CITY OF Armadale

Our Ref: CWP/51/19/7
Enquiries: Kobi Bradshaw-Chen

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ABN: 78[illegible]6326 9538

16th November 2018

Department of Water and Environmental Regulation
Locked Bag 33
Cloisters Square
PERTH WA 6850

Dear Sir/Madam

CLEARING PERMIT APPLICATON – BALANNUP ROAD UPGRADE

Description of Works

The City of Armadale (the City) is currently planning the upgrade of Balannup Road, Harrisdale. Proposed works consist of median, cycle lane and footpath construction (refer to Attachment 1 for a typical cross section).

Implementation of the proposed upgrades will require the removal of approximately 9,600m2 of vegetation (the clearing area). Images provided in Attachment 1 define the extent of the clearing area.

The environmental values and likely impacts of the clearing area are discussed below as well as Attachment 4.

Environmental Values

Flora
The proposed clearing area comprises roadside vegetation. Natural Area Management Services (NAMS) were engaged by the City to undertake a targeted flora survey during Spring 2018. Priority 3 conservation significant species, *Schoenus pennisetis,* was recorded in low, medium and high densities. No other conservation significant species were identified.

Vegetation
The vegetation complex associated with the proposed clearing area is defined as the Southern River Complex, and is characterised by an open woodland of jarrah-marri-banksia in elevated areas and fringing *Eucalyptus rudis* and *Melaleuca rhaphiophylla* along streams and wetlands areas; the latter is the most relevant to the proposed clearing area.

The field survey undertaken by NAMS confirmed that the vegetation condition of the site ranged from Completely Degraded to Very Good; the majority was Completely Degraded.

A number of invasive weed species were identified within the project area i.e. Patterson's Curse (*Echium plantagineum*), Arum Lily (*Zantedeschia aethiopica*), One-leaf Cape Tulip (*Moraea flaccida*) and Bridal Creeper (*Asparagus asparagoides*)

Fauna
Given the narrow extent of proposed clearing and already present disturbance, impacts to fauna species are considered to be low. A site walkover will be conducted by personnel prior to the commencement of clearing in an effort to identify any fauna species in need of relocation.

Wetlands and Watercourses
The site is classified is multiple use and resource enhancement wetland (UFI 15946). A conservation category wetland (UFI 14403) is located to the north of Balannup Road.

A number of changes to local drainage are required in order to facilitate the upgrade of Balannup Road. Due to the proximity of geomorphic wetlands to the project area the City engaged with the Department of Water and Environmental Regulation on the 11th of July regarding the aforementioned changes and has since received a response (refer to Attachment 6).

Conservation Reserves
No Conservation Reserves occur within the clearing area. Bushforever Site 403 occurs to the immediate north west of the clearing area. No vegetation removal is proposed to take place within the Bushforever Site.

Environmentally Sensitive Areas
The area is considered to be 'environmentally sensitive' based on its proximity to a defined wetland and Bushforever Site though specifically is not believed to hold any significant environmental value.

Conclusion

Given the above, the City is of the view that the proposed clearing will not be at variance to any of the ten clearing principles as summarised in Attachment 1.

Should you have any questions in relation to this application please do not hesitate to contact me at the City on (08) 9394 5249 or via email at kbradshaw-chen@armaale.wa.gov.au.

Yours sincerely

Kobi Bradshaw-Chen
Coordinator Environment

Attachments

1. Figures
2. Assessment Against the Ten Clearing Principles
3. Clearing Application
4. Supporting Technical Report
5. Additional Email Advice

Attachment 1: Figures

PLAN VIEW
SCALE N.T.S

No	Date	Revision	By	Approved
A	07/11/18	FOR INFORMATION ONLY	BV	M.C

Scale: AS SHOWN | Datum: AHD | Grid: PCG94 | Surveyed: Verlin | Date: 28/11/17

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Drawn: BV | Designed: BV | Date: 07/11/18 | Checked: M.T | Director Engineering Services:

Project: BALANNUP ROAD - HARRISDALE
RANFORD ROAD TO REILLY ROAD

Title: SITE AREA IN RELATION TO WETLANDS / ENVIRONMENTALLY SENSITIVE AREAS

Sheet No: 1 of 1 | Revision No: A | DWG No: E17-133-SK7

PLAN VIEW
SCALE 1 : 1000

No	Date	Revision	By	Approved
A	07/11/18	FOR INFORMATION ONLY	BV	M.C.

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Datum: AHD Grid: PCG94
Surveyed: Verified: Date: 28/11/17

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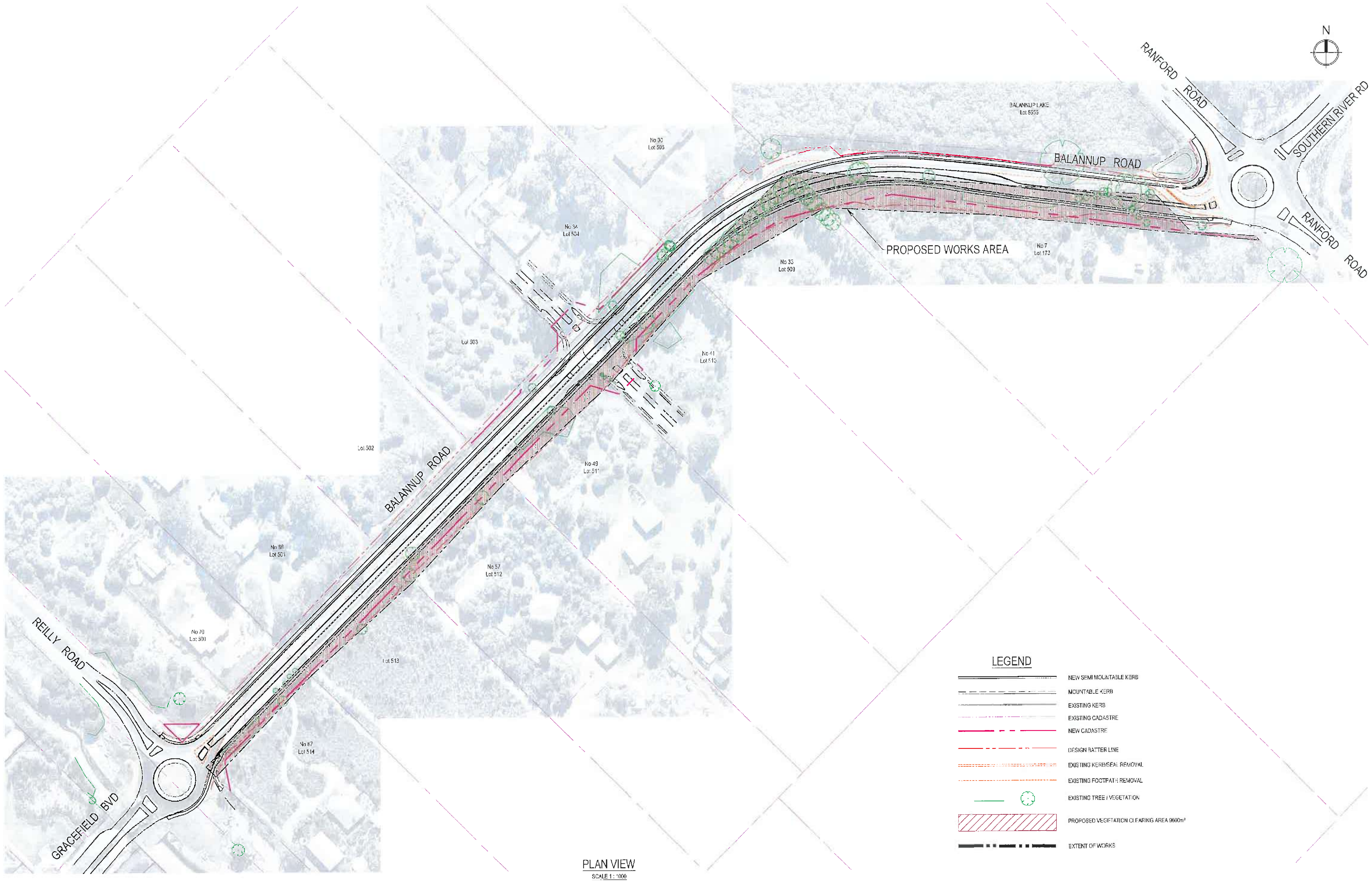
Drawn: BV
Designed: BV Date: 07/11/18
Checked: M.T.
Director Engineering Services:

Project: BALANNUP ROAD - HARRISDALE
RANFORD ROAD TO REILLY ROAD

Title: SITE LOCATION PLAN

Sheet No: 1 of 1
Revision No: A
DWG No: E17-133-SK5



PLAN VIEW

SCALE 1 : 1000

No	Date	Revision	By	Approved
A	07/11/18	FOR INFORMATION ONLY	BV	M.C

Scale: AS SHOWN
Datum: AHD | Grid: PCG94
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Designed: BV	Date: 07/11/18	Signed:
Checked: M.T	Date:	Signed:
Director Engineering Services:		Signed:

Project: BALANNUP ROAD - HARRISDALE
RANFORD ROAD TO REILLY ROAD

Title: PROPOSED VEGETATION CLEARING AREA

PC No:
Trim No:
Sheet No: 1 of 1
Revision No: A
DWG No: E17-133-SK6

Amendments

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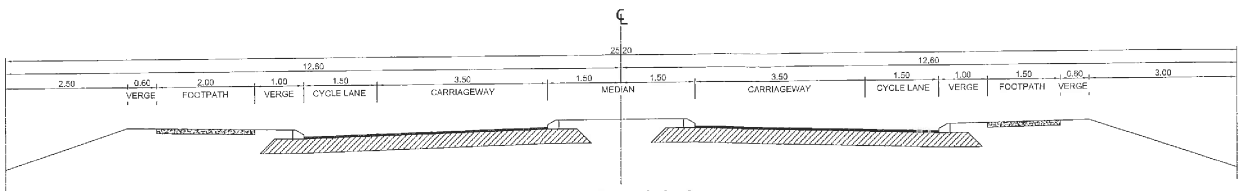

SECTION A-A

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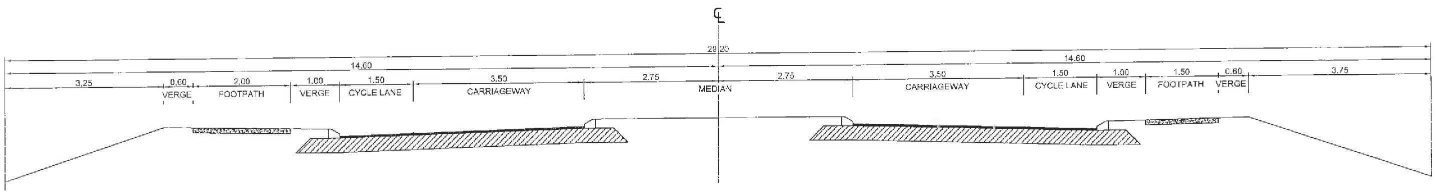
SCALE 1:50



SECTION B-B

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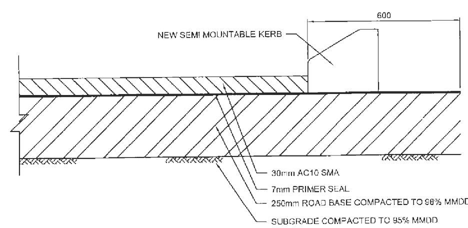

TYPICAL PAVEMENT DETAIL

SCALE NTS

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING No(s): E17-133-1, E17-133-2, E17-133-3 & E17-133-4.
2. ALL DIMENSIONS AND LEVELS ARE IN METERS (m) UNLESS OTHERWISE SHOWN.
   PIPE AND CONDUIT DIAMETERS/DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS OTHERWISE SHOWN.
3. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED BY THE CONTRACTOR ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORK OR ORDERING OF MATERIAL AND ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CITY OF ARMADALE TECHNICAL SERVICES ENGINEERING DESIGN SECTION IMMEDIATELY.
4. ALL WORK TO BE IN ACCORDANCE WITH THE CITY OF ARMADALE STANDARDS, SPECIFICATIONS AND REQUIREMENTS.
5. SAFETY ON WORK SITE(S) TO COMPLY WITH OCCUPATIONAL SAFETY AND HEALTH ACT 1984 AND REGULATIONS.
6. ALL TRAFFIC MANAGEMENT TO COMPLY WITH MAIN ROADS WA DOCUMENT TITLED: "TRAFFIC MANAGEMENT FOR WORKS ON ROADS - CODE OF PRACTICE".
7. EXISTING SERVICES ARE SHOWN ACCORDING TO LATEST "DIAL BEFORE YOU DIG" INFORMATION. CONTRACTOR TO CONFIRM EXACT LOCATION AND DEPTHS OF SERVICES BY HAND EXCAVATION PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION WORK AND ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE CITY OF ARMADALE TECHNICAL SERVICES ENGINEERING DESIGN SECTION IMMEDIATELY.
8. EXISTING SERVICES / INFRASTRUCTURE / PRIVATE PROPERTY SHALL BE ADEQUATELY PROTECTED / SUPPORTED DURING CONSTRUCTION.
9. EXISTING SERVICES/INFRASTRUCURE/PROPERTY SHALL BE REINSTATED TO ORIGINAL STATE AND TO THE SATISFACTION OF THE CITY OF ARMADALE MANAGER CIVIL WORKS.
10. EARTHWORKS:
    10.1. SUB-GRADE SHALL BE COMPACTED TO 95 % MMDD (MIN) AS TESTED IN ACCORDANCE WITH AS1289.
    10.2. ROADBASE SHALL BE USED FOR SUB-BASE AND BASECOURSE, COMPACTED TO 98% MMDD (MIN) AS TESTED IN ACCORDANCE WITH AS 1289.
11. MATERIALS:
    11.1. WHERE APPLICABLE, ALL MANUFACTURED MATERIALS SHALL BEAR THE RELEVANT AUSTRALIAN STANDARDS OR SIMILAR APPROVED STAMP.
    11.2. STORMWATER DRAINAGE PIPES SHALL BE: 300mm Ø RCP CLASS 2 IN VERGES (CLASS 4 UNDER ROAD CARRIAGE WAY) UNLESS OTHERWISE NOTIFIED OR APPROVED IN WRITING BY THE CITY OF ARMADALE TECHNICAL SERVICES ENGINEERING DESIGN SECTION.
12. BACKFILL:
    12.1. ALL BACKFILL SHALL BE SOURCED FROM SUITABLE MATERIAL APPROVED BY THE CITY OF ARMADALE MANAGER CIVIL WORKS AND IN LAYERS NOT EXCEEDING 150mm THICK, COMPACTED TO:
        12.1.1. NON-TRAFFICABLE AREAS - 95 % MMDD (MIN)
        12.1.2. TRAFFICABLE AREAS - 98 % MMDD (MIN)
13. ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARDS, MANUFACTURER'S SPECIFICATIONS AND GOOD BUILDING PRACTICE.

Amendments

No	Date	Revision	By	Approved
B	18/01/18	ROUNDABOUT SECTION REMOVED	BV	W.O
A	04/12/17	ISSUED FOR REVIEW	BV	

Scale: AS SHOWN	
Datum: AHD	Grid: PCG94
Surveyed: Veris	Date: 28/11/17

CITY OF Armadale
7 ORCHARD AVENUE, ARMADALE, WA 6112

Drawn: BV	Date: 04/12/17	Signed:
Designed: BV	Date: 04/12/17	Signed:
Checked: E. VORSTER.	Date:	Signed:
Director Engineering Services:		Signed:

Project: BALANNUP ROAD - HARRISDALE
RANFORD ROAD TO REILLY ROAD

Title: BALANNUP ROAD ULTIMATE DESIGN - TYPICAL CROSS SECTIONS

PC No:	
Trim No:	
Sheet No:	1 of 1
Revision No:	B
DWG No:	E17-133-5

V:\ENGINEERING & DESIGN DEPARTMENT\DESIGN DEPARTMENT_DESIGN PROJECTS\2018 DESIGNS\Balannup Rd (Reilly-Ranford) RDB_4314, CIVIL 3D - WORKING FOLDER\E17-133-5 To 133-11 Cross Sections.dwg

Attachment 2: Assessment Against Ten Clearing Principles

Principle Number	Principle Description	Assessment	Outcome
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.	A Priority 3 flora species was found during a targeted flora survey within the clearing area; *Schoenus pennisetis*. The majority of the clearing area was mapped as Completely Degraded.	The proposal is unlikely to be at variance with Principle A.
(b)	Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	The area proposed to be cleared is minimal (<1 ha) and is situated in a disturbed urban context.	The proposal is not at variance with Principle B.
(c)	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.	A Priority 3 flora species was found during a targeted flora survey within the clearing area; *Schoenus pennisetis*. The Department of Biodiversity Conservation and Attractions' definition of a 'Priority 3: Poorly Known Species' refers to "species that are known from several locations, and the species does not appear to be under imminent threat".	The proposal is unlikely to be at variance with Principle C.
(d)	Native vegetation should be cleared if it comprises the whole of a part of, or is necessary for the maintenance of a threatened ecological community.	An on-ground survey revealed no mapped Threatened Ecological Community within the clearing area which sits in isolation from other areas of remnant bushland.	This proposal is not at variance with principle D.
(e)	Native vegetation should not be	The vegetation	The proposal is not at

	cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	complex associated with the proposed clearing area is defined as the Southern River Complex however the majority of the clearing area was mapped as Completely Degraded.	variance with Principle E.
(f)	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The eastern portion of the clearing area is mapped Resource Enhancement Wetland (UFI 15946) and the remainder as Multiple Use wetland. Conservation Category Wetland (UFI 14403), Balannup Lake, is located outside of the clearing area to the north of the existing Balannup Road. Given that the vegetation resides in an urban context adjacent to Balannup Road, the proposed clearing is unlikely to have any significant impact on the wetland. *Additional information regarding altered hydrology associated with the broader road upgrade work has been referred to both DWER and DBCA by the City separate to this clearing permit for comment.	The proposal is unlikely to be at variance with Principle F.
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The area proposed to be cleared is minimal (<1 ha) and is situated in a disturbed urban context.	The proposal is not at variance with Principle G.

(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of an adjacent or nearby conservation area.	The proposed clearing area is bounded by the existing Balannup Road and residential lots. Given the minimal extent of clearing, the proposed clearing is unlikely to have any significant impact on the Balannup Wetland to the north.	The proposal is unlikely to be at variance with Principle H.
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of the surface or underground water.	Given the small scale of the proposed clearing and it being enveloped by urban development deterioration in ground water quality is considered unlikely. Detailed design will consider water run off management.	The proposal is not at variance with Principle I.
(j)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The cleared area will be replaced by 'hard-stand'. Any potential for flooding will be managed through design.	The proposal is not at variance with Principle J.

Natural Area
CONSULTING MANAGEMENT SERVICES

City of Armadale

Balannup Road Targeted Flora Survey

November 2018

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Document Title	ARM-R-Balannup Rd Targeted Flora V1
Location	Client Folders NAC/City of Armadale/RFQ Vegetation Survey 2018/

Draft/Version No.	Date	Changes	Prepared by	Approved by	Status
D1	03/10/2018	New Document	HT		Draft
V1	29/10/2018	Reviewed		LS	Superseded
V1.1	12/11/2018	Clarification of TEC following client review	HT		Final

Executive Summary

Natural Area Consulting Management Services (Natural Area) was commissioned by the City of Armadale to undertake a targeted flora survey within a proposed clearing area along Balannup Road, Harrisdale. The survey area is approximately 9,600 m^2 of roadside vegetation, located approximately 20 km from the Perth Central Business District. This survey was undertaken to inform future requests made to the Department of Water and Environmental Regulation (DWER).

Assessments were undertaken to determine habitat suitability including soil type, vegetation type and condition, and the presence of conservation significant flora within the proposed clearing boundary.

A desktop search of the available literature was undertaken to ensure botanists undertaking the site visit were familiar with the targeted flora species. A habitat assessment was undertaken, and it was determined that the site may contain suitable for eighteen conservation significant flora. One conservation significant flora species was found, *Schoenus pennisetis*; the majority of the population was found within the proposed clearing area. Based on distribution it is likely that this species emerges following disturbance and the population inclusive of seed bank may extend further that the current mapped population. No other conservation significant flora or threatened ecological communities were observed during the survey.

Based on the outcomes of this targeted flora survey discussions with the Department of Biodiversity, Conservation and Attractions (DBCA) and DWER are recommended ensure impacts on conservation significant flora are minimised as far as practicable.

Contents

1.0 Introduction

Natural Area Consulting Management Services (Natural Area) was commissioned by the City of Armadale to undertake a targeted flora survey within a proposed clearing area along Balannup Road, Harrisdale. The survey area is approximately 9,600 m^2 of roadside vegetation including an area of Resource Enhancement Wetland approximately 20 km south south-west of the Perth Central Business District (Figure 1). This survey was undertaken to inform a clearing proposal for the area for road widening.

1.1 Scope

Activities undertaken by Natural Area personnel included:

- desktop database searches to identify potential conservation significant flora species occurring within the proposed clearing area
- desktop search to determine habitat suitability of conservation significant flora potentially occurring within the proposed clearing area
- a targeted search for conservation significant flora, with a focus on species in which the habitat type is suitable
- verification of any species collected
- reporting outcomes of the survey.

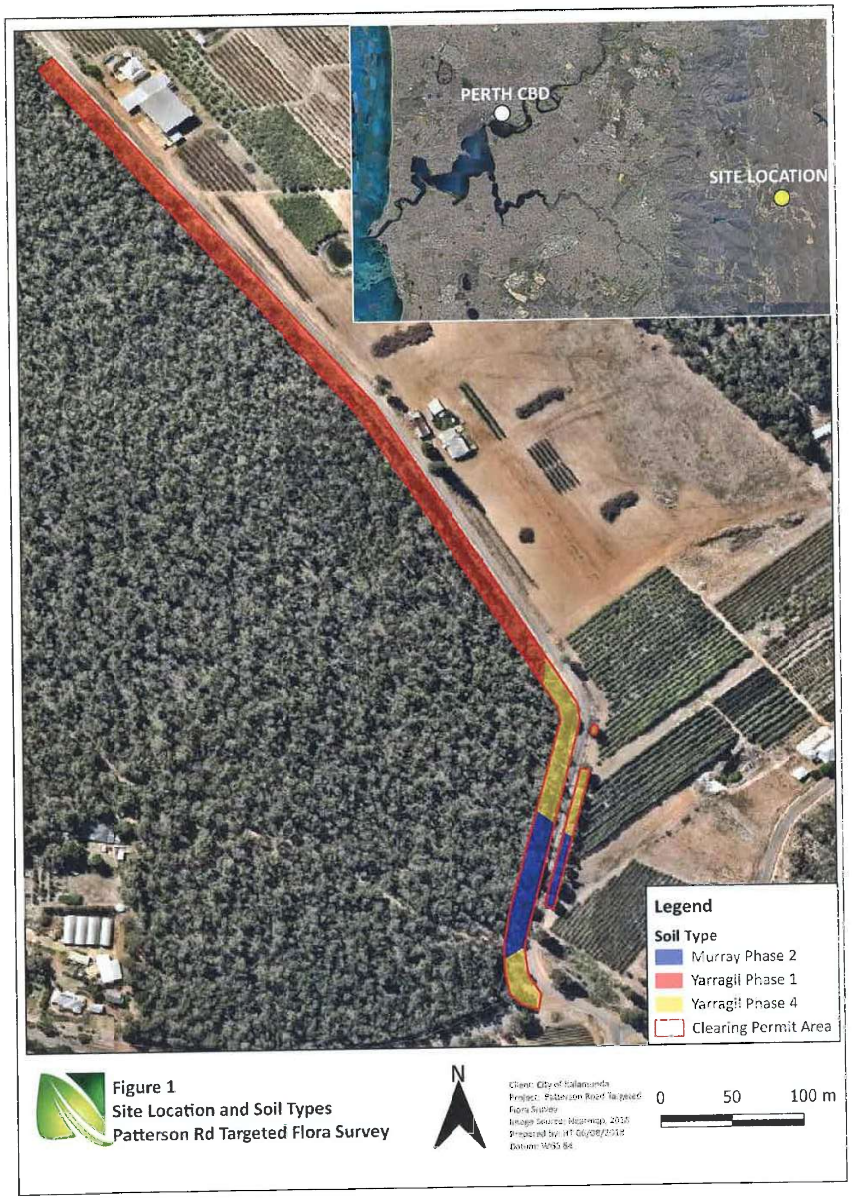


Figure 1
Site Location and Soil Types
Patterson Rd Targeted Flora Survey

2.0 Site Characteristics

The proposed clearing area is a narrow strip of vegetation located adjacent to Balannup Road in Harrisdale, approximately 9,600 m^2 in size.

2.1 Regional Context

According to Interim Biogeographical Regionalisation of Australia (IBRA) descriptions, Harrisdale is located in the Perth Swan Coastal Plain subregion (SW02). This area of the Swan Coastal Plain subregion is characterised by Banksia woodlands in sandy soils and paperbark in swampy areas (Mitchell, Williams & Desmond, 2002).

2.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. According to the Bureau of Meteorology (Perth Airport, Station ID 009021, 2018):

- average rainfall is 771.6 mm pa, with the majority falling between May and August;
- average maximum temperature ranges from 17.9 °C in winter to 31.9 °C in summer, with the highest recorded maximum being 46.7 °C;
- average minimum temperatures range from 8.0 °C in winter to 17.5 °C in summer, with the lowest recorded minimum being -1.3 °C; and
- predominant wind directions include morning easterlies and westerly sea breezes during summer months, with an average wind speed of 23.8 km/h and gusts of more than 100 km/h.

2.3 Vegetation Complex

The vegetation complex associated with the proposed clearing area is defined as the Southern River Complex, which is characterised by an open woodland of jarrah-marri-banksia in elevated areas and fringing *Eucalyptus rudis* and *Melaleuca rhaphiophylla* along streams and in wetland areas (Heddle, Loneragan & Havel, 1980). The site is classified as multiple use and resource enhancement wetland, with conservation category wetland located to the north of Balannup Road (WALGA 2018; Figure 1).

2.4 Topography and soils

Topography across the site ranges from 20 -- 22 m AHD. Two distinct soil types were identified using the NRInfo Portal (DPIRD, 2018; Figure 2):

- Bassendean B1 Phase (212Bs_B1) – Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m; Banksia dominant.
- Bassendean B3 Phase (212Bs_B3) – Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.

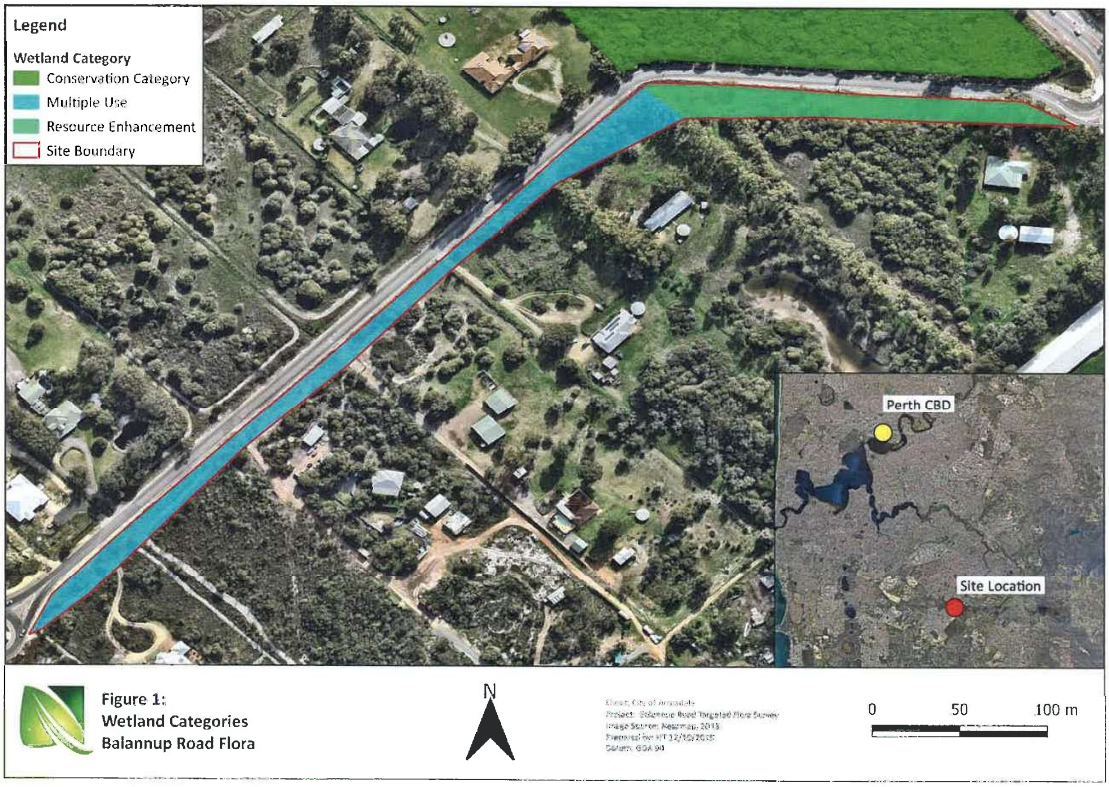


Figure 1:
Wetland Categories
Balannup Road Flora

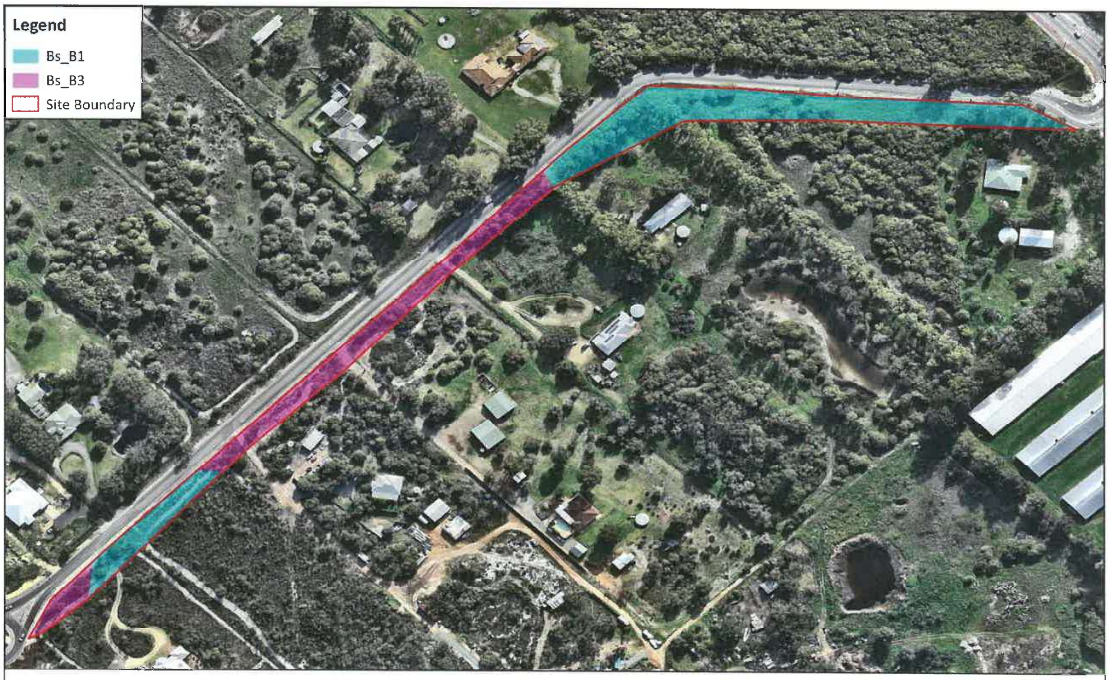


Figure 2:
Soil Types
Balannup Road Flora

3.0 Methodology

3.1 Desktop and Literature Review

The desktop flora survey was undertaken to determine the likely presence of conservation significant flora and threatened ecological communities within the survey area. A NatureMap (State) and Protected Matters Tool Search (PMST, Commonwealth) report for a 2 km buffer around the survey site was generated DBCA, 2018a; DEE, 2018a). Soil and vegetation type were also determined prior to the site visit to assess the suitability of the area to conservation significant species. Photographs and descriptions of the conservation significant flora were source predominantly from FloraBase (DBCA, 2018b) and summarised in a table for ease of reference in the field (Appendix 1).

3.2 Habitat Suitability

Habitat suitability of conservation significant flora was assessed on the basis of the dominant soil type, vegetation type, and vegetation condition. Soil type was assessed on ground to determine clay-loam-sand consistency, rock type and content (%). Vegetation condition was assessed using the rating scale attributed to Keighery in Bush Forever Volume 2 (Government of Western Australia, 2000) (Table 1). The vegetation type was determined using the structural classes described in Bush Forever Volume 2 (Government of Western Australia, 2000), and records dominant over storey, middle and understory species (Table 2).

Table 1: Vegetation condition ratings

Category		Description
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	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 and grazing.
4	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 and grazing.
5	Degraded	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 and grazing.
6	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 or shrubs.

(Source: Government of Western Australia, 2000)

Table 2: Vegetation structural classes

Life Form/Height Class	Canopy Percentage Cover			
	100 – 70%	70 – 30%	30 - 10%	10 – 2 %
Trees over 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 under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree Mallee	Closed tree mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub Mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

(Source: Government of Western Australia, 2000)

3.3 Targeted Flora survey

The on ground targeted flora survey for the species outlined above was carried out in accordance with *EPA Guidance Statement 51 – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (Environmental Protection Authority, 2016). Due to the small area of the site the entire site was traversed, with site conditions assessed to determine the search width.

Field data was recorded on a tablet using Mappt software, the outcomes of which were used to provide graphical representation of results. Samples were collected of species resembling conservation significant genera that could not be identified on site, specimens were verified at the reference herbarium.

In addition to a targeted flora survey, opportunities for plant salvage including potential retention trees were identified (Appendix 1).

3.4 Limitations

The survey was carried out mid-spring, the optimal time for assessing the targeted flora. The survey was timed so that the majority of the conservation significant species were likely to be flowering at this period, with species not flowering easily identifiable. The water level was high at the north end of the site, limiting

access, however this area was completely degraded with open understory and all of the site could be viewed from the shoreline. There was limited access to the private properties adjacent to the survey site; permission was sought to access the property in which the population of conservation significant species was located however only the front of the property was surveyed.

4.0 Flora Survey Results

4.1 Desktop survey

A review of NatureMap indicated 17 conservation significant flora species listed under the *Biodiversity Conservation Act 2016* (WA) as potentially occurring within 2 km of the site (Department of Biodiversity Conservation and Attractions 2018). A review of Protected Matters Search Tool (PMST) (DEE, 2018a) indicated 13 threatened flora species and two threatened ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) as potentially occurring within a 2 km radius of the site. Species information, including description, habitat requirements and photographs (where possible) of the 27 conservation significant species found in the area was summarised into a reference sheet for the field survey; it was determined that the site conditions (soil type, drainage, location) may be suitable for 18 of these species.

Of the two threatened ecological communities (TECs) listed in the PMST search it was determined that the site conditions may be suitable for one, Clay Pans of the Swan Coastal Plain. This Critically Endangered TEC is characterised by a highly diverse, mixed shrubland in which a suite of geophytes and annual herbs are present during the wetter months of the year (Department of Environment and Energy, 2018b).

4.2 Habitat suitability

The field survey was undertaken on 02 October 2018 by botanist Harley Taylor. The soil types identified during the desktop survey were confirmed to be accurate. Vegetation condition ranged from Completely Degraded to Very Good, with the majority of the site in Completely Degraded condition (Figures 3 and 4). There were a high level of invasive weeds including species classified as Declared Pests under the *Biosecurity Management Act 2007* (WA):

- Patterson's Curse (*Echium plantagineum*)
- Arum Lily (*Zantedeschia aethiopica*)
- One-leaf Cape Tulip (*Moraea flaccida*)
- Bridal Creeper (*Asparagus asparagoides*)

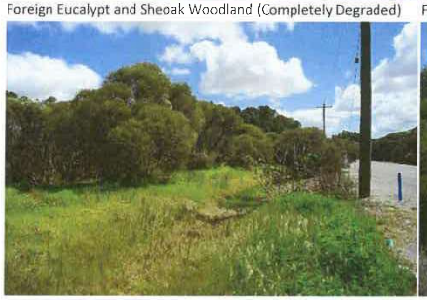
Three vegetation types were determined to be present along the site (Figure 3 and 5):

- *Melaleuca rhaphiophylla* Woodland – located in the lower lying areas of the site
- Foreign Eucalypt and *Casuarina glauca* Woodland – located on properties that had been completely cleared and planted
- *Melaleuca preissiana* Woodland – located in drier upland areas of the site, towards the southern end.

It was determined that no area of the survey site had a vegetation community consistent with the listing information for Clay Pans of the Swan Coastal Plain.

Foreign Eucalypt and Sheoak Woodland (Completely Degraded)

Foreign Eucalypt and Sheoak Woodland (Completely Degraded)



Melaleuca rhaphiophylla Woodland (Completely degraded)

Melaleuca preissiana Woodland (Very Good)

Figure 3: Vegetation types and condition

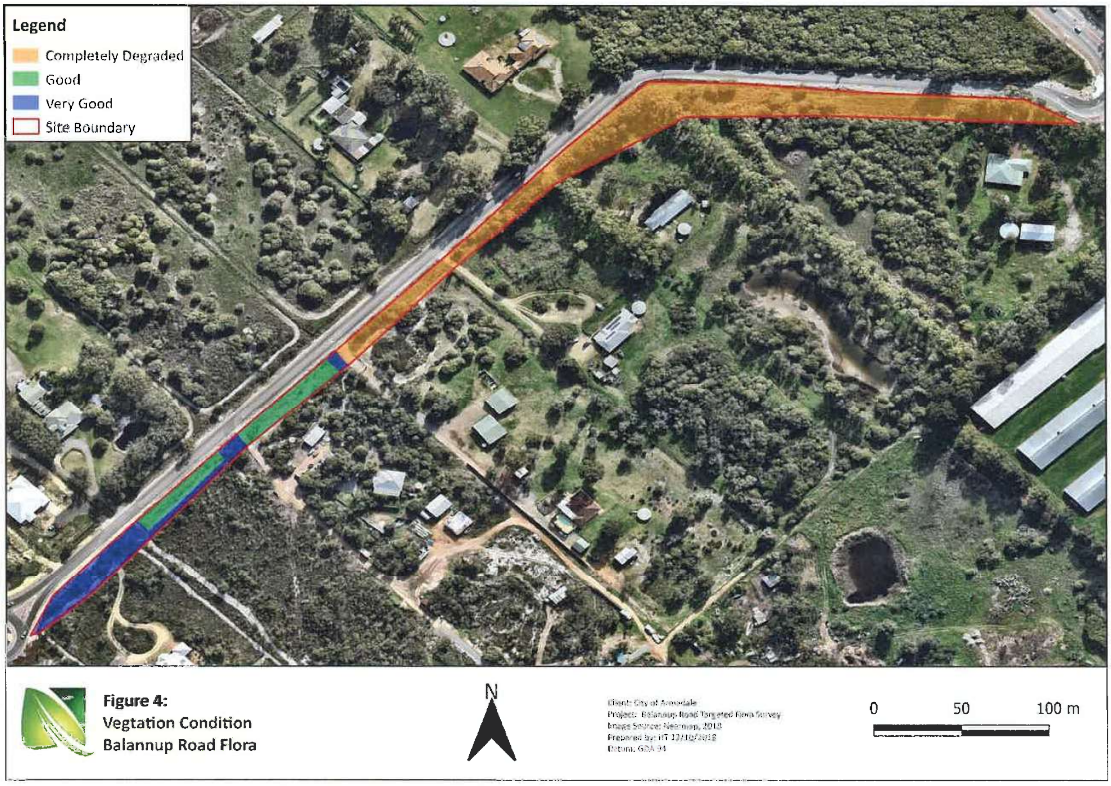


Figure 4:
Vegtation Condition
Balannup Road Flora

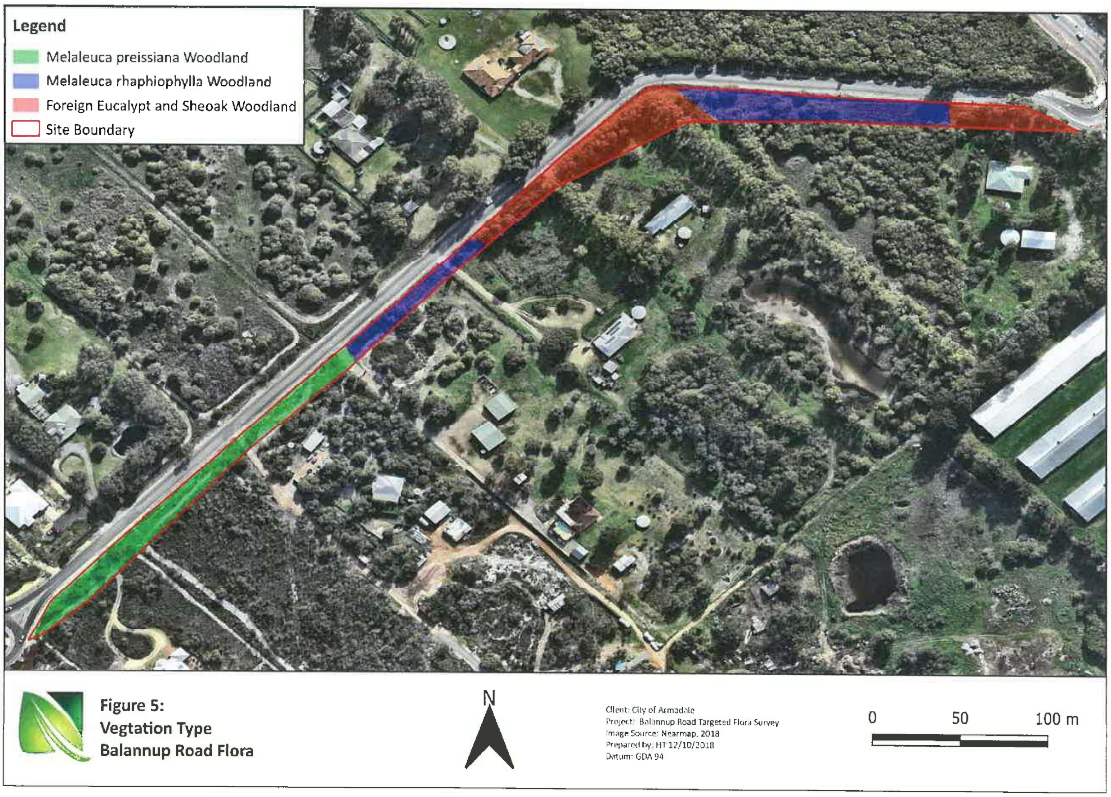
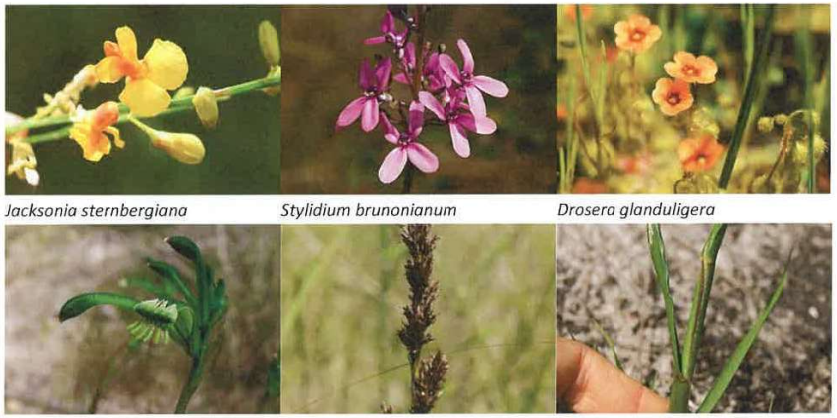


Figure 5:
Vegtation Type
Balannup Road Flora

4.3 Targeted Flora Survey

The extent of the clearing permit area was traversed to determine if any conservation significant species were located within the clearing boundary, with a focus on species outlined in the desktop survey results and species in which the habitat was determined to be suitable. Many species that were in the same genera as conservation significant flora were noted (Figure 6). Samples and photographs were taken of species unable to be identified in the field that resembled conservation significant flora.



Jacksonia sternbergiana | *Stylidium brunonianum* | *Drosera glanduligera*

Anigozanthos viridis | *Lepidosperma longitudinale* | *Austrostipa flavescens*

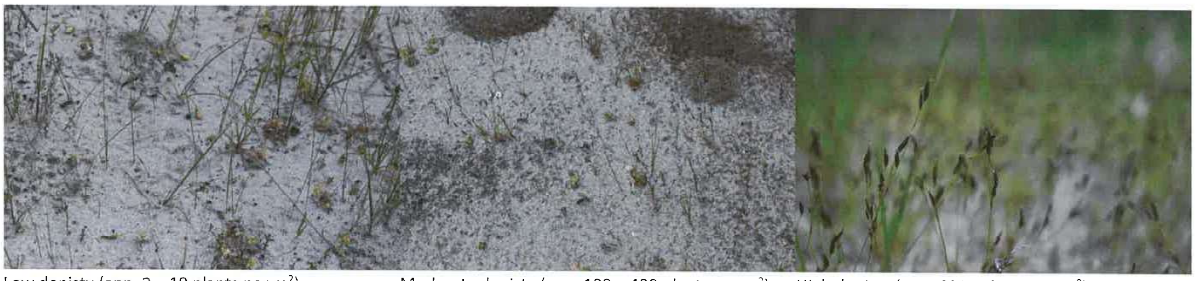
Figure 6: Species in the same genus as targeted conservation significant flora.

4.3.1 Conservation significant flora – *Schoenus pennisetis*

One Priority 3 flora species was found during the survey, *Schoenus pennisetis*. The species was not identified during the site visit however a sample was taken (as it was identified to be a *Schoenus*) and the species identified at the Western Australian Reference Herbarium (Figure 7). A secondary site visit was undertaken on 8 October 2018 to map the population of the Priority species (Figure 8). Population was mapped in three densities: low, moderate and high (Figure 7 and 8). Permission was sought from the land owners to access the private property adjacent to the survey site to ensure the extent of the population was mapped. The population occurred almost exclusively in areas that have been cleared for the firebreak or other purposes (Figure 8).

Schoenus pennisetis herbarium sample

Schoenus pennisetis collected



Low denisty (app. 2 – 10 plants per m^2) Moderate denisty (app. 100 – 400 plants per m^2) High denisty (app. 600+ plants per m^2)

Figure 7: *Schoenus pennisetis* identification and densities

Figure 8:
Schoenus pennisetis population extent
Balannup Road Flora

5.0 Conclusion

The flora survey carried out along Balannup Road in Harrisdale for the City of Armadale recorded one Priority 3 species, *Schoenus pennisetis*. This population occurred almost entirely within the proposed clearing area. Due to the population extent it is likely *S. pennisetis* is a species that emerges following disturbance (in this case the clearing of a firebreak) and therefore the extent of the emergent population may not be an accurate reflection of the population extent including the seed bank.

It is recommended that the presence of this species within the proposed clearing area is discussed with DWER and DBCA; arrangements for transplanting/salvage or seed collection may be suggested to mitigate the impact of clearing on the species. As the species is flowering presently seed collection may need to be undertaken in the following 1 – 2 months.

No other conservation significant flora of threatened ecological communities were observed during the survey. The results of this targeted flora survey will need to be considered during the clearing permit application process.

6.0 References

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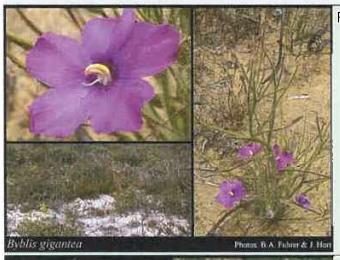
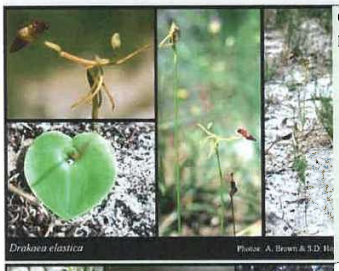
Appendix 1: Conservation Significant Flora Summary

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Slender Andersonia	Slender erect or open straggly shrub, 0.1–0.5(-1) m high. Fl. white-pink-purple	Sep to Nov	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps	EN	Y	Soil type and drainage may be suitable, occurs in adjacent LGA
	Stalked Water Ribbons	Rhizomatous or cormous, aquatic perennial, herb, leaves floating. Fl. green-white	Jul to Oct.	Mud, Freshwater: ponds, rivers, claypans.	P4	Y	Within extent, area may be wet enough to support this species

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Austrostipa jacobsiana[1]	Austrostipa jacobsiana is a perennial rhizomatous grass to 1.2 metres tall including flower spikes. The leaves are up to 45cm long, folded and swollen giving a terete appearance. The abaxial surface is strongly ribbed. The inflorescence is 10–20cm long. Flowering occurs in October–November. Fruit matures in November–December[1]	Oct- Nov	Low-lying area, fringing wetland vegetation	T, CR	Y	Found on roadside in one population so can exist in a degraded location

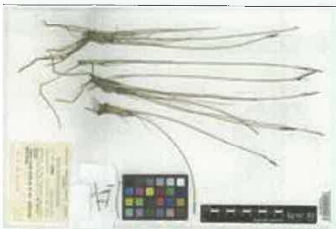
Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Rainbow Plant	Small, branched perennial, herb (or sub-shrub), to 0.45 m high. Fl. pink-purple/white,	Sep to Dec or Jan	Sandy-peat swamps. Seasonally wet areas.	P3	Y	Soil type and drainage suitable
	Grand Spider Orchid	Tuberous, perennial herb, 0.25 – 0.6m high. Green, cream and red flowers.	September to October.	Grey or brown sand, clay loam.	T, En	Y	Soil type suitable and site is within the species natural distribution, with population found in Forrestdale, an adjacent suburb. Soil may be too wet.

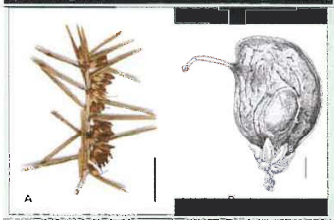
Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Dwarf Bee-Orchid	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow & brown	Sep to Oct	Brown loamy clay. Winter-wet swamps, in shallow water	VU	N	Drainage suitable, but site outside of range and soil type may not be suitable.
	Purdie's Donkey Orchid	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow	September to October	Grey-black sand, moist. Winter-wet swamps.	T, En	Y	Soil type and drainage suitable. Site is within the species natural distribution.
Dosera occidentalis subsp occidentalis		Fibrous-rooted, rosetted perennial, herb, to 0.01 m high. Fl. pink/white	Nov to Dec.	Sandy & clayey soils. Swamps & wet depressions	P4	Y	Soil types and drainage suitable, found in City of Armadale

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Glossy leaved Hammer Orchid	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow	October to November	White or grey sand. Low-lying situations adjoining winter-wet swamps	T, EN	Y	Soil type suitable and site is within the species natural distribution.
	Dwarf Hammer Orchid	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow	September to October	White-grey sand	T, VU	N	Soil type not suitable, not within recorded range

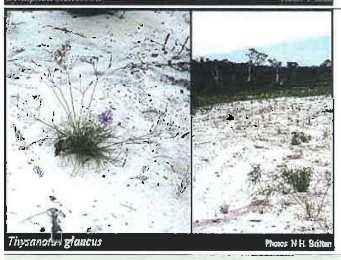
Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Cadda Road Mallee	(Mallee), to 5 m high, bark rough, flaky. Fl. white	Oct to Dec or Jan to Feb	Sandy soils with lateritic gravel.	EN	N	Soil type unsuitable, drainage unsuitable.
	Narrow curved-leaf Grevillea	Prostrate to erect shrub, 0.1-2.5 m high. Fl. white-cream, Aug to Sep	Aug to Sep	Sand, sandy loam. Winter-wet heath.	EN	N	Drainage suitable, but well outside recorded extent.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
					P3	Y	Occurs at Balannup Living Stream
	Waldjumi	Low spreading shrub, to 0.6 m high. Fl. orange, usually	Dec or Jan to Feb.	Calcareous & sandy soils.	P4	N	Soil type not suitable, typically occurs towards coast further.

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Beaked Lepidosperma	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown		Peaty sand, clay	T	Y	Soil type, drainage and location suitable.
 (Bryony Fremlin)	Ornduffia submersa	Small aquatic waterlily-like plant with hairy white flowers and glossy leaves	Oct-Dec	Swamps	P4	Y	Found in Forrestdale and Kenwick, soil type and drainage suitable
Schoenus capillifolius		Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green	Oct to Nov	Brown mud. Claypans.	P3	Y	Soil conditions may be suitable, site occurs within extent
Schoenus pennisetis		Tufted annual, grass-like or herb (sedge), 0.05-0.15 m high. Fl. purple-black	Aug to Sep	Grey or peaty sand, sandy clay. Swamps, winter-wet depressions	P3	Y	Soil conditions suitable, found within LGA

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
Stylidium aceratum		Fibrous rooted annual, herb, 0.05-0.09 m high, leaves spathulate. Fl. pink/white	Oct- Nov	Sandy soils, Swamp heathland	P3	Y	Soil type suitable, occurs within City of Armadale
		Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink,	Oct-Dec	Sandy clay, clay. Soasonal wetlands	P4	Y	Soil type suitable, occurs within the City of Armadale
	Styphelia filifolia[3]	Erect shrubs to c. 90 cm high and 70 cm wide fl white	Mar-May	sandy soils of the coastal plain usually in Banksia or Jarrah woodland and in low-lying situations.	P3	Y	Soil type and drainage may be suitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Selena's Synaphea	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. yellow	Oct	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	CR	N	Drainage suitable but soil type unsuitable
		Perennial, erect, clumped shrub to 60cm high by 50cm wide with yellow flowers borne on long spikes well above the leaves. [2]	Aug-Nov	grey-brown sandy-loam or clay in seasonally wet areas	CR	N	Drainage suitable, but occurs further to the south in narrow geographic range

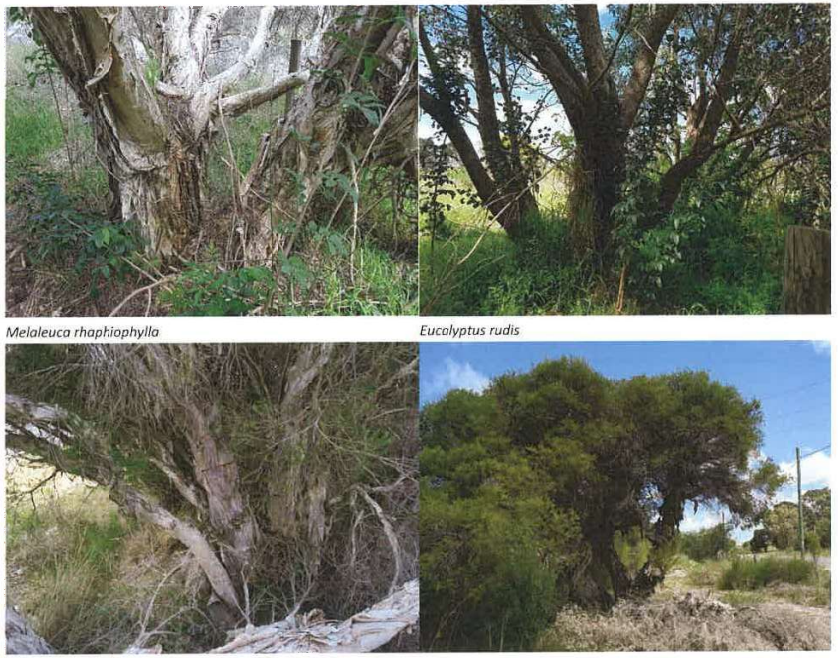
Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
	Dwelling Synaphea	Caespitose shrub, 0.3-0.45 m high. Fl. yellow,	Aug to Oct	Sandy or sandy clay soils. Winter-wet flats, granite.	FN	N	Extent further south
		Caespitose, glaucose perennial, herb, 0.1-0.2 m high. Fl. purple	Oct to Dec or Jan to Mar	White, grey or yellow sand, sandy gravel	P4	N	Soil type and drainage unsuitable
Tripterococcus sp. Brachylobus		Perennial, herb, to 1 m high. Fl. yellow-green	Oct to Nov.	black or peaty sand; winter wet flats	P4	Y	Found in Armadale LGA, soil type and drainage may be suitable

Picture	Common Name	Description	Flowering Period	Habitat Type	Cons Code	Likelihood (Y/N)	Comment
		Erect shrub, 0.2-0.75 m high. Fl. pink	May or Nov to Dec or Jan	Sand, sandy clay. Winter-wet depressions.	P4	Y	Occurs in LGA, drainage and soil type suitable

Source: Florabase (DBCA 2018b) unless otherwise noted
[1] Williams (2011)
[2] Hislop (2017)
[3] DPAW (2017)

Appendix 2: Plant Salvage and Retention Recommendations

Five trees at the edge of the site boundary were identified as of a significant size and it is recommended these be retained if feasible; two *Eucalyptus rudis*, two *Melaleuca preissiana* and one *M. rhaphiophylla* (Figure 9 and 10). Other trees noted had a smaller trunk diameter (<30 cm diameter) and many were growing with multiple trunks making it difficult to retain these as landscaped trees.



Melaleuca rhaphiophylla *Eucalyptus rudis*

Smaller *Melaleuca preissiana* growing with multiple trunks *Melaleuca preissiana*

Figure 9: Notable trees

There were many plant species that may be salvaged including difficult to propagate species such as *Phlebocarya ciliata*, *Dasypogon bromeliifolius*, Cyperaceae and Restionaceae species. These species were predominantly noted in the southern area in vegetation assigned Good and Very Good condition. Natural Area's nursery has extensive knowledge in plant salvage, particularly recalcitrant species, and can be contacted at nursery@naturalarea.com.au if assistance with plant salvage is required.

Retention of the areas to the east of the firebreak in southern lots is recommended where possible as vegetation condition is Very Good in the majority of these areas.

Figure 10:
Potenital Trees to Retain
Balannup Road Flora

N

Client: City of Armadale
Project: Balannup Road Targeted Flora Survey
Image Source: Nearmap, 2018
Prepared by: HT 25/10/2018
Datum: GDA 94

0 50 100 m