.

Map has been produced as background information to inform the Dempster Head Management Plan review 2017.

Appendix I Conservation Areas

Dempster Head Management Plan

Conservation Areas

121°53'0"E 121°53'15"E 121°53'30"E 121°53'45"E 121°54'0"E

33°52'30"S

33°52'45"S

Areas of Kwongkan TEC & uninfested vegetation

Erosion Risk

N

1:6,000

0 50 100 200 300 400 Meters

Legend

- Possible Kwongkan TEC
- Priority_flora
- Formal Tracks
- Conservation Areas
- Management Plan Boundary
- Local Cadastre

Hopetoun_to_Esperance_Coastline_May_2016_Mosaic.ecw

Author	V. Davies
Reviewer	D. Gleave
Date	9 February 2018
Status	DRAFT

Data Constraints:

Datasets used here are licenced from their respective custodians for use by South Coast NRM Inc.

Map has been produced as background information to inform the Dempster Head Management Plan review 2017.