Level 1 Flora and Vegetation Survey at Lot 67 Roe Terrace, Vasse

Prepared for Calibre Consulting
July 2016

Ecoedge

PO Box 1180 Bunbury WA 6231
9721 1377 | enquiries@ecoedge.com.au

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Executive Summary

Ecoedge was engaged by Calibre Consulting in July 2016 to undertake a Level 1 Flora and Vegetation Survey of approximately 1.5 ha of remnant vegetation on Lot 67 Roe Terrace, Vasse, (Lot 67) in the City of Busselton. The owner of Lot 67 intends to develop the site, and information pertaining to the conservation values of the remaining native vegetation onsite is required to progress the development application process.

The field assessment was carried out on 20 July, 2016.

The flora and vegetation assessment Lot 67 Roe Terrace resulted in the identification of Twenty-seven vascular plant taxa, of which ten were native species. One of the exotic species, **Zantedeschia aethiopica* (Arum Lily), is a pest plant listed under the *Biosecurity and Agriculture Management Act 2007*, with the category of C3 (Management) for the whole of the State.

No Declared Rare Flora under the *Wildlife Conservation Act 1950*, or plants listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act)* or species otherwise of conservation significance were found within the Project Area.

Two vegetation types were mapped for the Project Area; one, a completely degraded pasture, the other a Samphire shrubland vegetation type that represents a degraded occurrence of an ecological community, "Subtropical and Temperate Coastal Saltmarsh", which is listed (nationally) as a Threatened Ecological Community under the *EPBC Act*, ranked as "Vulnerable", and is on the Department of Parks and Wildlife's list of Priority Ecological Communities as Priority 3.

Three quarters of the Project Area was classified as "Completely Degraded". The remaining approximately 25% of vegetation, the area mapped as Samphire shrubland, is in "Degraded" condition. Originally, this area would have formed part of an occurrence of the TEC but because of its level of degradation and high incidence of non-native species, it is not considered to represent an intact example of that community.

A regional ecological linkage has been identified along the Vasse River. Due to the small area of native vegetation remaining onsite, and the fact that it is in 'Degraded' condition, the proposed clearing of Lot 67 is not expected to impact on the value or integrity of this linkage.

Approximately 50% of the site constitutes and Environmentally Sensitive Area associated with the riparian zone of the Vasse River, which has been classified as a Conservation Category wetland. Clearing permit exemptions designated under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 do not apply in ESAs and a clearing permit is required.

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Statement of limitations

Reliance on Data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge was engaged by Calibre Consulting in July 2016 to undertake a Level 1 Flora and Vegetation Survey of remnant vegetation on Lot 67 Roe Terrace, Vasse, (Lot 67) in the City of Busselton. The owner of Lot 67 intends to develop the site, and information pertaining to the conservation values of the remaining native vegetation onsite is required to progress the development application process.

Lot 67 covers an area of 1.91 ha, of which of approximately 1.5 ha is vegetated. The field assessment was carried out on 20 July, 2016.

The survey was undertaken in accordance with the Environmental Protection Authority (EPA) Guidance Statement 51, "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia" (EPA, 2004), and the EPA and Department of Parks and Wildlife (DPaW) "Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment" (EPA and DPaW, 2015).

This report compiles findings of the field survey.

1.1 Scope and objectives

The scope and objectives of the survey at Lot 67 were to carry out a Level 1 flora and vegetation assessment to determine whether there are any significant flora values within the Project Area. The survey scope specified the following requirements:

- Conduct an assessment of flora and vegetation values within the Project Area;
- Conduct a review of other literature to summarise the values of flora and vegetation significance in the project area;
- Review the documented flora and vegetation of significance, based on Department of Parks and Wildlife (DPaW) records (databases) (DPaW have mapped an occurrence of the Threatened Ecological Community "Subtropical and Temperate Coastal Saltmarsh" to the north of Lot 67)
- Conduct a field assessment to:
    - identify the vascular flora species present;
    - determine the presence or absence of Declared Rare Flora (DRF), Priority or Significant Species;
    - assess conservation significance of vegetation and flora;
    - define and spatially map vegetation condition;
    - define and spatially map vegetation communities; (achieved through the installation of a number of floristic relevés)
    - define and map threatened and priority ecological communities

- Determine whether the Project Area are wholly or partly with an Environmentally Sensitive Area (ESA)

- Prepare a report summarising findings.

1.2 Biogeographic region and location

The Project Area is situated within Perth Coastal Plain (SWA2) sub-region of the Swan Coastal Plain biogeographic region, as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Australian Government, 2009). The Project Area is located approximately 800 m south-southwest of the Busselton townsite, just south and west of the Vasse River within freehold land in the City of Busselton (**Figure 1**).

1.3 Site location and description

Elevation on site is at sea level in the north rising to approximately 1 m above sea level (ASL) at the southern boundary**.** Much of the site has been heavily disturbed in the past by landfilling which has covered over much of the original soil surface. About a quarter of Lot 67 (at the northern end) has not been affected by landfilling. At the time of survey (20/07/2016), a large part of this non-landfilled are was underwater because of flooding by the Vasse River.

1.4 Geology

Within the Swan Coastal Plain bioregion, the Project Area is situated on the broad floodplain of the Vasse River, which was mapped as “Vasse-Wonnerup very wet saline flats” by Tille and Lantzke (1990). This soil-landscape unit is described as: “Estuaries, low lying depressions which are often underwater in winter and saline in summer”. The soils are Wet and Semi-wet soils and Saline wet soils which are described as dark, waterlogged, clays, loams and sands that are often layered and saline (Tille and Lantzke, 1990).

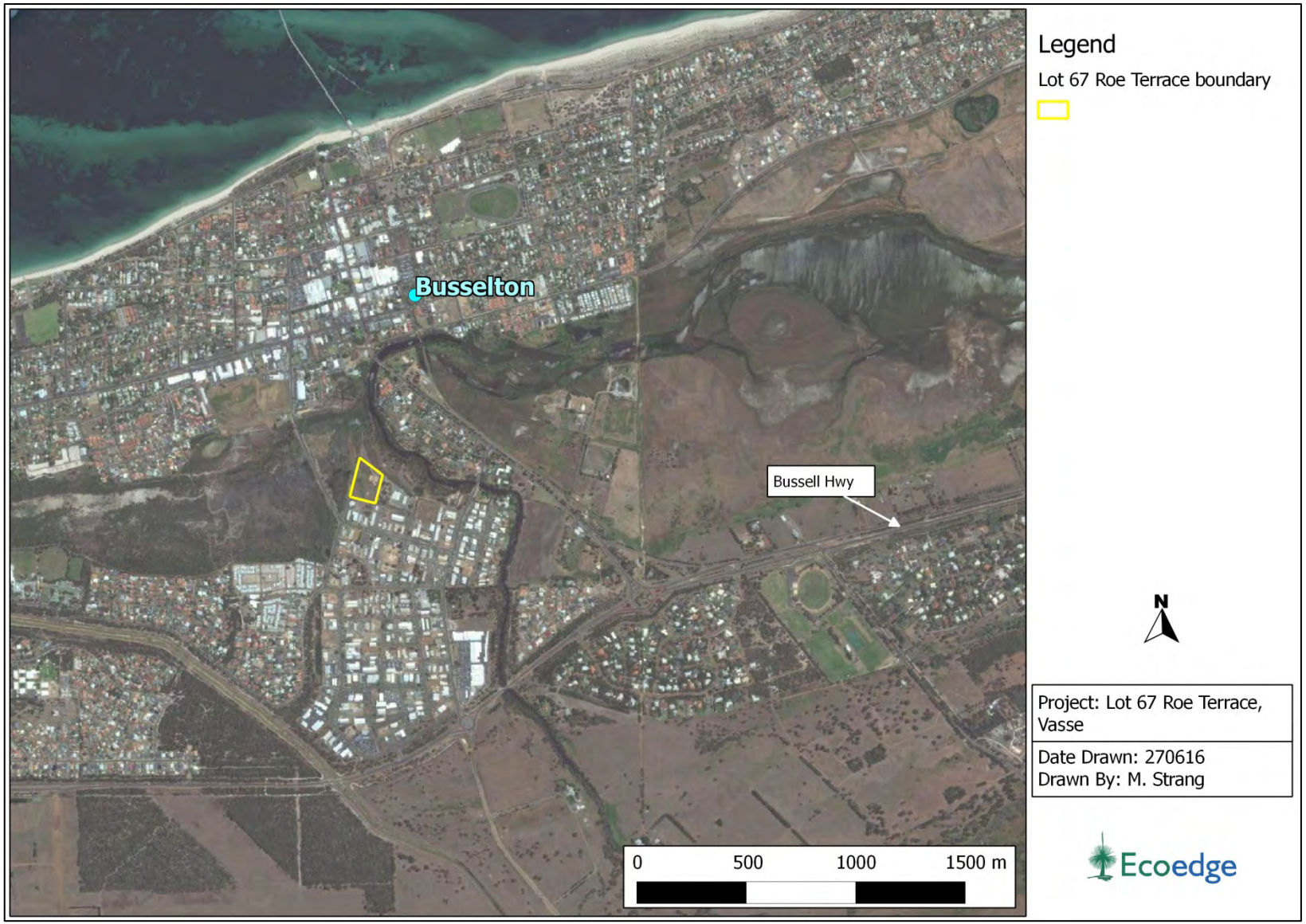

Figure 1. Aerial Photograph showing location of Project Area.

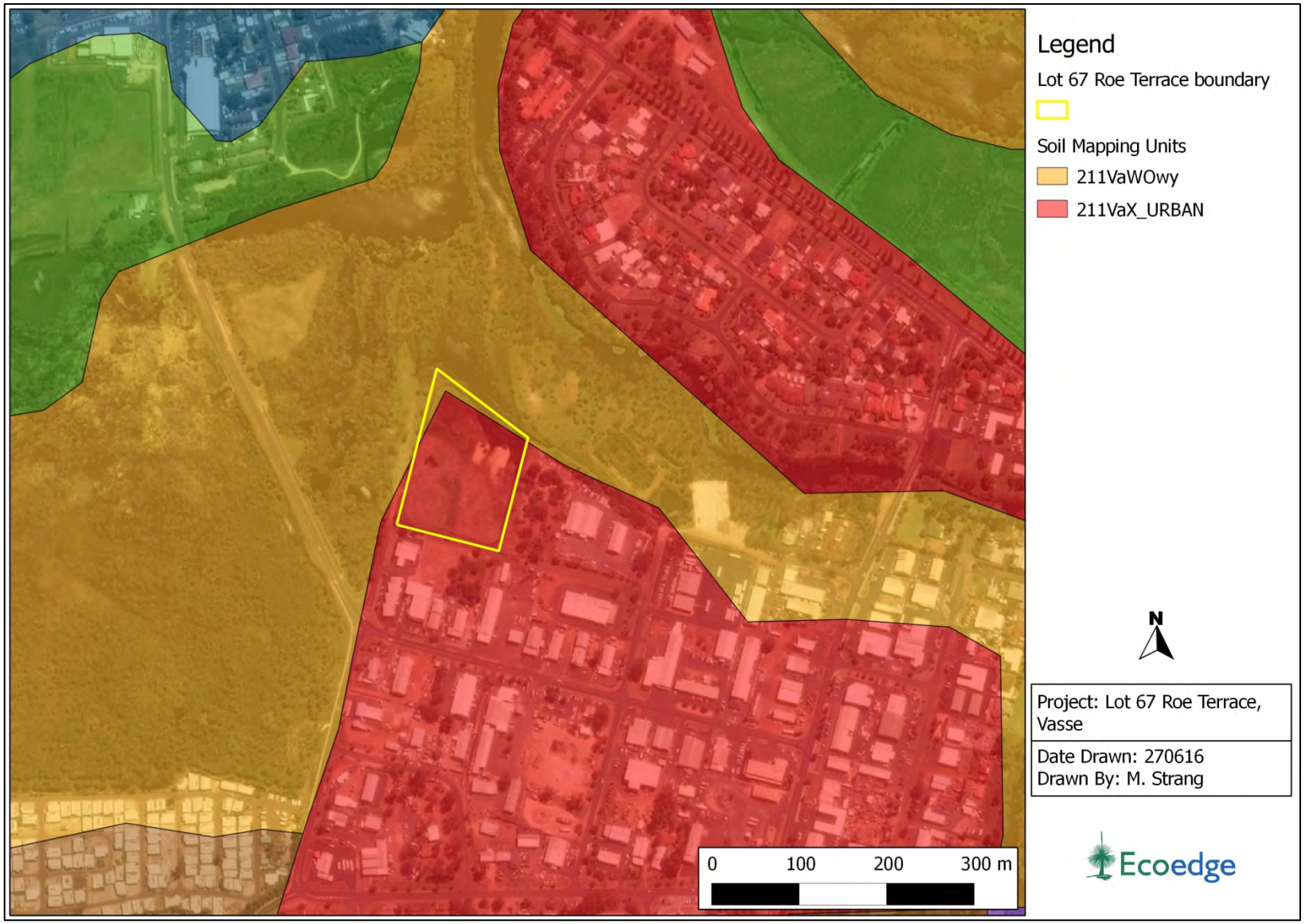

Figure 2. Soil mapping units occurring within the Project Area.

1.5 Vegetation

The South West Biodiversity Project Mapping and Information Installment 2 (Molloy *et al.*, 2007) provides mapping of the vegetation complexes in the South West region, particularly in the Busselton region, which was not included in other regional mapping programs. The Molloy *et al.* (2007) mapping utilises the Regional Forest Agreement (RFA) mapping of Mattiske and Havel (1998) as well as the Swan Coastal Plain (SCP) mapping of Heddle *et al.*, (1980).

Variation in vegetation mainly reflects the variations in soil and moisture condition of a landscape. As shown **in Figure 3**, vegetation within the Project Area was mapped by Molloy *et al*. (2007) as Quindalup (Qwy) Complex, which is component of the Vasse Complex as mapped by Heddle *et al.* (1980). It is situated on wet sands of the Quindalup dune system and is the southern extent of estuarine vegetation on the Busselton Plain (Webb, *et al.* 2009).

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community was necessary if Australia's biological diversity was to be protected (Environment Australia, 2001). This level of recognition is in keeping with the targets set in the EPA's Position Statement on the 'Environmental protection of native vegetation in Western Australia: clearing of native vegetation, with particular reference to the agricultural area' (EPA, 2000). With regard to conservation status, the EPA has set a target of 15% of pre-European extent for each ecological community to be protected in a comprehensive, adequate and representative reserve system (EPA, 2006).

Table 1 lists the percentage remaining of the Quindalup (Qwy) vegetation complex as well as the percentage in formal and formal plus informal reserves. It also lists whether this Complex meets the Commonwealth's 30% target (Environment Australia, 2001) and the EPA's 15% target (EPA, 2006). The Quindalup (Qwy) Complex does not meet either the Commonwealth's 30% target and the EPA's 15% target.

Table 1. The Quindalup (Qwy) vegetation complex with regard to EPA and Commonwealth retention targets (DEC 2007).

Vegetation Complex	% Remaining of pre-European	Is the 30% Target Met?	% in Formal Reserves	% in Formal + All Informal Reserves	Is the 15% Target Met?
Quindalup (Qwy)	19.96%	No	7%	7%	No

1.5.1 Wetlands

In the 'Geomorphic Wetlands of the Swan Coastal Plain' dataset (Department of Environment and Conservation, 2008), wetlands on the Swan Coastal Plain have been classified into types using a geomorphic wetland classification system (Semeniuk & Semeniuk 1995) based on the characteristics of landform and water permanence eg. lake, sumpland dampland and palusplain. The Swan Coastal Plain wetlands have also been evaluated and assigned an appropriate management category, providing guidance on the nature of the management and protection the wetland should be afforded i.e. Conservation, Resource Enhancement or Multiple Use category.

The majority of Lot 67 is mapped as a peripheral estuary wetland, and is assigned to the 'Multiple Use' management category. This is defined as 'wetlands that score poorly on both natural and human use attributes' (**Figure 4**).

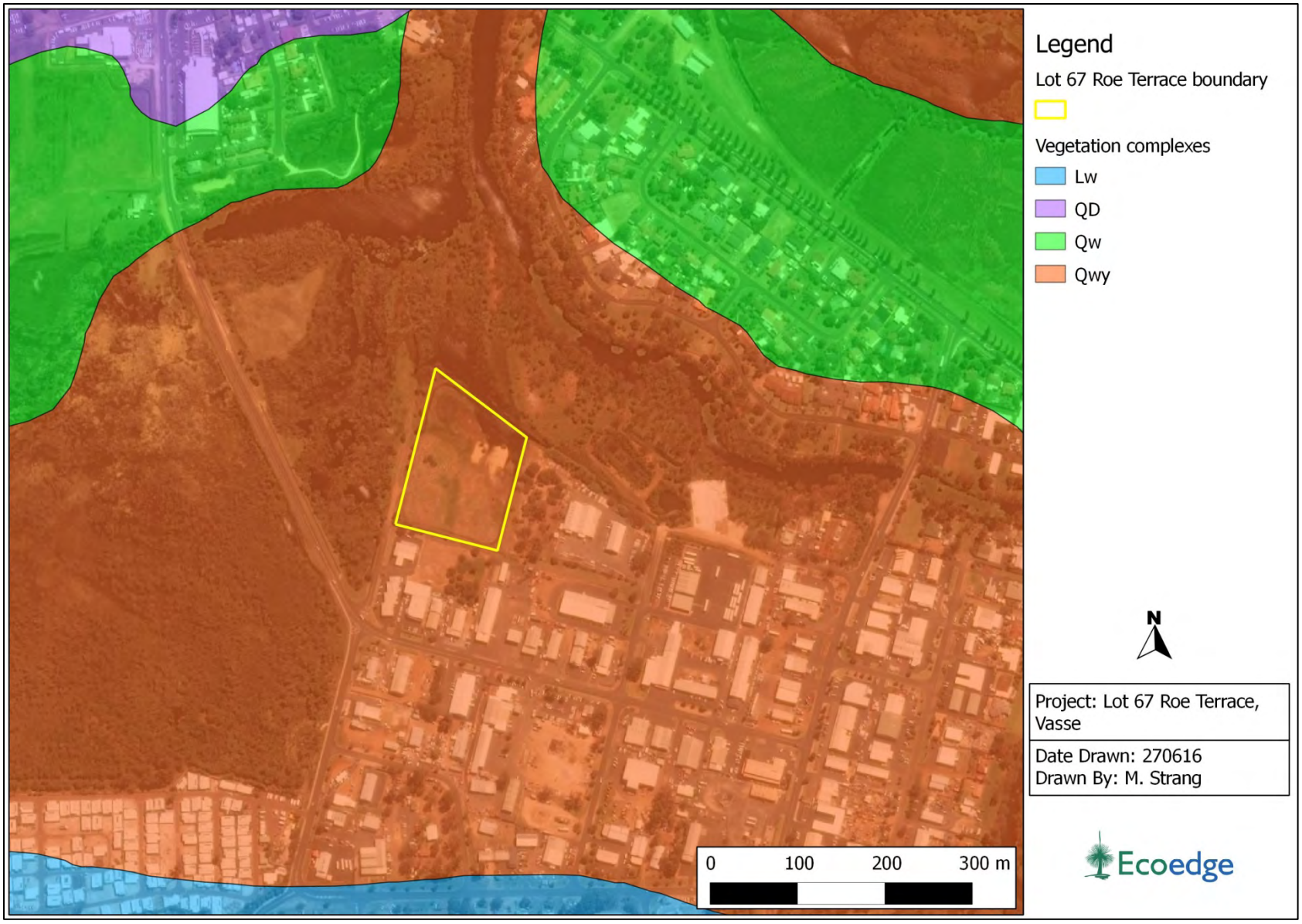

Figure 3. Vegetation complexes mapped as occurring within the Project Area.

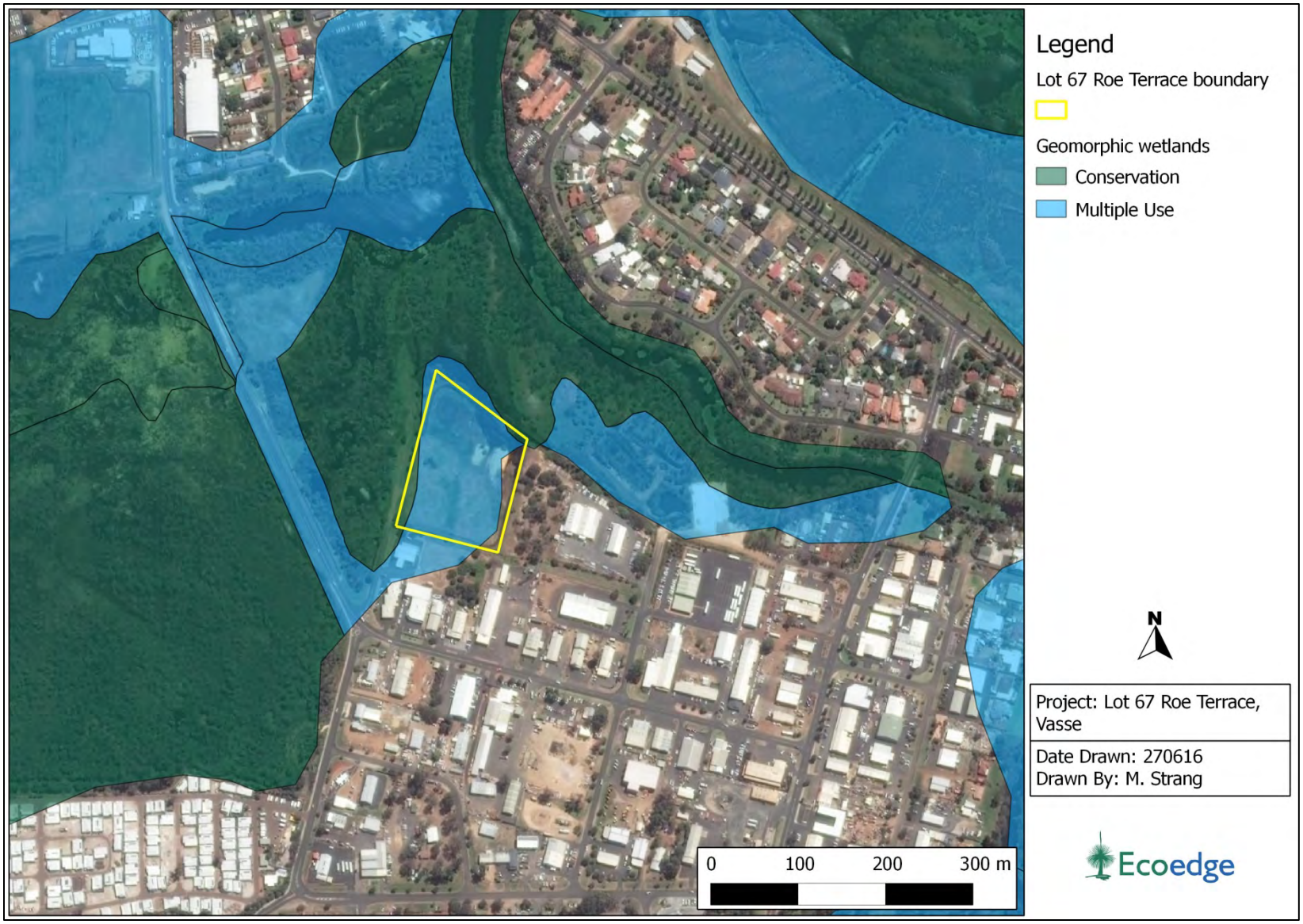

Figure 4. The site is mapped as a 'Multiple Use' wetland (DEC, 2008).

1.6 Threatened and Priority Ecological Communities

Ecological communities are defined by Western Australia's Department of Parks and Wildlife (DPaW, previously the Department of Environment and Conservation (DEC)) as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC, 2010).

A Threatened Ecological Community (TEC) is one which is found to fit into one of the following categories; Presumed Totally Destroyed (PD), Critically Endangered (CE), Endangered (E) or Vulnerable (V) (DEC, 2010). Possible threatened ecological communities that do not meet survey criteria are added to DPaW's Priority Ecological Community Lists under Priorities 1, 2 and 3 (referred to as P1, P2, P3). Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC, 2010). The current listing of Threatened and Priority Ecological Communities is specified in DPaW (2016a and 2016b).

Threatened Ecological Communities can also be listed under the Commonwealth *EPBC Act* (Department of the Environment (DotE), 2016a; Department of Environment, Water, Heritage and the Arts (DEWHA), 1999). There are three categories of TEC under the *EPBC Act*: Critically Endangered (CE), Endangered (E) and Vulnerable (V).

A Protected Matters Search Tool query for communities listed under the *EPBC Act* occurring within a 10 km radius of the Project Area was undertaken (DotE, 2016b, **Appendix 1**), and the current DPaW TEC and PEC listings were consulted (DPaW 2016a; 2016b).

Threatened and Priority Ecological Communities known to occur within 10 km of the Project Area are listed in **Table 2.**

Table 2. Threatened and Priority Ecological Communities known to occur within 10 km of the Project Area (DPaW 2016a; 2016b)

Community Name	Community Description	Status (WA)	Status (*EPBC Act*)
Subtropical and Temperate Coastal Saltmarsh	Consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, reeds, sedges and shrubs. Succulent herbs and grasses generally dominate. Vegetation is generally <0.5m tall with the exception of some reeds and sedges.	P3	TEC (VU)
SWAFCT09 - Dense shrublands on clay flats	Shrublands or open woodlands of clay flats that are inundated for long periods.	TEC (VU)	CR
SWAFCT3c – *Corymbia calophylla – Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain	*Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands.* Eucalyptus wandoo is an occasional dominant. This community occurs on heavy soils.	TEC (CR)	EN
SWAFCT1b – Southern *Corymbia calophylla* woodlands on heavy soils	Dominated by *C. calophylla* and *Eucalyptus marginata. Acacia extensa, Hypocalymma angustifolium* and *Xanthorrhoea preissii* are important shrubs. Mainly occurs south of Capel.	TEC (VU)	NA

1.7 Threatened and Priority Flora

Species of flora and fauna are defined as having Declared Rare (Threatened) or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment Regulation recognises these threats of extinction and consequently applies regulations towards population and species protection.

Declared Rare (Threatened) Flora species are gazetted under Subsection 2 of Section 23F of the *Wildlife Conservation Act 1950* (*WC* Act) and therefore it is an offence to 'take' or damage rare flora without Ministerial approval. Section 6 of the *WC Act* defines 'to take' as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means."

Priority Flora are under consideration for future declaration as 'rare flora', dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in

need of further survey to determine their status, while Priority Four (P4) species require monitoring every 5-10 years. Under the *WC Act*, Threatened Flora are ranked according to their level of threat using IUCN Red List categories and criteria of Extinct (EX), Critically Endangered (CE), Endangered (EN) or Vulnerable (VU). **Table 3** presents the categories of Declared Rare and Priority Flora as defined by the *WC Act* (DPaW 2014).

Table 3. Definitions of Declared Rare and Priority List flora (DPaW, 2014).

Conservation code	Category
T	Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the *Wildlife Conservation Act 1950*. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria (CR, EN, VU, EX). A species that is listed as Threatened and assessed as 'Critically Endangered' would therefore have its status written as T (CR).
P1	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3	Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4	Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Under the *EPBC Act,* a species may be listed in one of six categories; the definitions of these categories are summarised in **Table 4** (DotE, 2015c).

Threatened or Priority flora occurring within 5 km of the Project Area generated from a NatureMap search (DPaW, 2016c) are listed in **Table 5**. Taxa listed under the *EPBC Act* (based on results of the Protected Matters Search Tool query (DotE, 2016b)) are listed in **Appendix 1**.

Table 4. Categories of Threatened Species under the *EPBC Act* (DotE, 2015c).

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	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.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Table 5. List of Declared Rare and Priority List flora known to occur within 5 km of the Project Area (DPaW, 2016c; DotE, 2016b).

Species	Cons Status	Flowering	Habitat	Likelihood of Occurrence
Andersonia gracilis	T (E)	Sep-Nov	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Very Low
Brachyscias verecundus	T (CE)		Annual (or ephemeral), herb, 0.012-0.022 m high, entirely glabrous. Fl. white/cream. In a moss sward. On a granite outcrop.	Very Low
Caladenia huegelii	T (E)	Sep-Oct	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green, cream, red. Grey or brown sand, clay loam.	Very Low
Caladenia procera	T (E)	Sep-Oct	Tuberous, perennial, herb, 0.35-0.9 m high. Fl. yellow. Rich clay loam,. Alluvial loamy flats, jarrah/marri/peppermint woodland, dense heath, sedges.	Very Low
Diuris micrantha	T (VU)	Sep-Oct	Tuberous, perennial, herb, 0.3–0.6 m high. Fl. yellow, brown. Brown loamy clay. Winter-wet swamps, in shallow water.	Very Low
Diuris purdiei	T (E)	Sep-Oct	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow. Grey-black sand, moist. Winter-wet swamps.	Very Low
Drakaea micrantha	T (VU)	Sep-Oct	Tuberous, perennial, herb, 0.15–0.3 m high. Fl. red, yellow. White-grey sand.	Very Low
Lepidium pseudohyssopifolium	P1	Jun-Sept	Erect annual or perennial, herb, to 0.4(-0.6) m high. Swampy ground.	Very Low
Puccinellia vassica	P1	Sep-Nov	Caespitose annual or perennial, grass-like or herb, 0.41–0.55 m high. Saline soils. On the outer margins of coastal saltmarshes	Low
Acacia heteroclita subsp. *valida*	P2	Sep-Nov	Erect, spreading shrub or tree, 1-4 m high, phyllodes 4-9 mm wide. Fl. yellow. Shallow soils over granite. Rocky granite slopes & outcrops.	Very Low
Amperea micrantha	P2	Oct-Nov	Low, spreading, bushy perennial, herb, 0.1–0.3 m high. Fl. brown. Sandy soils.	Very Low
Leptomeria furtiva	P2	Aug-Oct	Lax, sprawling shrub, 0.2–0.45 m high. Fl. orange, brown. Grey or black peaty sand. Winter-wet flats.	Very Low
Thelymitra variegata	P2	Jun-Sep	Tuberous, perennial, herb, 0.1–0.35 m high. Fl. orange, red, purple, pink. Sandy clay, sand, laterite.	Very Low
Schoenus benthamii	P3	Oct-Nov	Tufted perennial, grass-like or herb (sedge), 0.15-0.45 m high. Fl. brown. White, grey sand, sandy clay. Winter-wet flats, swamps.	Low
Acacia flagelliformis	P4	May-Sep	Rush-like, erect or sprawling shrub, 0.3-0.75(-1.6) m high. Fl. yellow. Sandy soils. Winter-wet areas.	Very Low
Lepidium pseudotasmanicum	P4	Feb or Dec	Erect annual or biennial, herb, 0.2-0.4(-1) m high. Fl. white-green. Loam, sand.	Very Low
Ornduffia submersa	P4	Sep-Oct	Tuberous emergent aquatic perennial dwarf shrub, height to 35 cm; flowers white; leaves floating on surface of water. Clay-based ponds and swamps (semi-aquatic)	Very Low

(The *WC Act* Conservation Status is shown, *EPBC Act* status is in brackets.)

1.8 Regional Ecological Linkages

A Regional Ecological Linkage is defined by Molloy *et al*. (2009), in their South West Regional Ecological Linkages report as "*A series of (both contiguous and non-contiguous) patches which, by virtue of their proximity to each other, act as stepping stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within, and across, a landscape*."

Regional ecological linkages link protected patches of vegetation of regional significance by retaining the best (condition) patches available as stepping stones for flora and fauna between these regionally significant areas.

Molloy *et al*. (2009) identified a regional ecological linkage axis line along the Vasse River, approximately 140 m to 200 m to the north and west of the Project Area.

1.9 Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are declared by the Minister for Environment under section 51B of the *Environmental Protection Act 1986* (*EP Act*). ESAs are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 and are selected for their environmental values at state or national levels (Government of Western Australia, 2005). They include;

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened Ecological Communities;
- Area of vegetation within 50 m of Declared Rare Flora;
- Bush Forever sites; and
- Declared World Heritage property sites.

Because vegetation in the on Lot 67 is within 50 m of the riparian zone of the Vasse River, which is designated as a Conservation Category wetland, it forms part of an ESA (**Figure 5**) (Government of Western Australia, 2005).

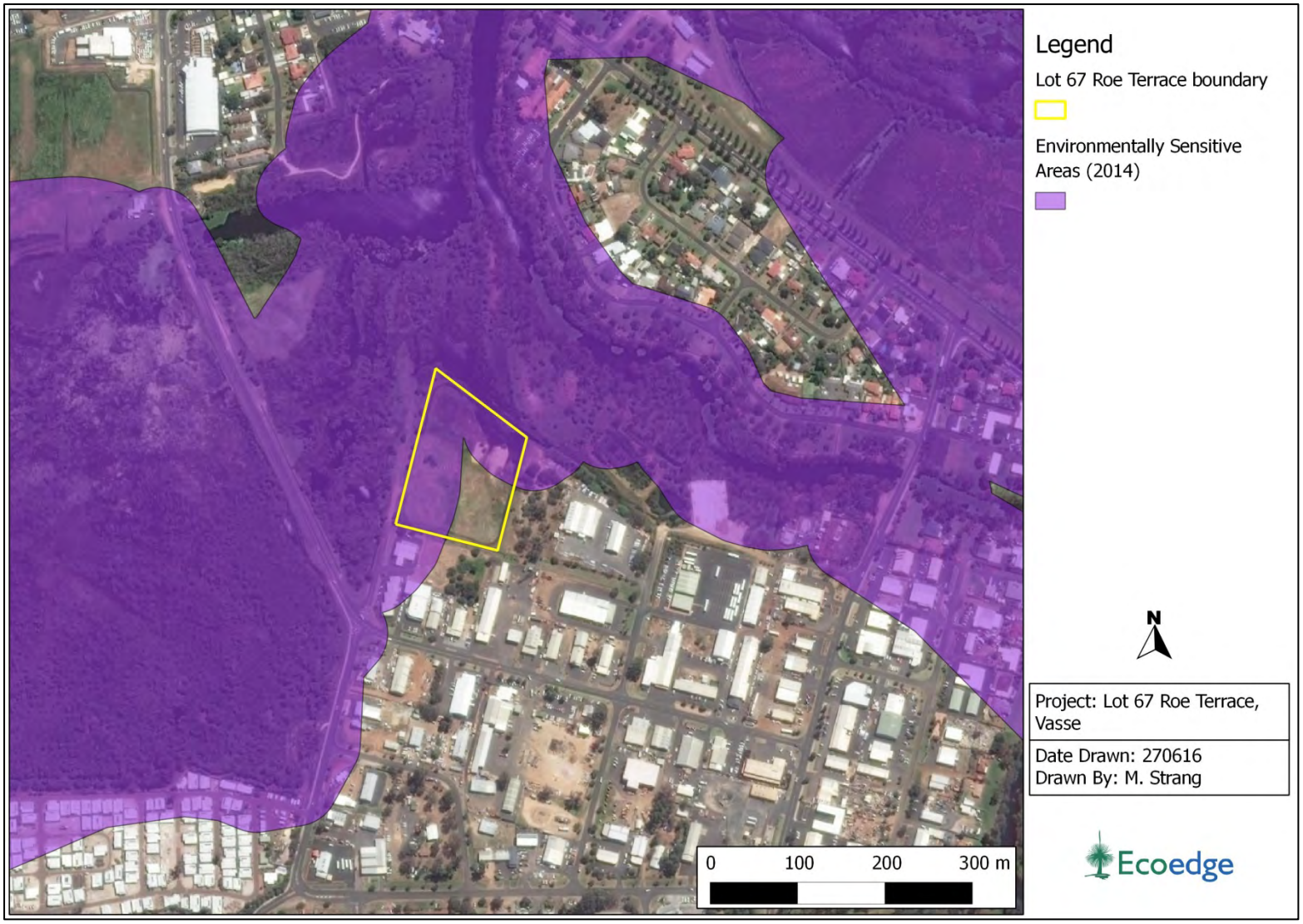

Figure 5. Approximately 50% of Lot 67 is mapped as an Environmentally Sensitive Area (DPaW, 2014d).

2 Methods

2.1 Field survey

The Project Area was surveyed on 20 July 2016. The random meander method as described in Cropper (1993) was used to search for rare flora. A comprehensive list of native and introduced species was compiled. Photographs were taken and notes on species composition, vegetation structure and vegetation condition were compiled. The field notes, together with aerial photography, was used in mapping vegetation type and condition. Flora species that were not identified in the field were collected or photographed for later identification. Taxonomy and conservation status of flora species was checked against Department of Parks and Wildlife databases (DPaW, 2016c, 2016e and 2016f).

Vegetation condition was assessed according to the scale of the Environmental Protection Authority (EPA) and DPaW (2015), which is defined in **Table 6**.

Table 6. Vegetation condition scale.

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

2.2 Survey limitations

Potential limitations with regard to the assessment are addressed in **Table 7**.

Table 7. Limitations with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	No	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements.
Proportion of flora identified	Moderate	The survey was carried out in July which is outside the main flowering season. Many species were not flowering, and consequently some could not be identified, however most of these were annual introduced species.
Availability of contextual information	Negligible	Comprehensive regional surveys of remnant vegetation, as well as more localised surveys, have been carried out in the southern Swan Coastal Plain.
Completeness of the survey	Negligible	Vegetation within the survey area was thoroughly searched on foot. Further assessments in spring would add to the completeness of the species list but probably only marginally affect the conclusions presented.
Skill and knowledge of the botanists	Negligible	The senior field botanist conducting the survey has had extensive experience in botanical survey in south west Australia over a period of 25 years.

3 Results

3.1 Flora

Twenty-seven species of vascular flora were identified within the Project Area, however only ten of these were native species (**Appendix 2**). Because of the timing of the survey, most species were not flowering and several evidently non-native species were not able to be identified.

Because of the extent of past physical disturbance on Lot 67, species richness is very low.

No Declared Rare Flora, Priority Flora, species of flora listed as Endangered under the *EPBC Act* or other flora of conservation significance were found within the Project Area.

One of the non-native species, **Zantedeschia aethiopica* (Arum Lily), is a pest plant listed under the *Biosecurity and Agriculture Management Act 2007*, with the category of C3 (Management) for the whole of the State.

3.2 Vegetation Types

Two vegetation types were recognised and mapped in the Project Area: a semi-natural formation mapped as “Samphire shrubland”, which occurs on the northern section of Lot 67 that was not impacted by landfilling and; the other, composed mostly of non-native species is situated on the landfill (which covers most of Lot 67), and is mapped as “Pasture” (**Figure 6**, **Figure 7**).

Figure 6. View north from the southern boundary of Lot 67.

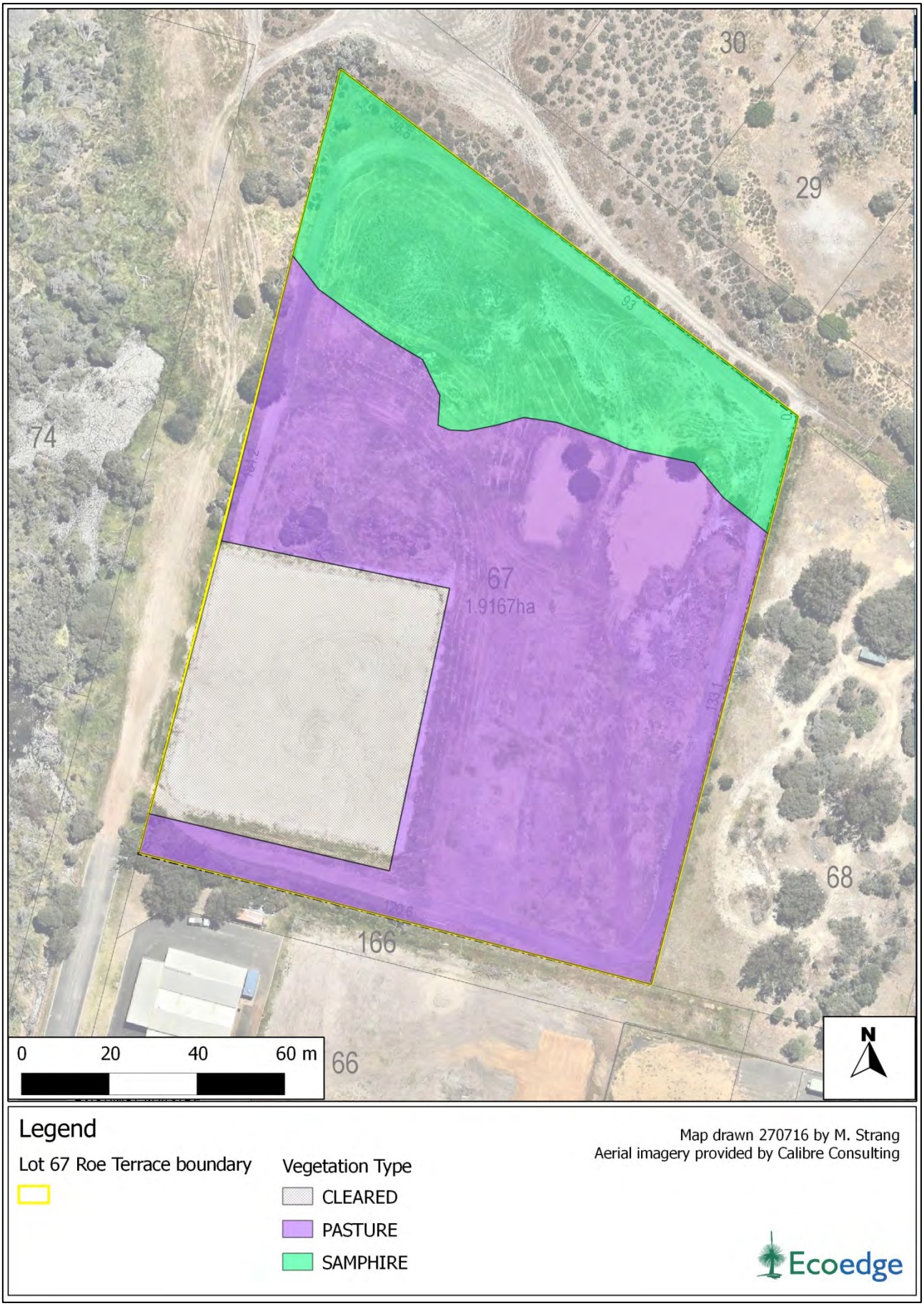

Figure 7. Vegetation types mapped at Lot 67.

The Samphire shrubland vegetation type represents a degraded occurrence of an ecological community, "Subtropical and Temperate Coastal Saltmarsh", which is listed under the *EPBC Act* as "Vulnerable" Threatened Ecological Community (nationally) and is on DPaW's list of Priority Ecological Communities (Priority 3).

Subtropical and Temperate Coastal Saltmarsh (Department of the Environment, 2016d) is described as:

> [An] assemblage of plants, animals and micro-organisms associated with saltmarsh in coastal regions of sub-tropical and temperate Australia (south of 23^{o}S latitude). The habitat is coastal areas under tidal influence. In southern latitudes saltmarsh are the dominant habitat in the intertidal zone and often occur in association with estuaries. It is typically restricted to the upper intertidal environment, generally between the elevation of the mean high tide, and the mean spring tide. The community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, reeds, sedges and shrubs. Succulent herbs and grasses generally dominate and vegetation is generally <0.5m tall with the exception of some reeds and sedges.

Subtropical and Temperate Coastal Saltmarsh in Good to Very Good condition occurs adjacent to the northern part of the Project Area on the unmade road reserve and Crown reserve along the Vasse River. The area mapped as "Samphire shrubland" in the northern part of the Project Area includes species typical of the threatened community, such as *Tecticornia pergranulata*, *Sarcocornia blackii* (Samphire), the native grass *Sporobolus virginicus* and the rush *Juncus kraussii*, is quite degraded and has a high proportion of introduced species, such as kikuyu (**Cenchrus clandestinus*) and the daisies **Cotula coronopifolia* and **C. turbinata*.

However, because of the extent of degradation evident in the Samphire shrubland, it would probably not be regarded as an occurrence of Subtropical and Temperate Coastal Saltmarsh (**Figure 8, Figure 9**).

Figure 8. View east along the northern boundary of Lot 67 showing the Subtropical and Temperate Coastal Saltmarsh on the road and Crown reserves on the left side and the degraded “Samphire shrubland” on the right.

Figure 9. Another view looking east along the northern boundary of Lot 67 showing “Samphire shrubland”, much of which was flooded at the time of survey. Some of the landfill can be seen on the right side of the photo.

3.3 Vegetation Condition

Three quarters of the Project Area was classified as “Completely Degraded” according to the scale of the EPA and DPaW (2015). This area constitutes the part of the lot that has been subject to landfilling. Except for a few native shrubs and trees, mostly around the boundary,

this vegetation type is almost completely composed of introduced “pasture” species. As discussed above, the part of Lot 67 not subject to landfilling was mapped as “Degraded” (**Figure 10**). This part of Lot 67 contains several species typical of the Subtropical and Temperate Coastal Saltmarsh TEC, mostly near the boundary. Much of this was flooded at the time of survey, however in the portion that was not flooded, there was a high proportion of introduced species as well as scattered native shrubs and rushes typical of the TEC.

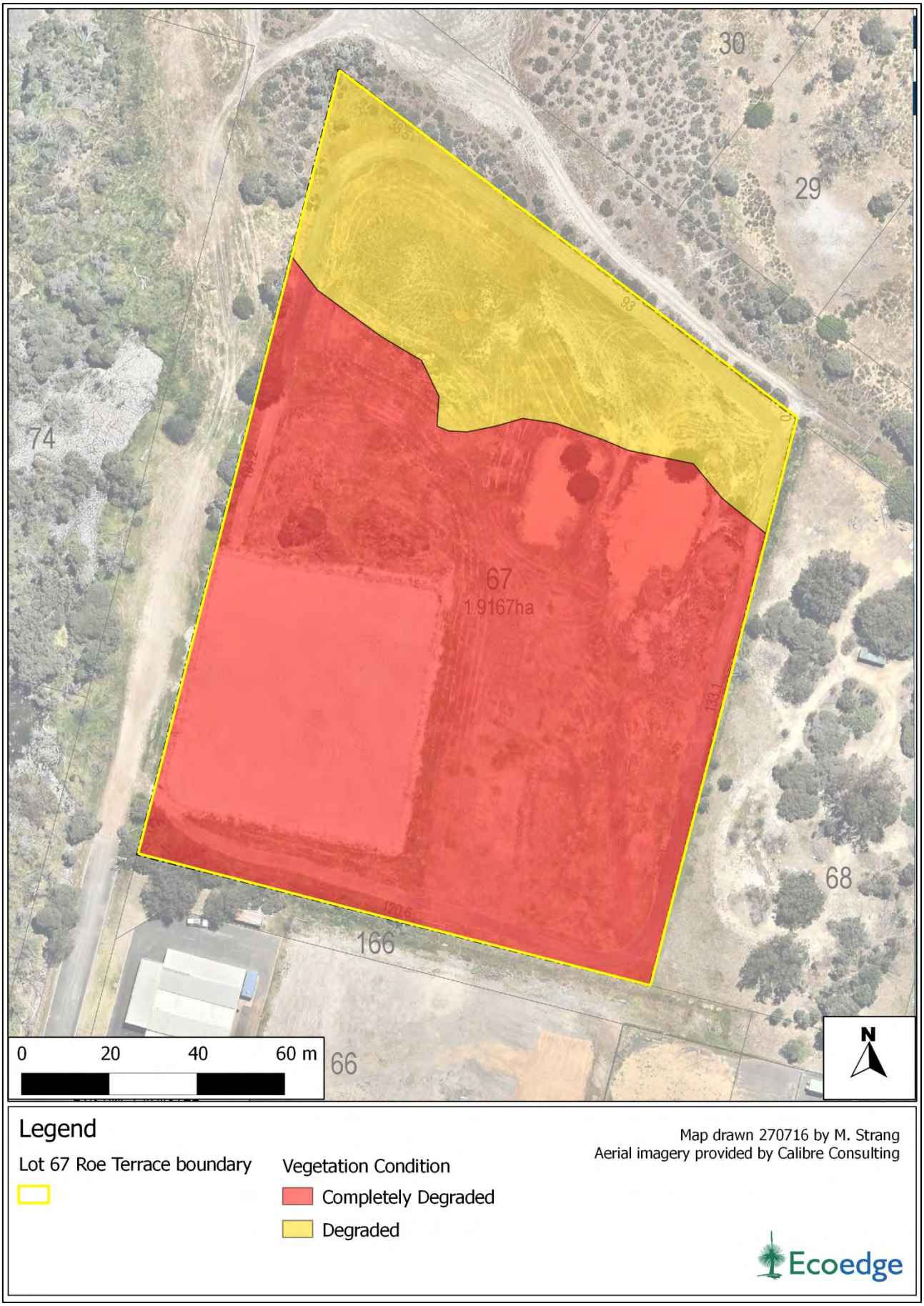

Figure 10. Condition of vegetation at Lot 67.

4 Discussion and conclusions

Three quarters of the Project Area has been subject to landfill in the past and this is reflected in the low number of native species and low biodiversity value of much of the site. All of the landfill part of the site was classed as Completely Degraded.

4.1 Samphire shrubland

The northernmost 25% of the Project Area has not been landfilled and retains some of its original character. Some of this area was flooded at the time of survey but it retains the original land surface and some of the original Samphire shrubland plant species. It was classified as Degraded. Originally, this area would have formed part of an occurrence of the TEC "Subtropical and Temperate Coastal Saltmarsh" (which is present on the adjacent Crown land), but because of its level of degradation and high incidence of non-native species, it is not considered to represent an intact example of that community.

It should be noted that the Department of Parks and Wildlife (Threatened Species Scientific Committee) are responsible for determining whether a degraded area of vegetation that was once an intact occurrence of a TEC is still considered an occurrence of the TEC.

4.2 Regional ecological linkages

Due to the small area covered by and poor condition of the vegetation onsite, the proposed clearing and development of Lot 67 is not expected to impact on the value of the nearby regional ecological linkage.

4.3 Environmentally Sensitive Areas

Because vegetation in the on Lot 67 is within 50 m of the riparian zone of the Vasse River, which is designated as a Conservation Category wetland, it forms part of an ESA. Clearing permit exemptions for low impact routine land management practices are prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. These exemptions do not apply in ESAs and a clearing permit is required.

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Appendix 1. Protected Matters Search Tool Report

Australian Government

Department of the Environment

EPBC Act Protected Matters Report

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

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

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

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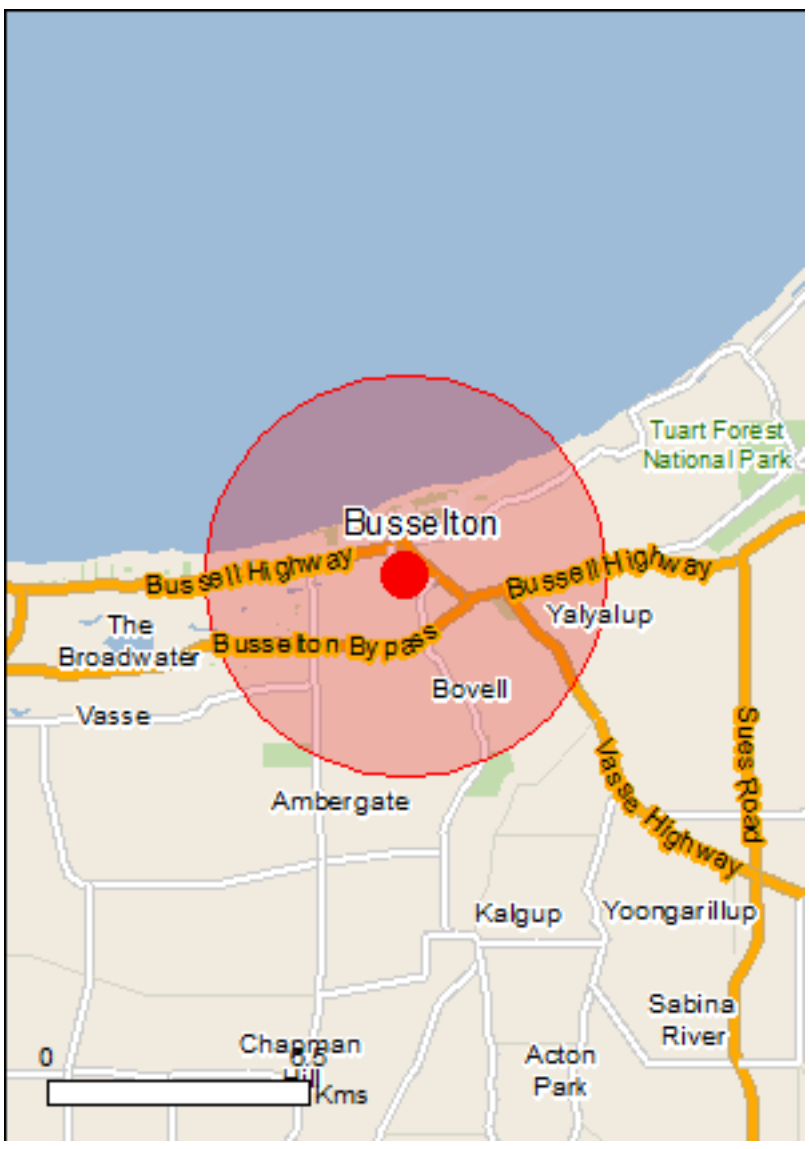

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

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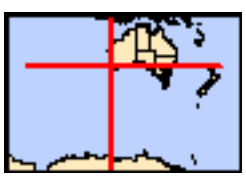

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	54
Listed Migratory Species:	42

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	71
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	10
Regional Forest Agreements:	None
Invasive Species:	24
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Vasse-wonnerup system	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Extinct within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or

Name	Status	Type of Presence
		aggregation known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Breeding known to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Banksia nivea subsp. uliginosa Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
Banksia squarrosa subsp. argillacea Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat likely to occur within area
Brachyscias verecundus Ironstone Brachyscias [81321]	Critically Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Caladenia procera Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area
Chamelaucium sp. S coastal plain (R.D.Royce 4872) Royce's Waxflower [87814]	Vulnerable	Species or species habitat likely to occur within area
Darwinia whicherensis Abba Bell [83193]	Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Gastrolobium papilio Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
Grevillea elongata Ironstone Grevillea [64578]	Vulnerable	Species or species habitat may occur within area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area
Petrophile latericola Laterite Petrophile [64532]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto)		
Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Sterna anaethetus		
Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia		
Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Congregation or

Name	Threatened	Type of Presence
		aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		

Name	Status	Type of Presence
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Sabina	WA
Unnamed WA25836	WA
Unnamed WA26620	WA
Unnamed WA41568	WA
Unnamed WA41597	WA
Unnamed WA42879	WA
Unnamed WA48837	WA
Unnamed WA49385	WA
Unnamed WA50017	WA

Name	State
Unnamed WA50270	WA

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Vasse-Wonnerup Wetland System	WA

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-33.65877 115.34522

Acknowledgements

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

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

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

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

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

Appendix 2. List of vascular flora found within the Lot 67 Roe Terrace Project Area.

FAMILY	LATIN NAME	NATURALISED
Alliaceae	*Allium triquetrum*	*
Apiaceae	*Hydrocotyle* sp.?	
Araceae	*Zantedeschia aethiopica*	*
Asphodelaceae	*Asphodelus fistulosus*	*
Asteraceae	*Arctotheca calendula*	*
	Cirsium vulgare	*
	Conyza canadensis	*
	Cotula coronopifolia	*
	Cotula turbinata	*
	Sonchus asper	*
Chenopodiaceae	*Rhagodia baccata*	
	Sarcocornia blackiana	
	Tecticornia pergranulata	
Euphorbiaceae	*Euphorbia peplus*	*
Fabaceae	*Acacia saligna*	
	Trifolium campestre	*
	Trifolium dubium	*
Geraniaceae	*Erodium botrys*	*
Juncaceae	*Juncus kraussii*	
Juncaceae	*Juncus pallidus*	
Myrtaceae	*Agonis flexuosa*	
	Melaleuca cuticularis	
	Melaleuca viminea	
Oxalidaceae	*Oxalis pes-caprae*	*
Poaceae	*Cenchrus clandestinus*	*
	Sporobolus virginicus	
Polygonaceae	*Rumex pulcher*	*
Solanaceae	*Solanum nigrum*	*