GOLDEN BAY

MINISTERIAL IMPLEMENTATION STATEMENT NO. 297 COMPLIANCE ASSESSMENT REPORT YEAR 2022

Prepared for:	Peet Golden Bay Pty Ltd and DevelopmentWA
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1 INTRODUCTION

1.1 Background

The proposal to develop Part Lot 12 and Reserve 34664, Golden Bay for urban development was referred to the Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986* (EP Act) in 1992 by H & B Developments. The EPA set the level of assessment as a Public Environmental Review (PER) (Assessment No. 604). The Minister for the Environment approved the proposal through Ministerial Statement 297 (MS 297) subject to environmental conditions in January 1993 (Attachment A).

Ministerial Statement 297 gave environmental approval subject to conditions to develop the landholding then known as Part Lot 12 and Reserve 34664, Golden Bay.

The Minister for the Environment confirmed on 30 July 1997 that the project had been substantially commenced, and as a result the environmental approval remains valid.

The Department of Environmental Protection (now the Department of Water and Environmental Regulation (DWER)) recognised the change in ownership to the Department of Housing and Works (now known as the Department of Communities (DoC)) and issued an Audit Table detailing the status of the Environmental Conditions and Commitments on 3 April 2001 (Attachment B).

The landholding is now referred to as Lot 2 Warnbro Sound Avenue (Lot 2) and Lot 3 Dampier Drive (Lot 3), Golden Bay.

1.2 Golden Bay Project Description

Golden Bay is located on the coast, approximately 62km south of the Perth Central Business District and 20km south of the City of Rockingham (Figure 1).

The landholding covers an area of approximately 161 hectares (ha) and is situated west of Mandurah Road (Figure 2). Lot 2 has approximately 800metres (m) of coastal frontage and the Foreshore Reserve covers an area of 10.61ha with vegetation that is largely in Excellent condition. Lot 3 has a Landscape Protection Area that conserves the parabolic dunal formation associated with Mandurah Hill, the highest point in the region.

The key environmental elements of the Golden Bay Proposal as described in the PER were listed as:

- Foreshore Reserve designation;
- Foreshore Reserve management;
- Landscape protection;
- Southern Brown Bandicoot Protection; and
- Protection of the heritage site.

1.3 Proponent

Peet Golden Bay Pty Ltd (Peet) and the Housing Authority (now DoC) formed a co-ownership in November 2014. The change in Proponent was endorsed by the Office of the Environmental Authority (now DWER) on 1 August 2016.

The Proponent for the project has changed from Peet Golden Bay Pty Ltd and the DoC to Peet Golden Bay Pty Ltd and Western Australian Land Authority as agent of the Housing Authority (trading as DevelopmentWA). DWER were informed of the change in ownership in April 2023.

1.4 Environmental Approval to Implement the Project

The proposal to develop the site was assessed through a Section 38 PER assessment process under the WA *Environmental Protection Act 1986* (EP Act). The project was approved through MS 297 in January 1993 (Appendix 1).

The Minister for the Environment confirmed on 30 July 1997 that the project had been substantially commenced.

1.5 Scope of the Report

Condition 8 of MS297 states the following:

8. Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

8-1 The Proponent shall prepare periodic 'Progress and Compliance Reports' to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

The reporting requirements set out in the Audit Table indicated that the first Compliance Assessment Report (CAR) was due before clearing activities commenced and the second one year after the clearing had commenced. Thereafter the submission of CARs was as required by the OEPA.

The OEPA advised in correspondence dated 8 April 2016 (Appendix 2) that a CAR was required to be submitted by 30 August 2016 and annually thereafter and to report on the period of the previous calendar year.

This is the eleventh CAR, the previous CARs were submitted on the following dates:

- 20 May 2010;
- 30 May 2011;
- 30 May 2012;
- 30 August 2016 (Report Period Year 2015);

- 30 August 2017 (Report Period Year 2016);
- 20 August 2018 (Report Period 2017);
- 30 August 2019 (Report Period 2018);
- 30 August 2020 (Report Period 2019);
- 30 August 2021 (Report Period 2020);
- 30 August 2022 (Report Period 2021); and
- 30 August 2023 (Report Period 2022).

This CAR has been prepared in accordance with the OEPA *Guidelines for Preparing a Compliance Assessment Report, August 2012.* This report is based on the Proponent's assessment of compliance with the conditions in accordance with the MS 297 and the MS 297 Audit Table. This CAR covers the period between January 2022 to December 2022.

2 CURRENT STATUS OF PROJECT IMPLEMENTATION

2.1 Golden Bay Project

Peet is delivering the urban development project on behalf of the landowners in accordance with the approved Comprehensive Development Plan (Figure 2) will deliver the following:

- Residential Lots;
- Commercial Precinct;
- Primary and Secondary Schools;
- Local Public Open Space (recreational and drainage functions);
- Landscape Protection Area; and
- A Foreshore Reserve.

2.2 Current Project Activities

Development construction has progressed over Lot 2 both east and west of Warnbro Sound Avenue and progressed on Lot 3 (Figure 3). The following tasks have been undertaken to date:

- Phase 1 works have been completed in the Foreshore Reserve in accordance with the Foreshore management Plan (FMP);
- The Southern Brown Bandicoots are being managed on the site and monitored twice yearly within the Foreshore Reserve;
- Feral cat, fox and rabbit control has been undertaken in the Foreshore Reserve;
- The wetlands within the Foreshore Reserve have been monitored annually;
- Rehabilitation works have continued in the southern portion of the Foreshore Reserve;
- A small section of clearing on the southern end of the Foreshore Reserve was cleared to make way for the construction of the Wastewater Pump Station. The 2m wide strip of clearing was approved through Addendum 1 of the FMP. A Regulation 10 licence was approved by the Department of Planning, Lands and Heritage (DPLH) for these works;
- Earthworks adjacent to and in the Landscape Protection Area have commenced to tie in the development levels and attain the maximum grades allowed by the CoR;
- Some sections of the Landscape Protection Area adjacent to subdivision and landscape works have been fenced;
- The Landscape Masterplan for the Landscape Protection Area has been approved by the CoR. The masterplan will be incorporated into the Landscape Management Plan which is under revision;
- Civil construction works continued in Lots 2 and 3;
- Works complete on the Lot 3 Wastewater Pump Station;
- Landscape works to the Lot 3 Central Landscape Protection Area and Public Open Space landscaping commenced;
- Stage 4 balance bulk earthworks (including the extension of Marillana Drive and Solstice Grove adjacent to the Foreshore Reserve were completed; and
- The Landscape Protection Area on Lot 3 has been implemented;

- The Landscape Protection Area Management Plan has been contemporised and will provide the guiding framework for rehabilitation works in the conservation areas;
- Works on the northern section of the Foreshore have commenced including the northern beach access point, carpark and continuation of Solstice Grove:
- Bulk earthworks on the southern section of Lot 3 have commenced in accordance with the Landscape Protection Area Management Plan and subdivision approval; and
- Some vegetation clearing has occurred in the south east corner of the Landscape Protection Area to stabilise the dune known as Mandurah Hill. The vegetation will be rehabilitated back to its original form as part of the works under the Landscape Protection Area Management Plan.

3 INSTANCES OF POTENTIAL NON-COMPLIANCE AND PREVENTATIVE ACTIONS UNDERTAKEN

In accordance with Condition 8-1 of MS 297, all instances of potential non-compliance with the conditions of MS 297 that are identified during the reporting period are to be reported in the annual CAR, and corrective and preventative actions taken are to be described. The status of all conditions is presented in Table 1 and Appendix 3.

There were no non-compliance issues during this reporting period.

4 PUBLIC AVAILABILITY OF REPORT

This CAR will be made publicly available within one month of being submitted to the OEPA. A copy of the most recent CAR will be placed on the Proponent's website until the subsequent annual CAR is placed on the website.

The website URL is www.peet.com.au/communities/perth-and-wa/golden-bay

5 COMPLIANCE

5.1 Compliance Assessment Method

An audit of the Golden Bay project was conducted in August 2022 to facilitate the assessment of compliance against MS 297 and the implementation of actions to meet environmental conditions. The audit was conducted by Belinda Heath of PGV Environmental.

The compliance status terminology to define the level of compliance used during the audit follows the EPA's *Post Assessment Guideline for Preparing an Audit Table* and is listed below:

- C = Compliant;
- CLD = Completed;
- NC = Non compliant
- NR = Not Required at this stage;
- IP = In Process may only be used by the proponent in circumstances outlined in Section 2.8 of the guideline

The information reviewed and the evidence obtained during this audit has been presented within the Compliance Assessment Audit Table (Appendix 3), along with additional information gathered during a desktop study/investigation.

5.2 Statement of Compliance

The Statement of Compliance and the Compliance Assessment Audit Table are attached at Appendix 3.

5.3 Summary Audit Table

Details on compliance with the MS 297 conditions and management plans are presented below in a summary audit table (Table 1). The detailed Compliance Assessment Audit Table is provided in Appendix 3.

Table 1: Summary Audit Table Status

Audit Code	Requirement	Status	Comment
297:M1-1	Fulfil the commitments	CLD	All commitments have been fulfilled
297:M2-1	Adhere to the Proposal	С	
297:M2-2	Seek approval for modifications to the Proposal	С	No modifications sought
297:M3-1	 Provide a Foreshore Reserve for conservation and recreation which: 1. Protects the Peelhurst Wetlands and the Southern Brown Bandicoot (<i>Isoodon obesulus</i>) population; and 2. Includes landscape and recreation values at least equivalent to the area affected by this proposal which is within System 6 Recommendation M107 Area. 	CLD	4 June 1993
297:M32	Transfer to public ownership the proposed Foreshore Reserve as required by M3-1.	CLD	4 June 1993
297:M4-1	Liaise with the Department of Planning and Urban Development (DPUD) and the CoR to incorporate planning measures which recognise and protect the landscape value of the parabolic ridge on the eastern edge of Golden Bay.	CLD	5 April 1994
297:M5-1:1	Establish the regional implications of disturbing the population of the Southern Brown Bandicoot (<i>Isoodon</i> obesulus) at Golden Bay.	CLD	6 February 1996
297:M5-1:2	Initiate management of the population of the Southern Brown Bandicoot (Isoodon obesulus)	CLD	Submitted 20 May 2010
297:M5-2:1	Carry out the ongoing management of the population of the Southern Brown Bandicoot (<i>Isoodon obesulus</i>) at Golden Bay as proposed in M5-1.	C	All stages of development have included a relocation program prior to any clearing activity. Monitoring the Foreshore Reserve bandicoot population has continued in Autumn and Spring
297:M5-2:2	Carry out the ongoing management of the population of the Southern Brown Bandicoot (<i>Isoodon obesulus</i>) at Golden Bay as proposed in M5-1.	NR	Post development management
297:M6-1	Seek approval for transfer of ownership, control or management of this project.		Proponents are DevelopmentWA and Peet Golden Bay Pty Ltd
297:M7-1	Seek approval to extend approval to implement proposal.	CLD	Minister for Environment confirmed project has commenced on 30 July 1997

297:M8 297:P1	Prepare a periodic 'Progress and Compliance Report' to help verify the environmental performance of this project. Provide in exchange for the development of the currently proposed System 6 Area M107, additional Regional and Public Open Space adjacent the Coastal Reserve as shown in the Structure Plan, in excess to that which	C CLD	OEPA has requested (Appendix 2) that from August 2016 compliance reports are to be submitted annually by 30 August for the previous calendar year. 26 October 1995 Not Audited (duplicated by
	would normally be required by DPUD.		condition M3-1) – Audit Branch
297:P2	Prepare a Management Plan for the coastal reserve at Golden Bay.	CLD	Golden Bay FMP approved by the OEPA on 30 March 2012 (on advice from DPLH and CoR) An addendum to the FMP to address the interface between the development and Foreshore Reserve was submitted and approved by the OEPA on 29 September 2016
297:P3	Include the historic aboriginal camping site within the proposed Public Open Space for the development.	CLD	13 December 1995
297:P4	Protect against Bushfire	CLD	Fire Management Plan for the Golden Bay Structure Plan Area was approved by the CoR in March 2012.
297:P5	Provide reticulated sewerage and stormwater drainage designated to infiltrate stormwater into the soil within the development site.	CLD	A Local Water Management Strategy (LWMS) has been prepared for the Structure Plan Area and approved by the DWER and the CoR. Urban Water Management Plans (UWMPs) are being

			prepared in accordance with the LWMS for each stage of subdivision.
297:P6	Liaise with CALM regarding the presence of bandicoots at Golden Bay and examine feasibility of relocating	CLD	13 December 1995
	bandicoots if required by CALM.		

5.4 Compliance with Management Plans

Commitment 2 of MS 297 required that a management plan be prepared for the Foreshore Reserve on advice from the DPLH and the CoR.

The Golden Bay FMP was prepared in consultation with the DPLH and the CoR and approved by the OEPA on 30 March 2012 (Appendix 3).

An addendum to the FMP to address the interface between the development and Foreshore Reserve was submitted and approved by the OEPA on 29 September 2016 (Appendix 8).

The FMP provides for the management and conservation of the Peelhurst Wetlands, Quenda, TEC 19a (Sedgelands in Holocene Dune Swales) and the Indigenous Heritage site located within the approved Foreshore Reserve. In addition, the FMP details the proposed infrastructure, recreational activities and relevant management strategies as proposed in the PER.

Implementation of the FMP has commenced and a status update on the management actions are provided in Appendix 4.

5.4.1 TEC19a Photo Point Monitoring

The condition of the TEC19a (*Sedgelands in Holocene Dune Swales*) has been recorded annually through photo point monitoring survey conducted in late September/October. The survey records the overall condition of the TEC and provides a basis to determine if the TEC is improving/degrading over time.

The photo point monitoring survey results are provided in Appendix 5.



Plate 1: TEC19a (Sedgelands in Holocene Dune Swales)

5.4.2 Quenda Monitoring

The local population of Quenda within the Foreshore Reserve have been monitored in Autumn and Spring for nine years by Terrestrial Ecosystems. The monitoring reports for 2022 are provided at Appendix 6 and summarised below.

Autumn Survey

The Autumn survey caught nineteen (19) individual Quenda (12 females and 5 males). Two (2) female juveniles were also captured (Terrestrial Ecosystems, 2022a).

All captured Quenda appeared healthy, and mange was not observed on any Quenda during this survey. Of the 19 Quenda caught, eight were caught for the first time during this monitoring program and did not have a microchip. The remaining eleven Quenda had been caught during previous monitoring surveys (Terrestrial Ecosystems, 2022a).

In addition to the Quenda, 30 bobtails (*Tiliqua rugosa*; Plate 4), 30 rats (*Rattus rattus*), eight house mice (*Mus musculus*), four rabbits (*Oryctolagus cuniculus*), two buff-banded rails (*Gallirallus philippensis*), one silvereye (*Zosterops lateralis*), one grey butcherbird (*Cracticus torquatus*) and one White-browed Scrubwren (*Sericornis frontalis*) were also caught (Terrestrial Ecosystems, 2022a).

Fresh fox, cat and rabbit tracks were observed on multiple occasions near the Foreshore Reserve boundaries.

Western Grey Kangaroos were observed on several days during the survey, as well as their tracks and scats, indicating there continues to be population of kangaroos in the Foreshore Reserve (Terrestrial Ecosystems, 2022a).

Spring Survey

The Spring survey caught nine (9) individual Quenda (5 females and 2 males). Two juveniles (<300g) were captured – one female and one male. The female weighed 80g and the male weighed 120g. The average weight of the adult males was 800g and adult females was 556g. Eight of the females had pouch young (Terrestrial Ecosystems, 2022b).

Most captured Quenda appeared healthy, and mange was not observed on any Quenda during this survey. One adult male was found dead in a trap but there were no obvious signs of sickness or injury. Of the nine Quenda caught, two were caught for the first time during this monitoring program and did not have a microchip. The remaining seven Quenda had been caught during previous monitoring surveys (Terrestrial Ecosystems, 2022b).

In addition to the Quenda, 51 Bobtails (*Tiliqua rugosa*), 30 rats (*Rattus*), 6 Rabbits (*Oryctolagus cuniculus*), 11 house mice (*Mus musculus*), 14 silvereyes (*Zosterops lateralis*), 5 Buff-banded Rails (*Gallirallus philippensis*), and 6 White-browed Scrubwren (*Sericornis frontalis*) were captured (Terrestrial Ecosystems, 2022b).

Western Grey Kangaroos were observed on most days during the survey, as well as their tracks and scats.

Six rabbits were captured during this survey and fresh fox, cat, and rabbit diggings (Plates 7, 8 and 9) were observed on multiple occasions near the reserve boundaries.

People were observed walking their dog(s) along the bank on the eastern side of the Foreshore Reserve and along the newly constructed road into the car park on the western side, but there was little sign of dogs being walked within the reserve.

Survey Summary

The results of the 2022 trapping program show a considerable decrease in numbers. There is evidence of breeding in the Quenda population, however, very few juveniles are entering the adult population, strongly suggesting predation on the smaller sized Quenda. There was no evidence of mange found during the current surveys. The surveys observed a number of fox and cat tracks in and adjacent to the foreshore reserve.

The continuation of a management program for rabbits, cats, and foxes in cooperation with the City of Rockingham for the coastal dune system is essential to maintaining a viable population of Quenda in the Foreshore Reserve. It is evident that the fox and cat trapping program undertaken by the City of Rockingham is inadequate as there was an abundance of fox and cat tracks which almost certainly indicates multiple foxes in the Foreshore Reserve and domestic cats from the adjacent properties are regularly visiting the area (Terrestrial Ecosystems, 2022b).



Plate 2: Quenda (photo source G. Thomson Terrestrial Ecosystems)

Plate 3: Quenda being Released (Photo source: Terrestrial Ecosystems)



Fauna Relocation

All stages of subdivision have included a Quenda relocation program prior to any vegetation clearing on Lots 2 and 3. Three relocation surveys were undertaken in this reporting period.

5.4.3 Feral Fauna Control

A feral fauna trapping program has been scheduled for Autumn 2023.

5.4.4 Groundwater Levels Monitoring

The groundwater levels in the Foreshore Reserve are monitored each month. The levels for the period July 2012 to December 2022 are provided at Appendix 7.



Plate 4: Groundwater Monitoring Bore (WB02)

5.4.5 Landscape Protection Management Plan

Development of the northern end of Lot 3 commenced in 2017.

The Landscape Protection Area has been partially fenced to protect it from construction activity.

The recently approved LSP over Lot 3 includes a condition for the original Landscape Protection Area Management Plan (1994) to be revised to represent contemporary management of bushland areas. A baseline flora, vegetation and weed survey was conducted in Spring 2020. The findings of this survey informed the revision of the original Landscape Protection Area Management Plan. Importantly, the area of dunes protected under the Landscape Protection Area set in 1994 will not change.

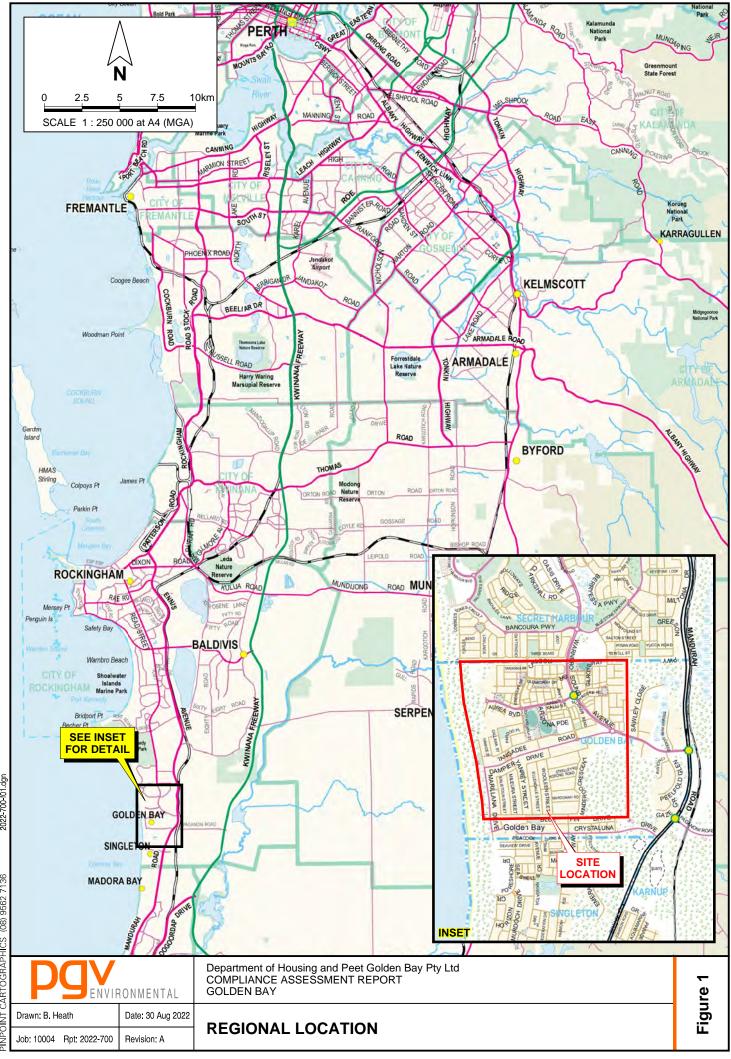
Rehabilitation works in the Landscape Protection Areas has continued as part of subdivisional and landscape works in accordance with the CoR approved Golden Bay Landscape Protection Area Management Plan. (Appendix 9).

Monitoring landscape protection rehabilitation areas to commence in 2023.

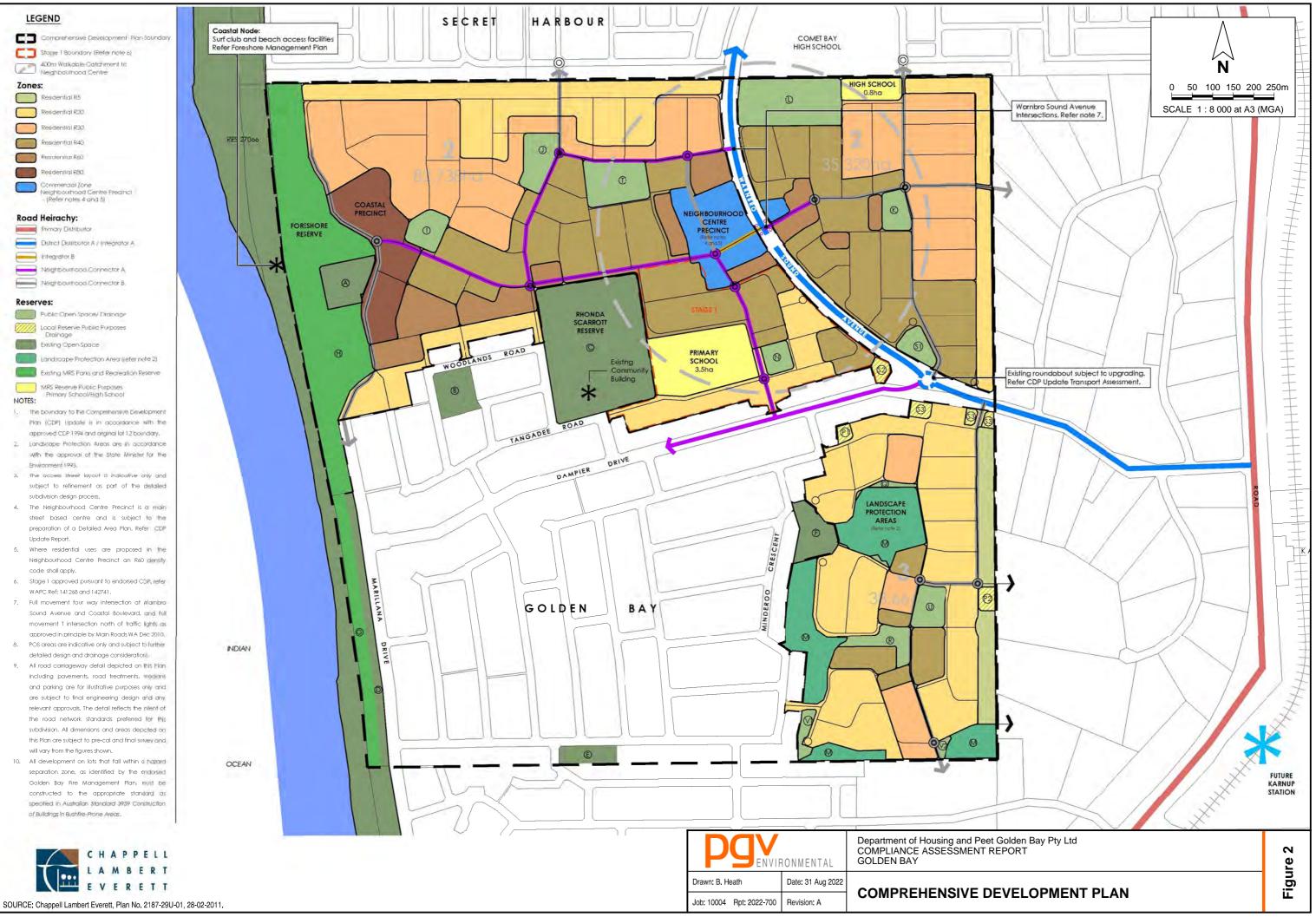
6 **REFERENCES**

- Borg, K. (1987). A review of wildlife diseases from Scandinavia. *Journal of Wildlife Diseases* 23:527-533.
- Bornstein, S., G. Zakrisson, and P. Thebo (1995). Clinical picture and antibody response to experimental *Sarcoptes scabiei var vulpes* infection in red foxes (*Vulpes vulpes*). Acta *Veterinaria Scandinavica* 36:509-519.
- Davidson, R. K., S. Bornstein, and K. Handeland (2008). Long-term study of *Sarcoptes scabiei* infection in Norwegian red foxes (Vulpes vulpes) indicating host/parasite adaptation. *Veterinary Parasitology* 156:277-283
- Environmental Protection Authority (EPA) (2012) *Post Assessment Guideline No. 3 for Preparing a Compliance Assessment Report* Perth Western Australia.
- Little, S. E., W. R. Davidson, E. W. Howerth, P. M. Rakich, and V. F. Nettles (1998). Diseases diagnosed in red foxes from the southeastern United States. *Journal of Wildlife Diseases* 34:620-624
- Newman, T. J., B. P.J., and S. Harris. 2002. Nutritional condition and survival of red foxes with sarcoptic mange. *Canadian Journal of Zoology-Revue Canadienne De Zoologie* 80:154-161.
- Office of the Environmental Protection Authority (2010c). *Post Assessment Guideline for making information publicly available*. Office of the Environmental Protection Authority, Government of Western Australia. August 2012
- Office of the Environmental Protection Authority (2012). *Post Assessment Guideline for Preparing an Audit Table*. Office of the Environmental Protection Authority, Government of Western Australia. August 2012
- Terrestrial Ecosystems (2022a). Quenda Monitoring Golden Bay Autumn 2022. Report prepared for Peet Limited.
- Terrestrial Ecosystems (2022b). Quenda Monitoring Golden Bay Spring 2022. Report prepared for Peet Limited.

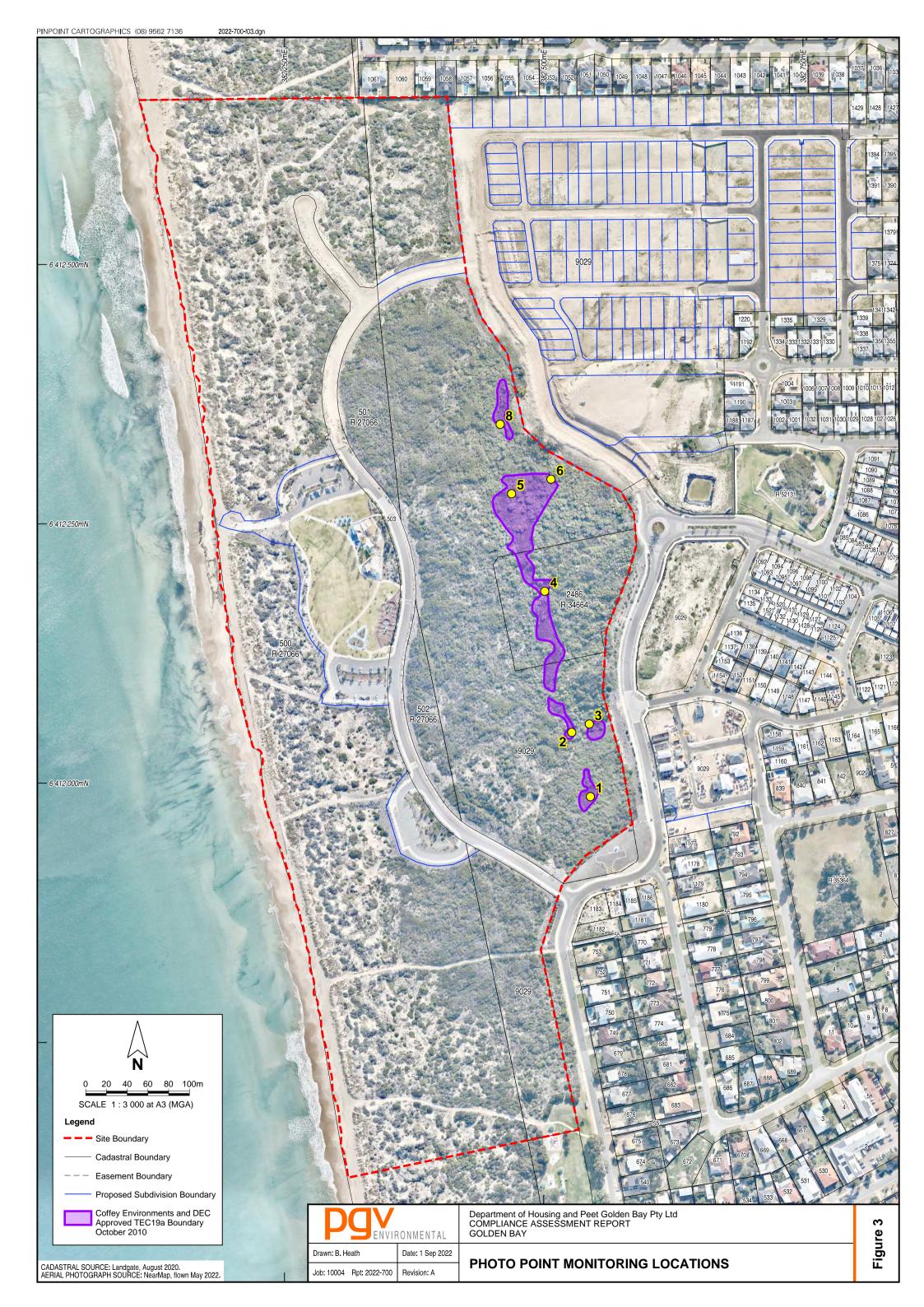
FIGURES



2022-700-f01 (08) 9562 7136 CARTOGRAPHICS PINPOINT



NT CARTOGRAPHICS (08) 9562 7136



APPENDIX 1 MINISTERIAL STATEMENT 297



Bull # 648

Appendix 1

604

297

State #

WESTERN AUSTRALIA MINISTER FOR THE ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)

URBAN DEVELOPMENT OF PART LOT 12 & RESERVE 34664 (AFFECTING PART OF SYSTEM SIX RECOMMENDATION M107), GOLDEN BAY (604)

H & B DEVELOPMENTS PTY LTD

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Consultative Environmental Review and included in Environmental Protection Authority Bulletin 648. (A copy of the commitments is attached.)

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Foreshore Reserve

- 3-1 The proponent shall provide a foreshore reserve for conservation and recreation which:
 - 1 protects the Peelhurst wetlands and the Southern Brown Bandicoot (Isoodon obesulus) population; and
 - 2 includes landscape and recreation values at least equivalent to the area affected by this proposal which is within System 6 Recommendation M107 Area.
- 3-2 Prior to the lifting of Urban Deferment, the proponent shall identify the foreshore reserve as required by condition 3-1, and at subdivision the proponent shall transfer to public ownership the proposed foreshore reserve, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Published on 1 2 JAN 1993

4 Landscape Protection

The landscape value of the parabolic dune ridge on the eastern edge of Golden Bay should be recognised.

4-1 Prior to subdivision approval, the proponent shall liaise with the Department of Planning and Urban Development and the City of Rockingham to incorporate planning measures which recognise and protect the landscape value of the parabolic dune ridge on the eastern edge of Golden Bay, to the requirements of the Minister for the Environment and the Minister for Planning on advice of the Department of Planning and Urban Development, the City of Rockingham and the Environmental Protection Authority.

5 Southern Brown Bandicoot (Isoodon obesulus)

The population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay requires special consideration.

- 5-1 Prior to the commencement of development and in consultation with the Department of Conservation and Land Management, the proponent shall establish the regional implications of disturbing the population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay and shall initiate management of the population, to the requirements of the Minister for the Environment on advice of the Department of Conservation and Land Management.
- 5-2 The proponent shall carry out the on-going management of the population of the Southern Brown Bandicoot (*Isoodon obesulus*) at Golden Bay to the requirements of the Department of Conservation and Land Management.

6 Proponent

These conditions legally apply to the nominated proponent.

6-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

7 Time Limit on Approval

The environmental approval for the proposal is limited.

7-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

8 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

8-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Jim McGinty, MLA MINISTER FOR THE ENVIRONMENT

12 JAN 1993

Appendix 1

PROPONENT'S COMMITMENTS

URBAN DEVELOPMENT OF PART LOT 12 & RESERVE 34664 (AFFECTING PART OF SYSTEM SIX RECOMMENDATION M107) GOLDEN BAY (604)

H & B DEVELOPMENTS PTY LTD

The proponent has made the following environmental commitments:

CONSOLIDATED LIST OF COMMITMENTS FOR GOLDEN BAY

- 1. The proponent will provide, in exchange for the development of the currently proposed System 6 Area M107, additional Regional and Public Open Space adjacent to the Coastal Reserve as shown in the Structure Plan, in excess to that which would normally be required by DPUD. This will be done to the satisfaction of the EPA, DPUD and the Local Authority at the rezoning stage.
- 2. The proponent will prepare a Management Plan for the Coastal Reserve at Golden Bay prior to development commencing. This will be done to the satisfaction of DPUD and the Local Authority.
- 3. The proponent will include an historic aboriginal camping site within the proposed Public Open Space for the development. This will be done to the satisfaction of the Local Authority.
- 4. The proponent will continue to provide and maintain a network of firebreaks and access tracks to protect against bushfire until the Local Authority takes on this responsibility. This will be done to the satisfaction of the Local Authority.
- 5. The proponent will provide reticulated sewerage and will design the development so that stormwater drainage is disposed of on site. This will be done during the installation of services within the development to the satisfaction of DPUD and the Local Authority.
- 6. The proponent will liaise with CALM regarding the presence of bandicoots at Golden Bay and if required by CALM will examine the feasibility of relocating the bandicoots to an appropriate location elsewhere. This will be done prior to any disturbance of the vegetation at Golden Bay and will be done to the satisfaction of both CALM and the EPA.

APPENDIX 2 OEPA CORRESPONDENCE



Government of Western Australia Office of the Environmental Protection Authority



Mr Alex Horsburgh Senior Project Manager Department of Housing 169 Hay Street EAST PERTH WA 6175

HAT ST.

Our Ref: 16-006294 Enquiries: Rowan Inglis, 6145 0849 Email: rowan.inglis@epa.wa.gov.au

Dear Mr Horsburgh

MINISTERIAL STATEMENT 297 – URBAN DEVELOPMENT OF PART LOT 12 & RESERVE 34664, GOLDEN BAY – ANNUAL COMPLIANCE ASSESSMENT REPORT REQUIRED

Ministerial Statement 297 places conditions on the implementation of the proposal above. Condition 8-1 of Statement 297 requires preparation and submission of a Compliance report.

The Office of the Environmental Protection Authority (OEPA) advises the Department of Housing that a Compliance Report reporting on the period of the previous calendar year (January to December 2015) is required to be submitted by **30 August 2016** and annually thereafter to demonstrate compliance with Statement 297.

The CAR must be developed in accordance with the following:

- Post Assessment Guideline for Preparing a Compliance Assessment Report
- Post Assessment Guideline for Preparing an Audit Table

These documents are available on the OEPA website www.epa.wa.gov.au

If you have any queries regarding this matter, or wish to align the submission of the Compliance Report with reporting submitted to other government agencies, please contact Rowan Inglis on 6145 0849.

Yours sincerely

Mr Ian Munro MANAGER COMPLIANCE BRANCH

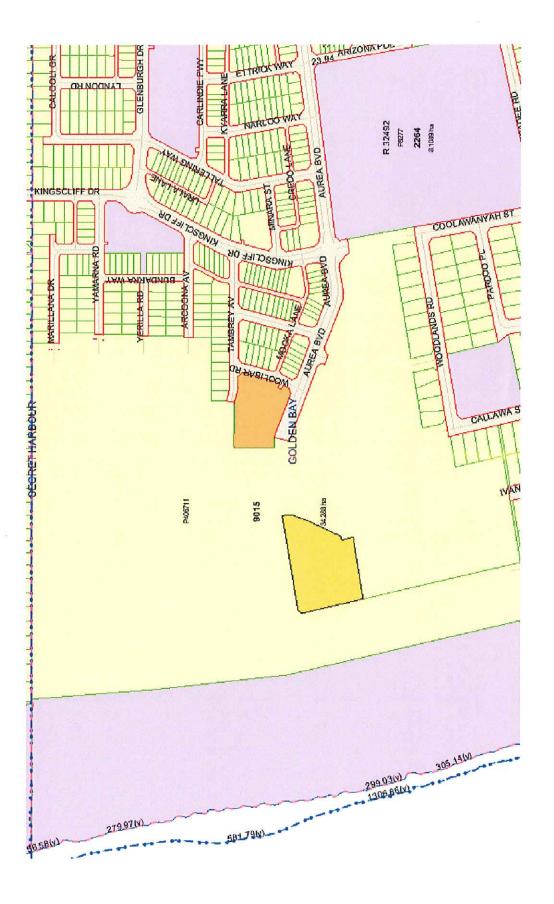
31 March 2016

Level 8, The Atrium, 168 St Georges Terrace, Perth, Western Australia 6000 Telephone 08 6145 0800 Facsimile 08 6145 0895 Email info@epa.wa.gov.au

Reserve	34664	Legal Area (ha)		1.2757		
Name	ייז איר אונייז אין איר אין	Status	a na ang ang ang ang ang ang ang ang ang	Current		
Type		Current Purpose	urpose	PUBLIC RECREATION		
Notes						
	3915/62	2 				
Class		Responsible Agency	le Agency		Date of Last Change	
C DEPARTMENT	T FOR PLANNING AND	INFRAS			23/10/1995	
Management Orders	ent Orders	Document	Land Use	Jse	Local Government Authority	
THE CITY OF ROCKINGHAM	GHAM	<u>T</u>	PUBLIC RECREATION		ROCKINGHAM, CITY OF	
Add Item CLT Number	iber	Parcel Identifier	Street Address	Suburb File Number	PIN Area (sqm)	Map Viewer
LR3067-211	Lot 2486) On Diagram 28721		3915/1962.	368857 12757.0	Ŷ
Reserve Number	34664					
	Previous Cer	Previous Certificates of Title		Histo	Historic Crown Allotments	
LR3053-222		Cancelled	COCKBURN	RN SOUND Location	n 2486	
Gaz Page/Document	Date	Type			Text	
4852	17/10/1995	Current Area	1.2757			
4852	17/10/1995	Public Plan	BG33 (2)	(2) 7.13		
2593	12/08/1977	Current Vesting	VEST SHI	SHIRE OF ROCKINGHAM		
1841	17/06/1977	Formerly	FORMERLY PTN		COCKBURN SOUND 16 LOT 246-D:28721	
1841	17/06/1977 17/06/1977	Original Gazettal and page Class		original gazette c		
	17/06/1977	Current Purpose	PUBLIC R	PUBLIC RECREATION		
	17/06/1977	Correspondence File Number				
	17/06/1977	Historical Area	2.4306			
999999, 199999, 1997, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977, 1977	17/06/1977	Location	COCKBURN	N SOUND,2486		anang kandarak dan san kana kathada

Reserve Enquiry Detail [5100L]

Appendix 2



APPENDIX 3 STATEMENT OF COMPLIANCE AND AUDIT TABLE

Urban Development of Part Lot 12 and Reserve 34664, Golden Bay (Assessment 604, Statement 297)

Ministerial Statement 297 Audit Table

Note:

Phases that apply in this table = Pre-Construction, Construction, Operation, Decommissioning, Overall (several phases)

This audit table is a summary and timetable of conditions and commitments applying to this project. Refer to the Minister's Statement for full detail/precise wording of individual elements.

Code prefixes: M=Minister's condition; P=Proponent's commitment; A=Audit specification; N=Procedure.

Abbreviations: CAR=Compliance Assessment Report; LPA=Landscape Protection Area; FMP=Foreshore/Management Plan; CEO=Chief Executive Officer of OEPA; Minister for Env.=Minister for the Environment; OEPA=Office of the Environmental Protection Authority; CoR = City of Rockingham; DoT = Department of Transport; CALM = Department of Conservation and Land Management (now known as Department of Parks and Wildlife); DPUD = Department of Planning and Urban Development (now Department of Planning, Lands and Heritage)

Compliance Status: C = Compliant, CLD = Completed, NC = Non-compliant, NR = Not Required at this stage. Please note the terms NA = Not Audited and VR = Verification Required are only for OEPA use. IP = In Process may only be used by the proponent in circumstances outlined in Section 2.8 of the Post Assessment Guideline for Preparing an Audit Table.

Audit Code	Subject	Requirement	How	Evidence	Phase	To requirements of On advice from	Timeframe	Status	Comment
297: M1-1	Commitments	Fulfil the commitments	Asperattachment to the Minister's statement.	CAR	Overall	epa Dpaw		С	
297: M2-1	The Proposal	Adhere to the Proposal	In accordance with any designs, specifications, plans or other technical material submitted by the Proponent to the OEPA.	CAR	Overall	epa Dpaw	Throughout life of the project		No changes proposed
297: M2-2	The Proposal	Seekapproval for modifications to the Proposal	Submit a written request to the Minister for Env. detailing changes to designs, specifications, plans or other technical material.		Overall	Minister for Env. EPA	Throughout life of the project	С	No changes proposed
297: MB-1	Foreshore Reserve	 Provide a Foreshore Reserve for conservation and recreation which: 1. Protects the Peelhurst Wetlands and the Southern Brown Bandiccot (Isocdon obesulus) population; and 2. Includes landscape and recreation values at least equivalent to the area affected by this proposal which is within System 6 Recommendation M107 Area. 	Make a submission to the Minister for Env. for approval on advice of the EPA.	Submission to the Minister for Env.	Pre- Construction	Minister for Env. EPA	Prior to lifting of 'Urban Deferred'	QD	4 June 1993
297: MB- 2	Foreshore Reserve	Transfer to public ownership the proposed Foreshore Reserve as required by IVB-1.	Make a submission to the Minister for Env. on advice of the CALM	Submission to the Minister for Env.	Pre- Construction	Minister for Env. EPA	Prior to lifting of 'Urban Deferred'	۵D	4 June 1993
297: N4-1	Landscape Protection	Liaise with the DPUD and the CoR to incorporate planning measures which recognise and protect the landscape value of the parabolic ridge on the eastern edge of Golden Bay.	Make a submission to the Minister for Env. and the Minister for Planning for approval on advice of the DPUD, CoR, EPA	Submission to the Minister for Env. and Minister for Planning	Pre- Construction	Minister for Env. Minister for Planning DPUD CoR EPA	Before or as a condition of subdivision	۵D	5 April 1994
297: M5- 1:1	Southern Brown Bandicoot	Establish the regional implications of disturbing the population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay.	Make a submission to the Minister for Env. on advice of the CALM	Correspondence with Minister for Env.	Pre- Construction	Minister for Env. CALM	Prior to any dearing/construct ion activities commending	đ	6 February 1996

Audit Code	Subject	Requirement	How	Evidence	Phase	To requirements of	Timeframe	Status	Comment
						On advice from			
297: MB- 1:2	Southern Brown Bandicoot	Initiate management of the population of the Southern Brown Bandicoot (Isocolon obesulus)		Report on this in the first report required under M8	Pre- Construction	Minister for Env. CALM	Prior to any dearing/construct ion activities commencing	Œ	CARSubmitted 201May 2010
297: МБ- 2:1	Southern Brown Bandicoot	Carry out the ongoing management of the population of the Southern Brown Bandicoot (Isocolon obesulus) at Golden Bay as proposed in M5-1.	Agreement with CALM	Report on this under M8	Construction	CALM	Orgoing	С	All stages of development have included a relocation program prior to any clearing activity.
297: МБ- 2:2	Southern Brown Bandicoot	Carry out the ongoing management of the Southern Brown Bandicoot (Isocolon obesulus) at Golden Bay as proposed in M5-1.	Agreement with CALM	Report on this under M8	Post Development	CAIM	Orgoing	С	Southern Brown Bandiccots are monitored in Autumnand Spring each year in the Foreshore Reserve in accordance with the RVP.
297: M6-1	Project Ownership, management, control	Seekapproval for transfer of ownership, control or management of this project.	Letter to the Minister for Env. together with the new proponent's endorsement of the Ministerial Statement	Letter and statement endorsed by the replacement proponent	Overall	Minister for Env. EPA	Before transfer of ownership	С	EPA informed of change in ownership Department of Communities and Peet to Development WA and Peet in April 2023
297: M7-1	Time limit on approval	Seek approval to extend approval to implement proposal.	Application to be made before the end of five years (from the publish date of the Minister's Statement)	Letterapplication	Overall	Minister for Env. EPA	Before 12 January 1998 if project has not commenced substantially		
297: M8	Compliance auditing	Prepare a periodic 'Progress and Compliance Report' to help verify the environmental performance of this project.	The report (CAR) should be an update on the project giving evidence of how compliance has been achieved. It should list each condition and commitment to be reported on showing for each: its code no. form the audit table; what action it requires; what has been done to meet the condition or commitment including any problems that may have arisen and what the proponent has done to address them; how compliance can be verified.	CAR providing evidence of compliance for each relevant audit element in the audit table.	Overall	ΕPA	First report before clearing activities commence, second report one year after clearing has commenced, then as required by the OEPA	С	OEPA has requested (Appendix 2) that from August 2016 CARs are to be submitted annually in August for the previous calendar year.
297: P1	Foreshore Reserve	Provide in exchange for the development of the currently proposed System 6 Area IV 1107, additional Regional and Public Open Space adjacent the Coastal Reserve as shown in the Structure Plan, in excess to that which would normally be required by DPUD.	Duplicated by MB-1		Pre- Construction	EPA DPUD CoR	At the rezoning stage	Ð	26 October 1995 Not Audited (duplicated by condition MB-1) —Audit Branch
297: P2	Management Plan	Prepare a Management Plan for the coastal reserve at Golden Bay.	In a submission to the CoR, Minster for Planning and EPA.	Management Plan for Foreshore Reserve to be submitted	Pre- Construction	EPA Minister for Planning CoR DEP	Before clearing/construct ion activities commence	ΔD	Golden Bay FIVP approved by the OEPA on 30 March 2012 (on advice from DoP and CoR). An addendum to the FIVP to address the interface between the development and

Aud Cod	-	Requirement	How	Evidence	Phase	To requirements of	Timeframe	Status	Comment
Cou	-					On advice from			
									Foreshore Reserve was submitted and approved by the OEPA on 29 September 2016.
297 P3		Include the historic aboriginal camping site within the proposed Public Open Space for the development.	Present a submission to the CoR		Pre- Construction	EPA CoR	Before dearing/construct ion activities commence	۵D	13 December 1995
297 P4	Fire	Protect against Bushfire	By providing and maintaining a network of firebreaks and access tracks until the CoR takes on this responsibility	Report on this under M8	Overall	EPA DEP	Until the CoR takes on this responsibility	۵D	Fire Management Plan for the Golden Bay LSP Area was approved by the CoR in March 2012.
297 P5	sewerage and stormwater drainage:	Provide reticulated sewerage and stormwater drainage designated to infiltrate stormwater into the soil within the development site.	To the satisfaction of the Minister for Planning and the CoR	Report on this under M8	Construction	EPA Minister for Planning CoR	Duringprovision of services within the development	CLD	ALW/VShas been prepared for the LSP Area and approved by the DWER and the CoR. UW/VPs will be prepared in accordance with the LW/VS for each stage of subdivision.
297 P6	Bandicoots	Liaise with CALM regarding the presence of bandicoots at Golden Bay and examine feasibility of relocating bandicoots if required by CALM.	Duplicated by M5		Pre- Construction	epa Calm	Prior to any disturbance of the vegetation at Golden Bay	QD	13December 1995

APPENDIX 4

FORESHORE MANAGEMENT PLAN MANAGEMENT ACTION TABLE

Statement of Compliance

1. Proposal and Proponent Details

Proposal Title	Urban Development of Part Lot 12 and Reserve 34664
Statement Number	Ministerial Statement 297
Proponent Name	Peet Golden Bay Pty Ltd and Western Australian Land Authority
Proponent's Australian Company	94 600325 175
Number (where relevant)	34 868 192 835

2. Statement of Compliance Details

Reporting Period

Implementation phase(s) during reporting period (please tick ✓ relevant phase(s))								
Pre-construction		Construction	~	Operation	\checkmark	Decommissioning		

Audit Table for Statement addressed in this Statement of	2
Compliance is provided at Attachment:	3

An audit table for the Statement addressed in this Statement of Compliance must be provided as Attachment 2 to this Statement of Compliance. The audit table must be prepared and maintained in accordance with the Department of Water and Environmental Regulation (DWER) *Post Assessment Guideline for Preparing an Audit Table*, as amended from time to time. The 'Status Column' of the audit table must accurately describe the compliance status of each implementation condition and/or procedure for the reporting period of this Statement of Compliance. The terms that may be used by the proponent in the 'Status Column' of the audit table are limited to the Compliance Status Terms listed and defined in Table 1 of Attachment 1.

Were all implementation conditions and within the reporting period? (please tick	 •	with
No (please proceed to Section 3)	Yes (please proceed to Section 4)	√

3. Details of Non-compliance(s) and/or Potential Non-compliance(s)

The information required Section 3 must be provided for each non-compliance or potential non-compliance identified during the reporting period covered by this Statement of Compliance.

Non-compliance/potential non-compliance 3-1

Which implementation condition or procedure was non-compliant or potentially non-compliant?
Was the implementation condition or procedure non-compliant or potentially non-compliant?
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?

Was this non-compliance or potential non-compliance reported to the Chief Executive Officer, DWER?

□ Yes

Reported to DWER verbally
 Reported to DWER in writing

Date _____ Date _____

□No

What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?

What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)

What was the cause(s) of the non-compliance or potential non-compliance?

What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?

What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?

Please provide information/documentation collected and recorded in relation to this implementation condition or procedure:

- in the reporting period addressed in this Statement of Compliance; and
- as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance.

(the above information may be provided as an attachment to this Statement of Compliance)

For additional non-compliance or potential non-compliance, please duplicate this page as required.

Each page (including Attachment 2) must be initialed by the person who signs Section 4 of this Statement of Compliance. INITIALS: <u>CR</u>_____

4. Proponent Declaration

I, Craig Raynor (Project Director)

declare that I am authorised on behalf of Peet Golden Bay Pty Ltd

(being the person responsible for the proposal) to submit this form and that the information

contained in this form is true and not misleading.

Signature:.....

Date: 30 August 2023

Please note that:

- it is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give or cause to be given information that to his knowledge is false or misleading in a material particular; and
- the Chief Executive Officer of the DWER has powers under section 47(2) of the *Environmental Protection Act 1986* to require reports and information about implementation of the proposal to which the statement relates and compliance with the implementation conditions.

5. Submission of Statement of Compliance

One hard copy and one electronic copy (preferably PDF on CD or thumb drive) of the Statement of Compliance are required to be submitted to the Chief Executive Officer, DWER, marked to the attention of Manager, Compliance (Ministerial Statements).

Please note, the DWER has adopted a procedure of providing written acknowledgment of receipt of all Statements of Compliance submitted by the proponent, however, the DWER does not approve Statements of Compliance.

6. Contact Information

Queries regarding Statements of Compliance, or other issues of compliance relevant to a Statement may be directed to Compliance (Ministerial Statements), DWER:

Manager, Compliance (Ministerial Statements)

Department of Water and Environmental Regulation

Postal Address:Locked Bag 33
Cloisters Square
PERTH WA 6850Phone:(08) 6364 7000Email:compliance@dwer.wa.gov.au

7. Post Assessment Guidelines and Forms

Post assessment documents can be found at www.epa.wa.gov.au

ATTACHMENT 1

Table 1 Compliance Status Terms

Compliance Status Terms	Abbrev	Definition	Notes		
Compliant	Compliant C Implementation of the proposal has been carried out in accordance with the requiremen of the audit element.		 This term applies to audit elements with: ongoing requirements that have been met during the reporting period; and requirements with a finite period of application that have been met during the reporting period, but whose status has not yet been classified as 'completed'. 		
of application has		A requirement with a finite period of application has been satisfactorily completed.	 This term may only be used where: audit elements have a finite period of application (e.g. construction activities, development of a document); the action has been satisfactorily completed; and the DWER has provided written acceptance of 'completed' status for the audit element. 		
at this stage		The requirements of the audit element were not triggered during the reporting period.	This should be consistent with the 'Phase' column of the audit table.		
Potentially Non-compliant	PNC	Possible or likely failure to meet the requirements of the audit element.	This term may apply where during the reporting period the proponent has identified a potential non-compliance and has not yet finalized its investigations to determine whether non-compliance has occurred.		
Non-compliant	NC	Implementation of the proposal has not been carried out in accordance with the requirements of the audit element.	This term applies where the requirements of the audit element are not "complete" have not been met during the reporting period.		
In Process	IP	Where an audit element requires a management or monitoring plan be submitted to the DWER or another government agency for approval, that submission has been made and no further information or changes have been requested by the DWER or the other government agency and assessment by the DWER or other government agency for approval is still pending.	The term 'In Process' may not be used for any purpose other than that stated in the Definition Column. The term 'In Process' may not be used to describe the compliance status of an implementation condition and/or procedure that requires implementation throughout the life of the project (e.g. implementation of a management plan).		

FORESHORE MANAGEMENT PLAN

MANAGEMENT COMMITMENTS AND RESPONSIBILITIES

Compliance Status: C = Compliant, CLD = Completed, NC = Non – compliant, NR = Not Required at this stage.

Task	Responsibility	Timeframe FMP Stages	Priority	Status
Locate roads, access tracks and DUPs, and the Coastal node along existing routes where possible, or realign them to move through areas of disturbed vegetation	Developer	Stage 4	2	CLD
Erect temporary fencing between the Foreshore Reserve vegetation and proposed development	Developer	Stage 2	1	C
Survey and peg the Foreshore Reserve area to ensure this is protected from potential impacts of subdivision development	Developer	Stage 2	1	CLD
Replace temporary fencing in appropriate areas with a permanent barrier once earthworks have been completed, to prevent unauthorised access to areas of native vegetation (embedded limestone and native vegetation can be used for this purpose)	Developer	Stage 3	3	NR
Erect interpretative signage on access paths near the TEC to inform DUP users of the conservation value of the vegetation	Developer	Stage 4	3	NR
Maintain grassed parkland area, toilets and showers, access paths, DUPS and fences.	Developer (2 years post- construction)	Stage 3-5	3	С

	then City of Rockingham			
Transfer of proposed Foreshore Reserve to public ownership (to the City of Rockingham)	Developer	Post Stage 5	3	NR
Machinery and vehicles will use the cleared, degraded areas for access, and must be clean on entry to the site.	Developer	Stage 2-5	2	С
Vegetation clearing will be undertaken in weather conditions that are conducive to effective dust control.	Developer	Stage 2-5	1	C
Wind-fencing will be used as required in conjunction with water sprays and tankers to control and limit excessive dust from earthworks operations and roads.	Developer	Stage 2-5	2	С
The size of soil stockpiles will be limited and water or stabilising agents used to control dust.	Developer	Stage 2-5	2	C
Soil stabilisation methods will be used to reduce the risks associated with wind erosion through the use of mulches, dust suppression agents or by revegetation as appropriate.	Developer	Stage 2-5	2	С
Work will be planned to ensure construction or stabilisation follows demolition wherever possible.	Developer	Stage 2-5	2	C
Dust suppression equipment and/or agents will be regularly inspected and maintained as required to prevent unacceptable dust emissions.	Developer	Stage 2-5	2	С
Regular inspections of adjacent roads will be undertaken for dust creating materials.	Developer	Stage 2-5	2	С

Excessive build-up of mud, debris or any other deleterious matter deposited on any road used for access to or egress from the project site will be removed.	Developer	Stage 2-5	2	С
Construction staff will be made aware of issues relevant to dust control and will be familiar with the requirements prescribed in this management plan.	Developer	Stage 2-5	2	С
Revegetate areas not likely to be impacted during construction as indicated in Figure 5	Developer	Stage 1	1	C
Apply brush to large dune "blowout" area	Developer	Stage 1-3	1	NR
Revegetate areas impacted during construction with species consistent with City of Rockingham's <i>Coastal Rehabilitation Policy</i> (CoR, 2002a)	Developer	Stage 2-5	2-3	С
Implement a monitoring program using visual inspections and photographs to monitor the progress of revegetation plans.	Developer (2 years post- construction) then City of Rockingham	Stage 1-5 Monitoring will be undertaken on a six- monthly basis, reviewed annually	3	C
Replace failed plants if coverage is not adequately achieved.	Developer (2 years post- construction) then City of Rockingham	As required, on a yearly basis post- construction	3	С
Carry out a visual inspection onsite to determine the success of weed control applied as determined in above task and establish a weed control program for the following two years.	Developer	Stage 2-5	2	С

		Six monthly following initial weed management		
Carry out the weed control program devised in the above task. Potentially regular spot-spraying or removal by hand, done periodically over several years.	Developer (2 years post- construction) then City of Rockingham	Stage 2-5 Pre-, during and post-construction	3	C
Erect a dog-proof fence between the residential subdivision and the Foreshore Reserve to protect Bandicoots within the conservation areas from domestic pets and feral animals.	Developer	Stage 2 During Construction	2	NR
Construct fauna access underpasses beneath paths intersecting known Bandicoot habitat vegetation.	Developer	Stage 3	2	NR
Ensure site crew are aware of the 24hr Wildcare Helpline number to call ((08) 9474 9055) in the case of wildlife being encountered during clearing of construction.	Developer	Stage 2-5	2	C
Erect signage indicating the conservation status of the Bandicoot nearby to their known habitat areas.	Developer	Stage 4	3	NR
Educate landowners on the effect of domestic animals on native fauna, such as by erecting signs addressing responsible pet ownership and protection of habitat for Bandicoot. Signs should also include information on the general biology of Bandicoots.	Developer (2 years post- construction) then City of Rockingham	Stage 3-5	2	NR
Consider seeking community consent for the trapping of cats (particularly after Bandicoot breeding) within conservation areas in the Foreshore Reserve	Developer (2 years post- construction)	Ongoing	3	NR

	then City of Rockingham			
Conserve and rehabilitate any good quality, dense wetland habitat which is planned for protection and provides protection for Bandicoots. The addition of further vegetation and cover (such as hollow logs) may assist with the survival of Bandicoot within protected areas at the Golden Bay site. (Such management actions should continue in parallel with the population monitoring.)	Developer (2 years post- construction) then City of Rockingham	Ongoing	1	C TEC19a Photo Point Monitoring Survey
Undertake an annual bandicoot trapping survey of seven nights in spring and autumn each year within the Foreshore Reserve (targeting conservation areas with known Bandicoot habitat).	Developer	Stage 2-5 During construction and for a period of 2 years post-construction.	1	C Bandicoot Monitoring Surveys
Continue to rehabilitate areas degraded as a result of construction and implement weed control.	Developer (2 years post- construction) then City of Rockingham	Ongoing	3	C
Removal of debris from bandicoot underpasses to prevent blockages.	Developer (2 years post- construction) then City of Rockingham	Ongoing (monthly)	3	NR
Remove all rubbish from conservation areas.	Developer (2 years post- construction) then City of Rockingham	Ongoing (monthly)	3	NR

Have regard to the Aboriginal Heritage site reserve boundary and erect signage to indicate the significance of the site.	Developer	Stage 1-5 Construction	2	С
Ensure adequate provision of emergency vehicle access through the Foreshore Reserve.	Developer	Ongoing	2	С
Provide suitable drainage infrastructure such as soakwells for hardstand areas (e.g. Car parks)	Developer	Stage 2-5 Construction	2	C
Provision of passive surveillance such as lighting within the Foreshore Reserve.	Developer	Stage 2-5 Construction	2	C

APPENDIX 5 TEC19A PHOTO POINT MONITORING REPORT

GOLDEN BAY FORESHORE RESERVE

2022 VEGETATION PHOTO POINT MONITORING REPORT

Prepared for:Peet Golden Bay Pty Ltd and Department of CommunitiesReport Date:30 August 2023Version:1Report No.2023-777



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Figure 2: TEC19a Locations

Appendices

- Appendix 1: Vegetation Photo Point Monitoring Proforma
- Appendix 2: Site Photos
- Appendix 3: Groundwater Levels in Wetland Bores

1 INTRODUCTION

1.1 Background

The urban development of Lots 2 and 3, Golden Bay was subject to a Public Environmental Review (EPA Assessment 604) and was approved in Ministerial Statement 297 in January 1993 (Appendix A). Ministerial Statement 297 contains three conditions relevant to the Foreshore Reserve at Golden Bay as follows:

Condition 3-1 The proponent shall provide a foreshore reserve for the conservation and recreation which:

1 Protects the Peelhurst wetlands and the Southern Brown Bandicoot (Isoodon obesulus) population; and

2 Includes landscape and recreation values at least equivalent to this proposal which is within System 6 Recommendation M106 Area.

Commitment P-2 The proponent will prepare a Management Plan for the Coastal Reserve at Golden Bay prior to development commencing. This will be done to the satisfaction of the DPUD [now Department of Planning, Lands and Heritage] and the Local Authority.

1.2 Location

The Golden Bay Foreshore Reserve (the study area) is situated 50km south of Perth and 16km south of the Rockingham Town Centre, within the City of Rockingham (Figure 1). The site is bounded by Secret Harbour to the north, the developing residential area on Lots 2 Warnbro Sound Avenue to the east and the existing Golden Bay Township to the south.

1.2.1 Foreshore Reserve Description

The Foreshore Reserve covers an area of approximately 10.61ha, is 800m in length and incorporates the beach, foredune and near-coastal dune systems. The width of the reserve from the back of the beach to its eastern extent ranges between approximately 400m (centre), 200m (southern end) and 250m (northern end). The western boundary of the reserve is marked by the high-water mark, the northern and southern boundaries in line with the northern and southern Lot 2 property boundaries and the eastern boundary marks the western limit of urban zoning. The extent of the reserve is shown in Figure 3.

1.2.2 Foreshore Reserve Ecological Values

The Foreshore Reserve contains wetlands that belong to the Peelhurst suite of wetlands. These wetlands form in low lying depressions within the Quindalup Dunes which have intercepted the water table and are typically small, seasonally inundated sumplands or seasonally wet damplands. The Golden Bay wetlands have been listed as Conservation Category in the *Geomorphic Wetlands of the Swan Coastal Plain* database.

The Threatened Ecological Community (TEC) 19a *Sedgelands in Holocene Dune Swales* is located in all the wetlands in the Foreshore Reserve at Golden Bay. This TEC is listed as "Critically Endangered" under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and is also recognised as a TEC at State level.

The vegetation in the Foreshore Reserve supports a population of Southern Brown Bandicoot (*Isoodon fusciventer*). Bandicoots have been identified as a species of state significance and are listed as a Priority 5 species by the Department of Biodiversity, Conservation and Attractions (DBCA).

An indigenous heritage site (DIA 2519) is located in the southern end of the Foreshore Reserve.

1.3 Report Purpose

A Foreshore Management Plan (FMP) was prepared for the study area by the developers of Lot 2 Warnbro Sound Ave (Peet Golden Bay Pty Ltd and Department of Housing now Department of Communities) and approved on 30 March 2012. An addendum to the FMP to address the interface between the development and foreshore reserve was submitted and approved by the OEPA on 29 September 2016.

The FMP contained a commitment to monitor the health of the vegetation in the wetlands using permanent photo points.

The initial photo point monitoring assessment was conducted in October 2012. This report documents the methods and results of the annual photo point monitoring undertaken in the Golden Bay Foreshore Reserve over the period from 2012 to 2022.

The objectives of the photo point monitoring report are to:

- Provide a qualitative assessment of the condition of the TEC19a vegetation in the wetlands;
- Assess any requirement for weeding;
- Assess any requirement for grazing control; and
- Determine if any erosion control is required.

2 EXISTING ENVIRONMENT

2.1 Topography

The topography of the Foreshore Reserve ranges from 1 to 10m AHD. The dunes closest to the coast are part of a recent parallel dune ridge system with dune crests up to 5-6m AHD. The eastern half of the Foreshore Reserve contains a low linear flat swale at an elevation of 1-2m AHD with some taller dunes up to 10m AHD.

2.2 Wetlands

The eastern half of the Foreshore Reserve contains a number of small wetlands within the flat swale directly behind the frontal dunes. The wetlands are described as sumplands and contain shallow freshwater above-ground in spring during an average rainfall season. The wetlands are rated as Conservation Category wetlands.

2.3 Vegetation

The Foreshore Reserve was subject to a bushfire on 1 January 2016. The fire was reported as being ignited by fireworks/boat flares. The area of the Foreshore Reserve impacted by the fire was estimated to be approximately 7ha. The northern section was burnt in patches and the eastern part of the central section was largely burnt.

The area burnt by the January 2016 bushfire was monitored in accordance with the FRP to assess the progress of regeneration. The monitoring program concluded in October 2018 and it was determined that supplementary planting would not be required. The Post Fire Vegetation Monitoring Survey results are provided in Appendix 4.

2.3.1 Vegetation Types

A variety of coastal Quindalup vegetation types occur in the Foreshore Reserve as listed below:

Western Half

- Spinifex hirsutus Grassland: Located on the foredune with Spinifex longifolius, Tetragonia decumbens and Cakile maritima present on the seaward facing slopes and Ficinia nodosa and Carpobrotus virescens frequent near the crest and leeward sides.
- Olearia axillaris Shrubland: Located immediately behind the foredune and forms a wide band parallel to the coast, containing *Cassytha* sp., *Pelargonium capitatum* and *Trachyandra divaricata*. It grades into the *Spyridium globulosum* Open Heath.
- Spyridium globulosum Open Heath: Located on the lower dunes and containing Acacia cyclops, Hibbertia cuneiformis, Alyxia buxifolia, Pelargonium capitatum and the creeper Hardenbergia comptoniana.

Eastern Half

• Acacia rostellifera/Spyridium globulosum Closed Shrub: An intermediate unit located in the central part of the site.

- Juncus kraussii Sedgeland: Located within the eastern low linear flat swale in the wetland areas, containing Baumea juncea, Centella asiatica, Ficinia nodosa, Dampiera alata and Lepidosperma gladiatum. Mature Paperbark trees (Melaleuca rhaphiophylla and Melaleuca cuticularis) also occur in the wetlands. The 2016 fire caused a multitude of M. rhaphiophylla seedlings to germinate from one mature tree in one of the wetlands in the reserve.
- Spyridium globulosum Closed Heath: Making up the majority of the transitional vegetation on slightly higher ground within the swale, it contains similar species to the Spyridium globulosum Open Heath on the low dunes and additionally a dense ground coverage of the Sword Sedge Lepidosperma gladiatum.

The Juncus kraussii Sedgeland vegetation type generally describes the vegetation in the wetlands.



Plate 1: TEC19a Vegetation

2.3.2 Vegetation Condition

The vegetation in most of the Foreshore Reserve was rated as mostly being in Excellent condition with only a few tracks through it. Some wetland areas had previously been impacted by off road vehicles. These tracks have been closed off to allow for natural regeneration of the wetlands.

A weed survey of the Foreshore Reserve conducted by PGV Environmental in May 2015, identified the most prevalent introduced species in the area as Rose Pelargonium (*Pelargonium capitatum*) and False Onion Weed (*Trachyandra divaricata*). Both species were more common on the western part of the Foreshore Reserve on sand dunes than in the eastern swales. Hares Tail Grass (*Lagurus ovatus*) and Geraldton Carnation Weed (*Euphorbia terracina*) were also present in parts of the Foreshore Reserve.

The wetlands on the site contained few weeds.

2.4 Native Fauna

The Foreshore Reserve at Golden Bay contains a population of Quenda (*Isoodon fusciventer*). The size and health of the Quenda population has been monitored by the developers for six years. The number of Quenda recorded during surveys in the foreshore reserve declined in 2016 after much of the bushland was burnt which resulted in reduced habitat and an increased exposure of Quenda to predators. Since 2016, the number of bandicoots has increased. This is partially a result of ten additional individuals being relocated into the Foreshore Reserve from other sites in East Rockingham, Florida and Madora Bay, but also post-fire recovery of the habitat. The Quenda population now has Sarcoptic Mange.

The Foreshore Reserve contains a population of Western Grey Kangaroos (*Macropus fuliginosus*). The condition of the wetland vegetation is being adversely impacted by kangaroos moving through or resting in the dense sedgelands. It is anticipated there will be a progressive increase in the kangaroo population.

2.5 Pest Fauna

The Foreshore Reserve contains an abundance of rabbits as evidenced by the quantity and distribution of scats and diggings. Foxes and cats are also common in the Foreshore Reserve.

Fox and cat trapping were undertaken post the 2016 fire event and additional cat trapping is undertaken during the biannual Quenda monitoring surveys. The number of foxes has increased, and it is likely that the Sarcoptic Mange, which can be carried by foxes, has infected some of the Quenda. During 2020, only one male Quenda was found to have Sarcoptic Mange, which is an improvement on the previous year.

No foxes or cats were caught during control program in Autumn 2020. A broad scale RHDV K5 deployment was undertaken to remove small pockets of rabbits during Autumn 2020 (TE, 2020).

3 MONTORING RESULTS

3.1 Photo Point Monitoring

Photo point monitoring was undertaken on 15 October 2022 at the seven monitoring sites established in the wetland vegetation in 2012 (Plate 1). Sites 5 and 7 have been combined into one site due to their proximity (4m apart).

Four photos (east, north, west, south) were taken from the permanent photo points which are marked with a metal dropper and flagging tape. The location of markers is recorded in eastings and northings as shown in Table 1 and shown in Plate 1.

6412185

6412279

6412293

6412346

Site	Eastings	Northings
1	382545	6411987
2	382527	6412049
3	382544	6412057

Table 1: Photo Point Locations.

382501

382469

382507

382458

4

5

6

8

3.2 Condition Assessment Method

The condition of the vegetation in the wetland areas was assessed using key indicators to facilitate comparison between the results from different years. A number of indicators were considered in the condition assessment, each of which were allocated a score using a three-point scoring system of 1 to 3 (Table 2). Relevant comments on condition indicators were also recorded as supplementary information. The scoring system will enable broad comparison over time between results, however, due to the subjective nature of the method, the scores are indicative only.

The nature of many of the indicators for the condition assessment is such that they will not change over the short term, for example surface water and fire history. The attributes most likely to change over time include weed invasion, grazing and flattening.

A standard proforma is used to document the condition assessment to ensure consistency across the subsequent monitoring events. The proforma is provided at Appendix 1.

Indicator	Rating	Measure
Grazing	1	Severe/heavy
	2	moderate (limited but evident)
	3	nil very low
Clearing	1	30% +cleared
	2	10-30% cleared
	3	<10% cleared

Table 2: Condition Indicators

Indicator	Rating	Measure
Weeds	1	30% +cover
	2	1-30% cover
	3	<10% cover
Erosion	1	severe impacting >30% of site
	2	moderate (limited but evident)
	3	nil very low (minimal impact)
Fire History	1	<10 years
	2	10 to 20 years
	3	>20 years
Surface Water	1	Damp at Surface
	2	<10cm
	3	>10cm

3.3 Condition Assessment Results

The results of the qualitative condition assessment for each monitoring point are provided in Table 3. The condition assessment photos are shown in Appendix 2.

Site 1 had an approximate water depth of 10cm significantly less than previous years. The remaining sites did not have any standing surface water and the surface was dry. Sites 3 and 6 were damp at the surface but did not contain any above ground water. The groundwater levels (JHD, 2020) in the ground water monitoring bore WB01 in the foreshore wetlands showed maximum levels of around 1.2m AHD in October 2020 (Appendix 3). Ground Water monitoring bore WB02 had maximum levels of 1.23m AHD in October 2020 (Appendix 3). The ground water levels were the same as Year 2019 which were slightly lower than previous years. Annual rainfall was slightly lower for these two years in comparison to years 2017-18.

The number of kangaroo trails and resting places have increased in all wetlands. Wetlands 4 and 5 show considerable flattening of the sedges where the kangaroos rest.

Weed encroachment has increased along the interface with development and along the interface with the foreshore recreation area.

Erosion rating has not changed significantly since 2012.

Site 3 is a wetland that has had a 4WD track through it for many years and, as such, started with a low condition score and high rating for clearing. The sedge *Isolepis nodosus* is regenerating on the track and the vegetation to the north is recovering well. There is some evidence of an increase in weed species such as *Pelargonium capitatum* (Ro) *Euphorbia terracina* (Geraldton Carnation Weed), *Cynodon dactylon* (Couch Grass) *and Carpobrotus edulis* (Hottentot Fig) to the north of the wetland.



Plate 2: Site 3 Area regeneration after cleared for fire management purposes

Table 3: Condition Assessment (2020)

Condition Attribute	Site	1	2	3	4	5	6	8
Grazing/flattening by rabbits or kangaroos	2022	-	-	-	-	-	-	-
	2021	2	2	3	2	3	2	3
	2020	2	2	3	2	3	2	3
	2019	3	2	3	1	1	2	3
	2018	2	2	3	2	2	2	3
	2017	2	2	3	2	2	2	3
	2016	2	3	3	3	3	3	3
	2015	2	2	2	2	2	3	3
	2012	1	2	3	3	3	3	2
Clearing	2022	3	3	3	3	3	3	3
	2021	3	3	3	3	3	3	3
	2020	3	3	3	3	3	3	3
	2019	3	3	2	3	3	3	3
	2018	3	3	1	3	3	2	3
	2017	3	2	1	3	3	2	3
	2016	3	1	1	2	2	2	2
	2015	3	3	1	3	3	2	3
	2012	3	3	1	3	3	1	2
Weed Invasion	2022	-	3	3	3	3	3	3
	2021	3	3	3	3	3	3	3
	2020	3	3	2	3	3	3	3
	2019	3	3	2	3	3	3	3
	2018	3	2	2	3	3	2	3
	2017	3	2	2	3	3	2	3
	2016	3	2	2	2	2	2	2
	2015	3	3	2	3	2	2	3
	2012	3	3	2	3	3	2	2
Erosion	2022	-	3	3	3	3	3	3
	2021	3	3	3	3	3	3	3
	2020	3	3	3	3	3	3	3
	2019	3	3	3	3	3	3	3
	2018	3	3	2	3	3	3	3
	2017	3	3	2	3	3	3	3
	2016	3	3	1	3	3	3	3

	2015	2	2	2	2	2	2	2
	2015	3	3	2	3	3	3	3
	2012	3	3	1	3	3	2	2
Fire History	2022	2	1	1	1	1	1	1
	2021	2	1	1	1	1	1	1
	2020	2	1	1	1	1	1	1
	2019	2	1	1	1	1	1	1
	2018	2	1	1	1	1	1	1
	2017	2	1	1	1	1	1	1
	2016	2	1	1	1	1	1	1
	2015	2	2	2	2	2	1	2
	2012	2	2	2	2	2	2	2
Surface Water	2022	-	1	2	2	2	1	2
	2021	2	1	1	1	1	1	1
	2020	2	1	1	1	1	1	1
	2019	3	1	1	2	2	1	2
	2018	3	3	1	2	3	1	3
	2017	3	2	1	3	3	1	2
	2016	2	1	1	1	1	1	1
	2015	1	1	1	1	1	1	1
	2012	2	1	1	1	2	1	2

3.4 Photo Point Monitoring Results

The full set of photos for each site year 2022 is provided in Appendix 2.

3.4.1 Site 1

Site 1 will be monitored from drone from year 2022 due to the vegetation becoming too thick to access the wetland. Comparison of photos from 2015, 2016, 2017, 2018, 2019 and 2020 showed that there was similar damage by kangaroos passing through and/or sleeping in the Site 1

Plate 3: Year 2015

Plate 4: Year 2016

Plate 5: Year 2017



Plate 9: Year 2021

Plate 10: Year 2022



3.4.2 Site 2

Comparison of photos from 2015, 2016, 2017, 2018, 2019, 2020 and 2021 shows the site has recovered fully from the fire. The sedges in the wetland have regrown to approximately 50cm in height. The wetland contained standing water less than 10cm. There was less evidence of kangaroos passing through the wetland than in previous years.

Plate 11: Year 2015



Plate 14: Year 2018

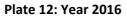




Plate 13: Year 2017



Plate 15: Year 2019

Plate 16: Year 2020



Plate 17: Year 2021

Plate 18: Year 2022



3.4.3 Site 3

Comparison of photos from 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022 shows the sedges have now covered the track and the vegetation to the south is encroaching further into the track.

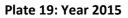


Plate 20: Year 2016

Plate 21: Year 2017



Plate 22: Year 2018

Plate 23: Year 2019

Plate 24: Year 2020



Plate 25: Year 2021

Plate 26: Year 2022



3.4.4 Site 4

Comparison of photos from 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022 show the vegetation within the wetland has recovered completely from the fire event. The sedges in the wetland have regenerated and were approximately 40-50cm in height. The wetland contained surface water less than 10cm deep on the day of the survey. There was less evidence of kangaroo activity passing through the wetland.

Plate 27: Year 2015

Plate 28: Year 2016

Plate 29: Year 2017





Plate 32: Year 2020

Plate 230: Year 2018





Plate 31: Year 2019



Plate 33: Year 2021

Plate 34: Year 2022





3.4.5 Site 5

Comparison of photos from 2015, 2016, 2017, 2019, 2020, 2021 and 2022 showed less kangaroo activity. There was surface water to 10cm and sedges were overall healthier than the previous year.

Plate 35: Year 2015

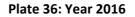


Plate 37: Year 2017



Plate 41: Year 2021

Plate 42: Year 2022



3.4.6 Site 6

Comparison of photos from 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022 showed no kangaroo activity and the original track is completely covered. The surface was dry.

Plate 43: Year 2015

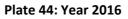


Plate 45: Year 2017



Plate 46: Year 2018

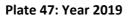


Plate 48: Year 2020



Plate 49: Year 2021

Plate 50: Year 2022



3.4.7 Site 8

Comparison of photos from 2015, 2016, 2018, 2019, 2020, 2021 and 2022 shows less disturbance than previous years and there was surface water to 10cm deep.

Plate 51: Year 2015

Plate 52: Year 2016

Plate 53: Year 2017



Plate 54: Year 2018

Plate 55: Year 2019

Plate 56: Year 2020



Plate 57: Year 2021

Plate 58: Year 2022



4 CONCLUSIONS

The photo monitoring of vegetation in the wetlands of the Golden Bay Foreshore Reserve shows the vegetation regeneration after the impact of the fire on 1 January 2016. The sedges in the wetlands have regrown and the surrounding vegetation is at pre-fire density and condition.

The impact of the fire in increasing weeds in the fire-affected areas is being monitored and, if required, weed control will be implemented. Currently, monitoring has not detected an increase in weed density or species richness after the fire. With the rapid recovery of the native vegetation the status of weeds in the wetlands is unlikely to change.

The wetlands were all wetter than previous years which correlates with the highest groundwater levels recorded since monitoring commenced. Wetland 1, 2, 4, 5 and 8 had surface water at the time of survey.

There is decreased evidence of kangaroos resting and passing through wetlands 2, 4, 5, and 6. The impact of kangaroos on the vegetation will be monitored further. If the impact is considered to be having long-term adverse effects, a programme to remove the kangaroos from the Foreshore Reserve will need to be investigated. Any kangaroo management in the Foreshore Reserve, however, will need to be a collaborative effort between all developers in the area, the City of Rockingham and the Department of Biodiversity, Conservation and Attractions.

5 **REFERENCES**

JDA Consultant Hydrologists (2023). Golden Bay – Wetland Groundwater Levels to end of 2022.

- PGV Environmental (2011). *Lots 2 and 3 Warnbro Sound Avenue Golden Bay Foreshore Management Plan.* Prepared for the Department of Housing. Report No. 2011-13 V6.
- Terrestrial Ecosystems (2022a and b). *Quenda Monitoring Golden Bay Autumn and Spring 2022.* Reports prepared for Peet Limited.

FIGURES

6 412 500mN

- 6 412 250mN

— 6 412 000mN















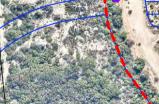








































1220

1335





















1177











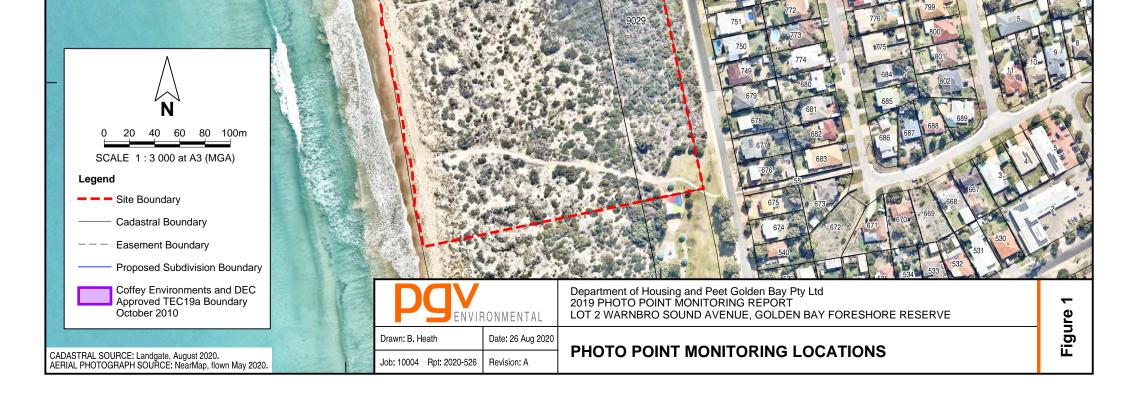












APPENDIX 1 SITE ASSESSMENT PROFORMA

Site No.	Recorder (s)		Date					
GPS Point	Easting		Northing					
Fencing: fully/partial/not fenced	Current Land Use							
	East	North						
Position of Marker in TEC		South West North						
Attribute of Site	Score		Comments					
Grazing								
1 = severe/heavy								
2= moderate (limited but evident)								
3=nil very low								
Clearing								
1 = 30% + cleared								
2 = 10-30% cleared								
3 = <10% cleared								
Weed Invasion								
1 = 30% + cover								
2 = 130%								
3 = <10%								
Erosion								
1 = severe impacting >30% of site								
2= moderate (limited but evident)								
3=nil very low (minimal impact)								
Fire History								
1 = <20 years								
2 = 20-50 years								
3 = > 50 years								
Surface Water								
1 = Damp at surface (no standing water)								
2 = < 10cm								
3 = >10cm								

APPENDIX 2 SITE PHOTOS

Site Photos 2021 – Taken from permanent marker in each of the wetlands

Site 1

382545 m E 6411987 m S

-32 25 22.93 115 45 2.08

Plate 1: Looking East



Plate 2: Looking south



Plate 3: Looking west

Plate 4: Looking north





Site 3

382527 m E6412049 m N32 25 21.10115 45 1.90

Plate 5: Looking East



Plate 7 Looking west



Plate 6: Looking south



Plate 8: Looking north



 Site 2

 382544 m E
 6412057 m S

 32 25 20.61
 115 45 2.79

 Plate 9: Looking East



Plate 11: Looking west





Plate 12: Looking north





Site 4

382501 m E6412185 m S32 25 16.6115 45 1.03

Plate 13: Looking East



Plate 15 Looking west





Plate 16: Looking north





Site 5 and 7 combined382469 m E6412279 m S32 25 13.6115 44 59.78

Plate 17: Looking East



Plate 19: Looking west



Plate 18: Looking south



Plate 20: Looking north



Site 6 -

382507 m E	6412293 m S
32 25 12.93	115 45 1.5

Plate 21: Looking East



Plate 23 Looking west

Plate 22: Looking south



Plate 24: Looking north





Site 8

382458.00 m E

6412346.00 m S

Plate 29: Looking East



Plate 31: Looking west





Plate 32: Looking north

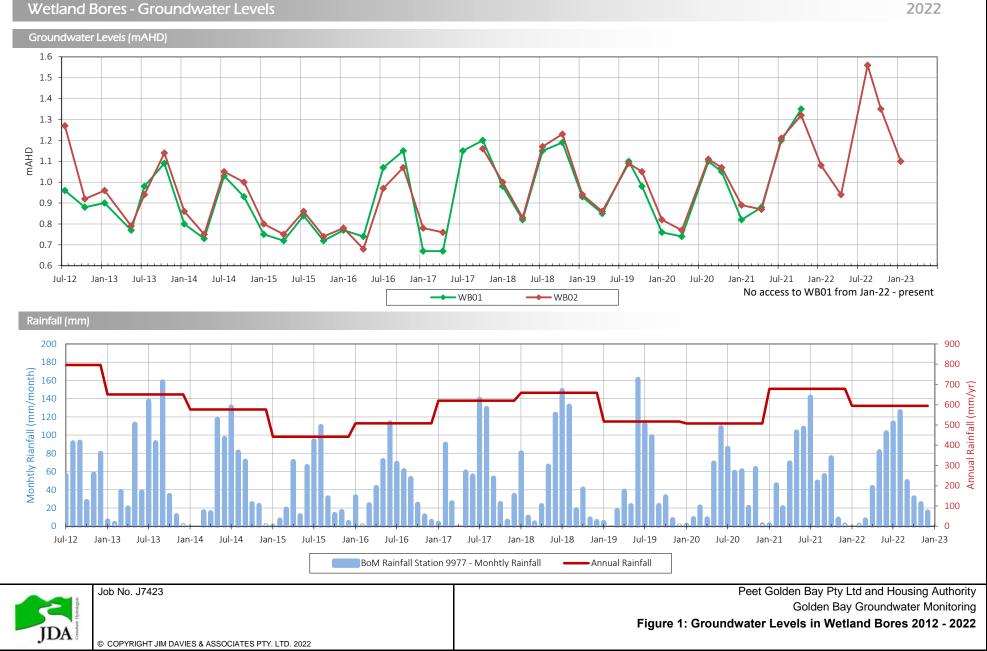




APPENDIX 3

GROUNDWATER LEVELS IN WETLAND BORES

Wetland Bores - Groundwater Levels



APPENDIX 6

QUENDA MONITORING SURVEY REPORTS



Quenda Monitoring Golden Bay

Autumn 2022

Prepared for: Peet Ltd

Version 1. May, 2022





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Appendix A. Quenda trapping results



EXECUTIVE SUMMARY

Peet Ltd, on behalf of Peet Ltd and the Department of Housing, requested a follow up monitoring survey of the Quenda (*Isoodon fusciventer*) population in the Foreshore Reserve adjacent to Lot 2, Warnbro Sound Ave, Golden Bay (i.e. 'project area'). This follows on from an initial survey in spring 2012 and subsequent monitoring surveys in autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021. Quenda (formerly part of the Southern Brown Bandicoot complex) monitoring is a requirement under the Ministerial Statement 150 and compliance reports are provided to the Office of the Environmental Protection Authority on an annual basis.

The Foreshore Reserve includes the foredune and swale, and the hinterland vegetation inland for about 400m from the ocean. The Foreshore Reserve includes a Conservation Category Wetland and a Threatened Ecological Community (TEC) that supported dense vegetation before it was burnt.

The project area was extensively burnt in January 2016 and the only continuous unburnt habitat that remained was in the southern end of the Foreshore Reserve. Since the burn in January 2016, there has been significant regrowth of vegetation across the entire burnt area.

In June 2019, vegetation was cleared for the construction of a sealed road and grassed area in the Foreshore dune area. The new sealed road enters from the southern end of the Foreshore Reserve, and there is now a large, cleared area between the wetland vegetation and foredunes. This area contains a playground and a formed track for bicycle riding, car parks at either end, and two access tracks to the beach. In July 2020, vegetation was cleared for the construction of a drain on the southern boundary adjacent to Solstice Grove. Construction of this area continued in August 2021, to build a sealed road that connects the playground carpark to the northern end of Marillana Drive, and to extend the subdivision. As part of these construction programs, some areas that we had previously trapped for Quenda were cleared of vegetation.

Quenda abundance has declined in 2022 compared with the previous four years. The population at Golden Bay often fluctuates in response to a combination of factors, including predator control and resource availability, however, construction activity, loss of habitat, reduced overall native vegetation, particularly east of the reserve and increasing access of feral predators into the bushland through fragmentation will inevitably result in a reduced population.

There is historical evidence of breeding in the Quenda population, however, as discussed in previous reports, very few juveniles are entering the adult population, strongly suggesting predation on the smaller sized Quenda is a major problem. There was no evidence of mange found during the current survey and all individuals were in good condition.

It is recommended that:

- 1. an active feral cat trapping program is continued on an ongoing basis;
- 2. an on-going fox trapping program is implemented in the reserve and surrounds. This may be combined with the City of Rockingham's annual trapping program; and
- 3. the rabbit reduction program using RHDV1 K5 is repeated again in autumn 2023.



1. INTRODUCTION

1.1 BACKGROUND

Peet Ltd, on behalf of Peet Ltd and the Department of Housing, requested a follow up monitoring survey of the Quenda (*Isoodon fusciventer*) population in the Foreshore Reserve adjacent to Lot 2, Warnbro Sound Ave, Golden Bay (i.e. 'project area'). This follows on from an initial survey in spring 2012 and subsequent monitoring surveys in autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021 (Terrestrial Ecosystems 2012, 2013b, a, 2014a, b, 2015a, b, 2016a, b, 2017b, a, 2018a, b, 2019a, b, 2020a, b, 2021a, b). Quenda (formerly part of the Southern Brown Bandicoot complex) monitoring is a requirement under the Ministerial Statement 150 and compliance reports are provided to the Office of the Environmental Protection Authority on an annual basis.

The Foreshore Reserve includes the foredune and swale, and the hinterland vegetation inland for about 400m from the ocean. The Foreshore Reserve includes a Conservation Category Wetland and a Threatened Ecological Community (TEC) that supported dense vegetation before it was burnt.

The project area was extensively burnt in January 2016 and the only continuous unburnt habitat that remained was in the southern end of the Foreshore Reserve. Since the burn in January 2016, there has been significant regrowth of vegetation across the entire burnt area.

In June 2019, vegetation was cleared for the construction of a sealed road and grassed area in the Foreshore dune area. The new sealed road enters from the southern end of the Foreshore Reserve, and there is now a large, cleared area between the wetland vegetation and foredunes (Figure 1). This area contains a playground and a formed track for bicycle riding, car parks at either end, and two access tracks to the beach. In July 2020, vegetation was cleared for the construction of a drain on the southern boundary adjacent to Solstice Grove. Construction of this area continued in August 2021, to build a sealed road that connects the playground carpark to the northern end of Marillana Drive, and to extend the subdivision. As part of these construction programs, some areas that we had previously trapped for Quenda were cleared of vegetation.

Due to the construction works and the regrowth in vegetation across the whole of the Foreshore Reserve, the location of traps was changed for the spring 2021 survey. For the current survey, we used the same number of traps and the same trap locations as spring 2021.

1.2 SCOPE OF THIS QUENDA SURVEY FOR LONG-TERM MONITORING

The Foreshore Reserve will remain public open space and the developer has made a commitment to monitor the health of the Quenda population on a twice yearly basis during the construction and development stages (PGV Environmental 2011).

Coffey Environments recorded eight Quenda in the reserve during its survey in mid-February 2010 (PGV Environmental 2011). It was reported that Quenda preferred scrubby, often swampy vegetation with a dense understorey of cover up to one metre high. The Threatened Ecological Community and wetland areas within the Foreshore Reserve were considered suitable habitat to sustain a bandicoot population in the long-term (PGV Environmental 2011).

A Quenda relocation program has been undertaken for each stage of development prior to vegetation clearing from Lot 2, Warnbro Sound Ave and Lot 3, Dampier Drive as required under Ministerial Statement 150. This program was implemented to minimise the impact of vegetation clearing on Quenda residing in these lots. All Quenda caught prior to the vegetation clearing program in July 2016 were relocated out of the monitoring area as there would have been insufficient habitat remaining to sustain this population given the area that had been burnt in January 2016.



The results of 19 previous monitoring surveys are shown in Table 1. This report provides the outcomes of the twentieth monitoring survey of Quenda in the Foreshore Reserve.

	Spring 2012	Winter 2013	Spring 2013	Winter 2014	Spring 2014	Autumn 2015	Spring 2015	Autumn 2016	Spring 2016	Autumn 2017	Spring 2017	Autumn 2018	Spring 2018	Autumn 2019	Spring 2019	Autumn 2020	Spring 2020	Autumn 2021	Spring 2021
# of indiv. captured	31	30	28	39	48	53	36	26	12	15	15	12	46	44	29	31	40	28	26
# of adult males	13	10	7	11	10	16	14	8	4	9	10	8	26	20	15	12	16	15	12
# of adult females	15	20	21	27	25	34	17	17	4	5	5	4	17	24	13	17	18	13	11
# of juvenile males	1			1						1						1	2		
# of juvenile females	2					3	5		4				1			1	3		3
# juvenile of unknown sex					12														
Unknown sex and age					1								2						
Unknown age								1F	<u> </u>						1F		1F		

Table 1. Number of Quenda in previous monitoring programs

* Notes -

Spring 2014 - there are 12 juveniles (less than 300g). No information available on weights

Autumn 2015 - 2 dead individuals included in table

Autumn 2016 - 2 females with no weight. One of them is an adult based on other measurements; other one has no measurements

Spring 2018- 2 adults with no data, one escaped.

Spring 2019- one male died (included in table). One female with no measurements

Spring 2020 – includes 4 individuals with chip reader fails.

The January 2016 fire was followed by a reduction in the population of Quenda in the reserve. The autumn 2018 survey report (Terrestrial Ecosystems 2018a) indicated that the vegetation in the burnt area had regenerated and much of the burnt section of the Foreshore Reserve could now support Quenda. To supplement the low Quenda population in the reserve, Quenda were relocated into the foreshore reserve from vegetation clearing projects at sites in east Rockingham, Florida and Madora Bay. All relocated Quenda had a microchip and were measured in a similar manner to those at Golden Bay.



2. BIOLOGY AND ECOLOGY OF QUENDA

The Quenda (*I. fusciventer*) is a medium-sized, ground-dwelling marsupial that belongs to the Peramelidae family (Van Dyck and Strahan 2008, Travouillon and Phillips 2018). Populations of Quenda occur widely throughout southern Western Australia (Rees and Paull 2000, Van Dyck and Strahan 2008). In 2018, Quenda was elevated to a full species and is now commonly called a Quenda in WA (Travouillon and Phillips 2018).

Isoodon fusciventer was listed as a Schedule 1 species (Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950* until 1998. An increase in the population, which was attributed to the implementation of fox baiting throughout the state, meant that in 1998 Quenda was removed from the threatened species list. Quenda is now listed as a Priority 4 species ('Taxa in need of monitoring') on the Department of Biodiversity, Conservation and Attractions' (DBCAs) Priority Fauna List.

Quenda are found in the wetter sections of the south-west of Western Australia, mostly along the Swan Coastal Plain from the Moore River to Walpole and the Fitzgerald River area. Populations of Quenda are found in a variety of habitats in this region and appear to be able to survive a level of habitat destruction and live close to urban and industrial developments. Quenda prefer habitats with a dense shrub understorey up to one metre high, but they are found in a variety of habitats including Banksia, Eucalypt and Melaleuca woodlands, but often in close proximity to a wetland where the vegetation is often more dense (Stoddard and Braithwaiter 1979, Ramalho et al. 2013). In areas of thick undergrowth, Quenda are able to establish runways that are difficult to detect beneath the interlocking vegetation (Craven 1981). They are vulnerable to cat, fox and dog predation and are occasionally seen dead on the roads in urban environments, with the result that they are increasingly under threat due to the clearing of bushland leading to habitat fragmentation, bushland degradation and predation by introduced predators including foxes, cats and dogs (Friend 1991).

Quenda and Southern Brown Bandicoots are both nocturnal and diurnal, but are mostly active during the day early in the morning or late afternoon (Van Dyck and Strahan 2008). Individuals are mostly solitary, but with overlapping home ranges. The home range size of Quenda decreases with increasing population size (Broughton and Dickman 1991). The smallest home range estimates of 2.1ha for males and 1.4ha for females were recorded for a high density population (1.3–1.4 animals/ha) on Franklin Island, South Australia (Copley et al. 1990). The largest home range estimates of 5.3ha for males and 2.3ha for females and were calculated for a low density population (0.07–0.2 animals/ha) in Tasmania (Heinsohn 1966). A study of Quenda in the Perth metropolitan area found that animals' increased their home range size and grazed in more open habitats in areas when predator control was implemented, compared to areas where there was no predator control (Gardner 2004).

Quenda are omnivorous, feeding on invertebrates (including earthworms, beetles and larvae), underground fungi, subterranean plant material, and occasionally small vertebrates such as lizards (Broughton and Dickman 1991). Quenda build a nest consisting of a heap of ground litter over a shallow depression providing an internal chamber with loose regions at both ends for entry and exit. The dense vegetation probably protects the nest from extremes in temperature and wind, rain and predators.

Heinsohn (1966) reported the sister species, the Southern Brown Bandicoots reach sexual maturity at five to six months of age when they weigh approximately 600g. As males produce sperm throughout the year, it is the reproductive activity of the female that determines the beginning and length of the breeding season (Heinsohn 1966). Breeding peaks in spring (Thomas 1987, Mallick et al. 1998) and females have a gestation period of 12 to 13 days and litters of one to six young are produced, although litters of two to four are most common. Two or three litters may be reared during a single breeding season, although this is dependent upon the availability of food resources (Friend 1991, Mallick et al. 1998) and rainfall (Barnes and Gemmell 1984).

Studies have reported the sex ratio of Southern Brown Bandicoots populations to be from 1.7 males to one female to 0.33 males to one female (Craven 1981, Thomas 1987, Mallick et al. 1998). The lifespan of the Quenda in the wild is estimated to be two to three years (Craven 1981).



3. METHODOLOGY

One hundred baited wire cage traps were set in locations shown in Figure 1. Traps were located around the periphery of the Foreshore Reserve in a similar location to the spring 2021 monitoring survey. All cage traps were baited with a peanut butter sandwich and were set for 10 nights between 28 March to 7 April 2022.

In addition, five large wire cage traps were set to catch feral cats. These traps had an internal, spring-loaded door and were baited with a tin of sardines. These traps were placed in the southern and northern areas of native vegetation (Figure 1), in the same locations as in the spring 2021 survey, during which the locations of the cat traps were altered due to the recent vegetation clearing and development.

All traps were baited when they were opened, when they had no bait and on every other day if they had bait. All traps had a shade cover and were placed under vegetation. Traps were cleared from first light each morning.

Trapping was conducted under License FR28000058. Captured Quenda were measured, weighed, sexed and released near the point of capture. All Quenda that had not previously been caught had a microchip inserted on the dorsal surface near the shoulder blades. Recaptured Quenda were identified and released near their site of capture.

3.1 DATA ANALYSIS

Trap success rate was determined by dividing the trapping effort by the number of Quenda caught per trapnight. There were 100 cage traps targeting Quenda, so the trapping effort was therefore 1,000 trap-nights. There were an additional 50 cat trap-nights however, Quenda were caught only in the small cage traps. Trapping data are compared with previous survey data.

3.2 SIGNS

As recommended in the winter 2014 monitoring report (Terrestrial Ecosystems 2014a) signs (Plate 1) were prepared by Peet, and set up by Terrestrial Ecosystems on each track leading into the survey area. These signs were designed to reduce the number of people and dogs interfering with traps and captured Quenda.



Plate 1. Sign placed near the end of an access track



4. **RESULTS AND DISCUSSION**

4.1 SURVEY MONITORING

The Quenda trapping results are shown in Appendix A. Nineteen individual Quenda were caught, with 14 females and 5 males. Six Quenda weighed 500g or less and two Quenda weighed less than 300g (i.e. juvenile). None of the females had pouch young. The overall trapping success was 18.4%, and 10.7% for Quenda. The Quenda trapping success was lower than previous survey rates (11.3% spring 2021, 14.7% in autumn 2021, 21.6% in spring 2020 and 15.1% in autumn 2020).

	Autumn 2022
Number of individuals captured	19
Number of males	5
Number of females	12
Number of male juveniles	-
Number of female juveniles	2

There were 107 separate Quenda capture events (i.e. an individual was caught) with the number of times an individual being caught varying between 1 and 10 (i.e. caught every day).

In addition to the Quenda (Plate 3), 30 bobtails (*Tiliqua rugosa*; Plate 4), 30 rats (*Rattus rattus*), eight house mice (*Mus musculus*; Plate 5), four rabbits (*Oryctolagus cuniculus*; Plate 6), two buff-banded rails (*Gallirallus philippensis*), one silvereye (*Zosterops lateralis*), one grey butcherbird (*Cracticus torquatus*) and one White-browed Scrubwren (*Sericornis frontalis*) were also caught.

All captured Quenda appeared healthy, and mange was not observed on any Quenda during this survey. Of the 19 Quenda caught, eight were caught for the first time during this monitoring program and did not have a microchip. The remaining eleven Quenda had been caught during previous monitoring surveys.

Two juvenile female Quenda (<300g) were captured while no immature males were captured. The immature females weighed 210g and 230g, respectively. The average weight of the adult males was 910g and adult females weighed an average of 485g (*note – four Quenda were weighed incorrectly so have been excluded from these calculations).

Four rabbits were captured during this survey and fresh fox, cat and rabbit tracks (Plate 5, 8 and 9) were observed on multiple occasions near the reserve boundaries. The vegetation clearing (Plates 10 and 11) across the Foreshore Reserve has increased predator access and foxes (and cats) will be predating on young Quenda and other small vertebrate fauna.

People were observed walking their dog(s) along the bank on the eastern side of the Foreshore Reserve and along the newly constructed road into the car park on the western side, but there was little sign of dogs being walked within the reserve.

Western Grey Kangaroos were observed on several days during the survey, as well as their tracks and scats. This indicated that there continues to be a small population of kangaroos in the Foreshore Reserve. Even though there is partial habitat linkage to other areas of remnant native vegetation, it is unlikely that the Western Grey Kangaroos are moving north to the golf course or south to Madora Bay.







Plate 2. Cage trap

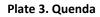




Plate 4. Bobtail



Plate 5. House Mouse

4.2 STATUS OF THE POPULATION

The total number of Quenda caught during this monitoring program (19) is lower than the previous seven surveys (to autumn 2018). The Foreshore Reserve population has now been supplemented on multiple occasions with Quenda from other areas, where vegetation clearing has removed their habitat. Additional Quenda were last relocated into the reserve in August 2021.

The number of adult females captured (12) is like the previous two surveys (11 and 13, respectively), while the number of adult males (5) is considerably lower. In previous surveys male captures have been around 10-15 individuals, and while this often fluctuates, single digit captures haven't occurred since autumn 2018.

It is very evident that few of the Quenda that are born each year are joining the adult population, almost certainly due to predation by large snakes, foxes and cats. Peet is funding an ongoing fox and cat reduction program, and the City of Rockingham's contractors occasionally trap foxes in this reserve. However, it is likely that the significant reduction in vegetation in the reserve, the new roads, infrastructure and grassed areas, and the lack of adjoining native vegetation along the eastern boundary, have also certainly had a very significant impact on the Quenda population. It is also likely that mature male quenda are now reaching the end of their lifespan and this combined with limited recruitment and habitat loss may result in further population decline.



4.3 WESTERN GREY KANGAROOS

Western Grey Kangaroos in the Foreshore Reserve and surrounds are very wary and largely remain out of sight. They were typically seen in the dense vegetation around the wetland area, although their tracks are occasionally seen on the sand on the eastern side of the reserve. It was not possible to estimate the population size, however, the number of observations during this monitoring program suggests that it either has not increased or the increase is small.

4.4 RABBITS

Based on the rabbit scats and tracks, the population of rabbits in the Foreshore Reserve and the adjacent beach dunes is at a similar level to previous surveys. Four rabbits were captured in the northern end of the reserve and diggings were observed in the sandy areas throughout the reserve.

4.5 REPTILES

Thirty Bobtails were caught during this survey, but we did not capture any snakes.



Plate 6. Rabbit



Plate 7. Rabbit tracks





Plate 8. Fox tracks







Plate 10. Construction area

Plate 11. Construction area



5. CONCLUSION

The regrowth in the vegetation since the January 2016 fire has provided good habitat for Quenda, particularly around the wetland areas (Plates 12 and 13). Although the regrowth has been appreciable in the non-wetland areas, few Quenda were caught in these areas. The vegetation regrowth is having a two-fold positive effect on the population, as it has increased suitable habitat and offers protection from feral predators. The Foreshore Reserve is probably able to support a population of ~50 Quenda, so there is scope for a population increase.



Plate 12. Regrowth in the sand dunes

Plate 13. Regrowth in the wetland area

The results of this trapping program show a decrease in the population, with the seven previous surveys (up to autumn 2018) having a greater number of individuals. The population at Golden Bay often fluctuates in response to a combination of factors, including predator control and resource availability. However, construction activity, loss of habitat, reduced overall native vegetation, particularly east of the reserve, and increasing access of feral predators to Quenda by vegetation clearing will inevitably result in a reduced population.

Despite all females having no pouch young this survey, there is evidence of breeding in the Quenda population. However, as discussed in previous reports, very few juveniles are entering the adult population, strongly suggesting predation on the smaller sized Quenda is a major problem. There was no evidence of mange found during the current survey and all individuals were in good condition.

As there are many fresh fox and cat prints found during this survey, the continuation of a management program for rabbits, cats and foxes in cooperation with the City of Rockingham for the coastal dune system is essential to maintaining a viable population of Quenda in the Foreshore Reserve.



6. **RECOMMENDATIONS**

It is recommended that:

- 1. an active feral cat trapping program is continued on an ongoing basis;
- 2. an on-going fox trapping program is implemented in the reserve and surrounds. This may be combined with the City of Rockingham's annual trapping program; and
- 3. the rabbit reduction program using RHDV1 K5 is repeated again in autumn 2023.



7. **REFERENCES**

- Barnes, A., and R. T. Gemmell. 1984. Correlations between breeding activity on the marsupial bandicoots and some environmental variables. Australian Journal of Zoology **32**:219-226.
- Broughton, S. K., and C. R. Dickman. 1991. The effect of supplementary food on home range of the Southern Brown Bandicoot, Isoodon obesulus (Marsupialia: Peramelidae). Australian Journal of Ecology **16**:71-78.
- Copley, P. B., V. T. Read, A. C. Robinson, and C. H. S. Watts. 1990. Preliminary studies of the Nuyts Archipelago bandicoot *Isoodon obesulus nauticus* on the Franklin Islands, South Australia. Pages 345-356 *in* J. H. Seebeck, P. R. Brown, R. L. Wallis, and C. M. Kemper, editors. Bandicoots and Bilbies. Surrey Beatty & Sons Pty Ltd, Chipping Norton, NSW.
- Craven, L. N. 1981. Ecology of a population of Quendas. Master of Science preliminary. University of Western Australia, Perth.
- Friend, T. 1991. Endangered Quenda. Landscope 7:15.
- Gardner, A. 2004. Habitat preference, home range and population demography of the Quenda (*Isoodon obesulus fusciventer*) in an urban environment. University of Western Australia, Perth.
- Heinsohn, G. E. 1966. Ecology and reproduction of the Tasmanian bandicoots (*Parmeles gunnii* and *Isoodon obesulus*). University of California Publications in Zoology **54**:1019-1024.
- Mallick, S. A., M. M. Driessen, and G. J. Hocking. 1998. Biology of the southern brown bandicoot (*Isoodon obesulus*) in south-eastern Tasmania. II. Demography. Australian Mammalogy **20**:339-347.
- PGV Environmental. 2011. Lot 2 Warnbro Sound Avenue and Lot 3 Dampier Drive Golden Bay Foreshore Management Plan. Perth.
- Ramalho, C. E., B. Glossop, G. Barrett, B. Wilson, N. Willers, and T. Friend. 2013. Modelling the potential habitat of the Quenda (*Isoodon obesulus fusciventer*) in the Swan Region, Western Australia. Perth.
- Rees, M., and D. Paull. 2000. Distribution of the Southern Brown Bandicoot (*Isoodon obesulus*) in the Portland region of south-western Victoria. Wildlife Research **27**:539-545.
- Stoddard, D. M., and R. W. Braithwaiter. 1979. A strategy for utilisation of regenerating heathland habitat by the brown bandicoot (*Isoodon obesulus*; Marsupialia: Peramelidae). Journal of Animal Ecology **48**:165-179.
- Terrestrial Ecosystems. 2012. Southern Brown Bandicoot Monitoring Golden Bay October November 2012. Perth.
- Terrestrial Ecosystems. 2013a. Southern Brown Bandicoot Monitoring Golden Bay August 2013. Perth.
- Terrestrial Ecosystems. 2013b. Southern Brown Bandicoot Monitoring Golden Bay May 2013. Perth.
- Terrestrial Ecosystems. 2014a. Southern Brown Bandicoot Monitoring Golden Bay May June 2014. Perth.
- Terrestrial Ecosystems. 2014b. Southern Brown Bandicoot Monitoring Golden Bay September October 2014. Perth.
- Terrestrial Ecosystems. 2015a. Southern Brown Bandicoot Monitoring Golden Bay March 2015. Perth.
- Terrestrial Ecosystems. 2015b. Southern Brown Bandicoot Monitoring Golden Bay September-October 2015. Perth.
- Terrestrial Ecosystems. 2016a. Southern Brown Bandicoot Monitoring Golden Bay Autumn 2016. Perth.
- Terrestrial Ecosystems. 2016b. Southern Brown Bandicoot Monitoring Golden Bay Spring 2016. Perth.
- Terrestrial Ecosystems. 2017a. Southern Brown Bandicoot Monitoring Golden Bay Autumn 2017. Perth.



Terrestrial Ecosystems. 2017b. Southern Brown Bandicoot Monitoring Golden Bay Spring 2017. Perth.

Terrestrial Ecosystems. 2018a. Quenda Monitoring Golden Bay - Autumn 2018. Perth.

Terrestrial Ecosystems. 2018b. Quenda Monitoring Golden Bay - Spring 2018. Perth.

Terrestrial Ecosystems. 2019a. Quenda Monitoring Golden Bay - Autumn 2019. Perth.

Terrestrial Ecosystems. 2019b. Quenda Monitoring Golden Bay - Spring 2019. Perth.

Terrestrial Ecosystems. 2020a. Quenda monitoring Golden Bay - Autumn 2020. Perth.

Terrestrial Ecosystems. 2020b. Quenda Monitoring Golden Bay - Spring 2020. Perth.

Terrestrial Ecosystems. 2021a. Quenda Monitoring Golden Bay - Autumn 2021. Perth.

Terrestrial Ecosystems. 2021b. Quenda Monitoring Golden Bay - Spring 2021. Perth.

- Thomas, L. N. 1987. The effects of stress on some aspects of the demography and physiology of *Isoodon obesulus*. University of Western Australia, Perth.
- Travouillon, K. J., and M. J. Phillips. 2018. Total evidence analysis of the phylogenetic relationships of bandicoots and bilbies (Marsupialia: Peramelemorphia): reassessment of two species and description of a new species. Zootaxa **4378**:224-256.

Van Dyck, S., and R. Strahan. 2008. The Mammals of Australia. Reed New Holland, Sydney.

Figures

DETECTION DOG

Quenda Monitoring Golden Bay Autumn 2022



Appendix A. Quenda trapping results

Quenda Monitoring Golden Bay Autumn 2022

ECTION



						Trapping days and number of trapped individuals											
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	29/3/22	30/3/22	31/3/22	1/4/22	2/4/22	3/4/22	4/4/22	5/4/22	6/4/22	7/4/22	Total	
F	610	78	31	55	7808BDC			1		1		1	1		1	5	
F	590	80	32	55	79D57A7	1	1	1	1	1	1	1	1	1	1	10	
М	950	90	36	62	79D585A	1	1	1	1	1	1	1	1	1	1	10	
F	680	72	35	55	79D5ADD	1	1	1		1	1	1	1	1	1	9	
М	1350	86	36	60	79D5C90									1		1	
F		78	30	54	7ABC9D5	1	1	1	1							4	
F	690	80	29	55	7AC1857	1	1		1	1		1				5	
F	470	77	32	55	7AC65A9		1		1		1	1	1		1	6	
F	410	76	29	52	7AC8D36					1		1	1	1	1	5	
F		79	31	55	7ACA518	1	1		1		1		1	1		6	
F	210	60	26	46	7E728C1	1			1		1	1			1	5	
F	340	64	28	49	7E72E85				1		1	1		1		4	
F	690	76	30	21	7E7315F								1	1	1	3	
М	570	65	28	49	7E7362C			1			1		1			3	
М	770	82	34	61	7E73C4A	1	1	1		1		1	1	1	1	8	
М		67	25	47	7E73C9D				1	1	1	1	1		1	6	
F	410	67	29	52	7E73F52				1	1		1		1		4	
F		61	32	50	7E7520B				1		1		1		1	4	
F	230	59	26	46	7E7A83A	1	1	1	1		1	1	1	1	1	9	





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Quenda Monitoring Golden Bay

Spring 2022

Prepared for: Peet Ltd

Version 1. March, 2023





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Appendix A. Quenda trapping results



EXECUTIVE SUMMARY

Peet Ltd, on behalf of Peet Ltd and the Department of Housing, requested a follow up monitoring survey of the Quenda (*Isoodon fusciventer*) population in the Foreshore Reserve adjacent to Lot 2, Warnbro Sound Ave, Golden Bay (i.e. 'project area'). This follows on from an initial survey in spring 2012 and subsequent monitoring surveys in autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021, and autumn 2022. Quenda (formerly part of the Southern Brown Bandicoot complex) monitoring is a requirement under the Ministerial Statement 150 and compliance reports are provided to the Office of the Environmental Protection Authority on an annual basis.

The Foreshore Reserve includes the foredune and swale, and the hinterland vegetation inland for about 400m from the ocean. The Foreshore Reserve includes a Conservation Category Wetland and a Threatened Ecological Community (TEC) that supported dense vegetation before it was burnt.

The project area was extensively burnt in January 2016 and the only unburnt habitat that remained was in the southern end of the Foreshore Reserve. Since the burn in January 2016, there has been significant regrowth of vegetation across the entire burnt area.

In June 2019, vegetation was cleared for the construction of a sealed road and grassed area in the foreshore dune area. The new sealed road enters from the southern end of the Foreshore Reserve, and there is now a large, cleared area between the wetland vegetation and foredunes. This area contains a playground and a formed track for bicycle riding, carparks at either end and two access tracks to the beach. In July 2020, vegetation was cleared for the construction of a drain on the southern boundary adjacent to Solstice Grove. Construction of this area continued in August 2021, to build a sealed road that connects the playground carpark to the northern end of Marillana Drive, and to extend the subdivision. As part of these construction programs, some areas that had previously been trapped for Quenda were cleared of vegetation.

Quenda abundance has declined in 2022 compared with all previous surveys. The population at Golden Bay often fluctuates in response to a combination of factors, including predator control and resource availability, however, construction activity, loss of habitat, reduced overall native vegetation, particularly east of the reserve and increasing access of feral predators into the bushland through fragmentation will inevitably result in a reduced population.

There is historical evidence of breeding in the Quenda population, however, as discussed in previous reports, very few juveniles are entering the adult population, strongly suggesting predation on the smaller sized Quenda is a major problem. There was no evidence of mange found during the current survey and all but one individual was in good condition.

It is recommended that:

- (1) a feral cat trapping program is undertaken on a twice-yearly basis until the Quenda population increases, and this may be combined with the City of Rockingham's annual trapping program;
- (2) a fox trapping program is undertaken on a twice-yearly basis until the Quenda population increases, and this may be combined with the City of Rockingham's annual trapping program; and
- (3) a rabbit reduction program using RHDV1 K5 is repeated in autumn 2023.



1. INTRODUCTION

1.1 BACKGROUND

Peet Ltd, on behalf of Peet Ltd and the Department of Housing, requested a follow up monitoring survey of the Quenda (*Isoodon fusciventer*) population in the Foreshore Reserve adjacent to Lot 2, Warnbro Sound Ave, Golden Bay (i.e. 'project area'). This follows on from an initial survey in spring 2012 and subsequent monitoring surveys in autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020 and 2021, and autumn 2022 (Terrestrial Ecosystems 2012, 2013b, a, 2014a, b, 2015a, b, 2016a, b, 2017a, b, 2018a, b, 2019a, b, 2020a, b, 2021a, b, 2022). Quenda (formerly part of the Southern Brown Bandicoot complex) monitoring is a requirement under the Ministerial Statement 150 and compliance reports are provided to the Office of the Environmental Protection Authority on an annual basis.

The Foreshore Reserve includes the foredune and swale, and the hinterland vegetation inland for about 400m from the ocean. The Foreshore Reserve includes a Conservation Category Wetland and a Threatened Ecological Community (TEC) that supported dense vegetation before it was burnt.

The project area was extensively burnt in January 2016 and the only continuous unburnt habitat that remained was in the southern end of the Foreshore Reserve. Since the burn in January 2016, there has been significant regrowth of vegetation across the entire burnt area.

In June 2019, vegetation was cleared for the construction of a sealed road and grassed area in the Foreshore dune area. The new sealed road enters from the southern end of the Foreshore Reserve, and there is now a large, cleared area between the wetland vegetation and foredunes (Figure 1). This area contains a playground and a formed track for bicycle riding, car parks at either end and two access tracks to the beach. In July 2020, vegetation was cleared for the construction of a drain on the southern boundary adjacent to Solstice Grove. Construction of this area continued in August 2021, to build a sealed road that connects the playground carpark to the northern end of Marillana Drive, and to extend the subdivision. As part of these construction programs, some areas that we had previously trapped for Quenda were cleared of vegetation.

Due to the construction works, flooding in the wetland and the regrowth in vegetation across the whole of the Foreshore Reserve, the location of traps was changed for the spring 2022 survey. We used the same number of traps and similar locations as spring 2021.

1.2 SCOPE OF THIS QUENDA SURVEY FOR LONG-TERM MONITORING

The Foreshore Reserve will remain public open space and the developer has made a commitment to monitor the health of the Quenda population on a twice yearly basis during the construction and development stages (PGV Environmental 2011).

Coffey Environments recorded eight Quenda in the reserve during its survey in mid-February 2010 (PGV Environmental 2011). It was reported that Quenda preferred scrubby, often swampy vegetation with a dense understorey of cover up to one metre high. The Threatened Ecological Community and wetland areas within the Foreshore Reserve were considered suitable habitat to sustain a bandicoot population in the long-term (PGV Environmental 2011).

A Quenda relocation program has been undertaken for each stage of development prior to vegetation clearing from Lot 2, Warnbro Sound Ave and Lot 3, Dampier Drive as required under Ministerial Statement 150. This program was implemented to minimise the impact of vegetation clearing on Quenda residing in these lots. All Quenda caught prior to the vegetation clearing program in July 2016 were relocated out of the monitoring area as there would have been insufficient habitat remaining to sustain this population given the area that had been burnt in January 2016.



The results of twenty previous monitoring surveys are shown in Table 1. This report provides the outcomes of the twenty-first monitoring survey of Quenda in the Foreshore Reserve.

	Spring 2012	Winter 2013	Spring 2013	Winter 2014	Spring 2014	Autumn 2015	Spring 2015	Autumn 2016	Spring 2016	Autumn 2017	Spring 2017	Autumn 2018	Spring 2018	Autumn 2019	Spring 2019	Autumn 2020	Spring 2020	Autumn 2021	Spring 2021	Autumn 2022
# of indiv. captured	31	30	28	39	48	53	36	26	12	15	15	12	46	44	29	31	40	28	26	19
# of adult males	13	10	7	11	10	16	14	8	4	9	10	8	26	20	15	12	16	15	12	5
# of adult females	15	20	21	27	25	34	17	17	4	5	5	4	17	24	13	17	18	13	11	12
# of juvenile males	1			1						1						1	2			
# of juvenile females	2					3	5		4				1			1	3		3	2
# juvenile of unknown sex					12															
Unknown sex and age					1								2							
Unknown age								1F							1F		1F			

Table 1. Number of Quenda in previous monitoring programs

* Notes -

Spring 2014 - there are 12 juveniles (less than 300g) and there was no information available on body weights

Autumn 2015 - 2 dead individuals included in table

Autumn 2016 – 2 females with no weight and 1 of them was an adult based on other measurements; the other one has no measurements recorded Spring 2018 - 2 adults with no data, one escaped.

Spring 2019 - one male died (included in table) and 1 female with no measurements recorded

Spring 2020 – includes 4 individuals where the chip reader failed.

The January 2016 fire was followed by a reduction in the population of Quenda in the reserve. The autumn 2018 survey report (Terrestrial Ecosystems 2018a) indicated that the vegetation in the burnt area had regenerated and much of the burnt section of the Foreshore Reserve could now support Quenda. To supplement the low Quenda population in the reserve, Quenda were relocated into the foreshore reserve from vegetation clearing projects at sites in east Rockingham, Florida and Madora Bay. All relocated Quenda had a microchip and were measured in a similar manner to those at Golden Bay.



2. BIOLOGY AND ECOLOGY OF QUENDA

The Quenda (*I. fusciventer*) is a medium-sized, ground-dwelling marsupial that belongs to the Peramelidae family (Van Dyck and Strahan 2008, Travouillon and Phillips 2018). Populations of Quenda occur widely throughout southern Western Australia (Rees and Paull 2000, Van Dyck and Strahan 2008). In 2018, the Western Australian Southern Brown Bandicoot was elevated to a full species and is now commonly called a Quenda in WA (Travouillon and Phillips 2018).

Isoodon fusciventer was listed as a Schedule 1 species (Fauna that is rare or likely to become extinct) under the Western Australian *Wildlife Conservation Act 1950* until 1998. An increase in the population, which was attributed to the implementation of fox baiting throughout the state, meant that in 1998 Quenda was removed from the threatened species list. Quenda is now listed as a Priority 4 species ('Taxa in need of monitoring') on the Department of Biodiversity, Conservation and Attractions' (DBCAs) Priority Fauna List.

Quenda are found in the wetter sections of the south-west of Western Australia, mostly along the Swan Coastal Plain from the Moore River to Walpole and the Fitzgerald River area. Populations of Quenda are found in a variety of habitats in this region and appear to be able to survive a level of habitat destruction and live close to urban and industrial developments. Quenda prefer habitats with a dense shrub understorey up to one metre high, but they are found in a variety of habitats including Banksia, Eucalypt and Melaleuca woodlands, but often in close proximity to a wetland where the vegetation is often more dense (Stoddard and Braithwaiter 1979, Ramalho et al. 2013). In areas of thick undergrowth, Quenda are able to establish runways that are difficult to detect beneath the interlocking overlying vegetation (Craven 1981). They are vulnerable to cat, fox and dog predation and are occasionally seen dead on the roads in urban environments, with the result that they are increasingly under threat due to the clearing of bushland leading to habitat fragmentation, bushland degradation and predation by introduced predators including foxes, cats and dogs (Friend 1991).

Quenda and its sister species, the Southern Brown Bandicoot, are both nocturnal and diurnal, but are mostly active during the day early in the morning or late afternoon (Van Dyck and Strahan 2008). Individuals are mostly solitary, but with overlapping home ranges. The home range size of Quenda decreases with increasing population size (Broughton and Dickman 1991). The smallest home range estimates of 2.1ha for males and 1.4ha for females were recorded for a high density population (1.3–1.4 animals/ha) on Franklin Island, South Australia (Copley et al. 1990). The largest home range estimates of 5.3ha for males and 2.3ha for females and were calculated for a low density population (0.07–0.2 animals/ha) in Tasmania (Heinsohn 1966). A study of Quenda in the Perth metropolitan area found that animals' increased their home range size and grazed in more open habitats in areas when predator control was implemented, compared to areas where there was no predator control (Gardner 2004).

Quenda are omnivorous, feeding on invertebrates (including earthworms, beetles and larvae), underground fungi, subterranean plant material, and occasionally small vertebrates such as lizards (Broughton and Dickman 1991). Quenda build a nest consisting of a heap of ground litter over a shallow depression providing an internal chamber with loose regions at both ends for entry and exit. The dense vegetation probably protects the nest from extremes in temperature and wind, rain and predators.

Heinsohn (1966) reported the sister species, the Southern Brown Bandicoots, reach sexual maturity at five to six months of age when they weigh approximately 600g. As males produce sperm throughout the year, it is the reproductive activity of the female that determines the beginning and length of the breeding season (Heinsohn 1966). Breeding peaks in spring (Thomas 1987, Mallick et al. 1998) and females have a gestation period of 12 to 13 days and litters of one to six young are produced, although litters of two to four are most common. Two or three litters may be reared during a single breeding season, although this is dependent upon the availability of food resources (Friend 1991, Mallick et al. 1998) and rainfall (Barnes and Gemmell 1984).



Studies have reported the sex ratio of Southern Brown Bandicoots populations to be from 1.7 males to one female to 0.33 males to one female (Craven 1981, Thomas 1987, Mallick et al. 1998). The lifespan of the Quenda in the wild is estimated to be two to three years (Craven 1981).



3. METHODOLOGY

One hundred baited wire cage traps were set in locations shown in Figure 1. Traps were located around the periphery of the Foreshore Reserve in a similar location to the spring 2021 monitoring survey. All cage traps were baited with a peanut butter sandwich and were set for 10 nights between 19 to 29 September 2022.

In addition, five large wire cage traps were set to catch feral cats. These traps had an internal, spring-loaded door and were baited with a tin of sardines. These traps were placed in the southern and northern areas of native vegetation (Figure 1), in the same locations as in the spring 2021 survey, during which the locations of the cat traps were altered due to the recent vegetation clearing and development.

All traps were baited when they were opened, when they had no bait and on every other day if they had bait. All traps had a shade cover and were placed under vegetation. Traps were cleared from first light each morning.

Trapping was conducted under License FR28000058. Captured Quenda were measured, weighed, sexed and released near the point of capture. All Quenda that had not previously been caught had a microchip inserted on the dorsal surface near the shoulder blades. Recaptured Quenda were identified and released near their site of capture.

3.1 DATA ANALYSIS

Trap success rate was determined by dividing the trapping effort by the number of Quenda caught per trapnight. There were 100 cage traps targeting Quenda, so the trapping effort was therefore 1,000 trap-nights. There were an additional 50 cat trap-nights however, Quenda were caught only in the small cage traps. Trapping data are compared with previous survey data.

3.2 SIGNS

As recommended in the winter 2014 monitoring report (Terrestrial Ecosystems 2014a) signs (Plate 1) were prepared by Peet, and set up by Terrestrial Ecosystems on each track leading into the survey area. These signs were designed to reduce the number of people and dogs interfering with traps and captured Quenda.



Plate 1. Sign placed near the end of an access track



4. **RESULTS AND DISCUSSION**

4.1 SURVEY MONITORING

The Quenda trapping results are shown in Appendix A. Nine individual Quenda were caught, with six females and three males. Five Quenda weighed 500g or less and two Quenda weighed less than 300g (i.e. juvenile). Five of the females had pouch young or an active pouch. The overall trapping success was 17% and 5.1% for Quenda. The Quenda trapping success was lower than previous survey rates (10.7% autumn 2022, 11.3% spring 2021, 14.7% in autumn 2021 and 21.6% in spring 2020).

	Spring 2022
Number of individuals captured	9
Number of adult males	2
Number of adult females	5
Number of male juveniles	1
Number of female juveniles	1

There were 51 separate Quenda capture events (i.e. an individual was caught) with the number of times an individual being caught varying between 1 and 9 (i.e. caught almost every day).

In addition to the Quenda (Plate 3), 51 bobtails (*Tiliqua rugosa*; Plate 4), 30 rats (*Rattus rattus*), 14 silvereyes (*Zosterops lateralis*), 11 house mice (*Mus musculus*; Plate 5), six rabbits (*Oryctolagus cuniculus*; Plate 6) and six White-browed Scrubwrens (*Sericornis frontalis*) were also caught.

Most captured Quenda appeared healthy, and mange was not observed on any Quenda during this survey. One adult male was found dead in a trap but there were no obvious signs of sickness or injury. Of the nine Quenda caught, two were caught for the first time during this monitoring program and did not have a microchip. The remaining seven Quenda had been caught during previous monitoring surveys.

Two juveniles (<300g) were captured – one female and one male. The female weighed 80g and the male weighed 120g. The average weight of the adult males was 800g and adult females was 556g.

Six rabbits were captured during this survey and fresh fox, cat, and rabbit diggings (Plates 7, 8 and 9) were observed on multiple occasions near the reserve boundaries. The vegetation clearing (Plates 10 and 11) across the Foreshore Reserve has increased predator access and foxes and cats will be predating on young Quenda and other small vertebrate fauna.

People were observed walking their dog(s) along the bank on the eastern side of the Foreshore Reserve and along the newly constructed road into the car park on the western side, but there was little sign of dogs being walked within the reserve.

Western Grey Kangaroos were observed on several days during the survey, as well as their tracks and scats. This indicated that there continues to be a small population of kangaroos in the Foreshore Reserve. Even though there is partial habitat linkage to other areas of remnant native vegetation, it is unlikely that the Western Grey Kangaroos are moving north to the golf course or south to Madora Bay.







Plate 3. Quenda



Plate 2. Cage trap

Plate 4. Bobtail



Plate 5. House Mouse

4.2 STATUS OF THE POPULATION

The total number of Quenda caught during this monitoring program (9) is considerably lower than all previous surveys (to 2012). The Foreshore Reserve population has now been supplemented on multiple occasions with Quenda from other areas, where vegetation clearing has removed their habitat. Additional Quenda were last relocated into the reserve in August 2021.

It is very evident that few of the Quenda that are born each year are joining the adult population, almost certainly due to predation by large snakes, foxes and cats. Peet is funding an ongoing fox and cat reduction program, and the City of Rockingham's contractors occasionally trap foxes in this reserve. However, it is likely that the reduction in vegetation in the reserve, the new roads, infrastructure and grassed areas, and the lack of adjoining native vegetation along the eastern boundary, have had a significant impact on the Quenda population. It is also clear that mature male quenda are now reaching the end of their lifespan and this combined with limited recruitment and habitat loss has resulted in a further population decline.



4.3 WESTERN GREY KANGAROOS

Western Grey Kangaroos in the Foreshore Reserve and surrounds are very wary and largely remain out of sight. They were typically seen in the dense vegetation around the wetland area, although their tracks are occasionally seen on the sand on the eastern side of the reserve. It was not possible to estimate the population size, however, the number of observations during this monitoring program suggests that it either has not increased or the increase is small.

4.4 RABBITS

Based on the rabbit scats and tracks, the population of rabbits in the Foreshore Reserve and the adjacent beach dunes is at a similar level to previous surveys. Six rabbits were captured across the reserve and diggings were observed in the sandy areas throughout the reserve.

4.5 REPTILES

Fifty-one Bobtails were caught during this survey, but we did not capture any snakes.



Plate 6. Rabbit



Plate 7. Rabbit diggings





Plate 8. Fox tracks







Plate 10. Construction area

Plate 11. Construction area



5. CONCLUSION

The regrowth in the vegetation since the January 2016 fire has provided good habitat for Quenda, particularly around the wetland areas (Plates 12 and 13). Although the regrowth has been appreciable in the non-wetland areas, few Quenda were caught in these areas. The vegetation regrowth is having a two-fold positive effect on the population, as it has increased suitable habitat and offers protection from feral predators. The Foreshore Reserve is probably able to support a population of ~50 Quenda, so there is scope for a population increase.





Plate 12. Regrowth in the sand dunes

Plate 13. Regrowth in the wetland area

The results of this trapping program show an appreciable decrease in the population, with all previous surveys having a greater number of individuals. The population at Golden Bay often fluctuates in response to a combination of factors, including predator control and resource availability. However, construction activity, loss of habitat, reduced overall native vegetation, particularly east of the reserve, and increasing access of feral predators to Quenda by vegetation clearing will inevitably result in a reduced population.

There is evidence of breeding in the Quenda population and two juveniles were captured this survey. However, as discussed in previous reports, very few juveniles are entering the adult population, strongly suggesting predation on the smaller sized Quenda is a major problem. There was no evidence of mange found during the current survey and all but one individual was in good condition.

As there are many fresh fox and cat prints found during this survey, the continuation of a management program for rabbits, cats, and foxes in cooperation with the City of Rockingham for the coastal dune system is essential to maintaining a viable population of Quenda in the Foreshore Reserve. It is evident that the fox and cat trapping program undertaken by the City of Rockingham is inadequate as there was an abundance of fox and cat tracks which almost certainly indicates multiple foxes in the Foreshore Reserve and domestic cats from the adjacent properties are regularly visiting the area.



6. **RECOMMENDATIONS**

It is recommended that:

- (1) a feral cat trapping program is undertaken on a twice-yearly basis until the Quenda population increases, and this may be combined with the City of Rockingham's annual trapping program;
- (2) a fox trapping program is undertaken on a twice-yearly basis until the Quenda population, and this may be combined with the City of Rockingham's annual trapping program; and
- (3) a rabbit reduction program using RHDV1 K5 is repeated again in autumn 2023.



7. **REFERENCES**

- Barnes, A., and R. T. Gemmell. 1984. Correlations between breeding activity on the marsupial bandicoots and some environmental variables. Australian Journal of Zoology **32**:219-226.
- Broughton, S. K., and C. R. Dickman. 1991. The effect of supplementary food on home range of the Southern Brown Bandicoot, Isoodon obesulus (Marsupialia: Peramelidae). Australian Journal of Ecology **16**:71-78.
- Copley, P. B., V. T. Read, A. C. Robinson, and C. H. S. Watts. 1990. Preliminary studies of the Nuyts Archipelago bandicoot *Isoodon obesulus nauticus* on the Franklin Islands, South Australia. Pages 345-356 *in* J. H. Seebeck, P. R. Brown, R. L. Wallis, and C. M. Kemper, editors. Bandicoots and Bilbies. Surrey Beatty & Sons Pty Ltd, Chipping Norton, NSW.
- Craven, L. N. 1981. Ecology of a population of Quendas. Master of Science preliminary. University of Western Australia, Perth.
- Friend, T. 1991. Endangered Quenda. Landscope 7:15.
- Gardner, A. 2004. Habitat preference, home range and population demography of the Quenda (*Isoodon obesulus fusciventer*) in an urban environment. University of Western Australia, Perth.
- Heinsohn, G. E. 1966. Ecology and reproduction of the Tasmanian bandicoots (*Parmeles gunnii* and *Isoodon obesulus*). University of California Publications in Zoology **54**:1019-1024.
- Mallick, S. A., M. M. Driessen, and G. J. Hocking. 1998. Biology of the southern brown bandicoot (*Isoodon obesulus*) in south-eastern Tasmania. II. Demography. Australian Mammalogy **20**:339-347.
- PGV Environmental. 2011. Lot 2 Warnbro Sound Avenue and Lot 3 Dampier Drive Golden Bay Foreshore Management Plan. Perth.
- Ramalho, C. E., B. Glossop, G. Barrett, B. Wilson, N. Willers, and T. Friend. 2013. Modelling the potential habitat of the Quenda (*Isoodon obesulus fusciventer*) in the Swan Region, Western Australia. Perth.
- Rees, M., and D. Paull. 2000. Distribution of the Southern Brown Bandicoot (*Isoodon obesulus*) in the Portland region of south-western Victoria. Wildlife Research **27**:539-545.
- Stoddard, D. M., and R. W. Braithwaiter. 1979. A strategy for utilisation of regenerating heathland habitat by the brown bandicoot (*Isoodon obesulus*; Marsupialia: Peramelidae). Journal of Animal Ecology **48**:165-179.
- Terrestrial Ecosystems. 2012. Southern Brown Bandicoot Monitoring Golden Bay October November 2012. Perth.
- Terrestrial Ecosystems. 2013a. Southern Brown Bandicoot Monitoring Golden Bay August 2013. Perth.
- Terrestrial Ecosystems. 2013b. Southern Brown Bandicoot Monitoring Golden Bay May 2013. Perth.
- Terrestrial Ecosystems. 2014a. Southern Brown Bandicoot Monitoring Golden Bay May June 2014. Perth.
- Terrestrial Ecosystems. 2014b. Southern Brown Bandicoot Monitoring Golden Bay September October 2014. Perth.
- Terrestrial Ecosystems. 2015a. Southern Brown Bandicoot Monitoring Golden Bay March 2015. Perth.
- Terrestrial Ecosystems. 2015b. Southern Brown Bandicoot Monitoring Golden Bay September-October 2015. Perth.
- Terrestrial Ecosystems. 2016a. Southern Brown Bandicoot Monitoring Golden Bay Autumn 2016. Perth.
- Terrestrial Ecosystems. 2016b. Southern Brown Bandicoot Monitoring Golden Bay Spring 2016. Perth.
- Terrestrial Ecosystems. 2017a. Southern Brown Bandicoot Monitoring Golden Bay Autumn 2017. Perth.



Terrestrial Ecosystems. 2017b. Southern Brown Bandicoot Monitoring Golden Bay Spring 2017. Perth.

Terrestrial Ecosystems. 2018a. Quenda Monitoring Golden Bay - Autumn 2018. Perth.

Terrestrial Ecosystems. 2018b. Quenda Monitoring Golden Bay - Spring 2018. Perth.

Terrestrial Ecosystems. 2019a. Quenda Monitoring Golden Bay - Autumn 2019. Perth.

Terrestrial Ecosystems. 2019b. Quenda Monitoring Golden Bay - Spring 2019. Perth.

Terrestrial Ecosystems. 2020a. Quenda monitoring Golden Bay - Autumn 2020. Perth.

Terrestrial Ecosystems. 2020b. Quenda Monitoring Golden Bay - Spring 2020. Perth.

Terrestrial Ecosystems. 2021a. Quenda Monitoring Golden Bay - Autumn 2021. Perth.

Terrestrial Ecosystems. 2021b. Quenda Monitoring Golden Bay - Spring 2021. Perth.

- Thomas, L. N. 1987. The effects of stress on some aspects of the demography and physiology of *Isoodon obesulus*. University of Western Australia, Perth.
- Travouillon, K. J., and M. J. Phillips. 2018. Total evidence analysis of the phylogenetic relationships of bandicoots and bilbies (Marsupialia: Peramelemorphia): reassessment of two species and description of a new species. Zootaxa **4378**:224-256.

Van Dyck, S., and R. Strahan. 2008. The Mammals of Australia. Reed New Holland, Sydney.

Figures

DETECTION DOG

Quenda Monitoring Golden Bay Spring 2022



Appendix A. Quenda trapping results

Quenda Monitoring Golden Bay Spring 2022

ECTION



						Trapping days and number of trapped individuals											
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	20/9/2022	21/9/2022	22/9/2022	23/9/2022	24/9/2022	25/9/2022	26/9/2022	27/9/2022	28/9/2022	29/9/2022	Total	
F	440	73	30	55	7808BDC			1		1	1	1		1		5	
F	620	77	34	54	79D5ADD	1	1	1	1		1	1	1	1	1	9	
м	1120	84	40	55	79D5C90		1	1	1	1		1	1			6	
F	430	65	37	48	7AC65A9		1	1	1	1				1		5	
F	760	81	34	57	7ACA518	1	1	1			1		1		1	6	
М	480	83	29	51	7E7362C	1	1	1	1	1		1	1	1	1	9	
F	530	74	34	-	7E73F52		1		1		1	1	1	1	1	7	
М	120	67	33	33	7E74E56/7E754B8						1		1		1	3	
F	80	61	27	54	7E755C3									1		1	



2022-0095-003-gt



8 September 2022

Kasia Majewski Development Manager Peet Ltd Level 7, 200 St Georges Terrace Perth WA 6000

Re: Fauna management - Golden Bay Stage 5H and 5I

Dear Kasia

Terrestrial Ecosystems is pleased to provide a report on the vertebrate fauna management program prior to and during the vegetation clearing program for Golden Bay Stage 5H and 5I.

All fauna we caught under a Regulation 28 Licence #FR28000058.

Baited cage traps were deployed between 15 and 19 August 2022, and a zoologist was on-site to catch and translocate vertebrate fauna between 22-24, 26 and 29 August 2022.

Six South-western Spiny-tailed Geckos (*Strophurus spinigerus*), one Bobtail (*Tiliqua rugosa*), one Western Blue-tongue (*Tiliqua occipitalis*), one West-coast Laterite Ctenotus (*Ctenotus fallens*) and two house mice (*Mus musculus*) were caught during the trapping and fauna salvage programs.

Images attached are of some of the translocated fauna and the vegetation clearing.

Please do not hesitate to contact the undersigned on 0407 385 239 should you have any queries.

Yours faithfully

hompson

Dr Scott Thompson Principal Zoologist and Partner

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Plate 3. West-coast Laterite Ctenotus





Plate 2. Bobtail



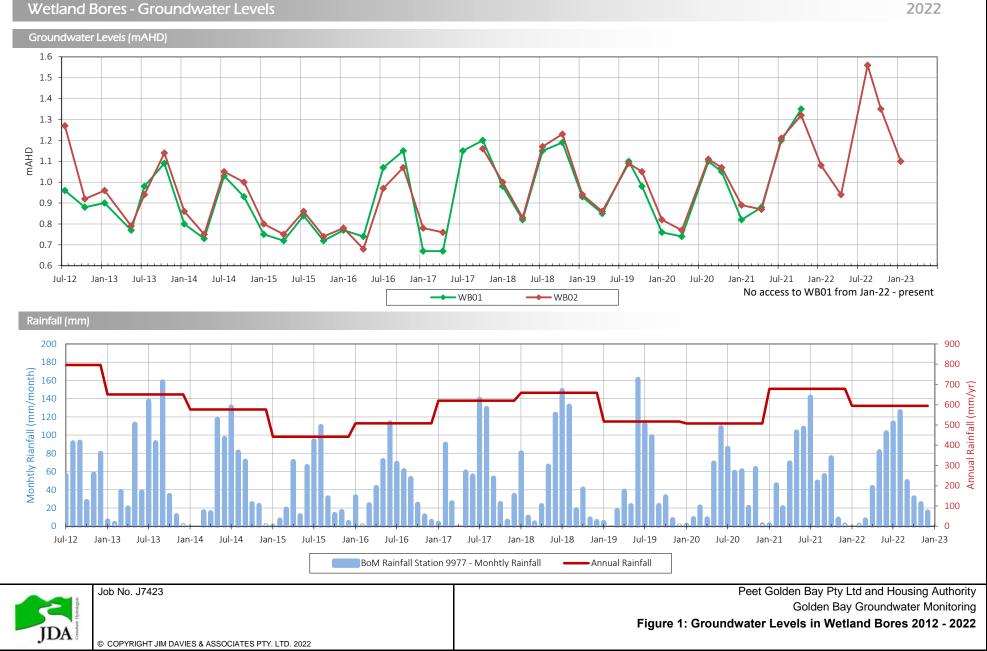
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Plate 5. Vegetation clearing

Plate 6. Vegetation clearing

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Wetland Bores - Groundwater Levels



APPENDIX 8 LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY

LOT 9027 DAMPIER DRIVE, GOLDEN BAY

LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY

Prepared for:		Peet Golden Bay Pty Ltd		
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1 INTRODUCTION

Lot 9027 Dampier Drive Golden Bay is located approximately 20km south of the Rockingham City Centre (Figure 1) in the City of Rockingham.

The Lot is zoned for urban development in the Metropolitan Region Scheme and the City of Rockingham Town Planning Scheme No 2. A Structure Plan has been approved for the Lot with modifications to the southern area through a subdivision approval in 2019. The Plan includes a mix of residential lots, Public Open Space and a Landscape Protection Area.

The requirement to include a Landscape Protection Area in the development of the Lot dates back to the original environmental approval for development in the early 1990s. Urban development of the Lot (formerly called Lot 3 Dampier Drive) was assessed by the Environmental Protection Authority (EPA) in 1992 and granted environmental approval through Ministerial Statement (MS) 297 in January 1993. Condition 4-1 of MS 297 required planning measures to recognise and protect the landscape value of the parabolic dune ridge on the Lot. To meet the condition, the Golden Bay Landscape Protection Management Plan was prepared by Mitchell Goff and Associates in November 1994. The Management Plan was approved by the EPA and other agencies.

Given the nearly 25-year date of the Landscape Protection Management Plan, the developers have committed to preparing an updated Management Plan for the Landscape Protection Area (LPA). The updated plan is currently being prepared. This Baseline Flora, Vegetation and Weed Survey report has been prepared to provide a description of the current status of the vegetation in the LPA and to assist in identifying any management actions to be included in the Management Plan.

2 LANDSCAPE PROTECTION AREAS

2.1 General Description

The boundary of the Landscape Protection Area (LPA) included in the Concept Development Plan is generally in accordance with the boundaries of the LPA as approved in 1994.

The LPA was chosen for a number of reasons, but primarily for the retention of significant landscape features but also to provide a buffer to existing housing development as it was in 1994. The LPA contains four areas, described in the original Management Plan as:

- The retained Central Dune;
- The Western Interface Reserve;
- The South Western Face or Southern Boundary; and
- The Mandurah Hill Area (Figure 2)

These names have been retained with slight modification in this report.

A review of the LPA by the developer's civil engineers identified some significant topographical constraints with respect to being able to develop residential lots and streets adjacent to some of the steeper sections of the LPA. As a result, some additional Public Open Space (POS) has been added to the South Western area that effectively enlarges the LPA in this area by a considerable amount.

Some other part of the LPA required vegetation to be cleared in the LPA to provide a stable interface between the residential development and the steep dunes of the LPA. Some earthworks into the LPA were deemed to be acceptable in the original Management Plan. These areas on the northern side of the LPA adjacent to the first stages of development on the Lot and have been cleared, re-graded and revegetated.

The total area of the LPA, including the additional POS in the South Western Area is around 15.5ha.

2.2 Central Dune

The Central Dune area contains the highest parts of the Lot with to peaks at 34-37m AHD. The land slopes down steeply to the north, east and south of the peaks. The area slopes more gently down to the west and joins up with the Western Interface part of the LPA.

2.3 Western Interface

The Western Interface area extends north-south along the central western boundary of the Lot for approximately 420m and varies in width from 60m - 150m. The landform is more undulating than the Central Dune area with some dune ridges and swales ranging in elevation from 11-22m AHD.

The northern end of the Western Interface area has already been ceded as a Conservation Reserve to the City of Rockingham.

2.4 South Western Interface

The South Western Interface extends along the south-western part of the Lot and includes a small original LPA section and a larger POS section. The LPA section is only about 30m wide from north to south and includes a narrow west-east ridge that slopes steeply down to the south and north. As a result of the steep contours an additional area of POS was added, making the area 80-120m wide.

2.5 Mandurah Hill Area

The south-east area of the LPA includes a portion of Mandurah Hill which has its peak at 42m AHD very close to the southeastern boundary of the area. The Mandurah Hill area slopes down from the high point in the south-east corner to low points on the western and northern boundaries around 23m AHD.

3 METHODOLOGY

3.1 Flora and Vegetation Survey

A Detailed Flora and Vegetation Survey was undertaken in accordance with the *EPA Technical Guidance: Flora and Vegetation Surveys* (EPA, 2016). The survey included the following:

- Review of previous flora and vegetation reports for Golden Bay;
- Desktop search and review of the Department of Biodiversity, Conservation and Attractions (DBCA) Naturemap database to determine if any species that have been listed since the previous studies were completed have been recorded in the area;
- Examination of historic and recent aerial photography and contour and soil maps to provisionally identify vegetation types and condition;
- Field survey using quadrats to record native and introduced species as well as a thorough site walkover of any areas of native vegetation;
- Recording of any significant plant species using a hand-held GPS;
- Description and mapping of vegetation types and vegetation condition; and
- Compilation of a flora list.

3.2 Weed Survey

A weed survey was undertaken using a 20m x 20m grid pattern, recording significant weed species and coverage at each intersecting point (Appendix 1).

Significant weeds were those that are:

- Weeds listed under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- Weeds of National Significance (WoNS);
- Priority weeds identified as being priority weeds in their reserves as identified in the *Reserve Prioritisation Report* (City of Rockingham, 2015); or
- Weeds listed in Environmental weed census and prioritisation, Swan NRM Region 2008.

Significant Weeds were recorded and mapped in accordance with *Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands* (SOP 22.1) (DEC, 2011) and *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (Technical Guidance) (Government of Western Australia, 2016). Weed occurrences were captured using a hand-held GPS.

The coverage of the significant weeds was rated using the Braun-Blanquet scale as per the SOP 22.1 as follows:

- 1 = Less than 5% cover
- 2 = 6 75 % cover
- 3 = 76 100 % cover

4 RESULTS

4.1 Timing

The 2020 flora and vegetation survey was undertaken on 16 October 2020 and the weed survey was undertaken on 19 October 2020.

4.2 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 1 in order to assess the adequacy of the survey. In summary there were no constraints to the survey.

Issue	Constraints (Y/N)*	Comment
Competency/experience of the consultant conducting the survey	No	Dr Paul van der Moezel has extensive botanical survey experience in the Perth Metropolitan Region, including previous surveys on the subject land
Proportion of the flora identified [^]	Yes	The timing of the survey in mid-October was optimal to identify all flora species on the site.
Sources of information (historic/recent or new data)	No	The flora in the Perth Metropolitan Region is well documented.
Proportion of the task achieved and further work that may need to be undertaken	No	No follow-up survey required as no conservation significant flora expected to occur in other seasons
Timing/weather/season/cycle	No	The survey was undertaken in mid- spring. 2020 was a good year for ephemeral species despite slightly lower rainfall in the region.
Disturbances (Fire)	No	The fire age of the vegetation was mostly greater than 5 years with some areas burnt less than 5 years ago but recovering well.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No	The time spent on the site (approx. 7hr) was considered adequate for the size of
Completeness (e.g. was relevant area fully surveyed)	No	the site (15.5ha), ease of access and low diversity of species and vegetation types.
Resources (e.g. degree of expertise available for plant identification)	No	Experienced botanist undertook plant identifications on site.
Remoteness and/or access problems	No	Easily accessible site in the Perth Metropolitan Region.
Availability of contextual (e.g. bioregional) information for the study area.	No	Bush Forever

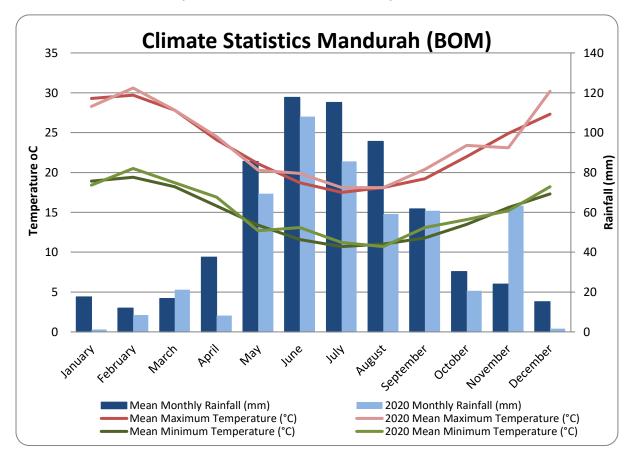
Table 1: Statement of Botanical Survey Conditions

*Constraints have been rated as Significant, Moderate or No constraints

[^]Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

4.3 Climate

Western Australia experiences a Mediterranean climate with warm dry summers and wet cool winters. Peak rainfall periods are between May and September. Climate statistics from the Bureau of Meteorology (BOM, 2020) can be used to compare the survey climatic conditions to mean values for temperature maximum, minimum and rainfall (Graph 1). The statistics have been measured on the Mandurah Site (BOM Site Number 009977), which has been collecting data from 2001 (BOM, 2021).



Graph 1: Mean climate statistics compared to 2020

Comparatively, the seasonal conditions for the 2020 monitoring were drier than average from April to August, similar in September and slightly below average in October. The 2020 temperatures were generally slightly higher than the average minimum temperatures with average maxima similar (Graph 1).

4.4 Naturemap Database Search

A search of the Naturemap Database (Appendix 2) indicates that a number of species that are listed as Endangered, Threatened or Priority have been located within a 10km radius of the site (Table 2).

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act	Habitat*	Likelihood to occur on the site
Drakaea elastica	Glossy-leafed Hammer Orchid	Schedule 1	Endangered	The Glossy-leafed Hammer Orchid prefers low-lying situations adjoining winter-wet swamps. This species does not survive in disturbed areas.	No – no winter wet habitat
Diuris drummondii	Schedule 3 Vulnerable swamps, in areas that contain surface water well into summer		No – no swamp habitat		
Acacia benthamii		Priority 2		Acacia benthamii grows on sand, typically on limestone breakaways	Highly Unlikely – no breakaway habitat
Cardamine paucijuga		Priority 2		<i>Cardamine paucijuga</i> is found on moist flats in calcareous clay over limestone.	No – not moist calcareous habitat
<i>Beyeria cinerea</i> subsp. <i>cinerea</i>		Priority 3		<i>Beyeria cinerea</i> subsp. <i>cinerea</i> grows in sand over limestone on road verges, gullies	Unlikely – not known from m dune habitat
Calandrinia oraria		Priority 3			Highly Unlikely – too far from the coast
Dillwynia dillwynioides		Priority 3		<i>Dillwynia dillwynioides</i> occurs in sandy soils in winter-wet depressions.	No – no winter wet habitat
Lasiopetalum membranaceum		Priority 3		Lasiopetalum membranaceum grows in sand over limestone.	Unlikely – not known from dune habitat
Pimelea calcicola	<i>imelea calcicola</i> Priority 3 <i>Pimelea calcicola</i> occurs in sand on coastal limestone ridges.		Highly Unlikely – no limestone ridges		

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act	Habitat*	Likelihood to occur on the site
Schoenus capillifolius		Priority 3		Schoenus capillifolius grows in brown mud on claypans.	No – no claypan habitat
Sphaerolobium calcicola		Priority 3		Sphaerolobium calcicola grows in white-grey-brown sand, sandy clay over limestone, black peaty sandy clay on tall dunes, winter-wet flats, interdunal swamps, low-lying areas.	Highly Unlikely – not suitable habitat
Caladenia speciosa	Sandplain White Spider Orchid	Priority 4		Sandplain White Spider Orchid occurs in white, grey or black sand in Banksia or Jarrah Woodland (Brown <i>et al.</i> , 2013).Highly Unlike woodland hall	
Conostylis pauciflora subsp. pauciflora		Priority 4		<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i> occurs in grey sand, limestone on hillslopes, consolidated dunes in coastal areas.	Possible
Jacksonia sericea	Waldjumi	Priority 4		Waldjumi grows in calcareous and sandy soils.	Unlikely – not limestone habitat preferred by this species
Parsonsia diaphanophleba		Priority 4		Parsonsia diaphanophleba occurs in alluvial soils along rivers.	No – not alluvial habitat
Stylidium longitubum	Jumping Jacks	Priority 4		Jumping Jacks prefer sandy clay, clay in seasonal wetlands. No – no wetland	

* Habitat description from Florabase (DPaW, 2016) or SPRAT (DoEE, 2017) unless otherwise denoted

Conservation Codes are shown in Appendix 3

4.5 TEC and PEC Desktop Search

The Threatened (TEC) and Priority Ecological Communities (PEC) that may occur on the site are outlined in Table 3.

Ecological	Description	Conservation	Status under	Potential
Community	Description	Status WA	the EPBC Act	to occur
SCP19a	Sedgelands in Holocene dune swales of the southern Swan Coastal Plain.	Critically Endangered	Endangered (Listed as FCT19)	Unlikely
I SCP19h I Holocene dune swales of the		Critically Endangered	Endangered (Listed as FCT19)	No - no woodland vegetation
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	No – no Banksias on site
Tuart woodlands	Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	No – no Tuarts on site
SCP29a	Coastal shrublands on shallow sands, southern Swan Coastal Plain	Priority 3		Possible
SCP29b	Acacia shrublands on taller dunes, southern Swan Coastal Plain	Priority 3		Likely

Table 3: Threatened and Priority Ecological Communities likely to occur within 5km of the Site

4.6 Flora

A total of 88 plant species were recorded in the survey area (Appendix 4). The total consisted of 53 native and 35 introduced species. The number of native species is low but typical for Quindalup sand dunes and a survey area of only 15.5ha. The percentage of introduced species, 40% is relatively high due to the adjoining residential development and long-term use of the dunes for recreation by pedestrians and off-road bikes.

The dominant plant Families were the Poaceae (Grass family – 9 species, including 2 native and 7 introduced), Asteraceae (Daisy family – 8 species, 5 native and 3 introduced) and the Fabaceae (Wattle and Pea family, 6 species, all native). The low number of species from the Myrtaceae and Proteaceae families reflects the nature of the Quindalup dune soils which typically have low representation of these families.

None of the species are Threatened (Declared Rare) or Priority species.

Non-native species were common along the western boundary of the site adjacent to the existing housing, and many appear to have been planted. Common tree and shrub species include WA Peppermint (*Agonis flexuosa*), Rottnest Island Pine (*Callitris preissii*), Geraldton Wax (*Chamelaucium uncinatum*) and Brazilian Pepper (*Schinus terebinthifolius*).

The batter slopes in the northern part of the survey area have been stabilised with mulch and revegetated with native shrub species.

A total of eight 10mx10m quadrats were sampled in the survey area (Appendix 5). Species richness in the quadrats ranged from 19-35 which is typical for Quindalup dune vegetation. The percentage of introduced species recorded in the quadrats averaged 27.3%.

4.7 Vegetation

4.7.1 Vegetation Complex

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle *et al.,* 1980). The areas of remnant native vegetation on the site is part of the Quindalup Complex which is described as:

'Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay (Heddle *et al.,* 1980)'

4.7.2 Vegetation Type

For small scale sites, such as the survey area, vegetation mapping can be further refined by using vegetation types which are described by the composition and structure of the dominant species rather than based on geomorphology.

Three native vegetation types and one area of exotic species were described and mapped on the site. Vegetation descriptions are provided in Table 4. Vegetation types are mapped in Figure 3.

Table 4: Vegetation Types

Vegetation Type	Description	Photograph
ArSg Acacia rostellifera/Spyridium globulosum Open to Closed Heath	This vegetation type commonly occurred on the mid- to lower slopes and swales on the site. Acacia rostellifera was the main shrub up to 2m high and 60-70% cover but Spyridium globulosum dominated some patches in the lower swales (photo 2 to the right). Diplolaena dampieri was a common tall shrub in some areas. Other common smaller species included Austrostipa flavescens, Melaleuca systena, Acanthocarpus preissii, Rhagodia baccata, Conostylis candicans, Daucus glochidiatus, Parietaria debilis, Hydrocotyle intertexta and Hardenbergia comptoniana. The soils brown to grey sands. Quadrats GB2, 3, 4 and 8 are representative of this vegetation type.	

Vegetation Type	Description	Photograph
ArMsAl Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low Heath	 This vegetation type commonly occurred on the upper slopes and ridges on the site. Acacia rostellifera was the tallest species but low (1m) and not very dense (15-20%). Common species included Melaleuca systena, Acacia lasiocarpa, Lomandra maritima, Austrostipa flavescens, Acanthocarpus preissii, Conostylis candicans, Senecio pinnatifolius, Scaevola thesioides, Desmocladus flexuosus, Trachymene pilosa and Calandrinia liniflora. Climbing species were often common including Hardenbergia comptoniana, Cassytha flava and Clematis linearifolia. The soils were light brown sands. Quadrats GB1, 6 and 7 are representative of this vegetation type. 	
SaMsAl Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/ Lomandra maritima Open Low Heath	This vegetation type occurred in one small area that was the only area that contained some surface limestone. However, the plant species did not reflect a typical limestone substrate. <i>Santalum acuminatum</i> was the tallest shrub at only 1m and 10% cover with <i>Melaleuca systena, Acacia lasiocarpa,</i> <i>Acanthocarpus preissii</i> and <i>Lomandra maritima</i> common smaller shrubs around 0.3-0.5m high. <i>Desmocladus flexuosus</i> and <i>Opercularia vaginata</i> were common ground shrubs. The soils were orange-brown sand with some surface limestone. Quadrats GB5 is representative of this vegetation type.	

4.7.3 Vegetation Condition

The condition of the vegetation for each quadrat was assessed according to the Keighery system described in Bush Forever (Government of Western Australia, 2000). Keighery's condition rating scale ranges from Pristine where the vegetation exhibits no visible signs of disturbance to Completely Degraded where the vegetation structure in no longer intact and without native plant species (Table 5).

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
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.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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.
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.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 5: Vegetation Condition Rating Scale.

Source: Government of Western Australia, 2000.

Overall, the condition of the areas of native vegetation in the survey area was high, ranging from Very Good to Good (Figure 4). The number of introduced species throughout the site was relatively high and did not allow an Excellent condition rating to be assigned to any areas.

Some areas had a higher grassy weed understorey, especially in swales and under the *Acacia rostellifera* dense stands and were rated as Good.

Tracks and the western area of non-native tree and shrub plantings were rated as Completely Degraded.

4.8 Conservation Significance of Flora and Vegetation

4.8.1 Flora

No Threatened or Priority species were recorded during the survey.

4.8.2 Vegetation

Vegetation Complex

The vegetation on the site is part of the Quindalup Complex (Heddle *et al.*, 1980). Approximately 60.49% of the pre-European vegetation extent of this complex remains, of which 9.01% is currently managed by DBCA (DBCA, 2018).

The percentage retention is above EPA's target for minimum 30% retention of vegetation complexes State-wide in the Perth and Peel Region Constrained Areas and the area in protection is just below the 10% minimum criteria for vegetation complexes.

Threatened and Priority Ecological Communities

The Floristic Community Type (FCT) for the three vegetation types was determined using the spreadsheet method which compares the species in the quadrats to the species found in each FCT (Table 12 in Gibson *et al.* 1994). The FCT of all three vegetation types had the highest correlation with FCT 29b 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. FCT 29b is a Priority 3 Ecological Community at State level.

4.9 Weed Density

4.9.1 Mandurah Hill Area

The overall weed coverage in the Mandurah Hill Area was moderate with 59% of the quadrats recording between 6 and 75% coverage and 22% having greater than 75% coverage (Table 6).

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	19%
6–75% coverage	59%
76–100% coverage	22%

Table 6: Quadrat percentage coverage in the Mandurah Hill Area

The total weed coverage recorded was used to develop a weed map for the Mandurah Hill Area (Figure 5). The highest density of weeds is located on the south-western and north-eastern corners with a small area in the central part of the southern boundary. The lowest density of weeds is through the central part of the site (Figure 5).

4.9.2 South West Interface

The overall weed coverage in South West Interface is moderate with 38% of the quadrats recording 6-76% coverage and 33% with a coverage greater than 76% (Table 7).

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	28%
6–75% coverage	38%
76–100% coverage	33%

The weed map for South West Interface (Figure 6) on the western boundary and scattered areas through the site. The areas that have a moderate coverage of 5-76% are mostly concentrated around areas associated with tracks through the site (Figure 6).

4.9.3 Western Interface

The overall weed coverage in the Western Interface is high with 43% of the quadrats sampled having a weed coverage of >75% (Table 8).

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	28%
6–75% coverage	29%
76–100% coverage	43%

The weed map for the Western Interface (Figure 7) shows that the areas with higher weed densities are mostly associated with tracks. The ridge in the central parts of the Landscape Protection Area contains very few weeds and small areas in the densest vegetation that contain a low weed coverage (Figure 7).

4.9.4 Central Dune

The overall weed coverage in the Central Dune area is lower than other LPAs with 60% of quadrats having a coverage <5% (Table 6). Only 10% had a weed coverage >75% (Table 9).

Table 9: Proportion of quadrats with each perc	centage coverage in the Central Dune Area
--	---

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	60%
6–75% coverage	30%
76–100% coverage	10%

The weed map for the Central Dune area (Figure 8) shows that the areas with higher weed densities are mostly associated with tracks. The less disturbed areas in the Landscape Protection Area contains very few weeds (Figure 8).

4.10 Significant Weed Species

4.10.1 Mandurah Hill Area

There were no Declared Weed species recorded.

Geraldton Carnation Weed (*Euphorbia terracina*) is classified as one of the 30 priority weeds on the Swan Coastal Plain (Bettink and Keighery, 2008). This species was recorded in 56% of quadrats and is generally associated with the track to the north of the site but does extend in low densities to the south-eastern corner of the site. There is a higher density infestation in the south-eastern part of the site (Figure 9). It is recommended that Geraldton Carnation Weed be targeted in weed control efforts as it is known to be highly invasive.

Rose Pelargonium (*Pelargonium capitatum*) was recorded in only 17% of quadrats and is located in the south-western part of the site with small dense infestation to the north-west, south-western

corner and a small, isolated patch in the eastern part of the site (Figure 10). Rose Pelargonium is considered to be a significant environmental weed (Queensland Government, 2015).

Branched Onion Weed (*Trachyandra divaricata*) was present in 12% of quadrats in low densities, mainly in the eastern part of the site and a small infestation on the western boundary (Figure 11). and is considered to be a high priority weed.

4.10.2 South Western Interface

No Declared weed species were recorded in the South Western Interface area.

Geraldton Carnation weed (*Euphorbia terracina*) is a priority species present in the South Western Interface area. Recorded in 27% of the quadrats this species is concentrated along tracks in the Landscape Protection Area (Figure 12) in low (<5%) to moderate densities (6-75% coverage). There are small areas that have a moderate coverage on the western boundary and on the southern boundary in the eastern part (Figure 12).

Rose Pelargonium (*Pelargonium capitatum*) was recorded in 37% of quadrats, mostly in low densities (<5% coverage) associated with the tracks through the site (Figure 13). There was one moderately dense (6-75% coverage) area of this weed in the south-eastern part of the site (Figure 13).

Branched Onion Weed (*Trachyandra divaricata*) occurs in scattered areas in the eastern and southern parts of the site (Figure 14) and was recorded in 22% of quadrats. There is one area in which this species was moderately dense (6-75% coverage) along the track in the central eastern part of the site (Figure 14).

There were three woody weeds recorded on the site. Brazilian Pepper (*Schinus terebinthifolius*) was recorded from three locations and is a Priority Weed in the Swan Natural Resource Management (NRM) Area (DEC, 2016). This species is located in the south-western part of the site (Figure 15). Century Plant (*Agave americana*) and Geraldton Wax (*Chamelaucium uncinatum*) are large weeds that could be prioritised for removal. These species were recorded in the south-western corner of the site (Figure 16).

4.10.3 Western Interface

No Declared weed species were recorded in the Western Interface Area.

Geraldton Carnation Weed (*Euphorbia terracina*) occurred in 39% of quadrats, mainly on the western side of the site at low densities (<5% coverage) (Figure 17). There were two areas that had a higher coverage of 6-75% on the western part of the site and one of high (6-75% and >75% coverage respectively) to the north along the western boundary (Figure 17).

Rose Pelargonium (*Pelargonium capitatum*) was recorded in 36% of the quadrats in scattered areas on the site (Figure 18). There were three infestations that had a coverage of 6-75%, one in the central-western part of the site and one on the eastern boundary in the central part of the site and one area of high density (>75% coverage) in the north-western part of the site (Figure 18).

Trachyandra divaricata (Branched Onion Weed), occurs in scattered areas in the northern part of the site in low densities (<5% coverage) with four areas of higher density (6-75% coverage) in scattered parts of the site (Figure 19). The species was recorded in 19% of quadrats.

4.10.4 Central Dune

There was one Declared weed species recorded in the Central Dune being *Gomphocarpus fruticosus* (Narrow-leafed Cottonbush) with one individual being recorded in the central part of the site (Figure 20).

Geraldton Carnation Weed (*Euphorbia terracina*) occurred in 26% of quadrats mostly along tracks (Figure 20) in low (<5% coverage) densities. There were four areas of moderate density (6-75% coverage) in the central and eastern part of the site.

Rose Pelargonium (*Pelargonium capitatum*) was present in 36% of quadrats, around tracks and extending into the bushland (Figure 21). The coverage of this species is mostly <5%, however there are two small areas with a coverage between 6 and 75% to the south and in the central part of the site (Figure 21).

Trachyandra divaricata (Branched Onion Weed occurs in areas near tracks (Figure 34) and was present in 5% of quadrats. The coverage is mostly low (<5%) with one area recorded with a moderate coverage between 6 and 75% in the central cleared part of the site (Figure 22).

5 SUMMARY AND CONCLUSION

5.1 Flora and Vegetation Survey

5.1.1 Flora

A total of 88 species were recorded in the Landscape Protection Area and adjoining POS to be retained as natural bushland. The list included 53 native and 35 introduced species (40% of the total).

No Threatened (Declared Rare) or Priority flora species were recorded on the site.

5.1.2 Vegetation

Three native vegetation types were described and mapped on the site and are typical of Quindalup dunes in the Perth Metropolitan Region with *Acacia rostellifera* the dominant taller shrub and *Melaleuca systena, Acacia lasiocarpa* and *Lomandra maritima* common shrub species.

The Floristic Community Types of all three vegetation types had the highest correlation with FCT 29b 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. FCT 29b is a Priority 3 Ecological Community at State level.

Most of the areas of native vegetation were rated in Very Good to Good condition. Some vegetation in swales and close to urban development were rated as Degraded due to the higher density of weed species. Tracks and areas of non-native vegetation were rated as Completely Degraded.

5.2 Weed Survey

Mandurah Hill Area

- Overall Weed Coverage in the POS is moderate with areas of heavy infestation along the boundary and a lower weed coverage along the ridge;
- Priority weeds identified in Landscape Protection Area A are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

South Western Interface

- Overall Weed Coverage is generally moderate to high with areas of less weed coverage in areas that have had less disturbance;
- Priority weeds identified in Landscape Protection Area B are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*);
 - Branched Onion Weed (*Trachyandra divaricata*);
 - Brazilian Pepper (Schinus terebinthifolius);
 - Century Plant (Agave americium); and
 - Geraldton Wax (Chamelaucium uncinatum).

Western Interface

- Overall Weed Coverage in the POS is moderate to high on the western side (>5%) and lower on the eastern side with the highest areas of weed coverage along the tracks;
- Priority weeds identified in Landscape Protection Area C are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

Central Dune

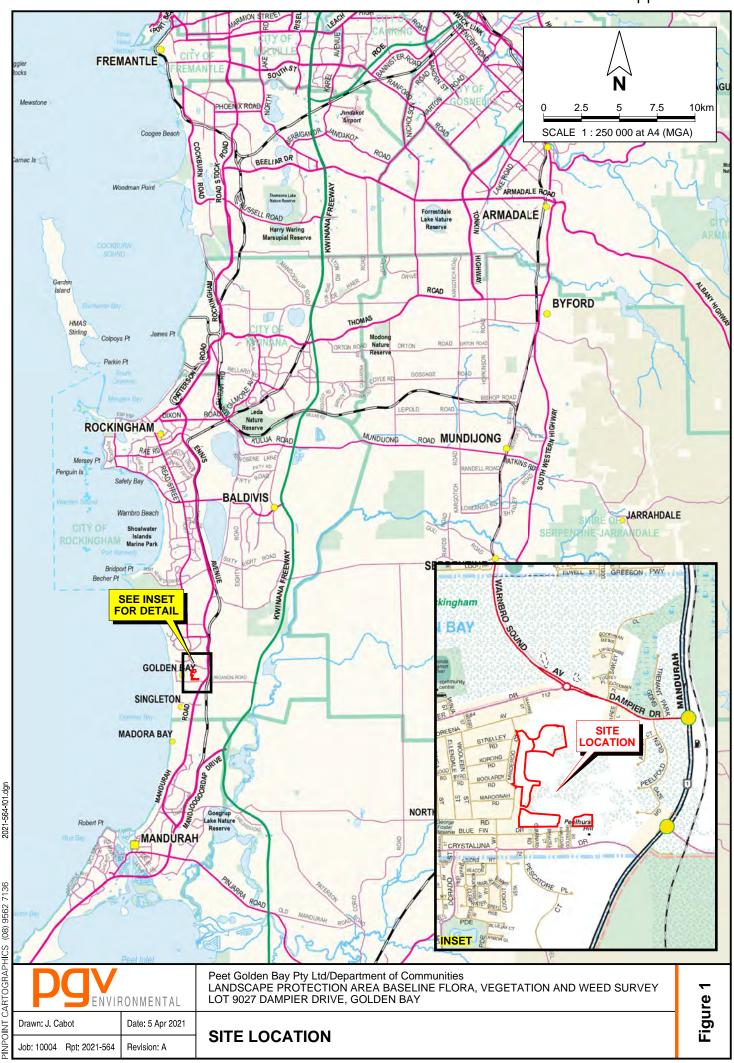
- Overall Weed Coverage in the POS is low with the highest areas of weed coverage associated with tracks;
- One Declared Pest under the BAM Act, *Gomphocarpus fruticosus* (Narrow-leafed Cottonbush) was recorded from a single location;
- Priority weeds identified in Landscape Protection Area D are:
 - Geraldton Carnation Weed (Euphorbia terracina);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

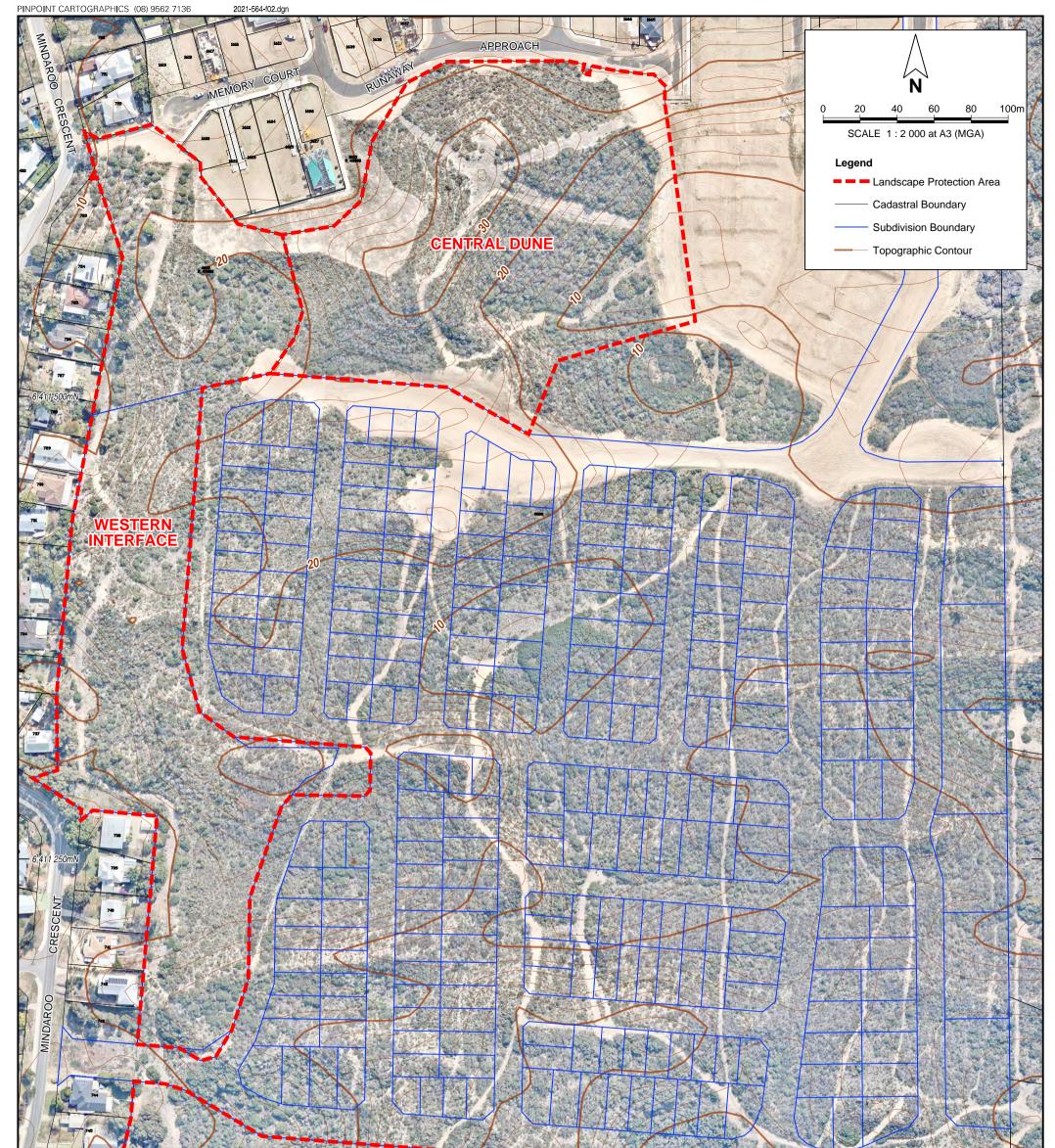
6 **REFERENCES**

- Bettink, K and Keighery, G (2008) Environmental weed census and prioritisation, Swan NRM Region Swan Catchment Council (SCC) and Department of Environment and Conservation (DEC) Perth Western Australia
- Brown, A., Dixon, K., French, C and Brockman, G. (2013) *Field Guide to the Orchids of Western Australia* Simon Nevill Publications Perth, Western Australia
- Brown, K., Cullity, J., Paczkowska, G. and Bettink, K. (2013) *Managing Geraldton carnation weed* (*Euphorbia terracina*), in the woodlands, wetlands and heathlands of the Swan Coastal Plain. Department of Environment and Conservation Government of Western Australia, Perth
- Department of Environment and Conservation (DEC) (2011) Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands Government of Western Australia, Perth
- Department of Parks and Wildlife (DPaW) (2015) *Florabase* <u>https://florabase.dpaw.wa.gov.au/</u> Accessed January 2015 Government od Western Australia Perth.
- Environmental Protection Authority (EPA) (2016) *Technical Guidance: Flora and Vegetation Surveys* for Environmental Impact Assessment Perth Western Australia
- Government of Western Australia (2000) Bush Forever *Keeping the Bush in the City. Volume 2:* Directory of Bush Forever Sites. Perth, Western Australia.
- Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980) Vegetation complexes of the Darling System,
 Western Australia. In Atlas of Natural Resources of the Darling System of Western Australia.
 Department of Conservation and Environment. Perth, Western Australia.
- Obbens, F.J. (2014) Two new species of *Calandrinia* (Portulacaceae) from southern Western Australia *Nuytsia* 24: 37-43 Perth Western Australia
- Western Australian Planning Commission (WAPC) (2003) *Coastal Planning and Management Manual* Government of Western Australia Perth.

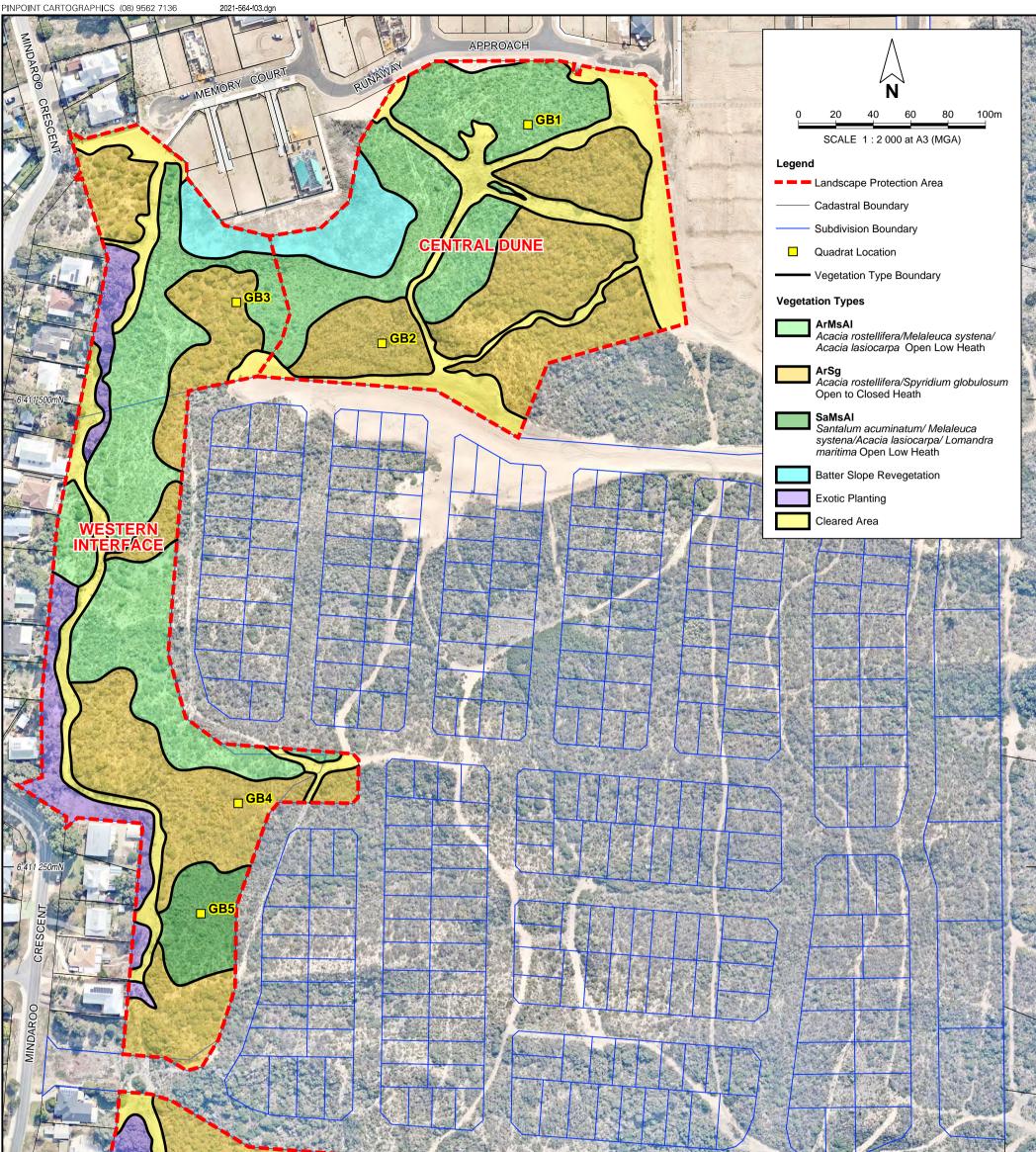
FIGURES

Appendix 8





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SUBDIVISION SOURCE: Nearmap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Job: 10004 Rpt: 2021-564	Revision: A		



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CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.	Drawn: J. Cabot	Date: 5 Apr 2021	VEGETATION TYPES	Figure
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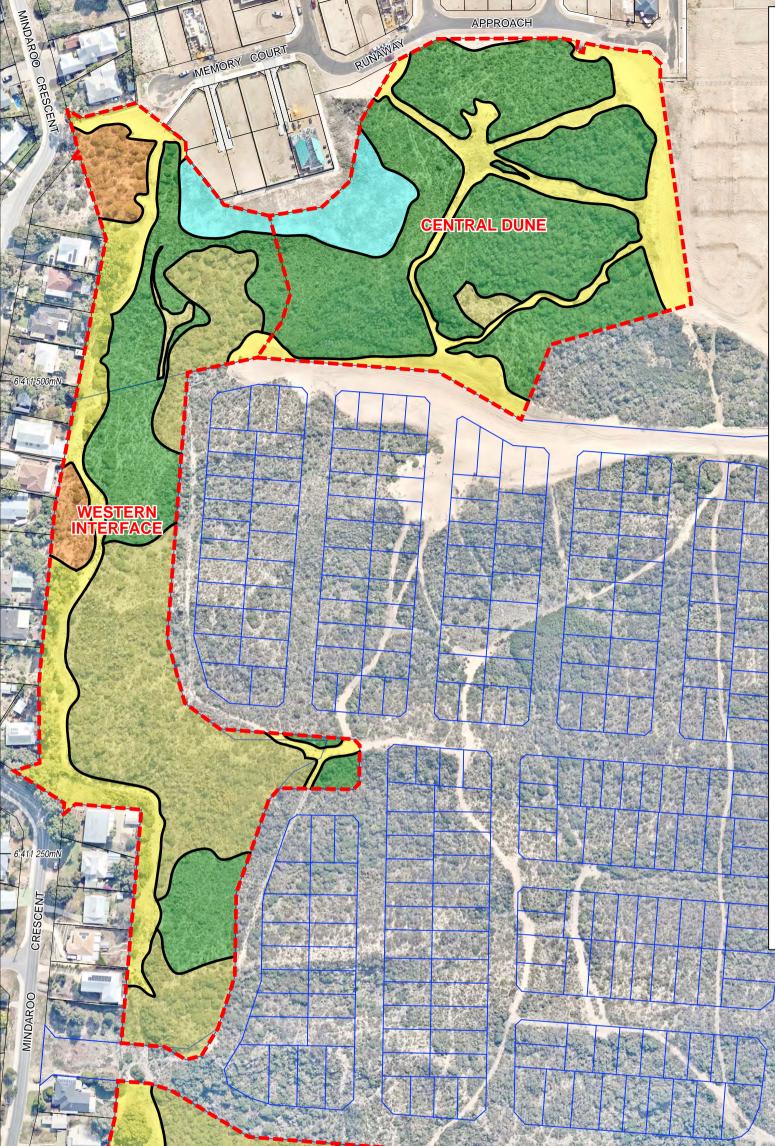
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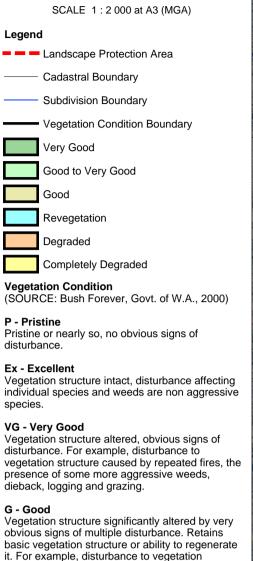
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G - Good Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

D - Degraded

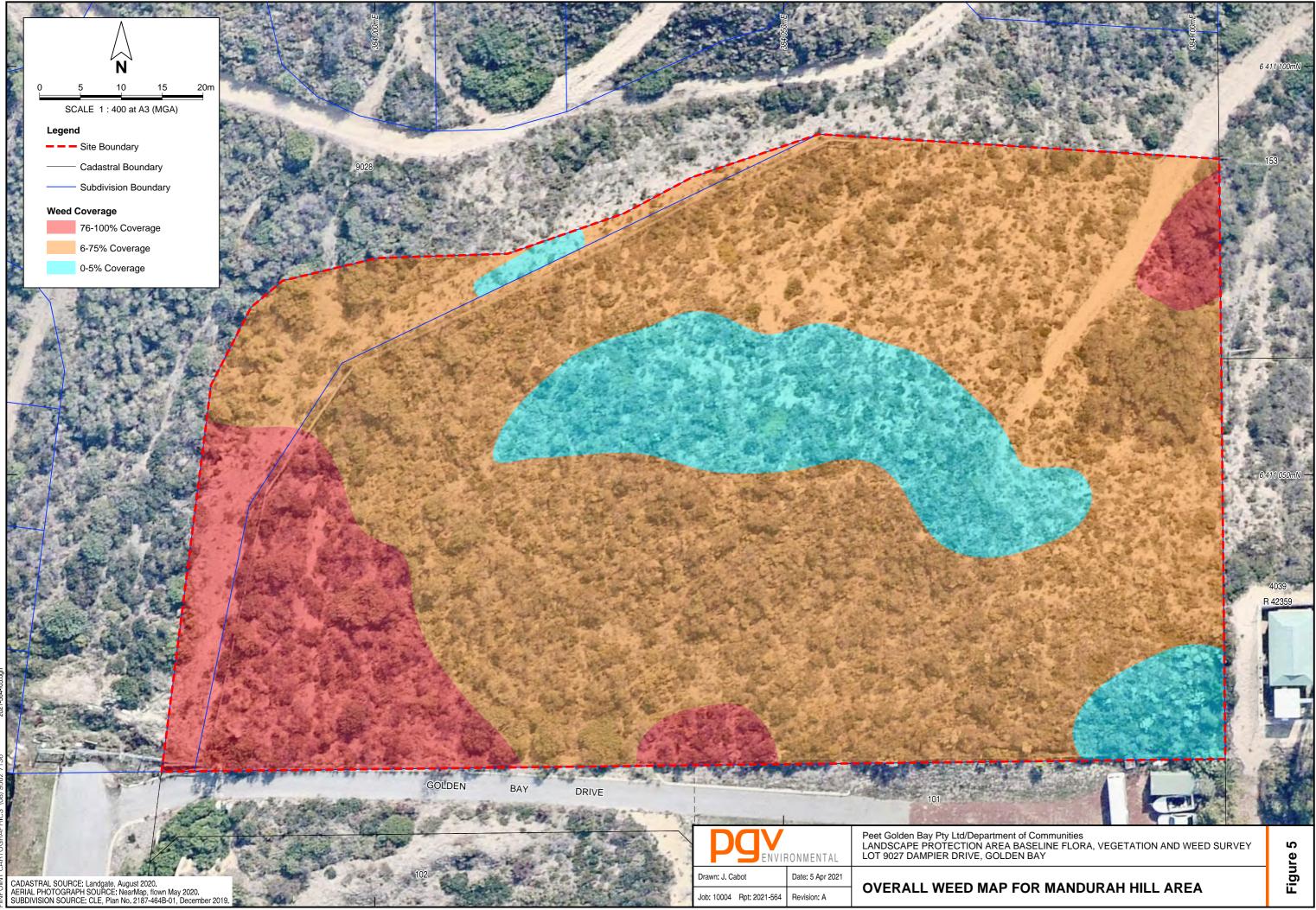
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

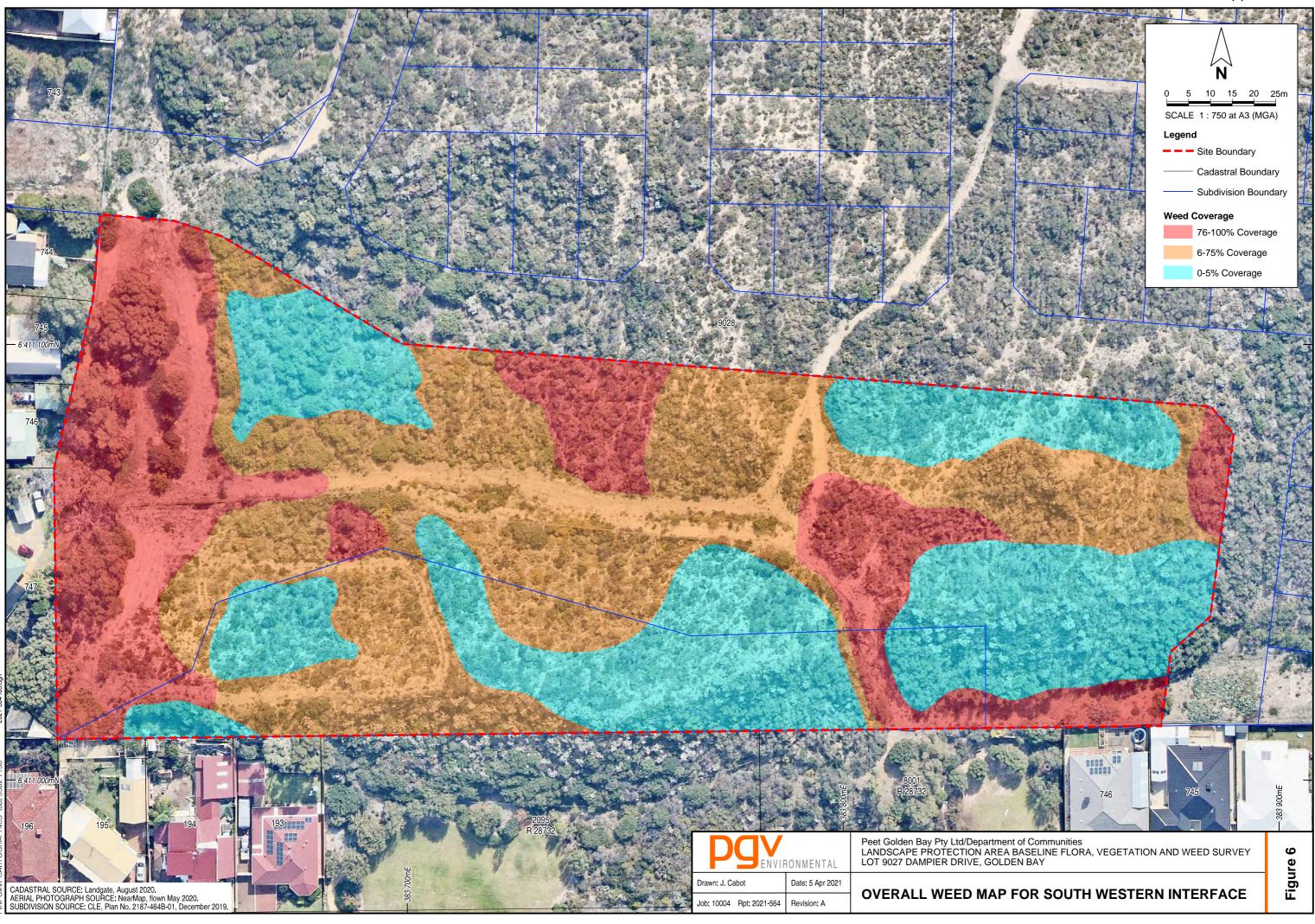
CD - Completely Degraded The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

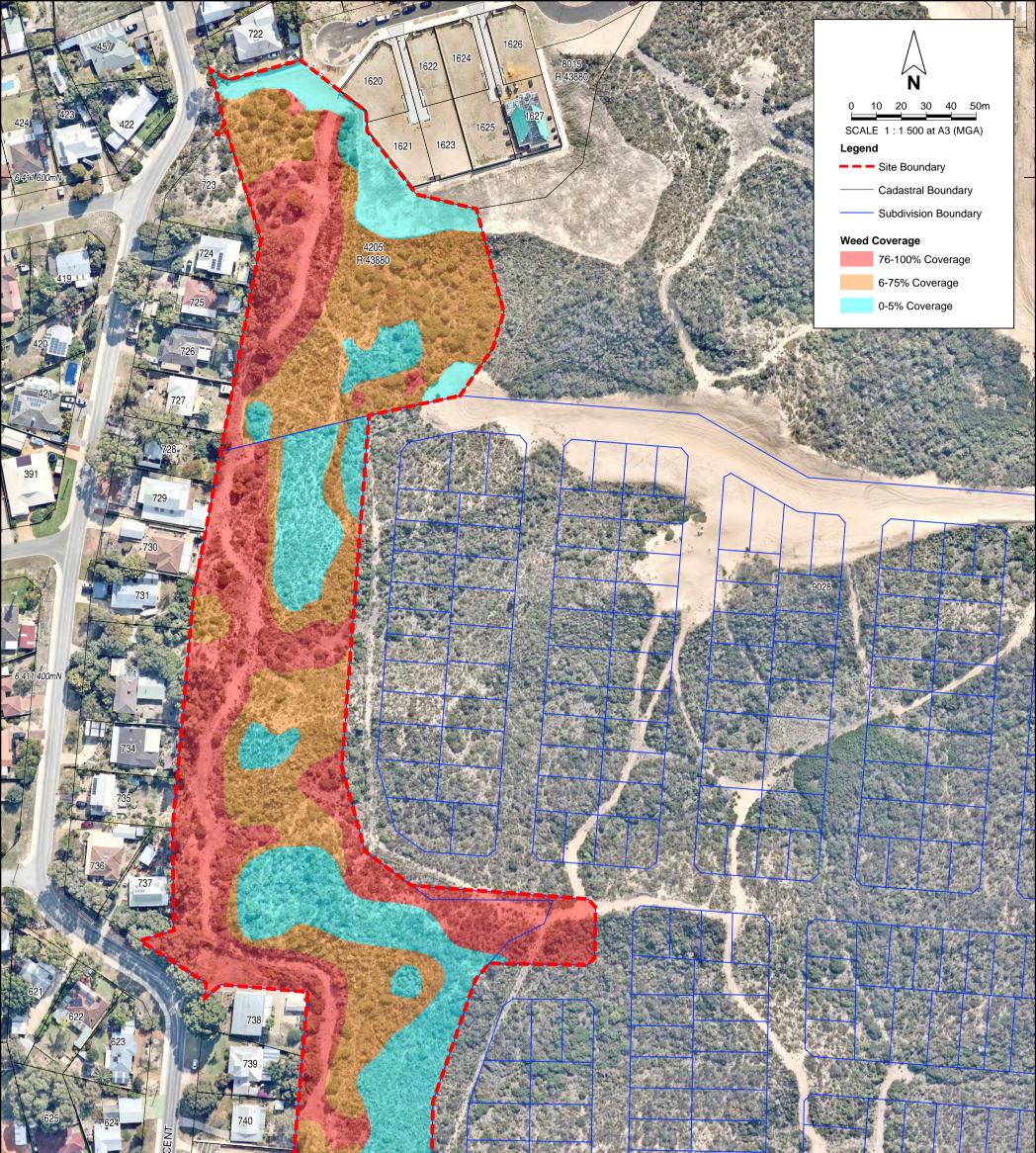
CI - Cleared



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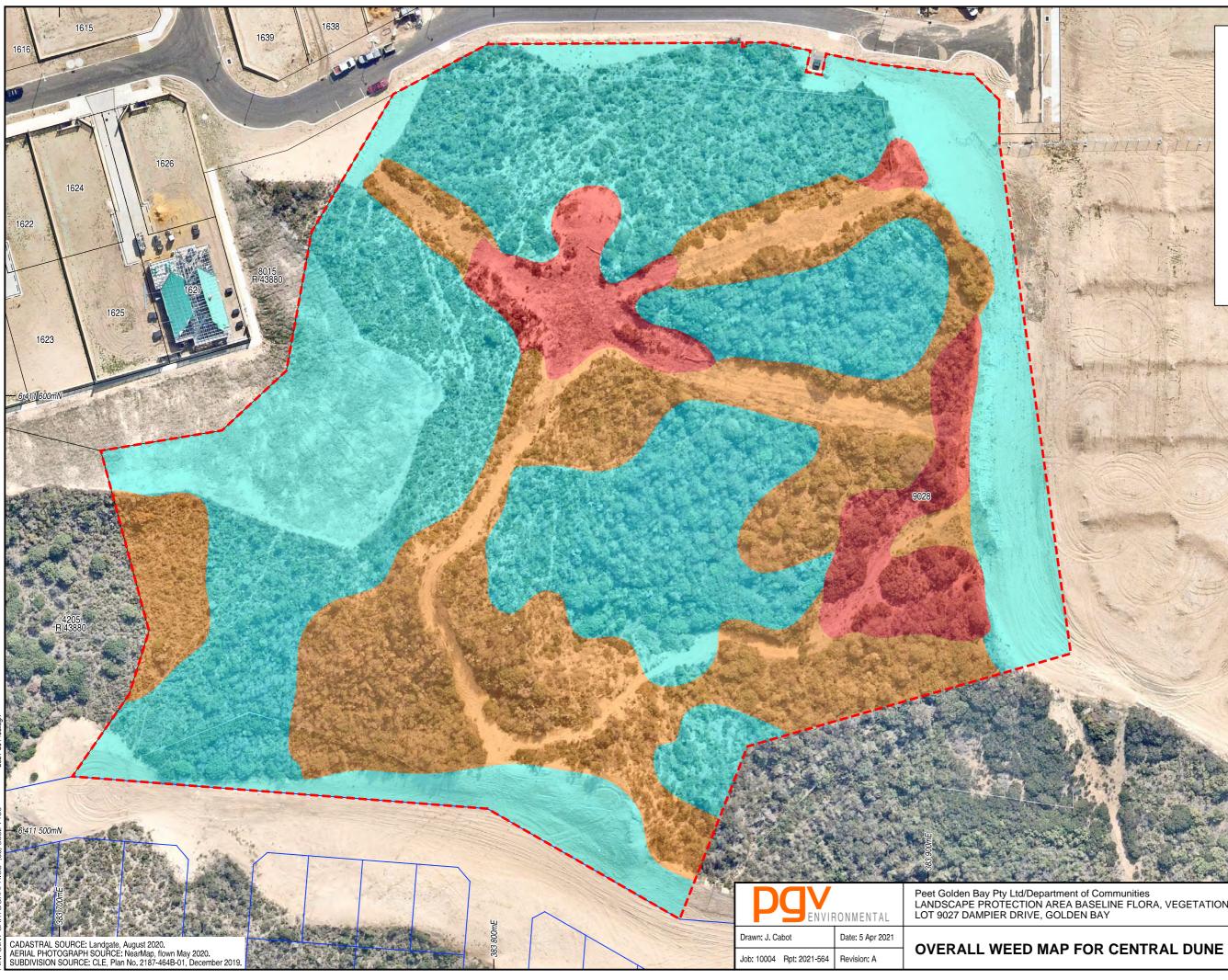


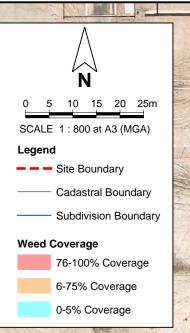


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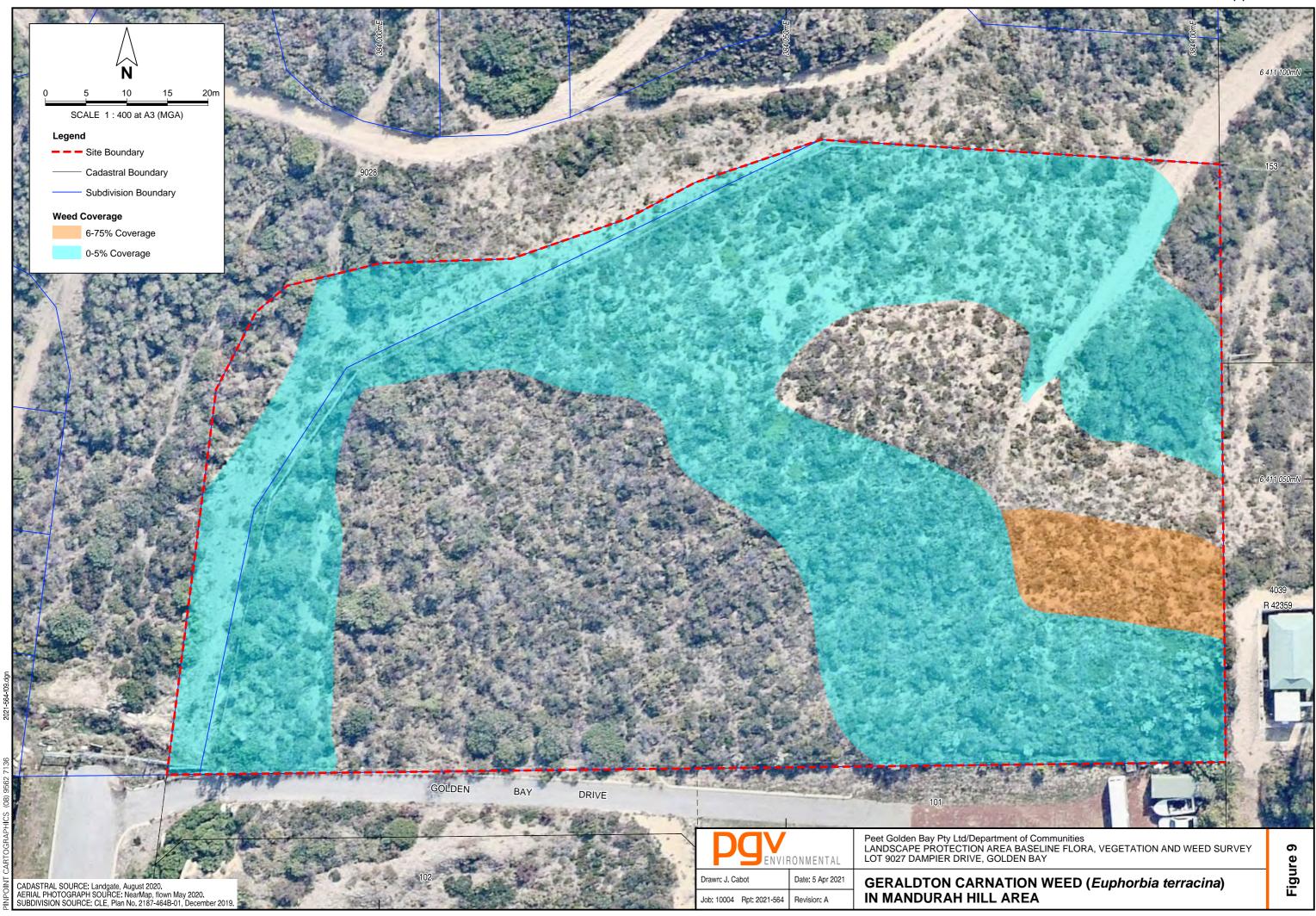
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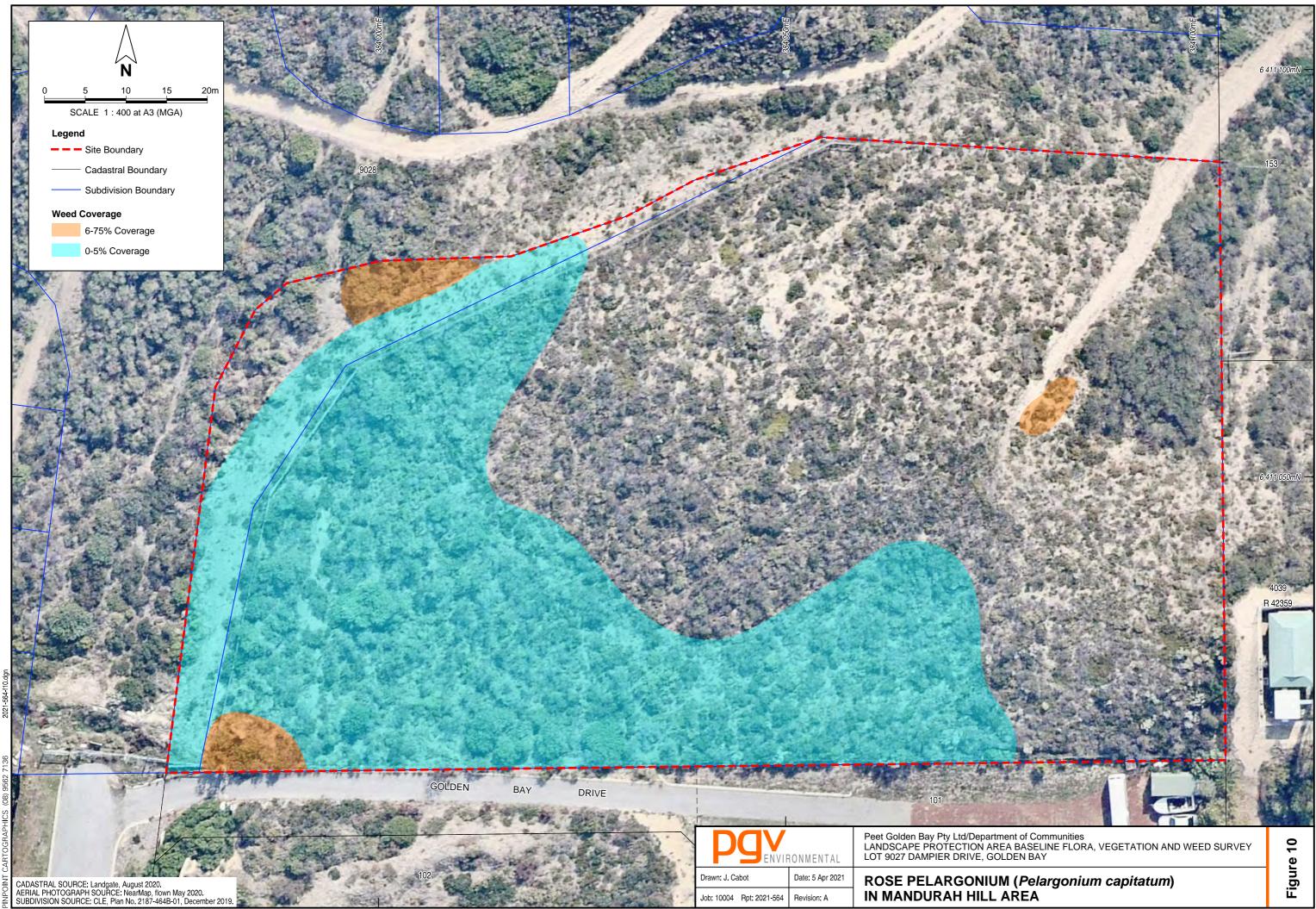


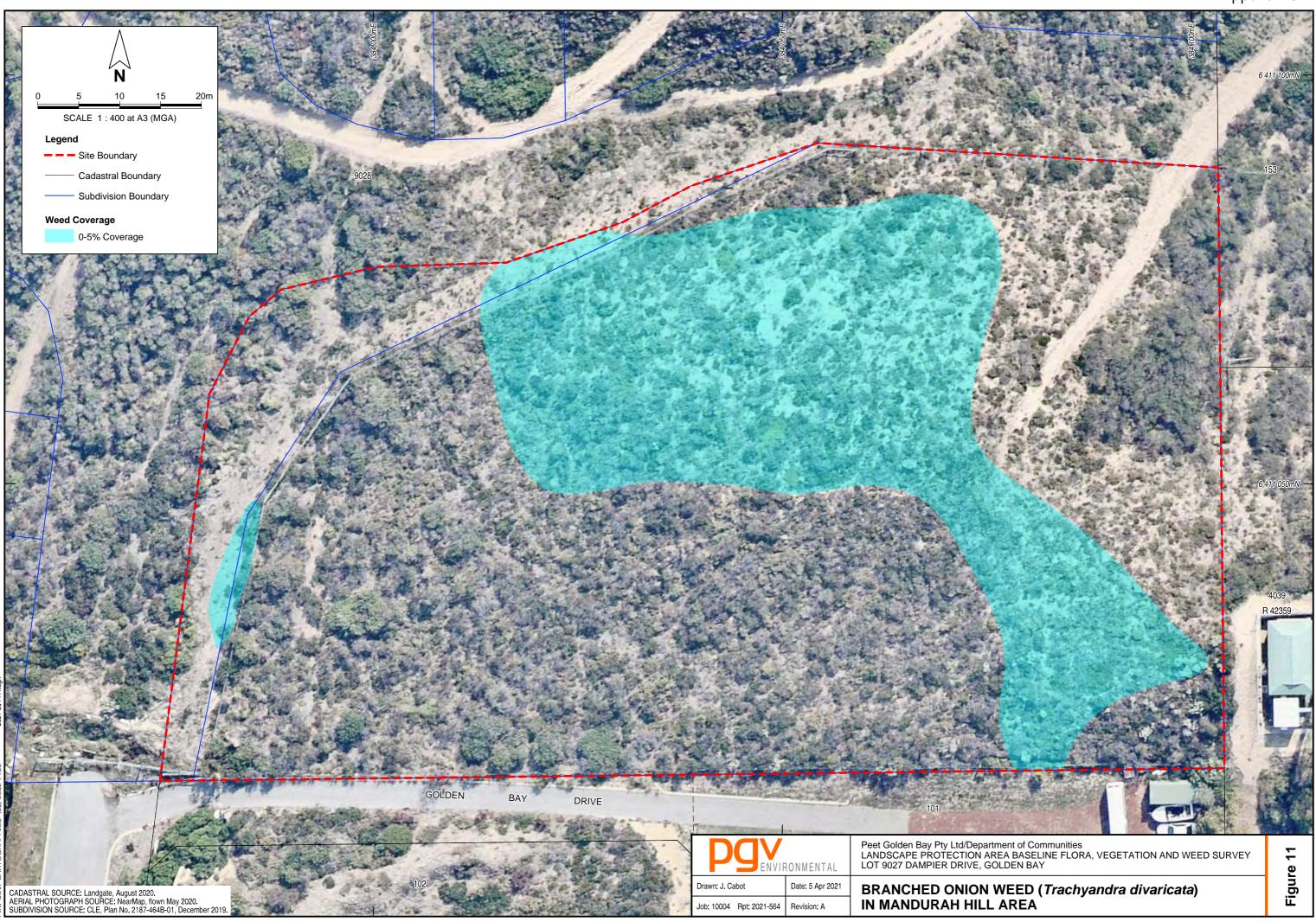


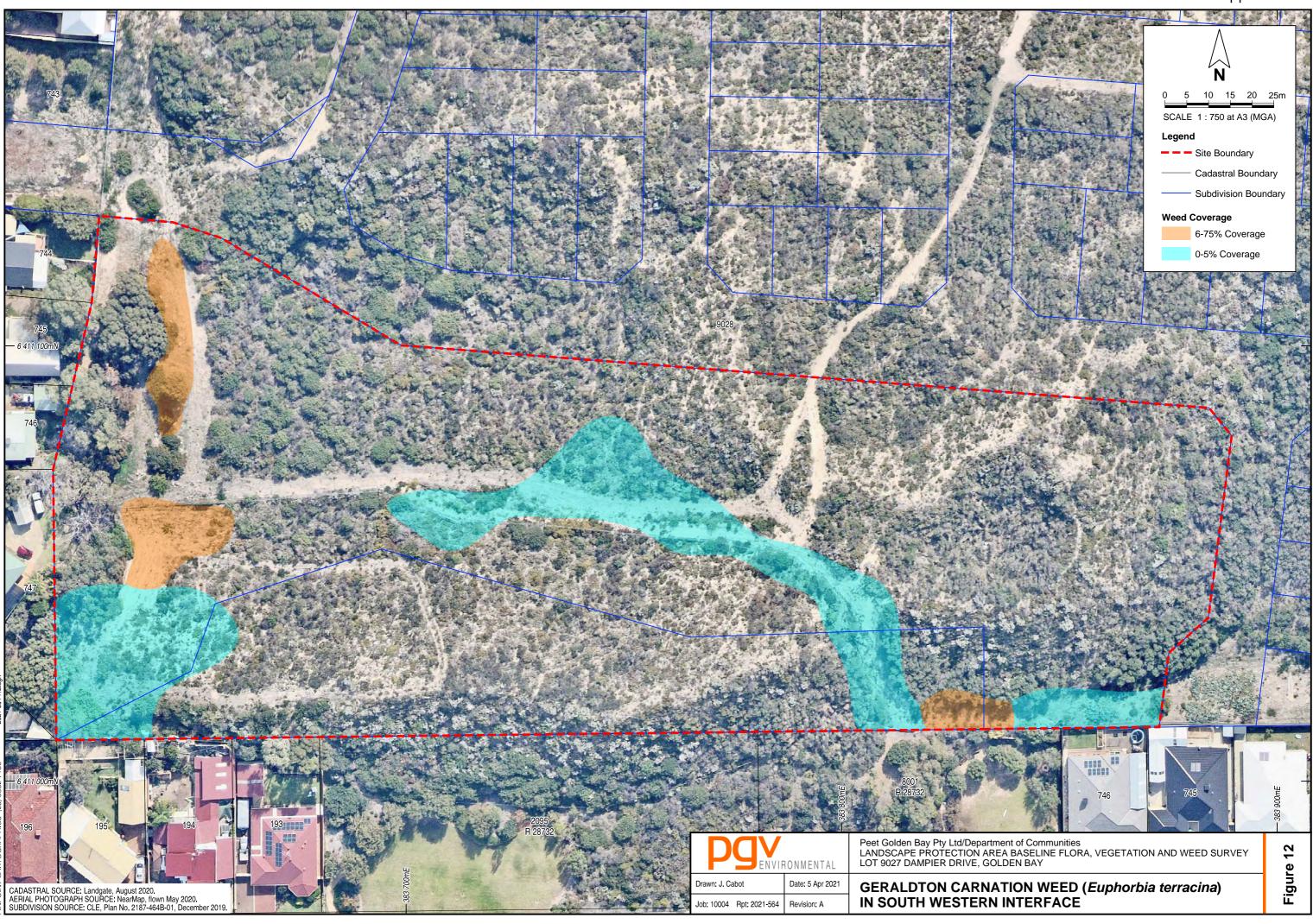
Peet Golden Bay Pty Ltd/Department of Communities LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY LOT 9027 DAMPIER DRIVE, GOLDEN BAY

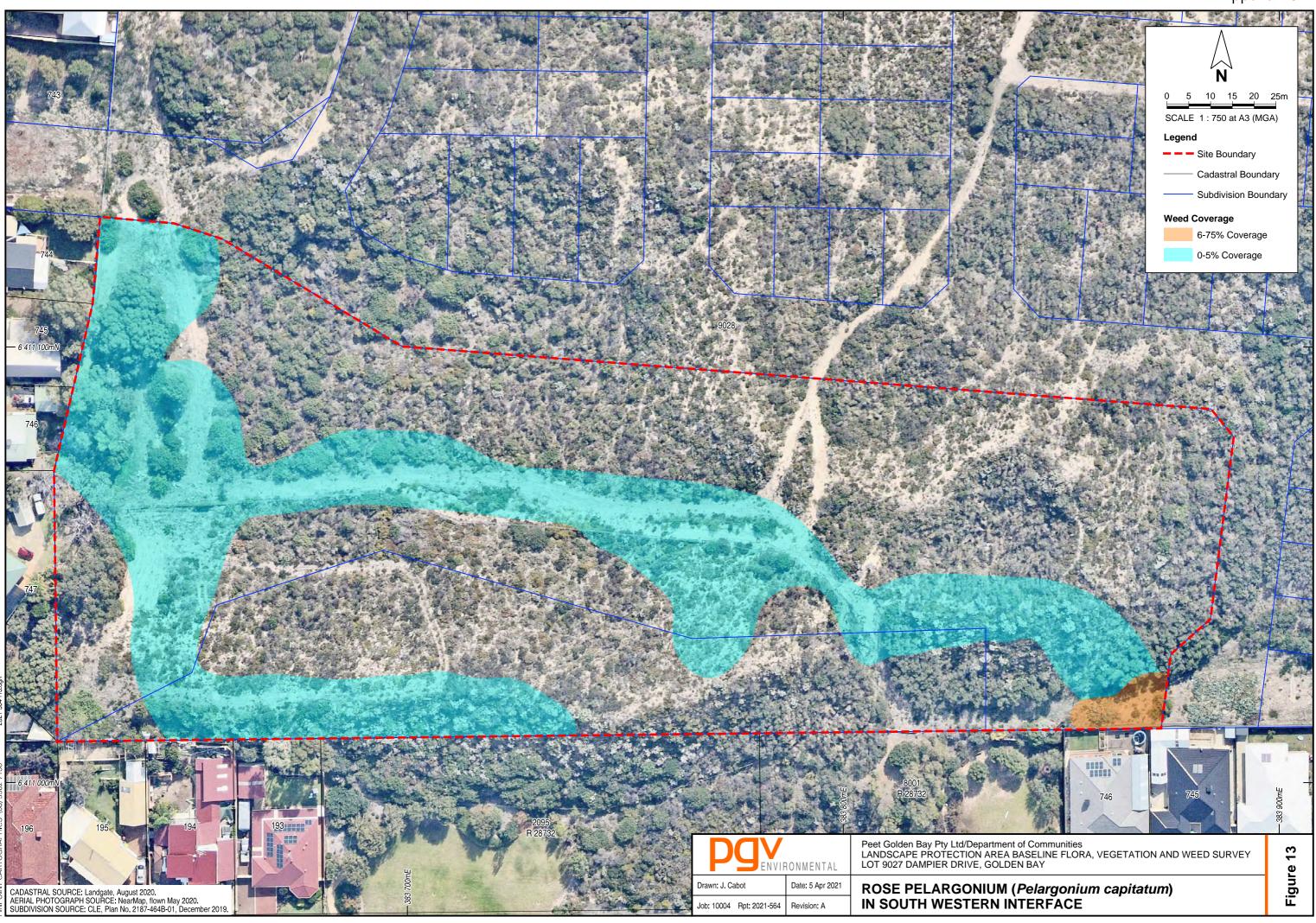
Figure 8

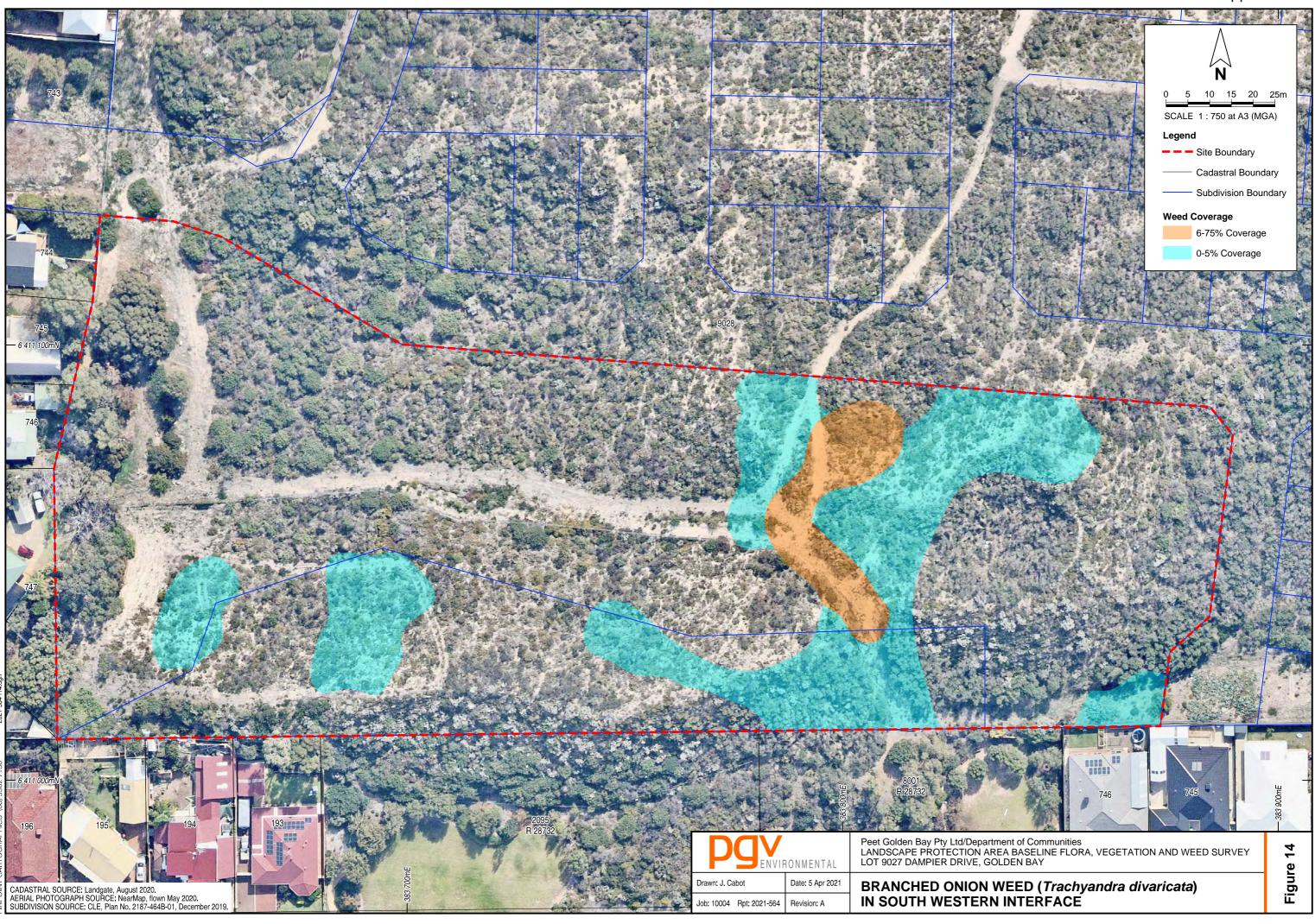


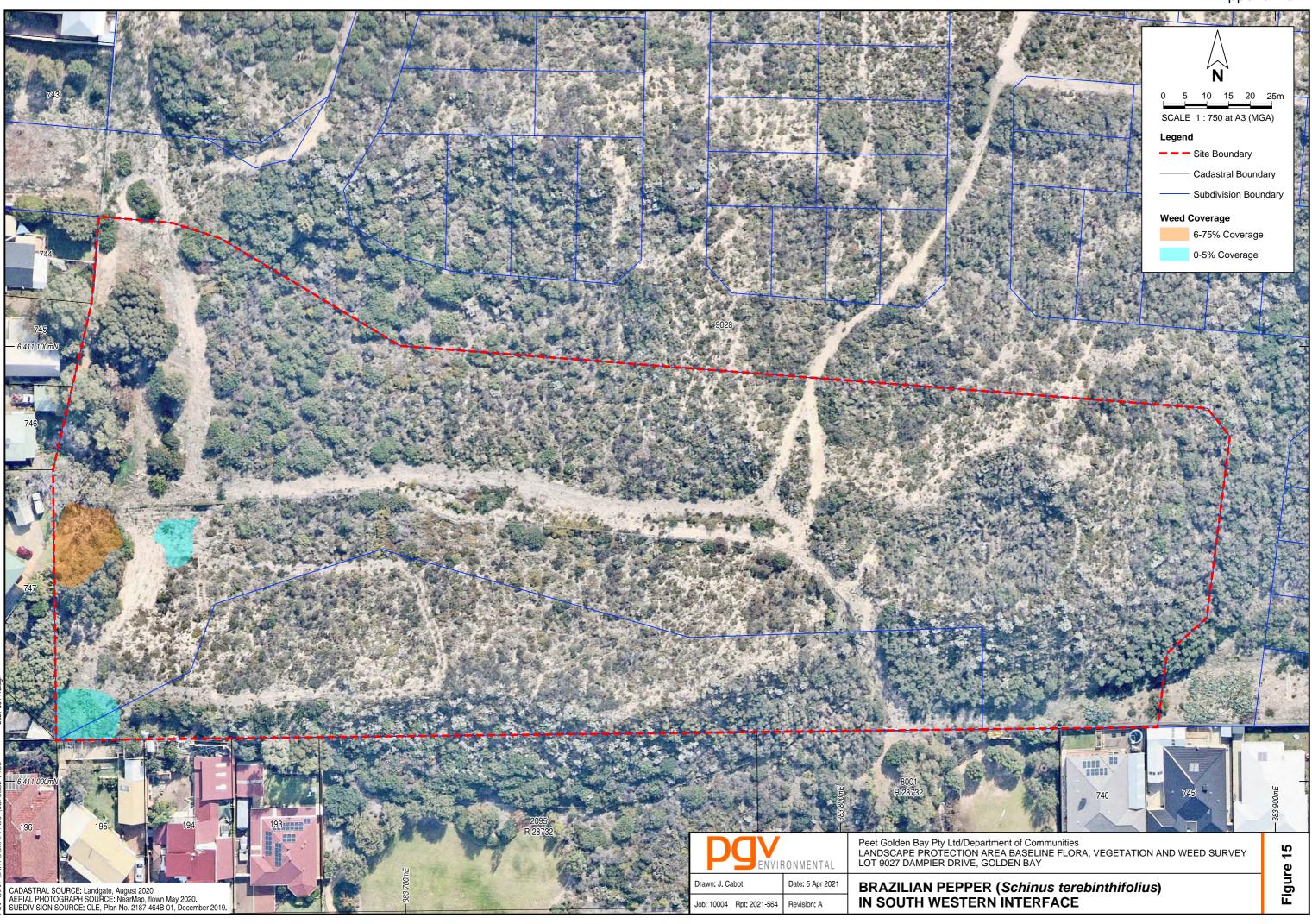


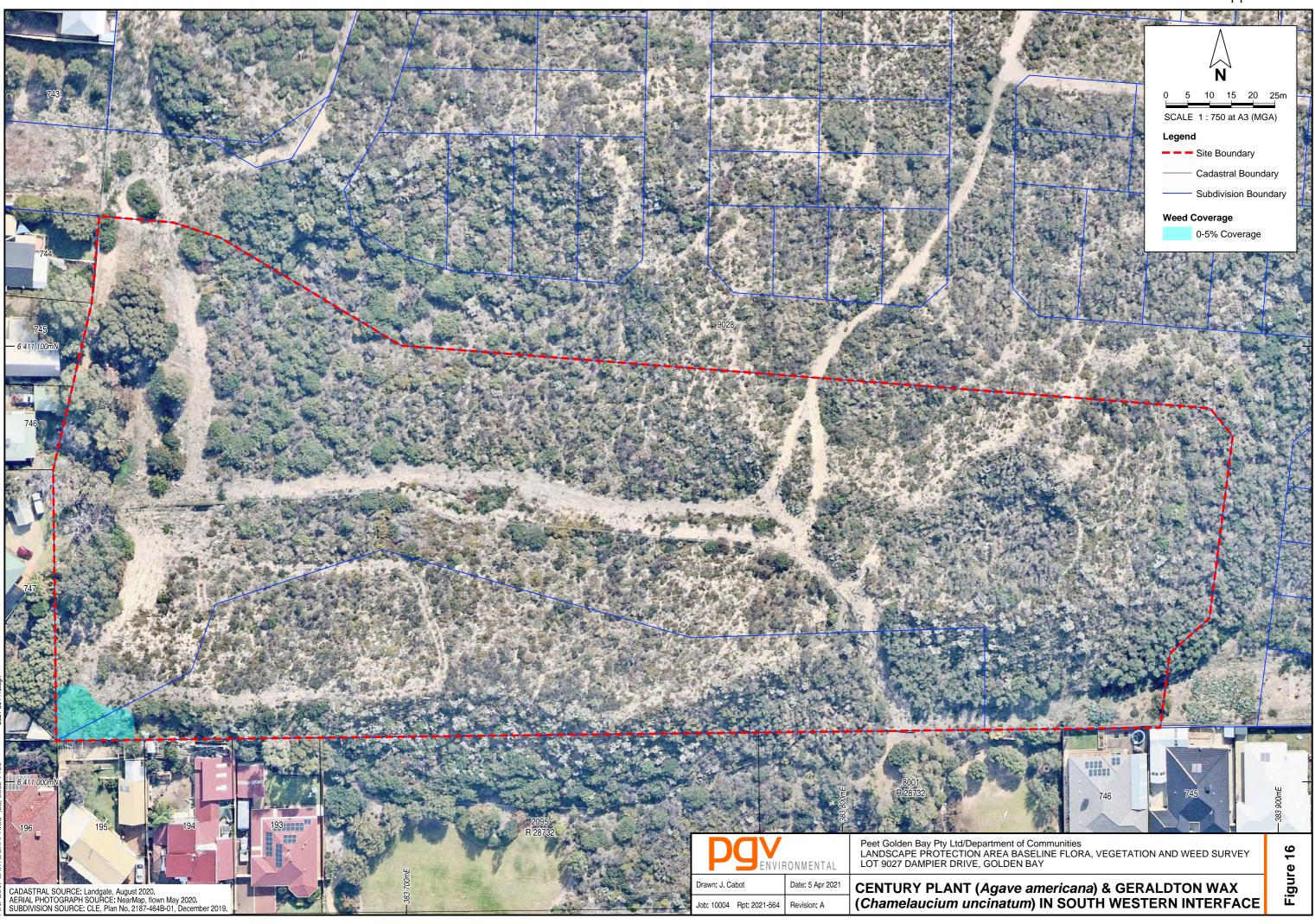


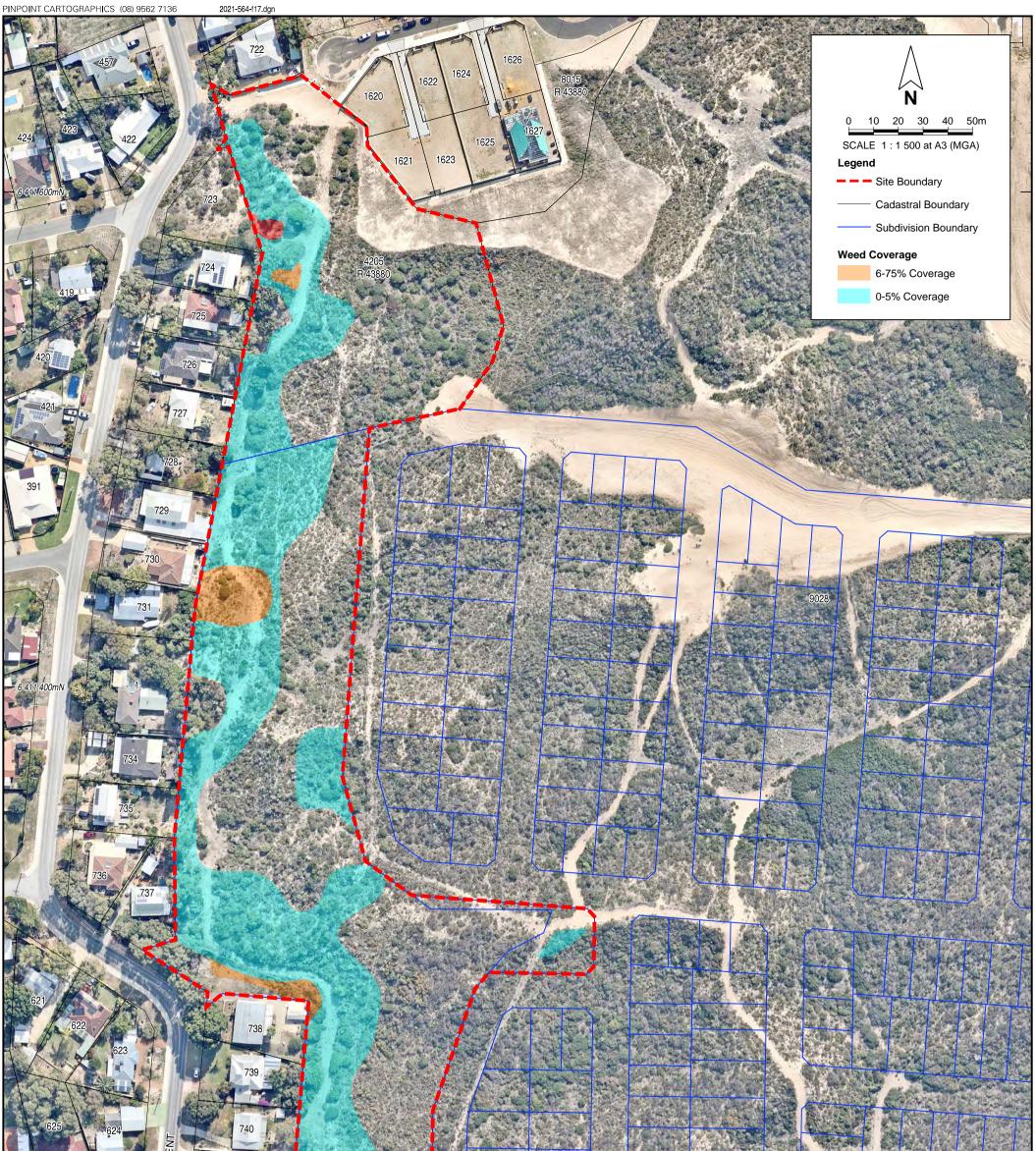








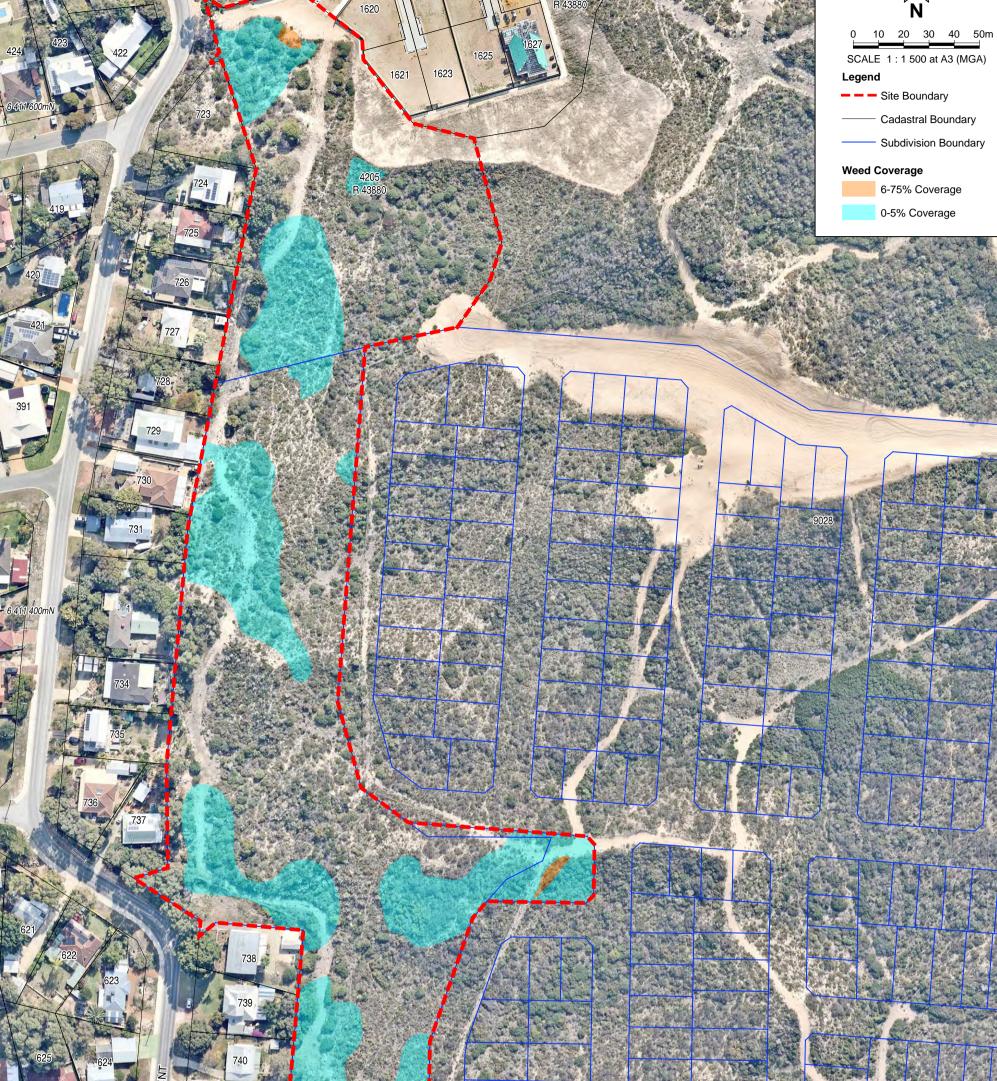




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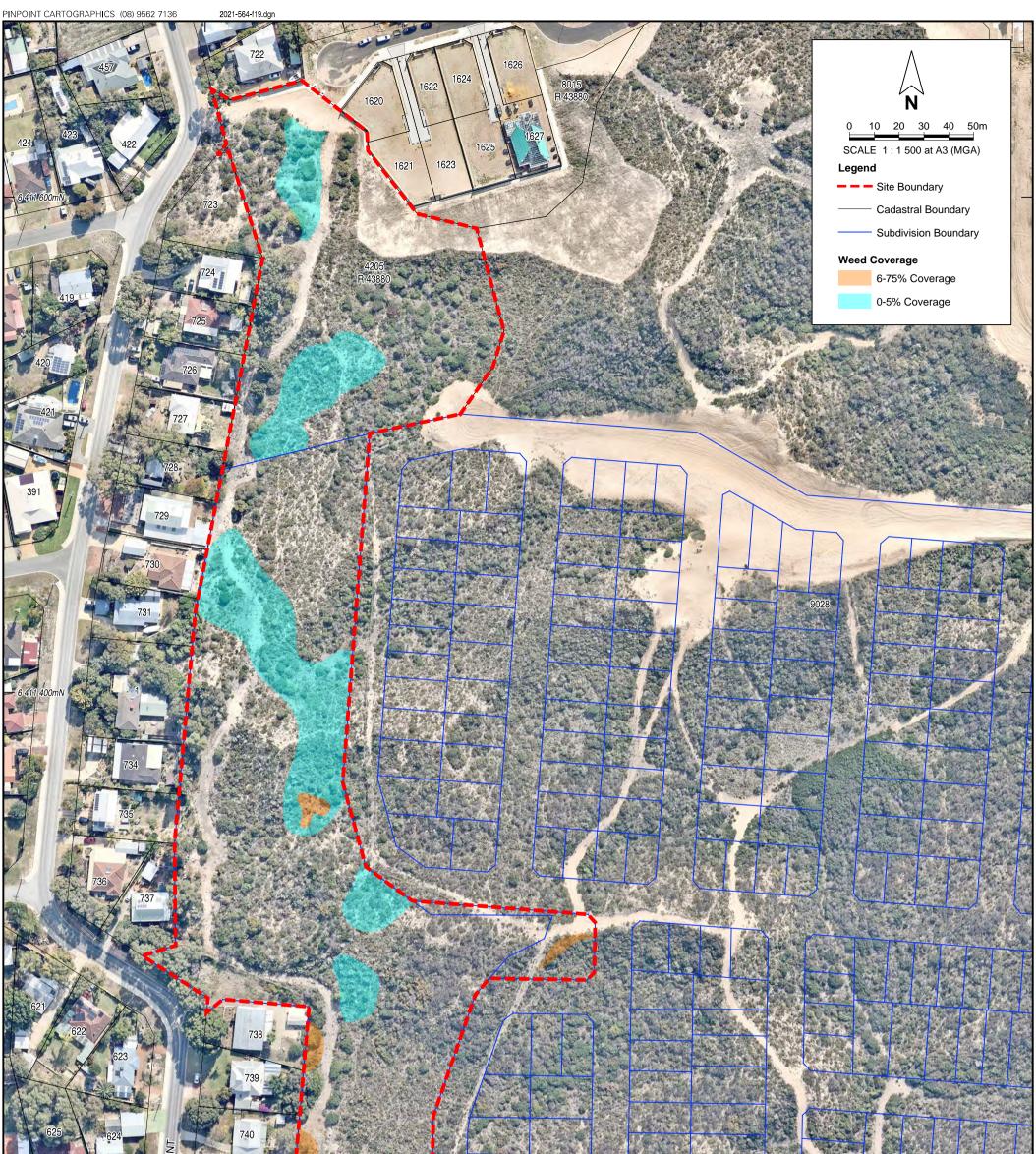
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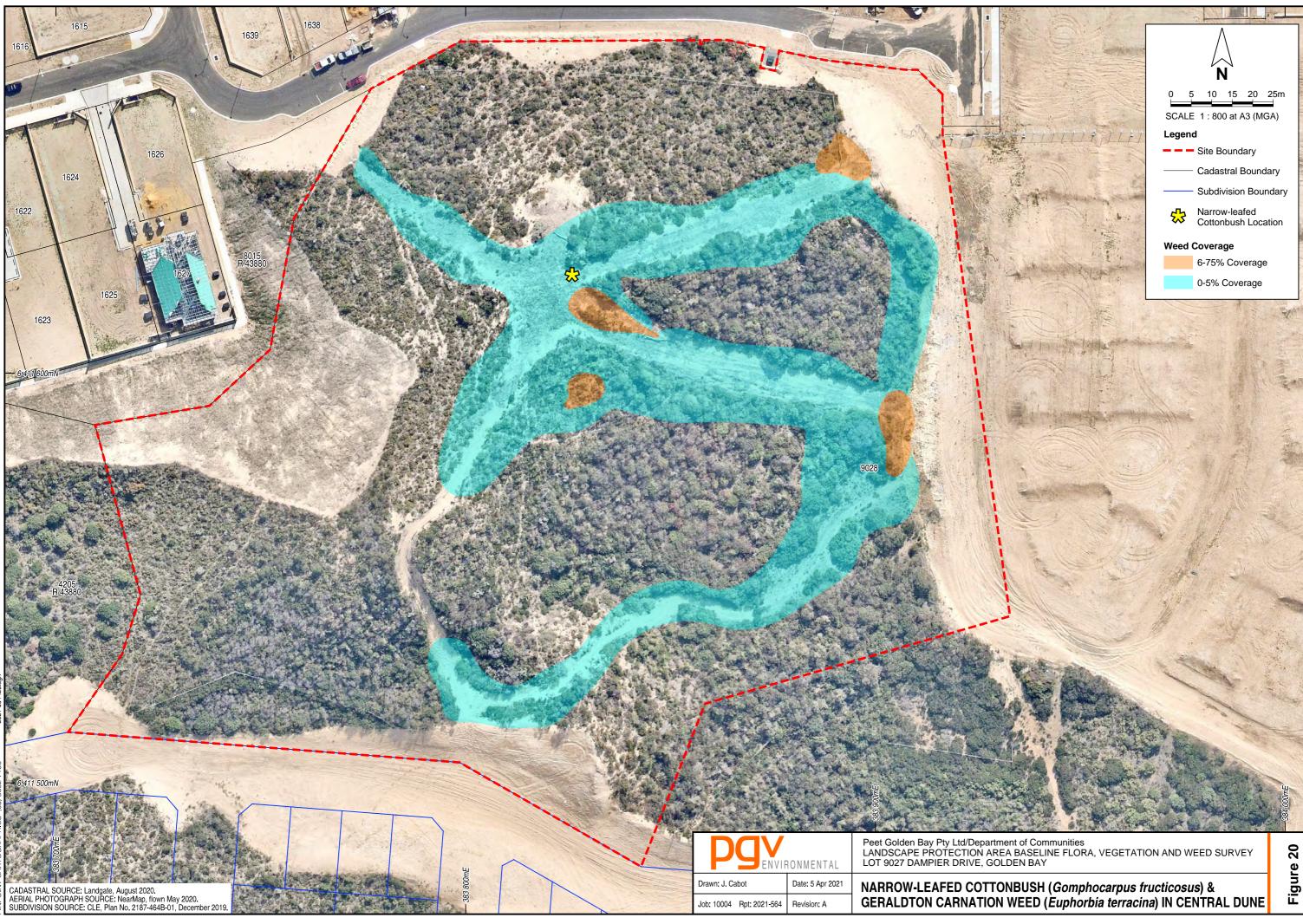
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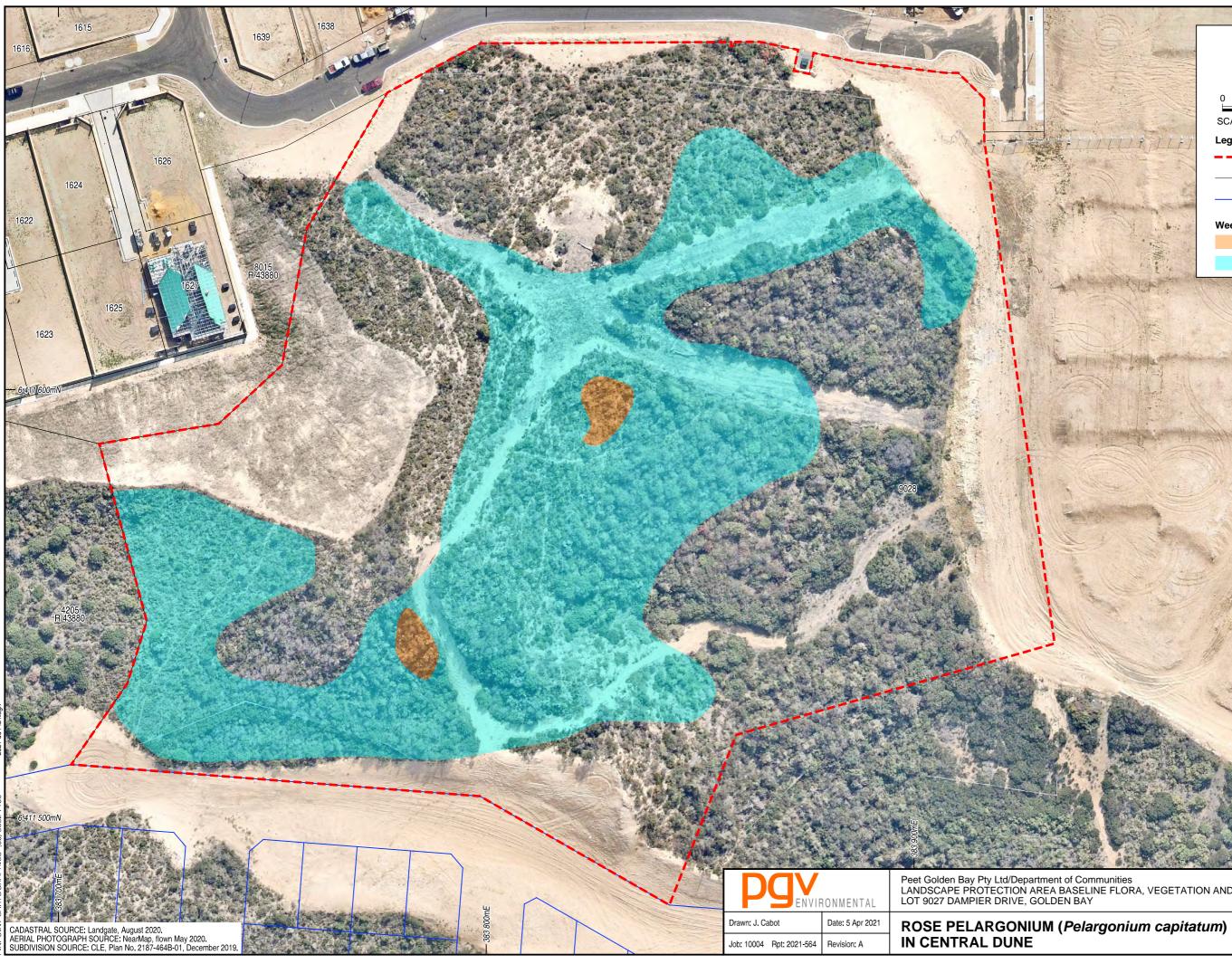


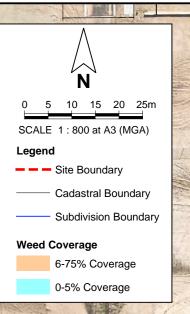


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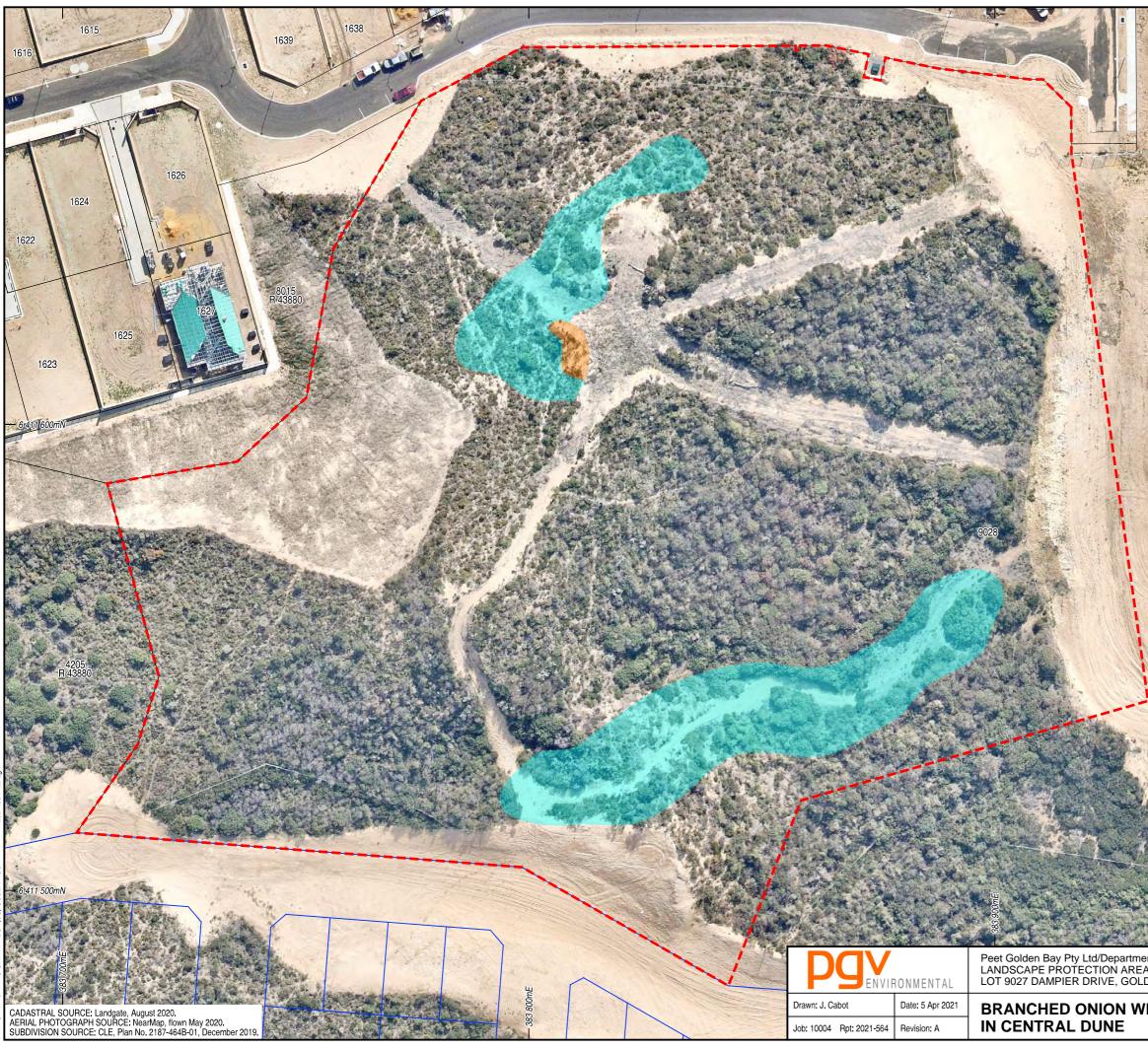
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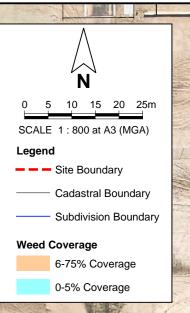




Peet Golden Bay Pty Ltd/Department of Communities LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Figure 21



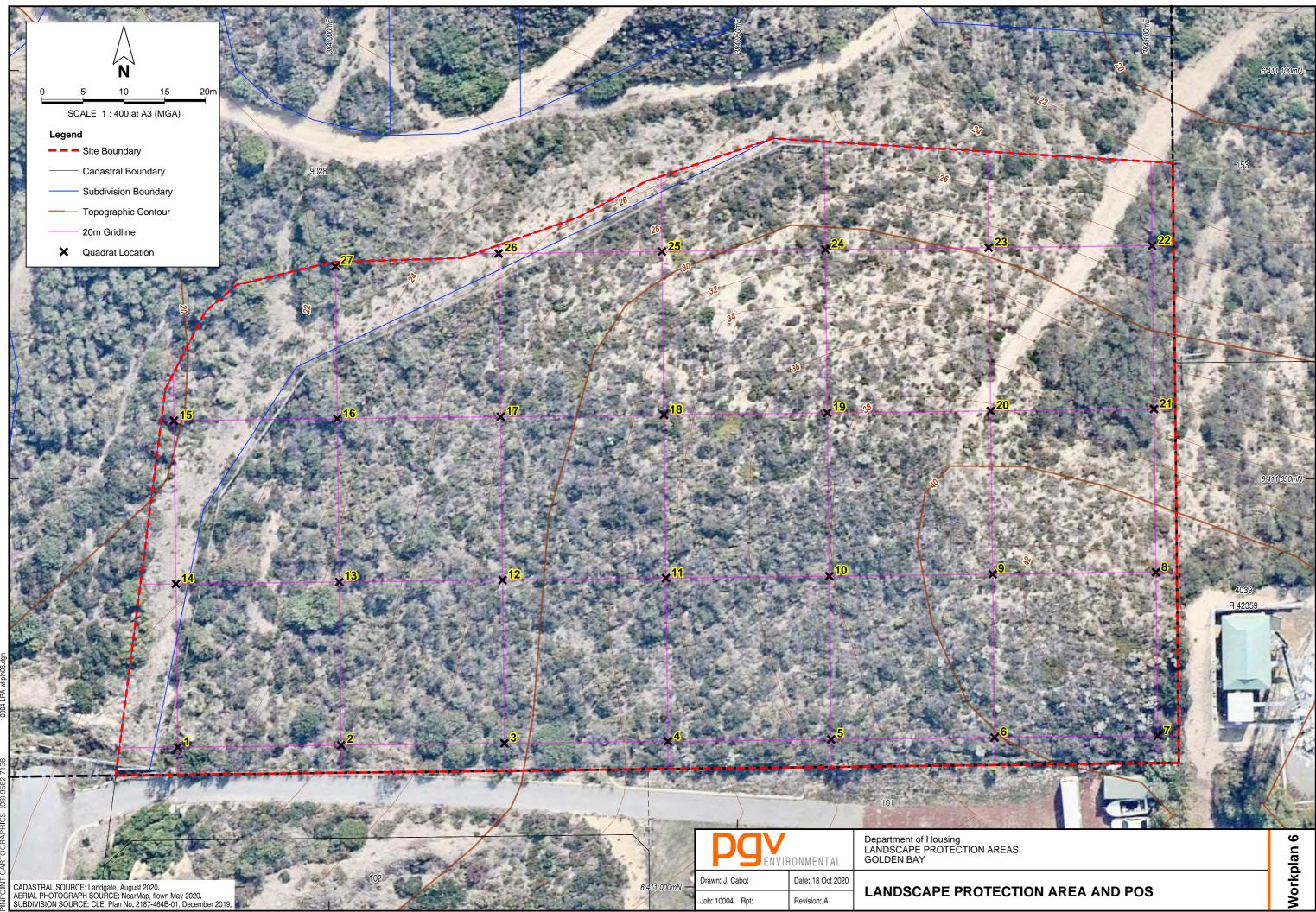


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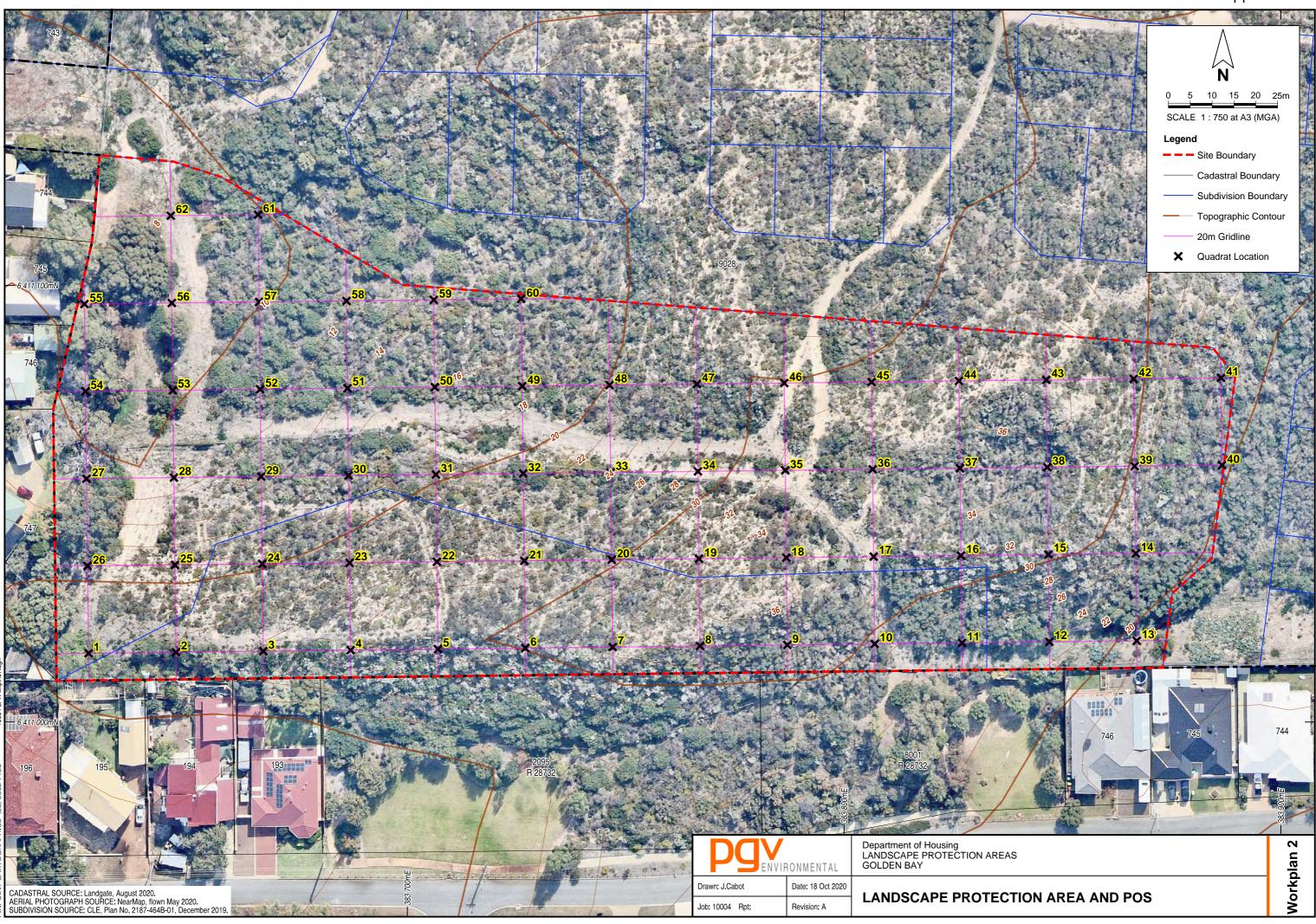
BRANCHED ONION WEED (Trachyandra divaricata)

Figure 22

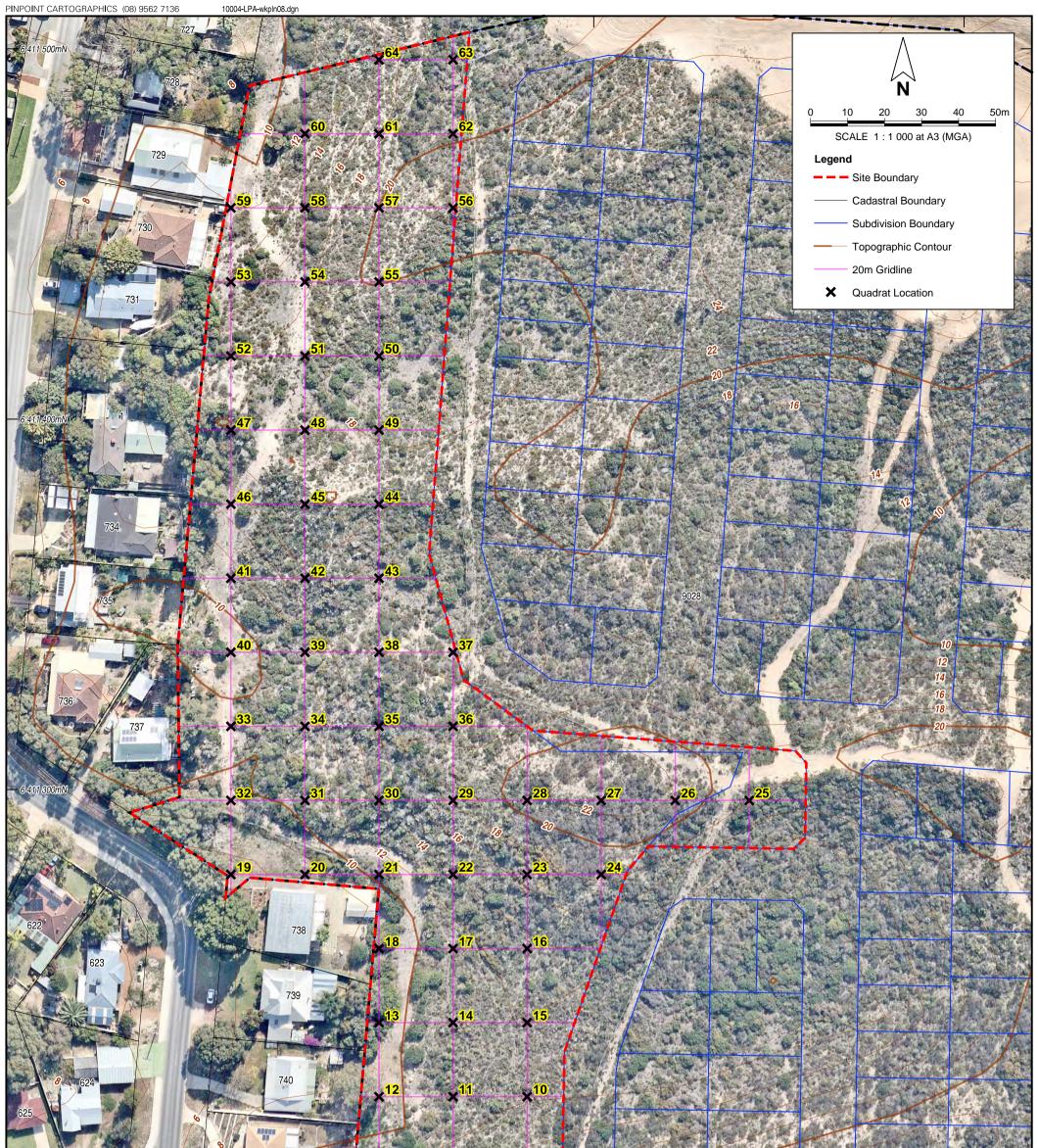
APPENDIX 1 Weed Mapping Grids







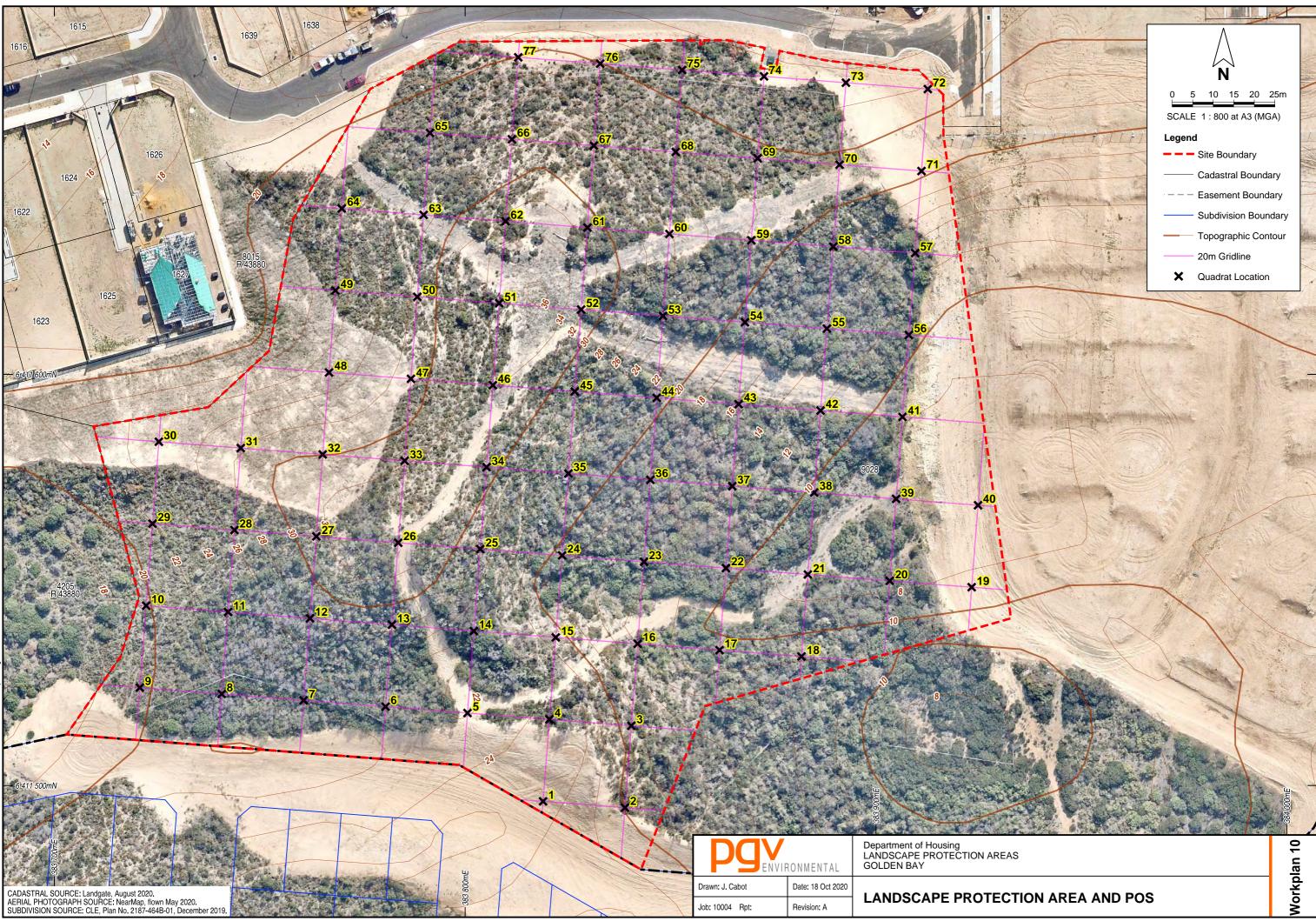




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APPENDIX 2 Naturemap Report



NatureMap Species Report

Created By Guest user on 11/03/2021

Current Names Only Yes Core Datasets Only Yes Method 'By Circle' Centre 115° 45' 55" E,32° 25' 43" S Buffer 10km Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	753	6530
Other specially protected fauna	2	10
Priority 2	2	8
Priority 3	10	53
Priority 4	8	89
Protected under international agreement	22	188
Rare or likely to become extinct	11	312
TOTAL	808	7190

	Name ID	Species Name	Naturalis	sed Conserv	ation Code	¹ Endemic To Query Area
Rare or like	ly to bec	ome extinct				
1.	24162	Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)			т	
2.	24784	Calidris ferruginea (Curlew Sandpiper)			т	
3.	24790	Calidris tenuirostris (Great Knot)			т	
4.	24731	Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)			т	
5.	24734	Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)			т	
6.	48400	Calyptorhynchus sp. (white-tailed black cockatoo)			т	
7.		Caretta caretta (Loggerhead Turtle)			T	
8.		Charadrius leschenaultii (Greater Sand Plover)			т	
9.		Dasyurus geoffroii (Chuditch, Western Quoll)			т	
10.		Diuris drummondii (Tall Donkey Orchid)			Т	
11.		Drakaea elastica (Glossy-leaved Hammer Orchid)			Т	
Protoctod u	ndor int	prostional agroement				
12.		ernational agreement Actitis hypoleucos (Common Sandpiper)			1.4	
12.		Arenaria interpres (Ruddy Turnstone)			IA IA	
13.		Calidris acuminata (Sharp-tailed Sandpiper)			IA IA	
14.		Calidris alba (Sanderling)			IA	
15.						
10.		Calidris melanotos (Pectoral Sandpiper)			IA IA	
17.		Calidris ruficollis (Red-necked Stint)				
18.		Calidris subminuta (Long-toed Stint)			IA	
19. 20.		Glareola maldivarum (Oriental Pratincole)			IA	
20.		Hydroprogne caspia (Caspian Tern) Limosa lapponica (Bar-tailed Godwit)			IA	
21.		Macronectes giganteus (Southern Giant Petrel)			IA IA	
22.		,			IA	
23.		Numenius phaeopus (Whimbrel) Pandion cristatus (Osprey, Eastern Osprey)			IA	
24.		Philomachus pugnax (Ruff, reeve)				
25.					IA IA	
20.		Plegadis falcinellus (Glossy Ibis) Pluvialis fulva (Pacific Golden Plover)			IA	
28.		Pluvialis squatarola (Grey Plover)			IA	
20.		Puffinus pacificus (Wedge-tailed Shearwater)			IA	
29. 30.		Sternula albifrons (Little Tern)			IA	
31.		Thalasseus bergii (Crested Tern)			IA	
32.		Tringa glareola (Wood Sandpiper)			IA	
33.		Tringa nebularia (Common Greenshank, greenshank)			IA	
					IA	
Other speci					•	
34.		Falco peregrinus (Peregrine Falcon)			S	
35.	48070	Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)			S	
ureMap is a collaborat	tive project of	the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.	OVERDAMENT OF WESTERN AUSTRALIA	Department of Biodiversity , Conservation and Attractions	W	

NatureMap	
Mapping Western Australia's biodiversity	

		Species Name	Naturalised Conservation Code Endemic To Qu Area
riority 2 36.	3237	Acacia benthamii	P2
37.		Cardamine paucijuga	P2
-iit 0			
riority 3	24220	Paularia airarra autor airarra	22
38. 39.		Beyeria cinerea subsp. cinerea Calandrinia oraria	P3 P3
40.		Dillwynia dillwynioides	P3
41.		Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)	P3
42.		Lasiopetalum membranaceum	P3
43.		Lerista lineata (Perth Slider, Lined Skink)	P3
44.		Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)	P3
45.		Pimelea calcicola	P3
46.		Schoenus capillifolius	P3
47.	20348	Sphaerolobium calcicola	P3
riority 4	40000	Colodania anaziana	24
48.		Caladenia speciosa	P4
49.		Conostylis pauciflora subsp. pauciflora	P4
50. 51.		Isoodon fusciventer (Quenda, southwestern brown bandicoot)	P4
52.		Jacksonia sericea (Waldjumi) Oxyura australis (Blue-billed Duck)	P4 P4
53.		Parsonsia diaphanophleba	P4
54.		Stylidium longitubum (Jumping Jacks)	P4
55.		Synemon gratiosa (Graceful Sunmoth)	P4
			14
lon-consei			
56.		Acacia applanata	
57.		Acacia cochlearis (Rigid Wattle)	
58.		Acacia cyclops (Coastal Wattle)	
59.		Acacia huegelii	
60.		Acacia lasiocarpa (Panjang)	
61.		Acacia lasiocarpa var. lasiocarpa	
62.		Acacia pulchella (Prickly Moses)	
63.		Acacia pulchella var. glaberrima	
64.		Acacia rostellifera (Summer-scented Wattle)	
65.		Acacia saligna (Orange Wattle, Kudjong)	
66.		Acacia saligna subsp. lindleyi	
67.		Acacia saligna subsp. saligna	
68.		Acacia stenoptera (Narrow Winged Wattle)	
69. 70		Acacia truncata	
70.		Acacia willdenowiana (Grass Wattle)	
71. 72.		Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill) Acanthiza chrysorrhoa (Yellow-rumped Thornbill)	
73.			
73.		Acanthiza inornata (Western Thornbill) Acanthocarpus preissii	
74.		Acanthorhynchus superciliosus (Western Spinebill)	
76.		Accipiter cirrocephalus (Collared Sparrowhawk)	
77.		Accipiter fasciatus (Brown Goshawk)	
78.		Acritoscincus trilineatus (Western Three-lined Skink)	
79.		Acrocephalus australis (Australian Reed Warbler)	
80.		Acrotriche cordata (Coast Ground Berry)	
81.		Adenanthos meisneri	
82.		Adriana quadripartita (Bitter Bush)	
83.		Afurcagobius suppositus	
84.	17202	Agonis flexuosa var. flexuosa	
85.	184	Aira caryophyllea (Silvery Hairgrass)	Υ
86.		Allocasuarina fraseriana (Sheoak, Kondil)	
87.	1732	Allocasuarina humilis (Dwarf Sheoak)	
88.		Alyxia buxifolia (Dysentery Bush)	
89.	35159	Ammophila arenaria subsp. arenaria	Υ
90.	13101	Amperea simulans	
91.		Aname mainae	
92.		Aname tepperi	
93.	24310	Anas castanea (Chestnut Teal)	
94.	24312	Anas gracilis (Grey Teal)	
95.	24313	Anas platyrhynchos (Mallard)	
96.	24315	Anas rhynchotis (Australasian Shoveler)	
97.	24316	Anas superciliosa (Pacific Black Duck)	
98.	47414	Anhinga novaehollandiae (Australasian Darter)	
00	1409	Anigozanthos humilis (Catspaw)	
99.			
99. 100.	11434	Anigozanthos humilis subsp. humilis	Conservation and Attractions

NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Q Area
101.	1411	Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)			
102.	11566	Anigozanthos viridis subsp. viridis			
103.	44629	Anilios australis			
104.	11725	Anthocercis ilicifolia subsp. ilicifolia			
105.	6949	Anthocercis littorea (Yellow Tailflower)			
106.	24561	Anthochaera carunculata (Red Wattlebird)			
107.	24562	Anthochaera lunulata (Western Little Wattlebird)			
108.	12724	Anthotium junciforme			
109.	202	Anthoxanthum odoratum (Sweet Vernal Grass)	Y		
110.	25670	Anthus australis (Australian Pipit)			
111.	3688	Aotus gracillima			
112.	3692	Aotus procumbens			
113.	1117	Aphelia cyperoides			
114.	6210	Apium annuum			
115.	6211	Apium prostratum (Sea Celery)			
116.		Apium prostratum subsp. prostratum var. prostratum (Sea Celery)			
117.		Aprasia repens (Sand-plain Worm-lizard)			
118.		Aquila audax (Wedge-tailed Eagle)			
119.		Arctotheca calendula (Cape Weed, African Marigold)	Y		
120.					
120.		Arctotis stoechadifolia (White Arctotis, Silver Arctotis)	Y		
		Ardea novechallendiaa (Mikita faced Haran)			
122.		Ardea novaehollandiae (White-faced Heron)			
123.	24341	Ardea pacifica (White-necked Heron)			
124.		Armillaria luteobubalina			
125.		Arnocrinum preissii			
126.		Artamus cinereus (Black-faced Woodswallow)			
127.	24353	Artamus cyanopterus (Dusky Woodswallow)			
128.	6580	Asclepias curassavica (Redhead Cottonbush)	Y		
129.	8779	Asparagus asparagoides (Bridal Creeper)	Y		
130.	1364	Asphodelus fistulosus (Onion Weed)	Y		
131.	20350	Astartea affinis (West-coast Astartea)			
132.	20283	Astartea scoparia (Common Astartea)			
133.	7851	Asteridea pulverulenta (Common Bristle Daisy)			
134.	6323	Astroloma ciliatum (Candle Cranberry)			
135.	6334	Astroloma pallidum (Kick Bush)			
136.	2471	Atriplex prostrata (Hastate Orache)	Y		
137.	2480	Atriplex suberecta			
138.		Auriscalpium barbatum			
139.		, Austronomus australis (White-striped Free-tailed Bat)			
140.		Austrostipa compressa			
141.		Austrostipa exilis			
142.		Austrostipa flavescens			
143.		Avena barbata (Bearded Oat)	V		
			ř		
144.		Aythya australis (Hardhead)			
145.		Banksia attenuata (Slender Banksia, Piara)			
146.		Banksia dallanneyi subsp. dallanneyi var. dallanneyi			
147.		Banksia grandis (Bull Banksia, Pulgarla)			
148.		Banksia littoralis (Swamp Banksia, Pungura)			
149.		Banksia menziesii (Firewood Banksia)			
150.	32202	Banksia nivea (Honeypot Dryandra, Pudjarn)			
151.		Barnardius zonarius			
152.	741	Baumea articulata (Jointed Rush)			
153.	743	Baumea juncea (Bare Twigrush)			
154.	744	Baumea laxa			
155.	748	Baumea vaginalis (Sheath Twigrush)			
156.	7046	Bellardia trixago (Bellardia)	Y		
157.	48868	Bellardia viscosa	Y		
158.	24319	Biziura lobata (Musk Duck)			
159.	749	Bolboschoenus caldwellii (Marsh Club-rush)			
160.		Boletus sp.			
161.	3710	Bossiaea eriocarpa (Common Brown Pea)			
162.		Brachyloma preissii (Globe Heath)			
163.		Brachypodium distachyon (False Brome)	Y		
164.		Brachyscome iberidifolia	1		
165.		Briza maxima (Blowfly Grass)	Y		
166.		Briza minor (Shivery Grass)	Y		
167.		Bromus arenarius (Sand Brome)			
168.		Bromus diandrus (Great Brome)	Y		
169.		Burchardia bairdiae			
170.	12770	Burchardia congesta			
170.			P. 12		

NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Quer Area
171.	1385	Burchardia multiflora (Dwarf Burchardia)			7
172.	25714	Cacatua pastinator (Western Long-billed Corella)			
173.	25715	Cacatua roseicapilla (Galah)			
174.	25716	Cacatua sanguinea (Little Corella)			
175.	24729	Cacatua tenuirostris (Eastern Long-billed Corella)	Y		
176.		Cacomantis flabelliformis (Fan-tailed Cuckoo)			
177.		Caesia micrantha (Pale Grass Lily)			
178.		Cakile maritima (Sea Rocket)	Y		
179.		Caladenia arenicola			
180.		Caladenia flava (Cowslip Orchid)			
181.		Caladenia latifolia (Pink Fairy Orchid)			
182.		Caladenia longicauda subsp. calcigena			
183. 184.		Caladenia occidentalis			
185.		Caladenia vulgata			
185.		Calandrinia brevipedata (Short-stalked Purslane) Calandrinia corrigioloides (Strap Purslane)			
187.		Calandrinia conglotides (Strap + distane) Calandrinia granulifera (Pygmy Purslane)			
188.		Calandrinia grandinera (rygny rusiane) Calandrinia liniflora (Parakeelya)			
189.		Calandrinia tholiformis			
190.		Calyptorhynchus banksii (Red-tailed Black-Cockatoo)			
191.	20/11	Calyptorhynchus latirostris?			Y
191.	5439	Calytrix angulata (Yellow Starflower)			
192.		Calytrix angulata (Tellow Stanlower) Calytrix flavescens (Summer Starflower)			
194.	0100	Candelariella sp.			
195.	48920	Canis familiaris (Dog, Dingo)	Y		
196.		Cardamine hirsuta (Common Bittercress)	Y		
197.		Carduelis carduelis (Goldfinch, European Goldfinch)	Y		
198.		Carex thecata			
199.		Carpobrotus virescens (Coastal Pigface, Kolboko, Bain)			
200.	1162	Cartonema philydroides			
201.	2951	Cassytha flava (Dodder Laurel)			
202.	2957	Cassytha racemosa (Dodder Laurel)			
203.	11799	Cassytha racemosa forma racemosa			
204.	259	Cenchrus echinatus (Burrgrass)	Y		
205.	7916	Centaurea melitensis (Maltese Cockspur, Malta Thistle)	Y		
206.	6542	Centaurium tenuiflorum	Y		
207.	6214	Centella asiatica			
208.	35322	Centranthus ruber subsp. ruber	Y		
209.	1120	Centrolepis alepyroides			
210.	1121	Centrolepis aristata (Pointed Centrolepis)			
211.	2889	Cerastium glomeratum (Mouse Ear Chickweed)	Y		
212.	24186	Chalinolobus gouldii (Gould's Wattled Bat)			
213.	1280	Chamaescilla corymbosa (Blue Squill)			
214.	24377	Charadrius ruficapillus (Red-capped Plover)			
215.		Chelodina colliei (South-western Snake-necked Turtle)			
216.	24321	Chenonetta jubata (Australian Wood Duck, Wood Duck)			
217.	2490	Chenopodium glaucum (Glaucous Goosefoot)	Y		
218.		Cherax destructor			
219.		Cherax quinquecarinatus			
220.		Chloris gayana (Rhodes Grass)	Y		
221.		Chorizandra enodis (Black Bristlerush)			
222.	24980	Christinus marmoratus (Marbled Gecko)			
223.	04404	Chroicocephalus novaehollandiae			
224.		Chrysococcyx basalis (Horsfield's Bronze Cuckoo)			
225.		Circus approximans (Swamp Harrier)			
226.		Circus assimilis (Spotted Harrier)			
227.		Cladorhynchus leucocephalus (Banded Stilt)			
228.		Clematis linearifolia			
229.		Colluricincla harmonica (Grey Shrike-thrush)			
230.		Columba livia (Domestic Pigeon)	Y		
231. 232.		Comesperma calymega (Blue-spike Milkwort)			
232.		Comesperma confertum			
233. 234.		Comesperma integerrimum Comesperma virgatum (Milkwort)			
		Conesperma virgatum (Milkwort)			
235. 236.		Conospermum capitatum subsp. glabratum Conospermum trinlinenujum (Tree Smokebush)			
236.		Conospermum triplinervium (Tree Smokebush)			
237.		Conostephium preissii Conostulis aculeata (Prickly Conostulis)			
238.		Conostylis aculeata (Prickly Conostylis) Conostylis aculeata subsp. aculeata			
239. 240.		Conostylis aculeata subsp. aculeata Conostylis candicans (Grey Cottonhead)			
270.	1427	Conseque canaleans (Crey Contenticad)	· @	utmont of Biodiversity	WEETER
			Depa	artment of Biodiversity, servation and Attractions	WESTER



	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
241.	12027	Conostylis candicans subsp. calcicola			Alou
242.	1436	Conostylis juncea			
243.	1443	Conostylis pauciflora (Dawesville Conostylis)			
244.		Coracina novaehollandiae (Black-faced Cuckoo-shrike)			
245.		Corvus coronoides (Australian Raven)			
246.		Corynotheca micrantha (Sand Lily)			
247. 248.		Cotula coronopifolia (Waterbuttons) Coturnix pectoralis (Stubble Quail)	Y		
248.					
249. 250.		Cracticus tibicen (Australian Magpie) Cracticus torquatus (Grey Butcherbird)			
251.	20000	Crapatalus sp.			v
252.	42009	Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)			
253.		Crassula colorata (Dense Stonecrop)			
254.		Crassula colorata var. acuminata			
255.	11563	Crassula colorata var. colorata			
256.	3140	Crassula glomerata	Y		
257.	15706	Crassula natans var. minus	Y		
258.	25399	Crinia glauerti (Clicking Frog)			
259.	25400	Crinia insignifera (Squelching Froglet)			
260.	4802	Cryptandra mutila			
261.	30893	Cryptoblepharus buchananii			
262.	30899	Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)			
263.	25027	Ctenotus australis			
264.	25039	Ctenotus fallens			
265.		Cuscuta epithymum (Lesser Dodder, Greater Dodder)	Y		
266.		Cuscuta planiflora	Y		
267.		Cyathochaeta avenacea			
268.		Cycnogeton lineare			
269.		Cygnus atratus (Black Swan)			
270.		Cymbalaria muralis subsp. muralis	Y		
271.		Cynosurus echinatus (Rough Dogstail)	Y		
272.		Cyperus congestus (Dense Flat-sedge)	Y		
273. 274.		Cyperus tenuiflorus (Scaly Sedge)	Y		
274.		Cyrtostylis huegelii Dacelo novaeguineae (Laughing Kookaburra)	Y		
276.		Dampiera linearis (Common Dampiera)	I		
277.		Dampiera trigona (Angled-stem Dampiera)			
278.		Daphoenositta chrysoptera (Varied Sittella)			
279.		Darwinia neildiana (Fringed Bell)			
280.		Dasypogon bromeliifolius (Pineapple Bush)			
281.		Daucus glochidiatus (Australian Carrot)			
282.	15505	Daviesia incrassata subsp. incrassata			
283.	3832	Daviesia physodes			
284.	3845	Daviesia triflora			
285.	25766	Delma fraseri (Fraser's Legless Lizard)			
286.	24999	Delma grayii			
287.	25468	Demansia psammophis (Yellow-faced Whipsnake)			
288.		Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)			
289.		Desmocladus asper			
290.		Desmocladus fasciculatus			
291.		Desmocladus flexuosus			
292.		Deyeuxia quadriseta (Reed Bentgrass)			
293.		Dicaeum hirundinaceum (Mistletoebird)			
294.		Dichelachne crinita (Longhair Plumegrass)			
295. 296.		Dichopogon capillipes Diplolaena dampieri (Southern Diplolaena)			
296. 297.		Diplopeltis huegelii subsp. huegelii			
297.		Dipiopenis naegeni subsp. naegeni Dischisma arenarium	Y		
290.		Dischisma arenanum Dischisma capitatum (Woolly-headed Dischisma)	Y		
300.		Discristria capitatum (wooliy-feaded Discristria) Diuris longifolia (Common Donkey Orchid)	1		
301.		Dromaius novaehollandiae (Emu)			
302.		Drosera erythrorhiza (Red Ink Sundew)			
303.		Drosera gigantea (Giant Sundew)			
304.		Drosera glanduligera (Pimpernel Sundew)			
305.		Drosera menziesii (Pink Rainbow)			
306.		Drosera neesii (Jewel Rainbow)			
307.	3114	Drosera nitidula (Shining Sundew)			
308.	3118	Drosera pallida (Pale Rainbow)			
309.	49090	Drosera sp. Branched styles (S.C. Coffey 193)			
310.	3131	Drosera stolonifera (Leafy Sundew)			
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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Que Area
311.	13205	Drosera tubaestylis			
312.	25096	Egernia kingii (King's Skink)			
313.	25100	Egernia napoleonis			
314.		Egretta garzetta			
315.		Egretta novaehollandiae			
316.	347	Ehrharta calycina (Perennial Veldt Grass)	Y		
317.		Elanus axillaris			
318.	25540	Elanus caeruleus (Black-shouldered Kite)			
319.		Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)			
320.		Elseyornis melanops (Black-fronted Dotterel)			
321.		Eolophus roseicapillus			
322.	6131	Epilobium billardiereanum (Glabrous Willow Herb)			
323.		Epilobium hirtigerum (Hairy Willow Herb)			
324.		Epilobium tetragonum subsp. tetragonum	Y		
			I		
325.		Epthianura albifrons (White-fronted Chat)			
326.		Eremophila glabra subsp. albicans			
327.		Eriochilus dilatatus subsp. dilatatus			
328.		Eriochilus dilatatus subsp. multiflorus			
329.		Erodium botrys (Long Storksbill)	Y		
330.		Erodium cicutarium (Common Storksbill)	Y		
331.		Eryngium pinnatifidum subsp. pinnatifidum			
332.		Erythrogonys cinctus (Red-kneed Dotterel)			
333.		Eucalyptus foecunda (Narrow-leaved Red Mallee)			
334.	5659	Eucalyptus gomphocephala (Tuart, Duart)			
335.	5708	Eucalyptus marginata (Jarrah, Djara)			
336.	13547	Eucalyptus marginata subsp. marginata (Jarrah)			
337.	20808	Eucalyptus petiolaris	Y		
338.	5763	Eucalyptus rudis (Flooded Gum, Kulurda)			
339.	13511	Eucalyptus rudis subsp. rudis			
340.	4636	Euphorbia paralias (Sea Spurge)	Y		
341.	4648	Euphorbia terracina (Geraldton Carnation Weed)	Y		
342.		Eutaxia virgata			
343.		Exocarpos sparteus (Broom Ballart, Djuk)			
344.		Falco berigora (Brown Falcon)			
345.		Falco cenchroides (Australian Kestrel, Nankeen Kestrel)			
346.		Falco longipennis (Australian Hobby)			
347.		Felis catus (Cat)	Y		
348.		Ficinia nodosa (Knotted Club Rush)	I		
349.		Fulica atra (Eurasian Coot)			
349. 350.					
		Fulica atra subsp. australis (Eurasian Coot)			
351.		Gahnia trifida (Coast Saw-sedge)			
352.		Galaxias occidentalis (Western Minnow)			
353.		Gallinula tenebrosa (Dusky Moorhen)			
354.	24763	Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)			
355.		Gastrolobium ebracteolatum			
356.	20482	Gastrolobium nervosum			
357.	4339	Geranium molle (Dove's Foot Cranesbill)	Y		
358.	4340	Geranium retrorsum			
359.	4341	Geranium solanderi (Native Geranium)			
360.	25530	Gerygone fusca (Western Gerygone)			
361.	1520	Gladiolus caryophyllaceus (Wild Gladiolus)	Y		
362.	24054	Globicephala macrorhynchus (Short-finned Pilot Whale)			
363.	10909	Gompholobium confertum			
364.		Gompholobium tomentosum (Hairy Yellow Pea)			
365.		Goodenia pulchella			
366.		Grallina cyanoleuca (Magpie-lark)			
367.		Grevillea crithmifolia			
368.		Grevillea preissii subsp. preissii			
369.		Grevillea vestita subsp. vestita			
309. 370.	12024	Grevillea vesilla subsp. vesilla Gymnopilus allantopus			
371.		Gymnothorax prasinus			
	04407				
372.		Haematopus longirostris (Pied Oystercatcher)			
373.		Haemodorum laxum			
374.		Haemodorum simplex			
375.		Hakea prostrata (Harsh Hakea)			
376.		Hakea varia (Variable-leaved Hakea)			
377.	24293	Haliaeetus leucogaster (White-bellied Sea-Eagle)			
378.	24295	Haliastur sphenurus (Whistling Kite)			
	24689	Halobaena caerulea (Blue Petrel)			
379.					
379. 380.	3961	Hardenbergia comptoniana (Native Wisteria)			

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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
381.	25410	Heleioporus eyrei (Moaning Frog)			Alea
382.	25412	Heleioporus psammophilus (Sand Frog)			
383.	3016	Heliophila pusilla	Y		
384.	16933	Hemiandra glabra			
385.		Hemiandra pungens (Snakebush)			
386.		Hemidactylus frenatus (Asian House Gecko)	Y		
387.		Hemiergis quadrilineata			
388.		Hibbertia cuneiformis (Cutleaf Hibbertia)			
389. 390.		Hibbertia hypericoides (Yellow Buttercups) Hibbertia hypericoides subsp. hypericoides			
391.		Hibbertia racemosa (Stalked Guinea Flower)			
391.		Hibbertia stellaris (Orange Stars)			
393.		Hibbertia vaginata			
394.		Hieraaetus morphnoides (Little Eagle)			
395.		Himantopus himantopus (Black-winged Stilt)			
396.		Hirundo neoxena (Welcome Swallow)			
397.		Histiopteris incisa			
398.		Holcus setiger (Annual Fog)	Y		
399.	6222	Homalosciadium homalocarpum			
400.	3968	Hovea trisperma (Common Hovea)			
401.	12859	Hovea trisperma var. trisperma			
402.	5216	Hybanthus calycinus (Wild Violet)			
403.	6229	Hydrocotyle diantha			
404.	11546	Hydrocotyle pilifera var. glabrata			
405.	6241	Hydrocotyle tetragonocarpa			
406.	25366	Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)			
407.	452	Hyparrhenia hirta (Tambookie Grass)	Y		
408.	35070	Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)			
409.	8086	Hypochaeris glabra (Smooth Catsear)	Y		
410.		Hypolaena exsulca			
411.	17841	Hypolaena pubescens			
412.		Idiommata blackwalli			
413.		Inocybe acaciae			
414.		Inocybe sabulosa			
415.		Isolepis cernua (Nodding Club-rush)			
416.		Isolepis cernua var. setiformis			
417.		Isolepis marginata (Coarse Club-rush)			
418. 419.	921	Isolepis producta Isopeda leishmanni			
419.	3002	Isotropis cuneifolia (Granny Bonnets)			
421.		Isotropis cuneifolia subsp. cuneifolia			
422.		Ixiolaena viscosa (Sticky Ixiolaena)			
423.		Jacksonia furcellata (Grey Stinkwood)			
424.		Juncus acutus subsp. acutus	Y		
425.		Juncus bufonius (Toad Rush)	Y		
426.		Juncus kraussii (Sea Rush)			
427.		Juncus kraussii subsp. australiensis			
428.	1188	Juncus pallidus (Pale Rush)			
429.		Kennedia prostrata (Scarlet Runner)			
430.		Kunzea ericifolia (Spearwood, Pondil)			
431.	15498	Kunzea glabrescens (Spearwood)			
432.	13562	Lachenalia aloides	Y		
433.	20019	Lachnagrostis filiformis			
434.	467	Lagurus ovatus (Hare's Tail Grass)	Y		
435.	25637	Larus novaehollandiae (Silver Gull)			
436.	1309	Laxmannia squarrosa			
437.		Lechenaultia expansa			
438.		Leontodon rhagadioloides	Y		
439.		Lepidosperma angustatum			
440.		Lepidosperma calcicola			
441.		Lepidosperma effusum (Spreading Sword-sedge)			
442.		Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)			
443.		Lepidosperma longitudinale (Pithy Sword-sedge)			
444.	940	Lepidosperma pubisquameum			
445.	0.45	Lepidosperma sp.			
446.		Lepidosperma squamatum			
447.		Leporella fimbriata (Hare Orchid)			
448. 449.		Leptocarpus coangustatus Leptocarpus decipiens			
449. 450.		Leptocarpus decipiens Leptocarpus roycei			
-50.	-10502		Net Danastina	nt of Biodiversity,	
		the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.	Conserva	tion and Attractions	AUSTRA

NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Que Area
451.	1080	Leptocarpus scariosus			
452.	15418	Leptoceras menziesii			
453.		Leptomeria empetriformis			
454.		Leptomeria preissiana			
455.		Leptorhynchos scaber (Lanky Buttons)			
456.		Leptospermum laevigatum (Coast Teatree)	Y		
457.		Lepyrodia glauca			
458.		Lepyrodia macra (Large Scale Rush)			
459.		Lepyrodia muirii			
460.		Lerista elegans			
461.		Leucopogon australis (Spiked Beard-heath)			
462.		Leucopogon parviflorus (Coast Beard-heath)			
463.		Leucopogon propinquus			
464.		Levenhookia stipitata (Common Stylewort)			
465.		Lialis burtonis			
466.		Lichmera indistincta (Brown Honeyeater)			
467.		Lichmera indistincta subsp. indistincta (Brown Honeyeater)			
468.		Limnodynastes dorsalis (Western Banjo Frog)			
469.		Linaria maroccana	Y		
470.	36160	Liparophyllum capitatum			
471.		Liparophyllum violifolium			
472.		Litoria adelaidensis (Slender Tree Frog)			
473.		Litoria moorei (Motorbike Frog)			
474.		Lobelia anceps (Angled Lobelia)			
475.		Lobelia tenuior (Slender Lobelia)			
476.		Logania vaginalis (White Spray)			
477.		Lolium perenne (Perennial Ryegrass)	Y		
478.	478	Lolium rigidum (Wimmera Ryegrass)	Y		
479.		Lolium sp.			
480.		Lolium x hybridum	Y		
481.		Lomandra caespitosa (Tufted Mat Rush)			
482.	1228	Lomandra hermaphrodita			
483.	1231	Lomandra maritima			
484.		Lomandra micrantha (Small-flower Mat-rush)			
485.		Lomandra micrantha subsp. micrantha			
486.		Lomandra preissii			
487.		Lomandra sericea (Silky Mat Rush)			
488.	1246	Lomandra suaveolens			
489.		Lophoictinia isura			
490.		Lotus subbiflorus	Y		
491.		Luzula meridionalis (Field Woodrush)			
492.		Lyginia barbata			
493.		Lyginia imberbis			
494.		Lysimachia arvensis (Pimpernel)	Y		
495.	2839	Macarthuria australis			
496.		Macrolepiota clelandii			
497.		Macropus fuliginosus (Western Grey Kangaroo)			
498.		Macrozamia riedlei (Zamia, Djiridji)			
499.		Malacorhynchus membranaceus (Pink-eared Duck)			
500.		Malurus splendens (Splendid Fairy-wren)			
501.		Malurus splendens subsp. splendens (Splendid Fairy-wren)			
502.		Malva parviflora (Marshmallow)	Y		
503.		Malva pseudolavatera	Y		
504.		Medicago polymorpha (Burr Medic)	Y		
505.		Medicago sativa (Alfalfa)	Y		
506.		Megalurus gramineus (Little Grassbird)			
507.		Meionectes brownii (Swamp Raspwort)			
508.		Melaleuca incana (Grey Honeymyrtle)			
509.		Melaleuca incana subsp. incana			
510.		Melaleuca lateritia (Robin Redbreast Bush)			
511.		Melaleuca preissiana (Moonah)			
512.		Melaleuca rhaphiophylla (Swamp Paperbark)			
513.		Melaleuca systema			
514.		Melaleuca teretifolia (Banbar)			
515.		Melaleuca thymoides			
516.		Melaleuca viminea (Mohan)			
517.	13280	Melaleuca viminea subsp. viminea			
518.	4085	Melilotus indicus	Y		
519.		Menetia greyii			
520.	6886	Mentha x piperita	Y		Y
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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Quer Area
521.	24598	Merops ornatus (Rainbow Bee-eater)			
522.	955	Mesomelaena pseudostygia			
523.	957	Mesomelaena tetragona (Semaphore Sedge)			
524.		Microcarbo melanoleucos			
525.	25693	Microeca fascinans (Jacky Winter)			
526.		Microlaena stipoides (Weeping Grass)			
527.		Microtis media subsp. media			
528.	1660	Microtis orbicularis (Dark Mignonette Orchid)			
529.		Millotia myosotidifolia			
530.	16693	Minuartia mediterranea	Y		
531.		Missulena granulosa			
532.	07440	Missulena hoggi			
533.		Monopsis debilis var. depressa	Y		
534. 535.		Morelia spilota subsp. imbricata (Carpet Python) Morethia lineoocellata			
536.		Morus serrator (Australasian Gannet)			
537.		Muehlenbeckia adpressa (Climbing Lignum)			
538.		Mus musculus (House Mouse)	Y		
539.		Mycena clarkeana	I		
540.	50011	Mycena nargan			
541.	7289	Myoporum caprarioides (Slender Myoporum)			
542.	.200	Nanoperca vittata			
543.	24738	Neophema elegans (Elegant Parrot)			
544.		Nicodamus mainae			
545.	25252	Notechis scutatus (Tiger Snake)			
546.		Nuytsia floribunda (Christmas Tree, Mudja)			
547.	25564	Nycticorax caledonicus (Rufous Night Heron)			
548.	24407	Ocyphaps lophotes (Crested Pigeon)			
549.	16390	Oenothera drummondii subsp. drummondii	Y		
550.	35416	Oenothera lindheimeri	Y		
551.	8127	Olearia axillaris (Coastal Daisybush)			
552.	38816	Omphalotus nidiformis			
553.	7348	Opercularia hispidula (Hispid Stinkweed)			
554.	18255	Opercularia vaginata (Dog Weed)			
555.	4113	Ornithopus compressus (Yellow Serradella)	Y		
556.	7122	Orobanche minor (Lesser Broomrape)	Y		
557.		Oryctolagus cuniculus (Rabbit)	Y		
558.		Oxalis exilis			
559.		Oxalis perennans			
560.		Pachycephala rufiventris (Rufous Whistler)			
561.		Pachyptila desolata (Antarctic Prion)			
562.		Paracaleana nigrita (Flying Duck Orchid)			
563.		Parasuta gouldii Bandalata gouldii			
564.		Pardalotus punctatus (Spotted Pardalote)			
565.		Pardalotus striatus (Striated Pardalote) Parentucellia latifolia (Common Bartsia)	Y		
566. 567.		Parietaria judaica (Pellitory)	Y		
568.		Patersonia occidentalis (Purple Flag, Koma)	ř		
569.		Pelargonium capitatum (Rose Pelargonium)	Y		
570.		Pelargonium littorale	1		
571.		Pelecanus conspicillatus (Australian Pelican)			
572.		Pericalymma ellipticum (Swamp Teatree)			
573.		Pericalymma ellipticum var. floridum			
574.		Petrochelidon nigricans (Tree Martin)			
575.		Petroica boodang (Scarlet Robin)			
576.		Petrophile axillaris			
577.		Petrophile linearis (Pixie Mops)			
578.		Petrorhagia dubia	Y		
579.		Phalacrocorax carbo (Great Cormorant)			
580.		Phalacrocorax melanoleucos (Little Pied Cormorant)			
581.	24667	Phalacrocorax sulcirostris (Little Black Cormorant)			
582.	25699	Phalacrocorax varius (Pied Cormorant)			
583.	548	Phalaris aquatica (Phalaris)	Y		
584.	24409	Phaps chalcoptera (Common Bronzewing)			
585.	20460	Pheladenia deformis			
586.	18529	Philotheca spicata (Pepper and Salt)			
587.	1478	Phlebocarya ciliata			
588.	48071	Phylidonyris niger (White-cheeked Honeyeater)			
589.		Phylidonyris novaehollandiae (New Holland Honeyeater)			
		Phyllangium paradoxum			
590.	16177	Filyilangium paradoxum	2.5		

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Mapping Western Australia's biodiversity

	Name ID	Species Name	Naturalise	ed Conservation Code	¹ Endemic To Que Area
591.	4675	Phyllanthus calycinus (False Boronia)			
592.		Phyllichthys punctatus			
593.	4	Phylloglossum drummondii (Pigmy Clubmoss)			
594.		Phytophthora cinnamomi			
595.		Picris angustifolia subsp. angustifolia			
596.		Pimelea lanata			
597.		Pimelea rosea (Rose Banjine)			
598.		Pimelea rosea subsp. rosea			
599.	87	Pinus pinaster (Pinaster Pine)	Y		
600.	42281	Pithocarpa cordata			
601.	24841	Platalea flavipes (Yellow-billed Spoonbill)			
602.	25720	Platycercus icterotis (Western Rosella)			
603.	24747	Platycercus spurius (Red-capped Parrot)			
604.	25721	Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)			
605.	24750	Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)			
606.	38823	Pleuroflammula praestans			
607.	571	Poa annua (Winter Grass)	Y		
608.	573	Poa drummondiana (Knotted Poa)			
609.	577	Poa poiformis (Coastal Poa)			
610.	578	Poa porphyroclados			
611.	25704	Podiceps cristatus (Great Crested Grebe)			
612.		Podolepis gracilis (Slender Podolepis)			
613.		Podotheca angustifolia (Sticky Longheads)			
614.		Podotheca chrysantha (Yellow Podotheca)			
615.		Podotheca gnaphalioides (Golden Long-heads)			
616.		Podotheca sp.			
617.	25510	Pogona minor (Dwarf Bearded Dragon)			
618.		Pogona minor subsp. minor (Dwarf Bearded Dragon)			
619.		Poliocephalus poliocephalus (Hoary-headed Grebe)			
620.		Polypogon monspeliensis (Annual Beardgrass)	Y		
621.		Polytelis anthopeplus (Regent Parrot)			
622.		Porphyrio porphyrio (Purple Swamphen)			
623.		Porphyrio porphyrio subsp. bellus (Purple Swamphen)			
624.		Prasophyllum brownii			
625.		Prasophyllum drummondii (Swamp Leek Orchid)			
626.					
627.		Prasophyllum fimbria (Fringed Leek Orchid)			
628.		Prasophyllum giganteum (Bronze Leek Orchid)			
		Prasophyllum hians (Yawning Leek Orchid)			
629.		Pseudonaja affinis (Dugite)			
630.		Pseudonaja affinis subsp. affinis (Dugite)			
631.		Pseudonaja nuchalis (Gwardar, Northern Brown Snake)			
632.		Pterodroma brevirostris (Kerguelen Petrel)			
633.	25710	Pterodroma macroptera (Great-winged Petrel)			
634.		Pterostylis aff. nana			
635.		Pterostylis angulata			
636.		Pterostylis barbata (Bird Orchid)			
637.		Pterostylis brevisepala			
638.		Pterostylis orbiculata			
639.		Pterostylis pyramidalis (Snail Orchid)			
640.	12217	Pterostylis sanguinea			
641.		Pterostylis sp.			
642.		Ptilotus drummondii (Narrowleaf Mulla Mulla)			
643.		Ptilotus polystachyus (Prince of Wales Feather)			
644.	2759	Ptilotus sericostachyus			
645.	15856	Ptilotus sericostachyus subsp. sericostachyus			
646.	24711	Puffinus assimilis subsp. assimilis (Little Shearwater)			
647.		Purpureicephalus spurius			
648.	8195	Quinetia urvillei			
649.	2935	Ranunculus pumilio (Smallflower Buttercup)			
650.	11927	Ranunculus sessiliflorus var. sessiliflorus			
651.	2938	Ranunculus trilobus (Buttercup)	Y		
652.	3061	Raphanus raphanistrum (Wild Radish)	Y		
653.	24243	Rattus fuscipes (Western Bush Rat)			
654.		Rattus rattus (Black Rat)	Y		
655.		Raveniella peckorum			
656.	24776	Recurvirostra novaehollandiae (Red-necked Avocet)			
657.		Resupinatus cinerascens			
658.		Retama raetam	Y		
659.		Rhagodia baccata subsp. baccata			
660.		Rhagodia baccata subsp. dioica (Sea Berry Saltbush)			
	11330	ייייטער אינטער אינטער אינטער אינטער אינטער אינעראין אינעראין אינעראין אינעראין אינעראין אינעראין אינעראין אינער	2.3		
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NatureMap	
Mapping Western Australia's biodiversity	

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
661.	48096	Rhipidura albiscapa (Grey Fantail)			
662.	25614	Rhipidura leucophrys (Willie Wagtail)			
663.	24454	Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)			
664.	13300	Rhodanthe citrina			
665.		Rhycherus gloveri			
666.	1556	Romulea rosea (Guildford Grass)	Y		
667.	2433	Rumex crispus (Curled Dock)	Y		
668.	2440	Rumex pulcher (Fiddle Dock)	Y		
669.	40426	Rytidosperma occidentale			
670.	48430	Salicornia quinqueflora			
671.	48431	Salicornia quinqueflora subsp. quinqueflora (Beaded Glasswort)			
672.	6483	Samolus junceus			
673.	7368	Scabiosa atropurpurea (Purple Pincushion)	Y		
674.	7595	Scaevola anchusifolia			
675.	7603	Scaevola canescens (Grey Scaevola)			
676.	7606	Scaevola crassifolia (Thick-leaved Fan-flower)			
677.	7614	Scaevola globulifera			
678.	13152	Scaevola thesioides subsp. thesioides			
679.	48834	Schinus terebinthifolia	Y		
680.	48356	Schoenoplectus tabernaemontani			
681.	978	Schoenus brevisetis			
682.	986	Schoenus efoliatus			
683.		Schoenus grandiflorus (Large Flowered Bogrush)			
684.		Schoenus nitens (Shiny Bog-rush)			
685.		Schoenus odontocarpus			
686.		Schoenus subfascicularis			
687.	6033	Scholtzia involucrata (Spiked Scholtzia)			
688.		Selaginella gracillima (Tiny Clubmoss)			
689.		Sematophyllum homomallum			
690.		Senecio condylus			
691.		Senecio diaschides			
692.		Senecio pinnatifolius			
693.		Senecio ramosissimus (Auricled Groundsel)			
694.		Sericornis frontalis (White-browed Scrubwren)			
695.		Sericornis frontalis subsp. maculatus (White-browed Scrubwren)			
696.		Silene gallica (French Catchfly)	Y		
697.		Siloxerus filifolius	1		
698.		Siloxerus humifusus (Procumbent Siloxerus)			
699.		Sinoselaps bertholdi (Jan's Banded Snake)			
700.		Smicrornis brevirostris (Weebill)			
700.			N/		
		Sonchus asper (Rough Sowthistle)	Y		
702.		Sonchus hydrophilus (Native Sowthistle)			
703.		Sonchus oleraceus (Common Sowthistle)	Y		
704.	1312	Sowerbaea laxiflora (Purple Tassels)			
705.		Sphyraena obtusata			
706.		Spinifex hirsutus (Hairy Spinifex)			
707.		Spinifex longifolius (Beach Spinifex)			
708.		Sporobolus africanus (Parramatta Grass)	Y		
709.		Sporobolus virginicus (Marine Couch)			
710.	4828	Spyridium globulosum (Basket Bush)			
711.		Squatina australis			
712.		Stackhousia huegelii			
713.		Stackhousia monogyna			
714.	2918	Stellaria media (Chickweed)	Y		
715.	48113	Stenella coeruleoalba (Striped Dophin)			
716.	24522	Sterna bergii (Crested Tern)			
717.	24533	Sterna paradisaea (Arctic Tern)			
718.	48594	Sternula nereis (Fairy Tern)			
719.	24554	Stipiturus malachurus subsp. westernensis (Southern Emu-wren)			
720.	2316	Stirlingia latifolia (Blueboy)			
721.	25597	Strepera versicolor (Grey Currawong)			
722.	25590	Streptopelia senegalensis (Laughing Turtle-Dove)	Y		
723.	25518	Strophurus spinigerus			
724.	7693	Stylidium brunonianum (Pink Fountain Triggerplant)			
725.		Stylidium calcaratum (Book Triggerplant)			
726.		Stylidium despectum (Dwarf Triggerplant)			
727.		Stylidium dichotomum (Pins-and-needles)			
728.		Stylidium divaricatum (Daddy-long-legs)			
729.		Stylidium neurophyllum (Coastal Plain Triggerplant)			
730.		Stylidium piliferum (Common Butterfly Triggerplant)			
, 50.	1114	Synamic pillorum (Common Ballomy Higgorpiant)	New Dearth	ent of Biodiversity,	WEETER
		the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.	Conser	vation and Attractions	AUSTRA



	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Q Area
731.	7785	Stylidium repens (Matted Triggerplant)			
732.	7798	Stylidium schoenoides (Cow Kicks)			
733.	2639	Suaeda australis (Seablite)			
734.	2329	Synaphea spinulosa			
735.	25705	Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)			
736.	24682	Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-			
		throated Grebe)			
737.	25552	Tadorna radjah (Radjah Shelduck)			
738.	24331	Tadorna tadornoides (Australian Shelduck, Mountain Duck)			
739.	20135	Taxandria linearifolia			
740.	4256	Templetonia retusa (Cockies Tongues)			
741.	2791	Tersonia cyathiflora (Button Creeper)			
742.	2820	Tetragonia decumbens (Sea Spinach)	Y		
743.	1036	Tetraria octandra			
744.		Thelymitra aff. pauciflora			
745.	1701	Thelymitra antennifera (Vanilla Orchid)			
746.	10856	Thelymitra benthamiana (Leopard Orchid)			
747.	1705	Thelymitra crinita (Blue Lady Orchid)			
748.	1707	Thelymitra flexuosa (Twisted Sun Orchid)			
749.	1708	Thelymitra fuscolutea (Chestnut Sun Orchid)			
750.	20730	Thelymitra paludosa			
751.		Thelymitra sp.			
752.	2644	Threlkeldia diffusa (Coast Bonefruit)			
753.	24845	Threskiornis spinicollis (Straw-necked Ibis)			
754.	1318	Thysanotus arbuscula			
755.	1319	Thysanotus arenarius			
756.	1338	Thysanotus manglesianus (Fringed Lily)			
757.	1339	Thysanotus multiflorus (Many-flowered Fringe Lily)			
758.	1354	Thysanotus tenellus			
759.	25203	Tiliqua occipitalis (Western Bluetongue)			
760.	25519	Tiliqua rugosa			
761.	25207	Tiliqua rugosa subsp. rugosa			
762.	25549	Todiramphus sanctus (Sacred Kingfisher)			
763.	32445	Tortula muralis			
764.	1368	Trachyandra divaricata	Y		
765.	6266	Trachymene coerulea (Blue Lace Flower)			
766.		Trachymene coerulea subsp. coerulea			
767.	6280	Trachymene pilosa (Native Parsnip)			
768.	1481	Tribonanthes australis (Southern Tiurndin)			
769.	25723	Trichoglossus haematodus (Rainbow Lorikeet)			
770.	25521	Trichosurus vulpecula (Common Brushtail Possum)			
771.	24158	Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)			
772.	1361	Tricoryne elatior (Yellow Autumn Lily)			
773.	4291	Trifolium arvense (Hare's Foot Clover)	Y		
774.	4292	Trifolium campestre (Hop Clover)	Y		
775.	4295	Trifolium dubium (Suckling Clover)	Y		
776.	4297	Trifolium glomeratum (Cluster Clover)	Y		
777.	147	Triglochin mucronata			
778.		Triglochin striata			
779.	152	Triglochin trichophora			
780.		Trygonoptera mucosa			
781.		Trygonoptera personata			
782.	11665	Trymalium ledifolium var. ledifolium			
783.	48147	Turnix varius (Painted Button-quail)			
784.		Tyto alba subsp. delicatula (Barn Owl)			
785.		Urolophus lobatus			
786.	8255	Ursinia anthemoides (Ursinia)	Y		
787.	24386	Vanellus tricolor (Banded Lapwing)			
788.		Varanus gouldii (Bungarra or Sand Monitor)			
789.		Varanus rosenbergi (Heath Monitor)			
790.		Varanus tristis (Racehorse Monitor)			
791.		Varanus tristis subsp. tristis (Racehorse Monitor)			
792.		Verbascum virgatum (Twiggy Mullein)	Y		
793.		Verbesina encelioides	Y		
794.		Verbesina encelioides var. encelioides (Crownbeard, Wild Sunflower, Goldweed,			
		South African Daisy)	Y		
795.	24206	Vespadelus regulus (Southern Forest Bat)			
796.		Viminaria juncea (Swishbush, Koweda)			
797.		Vulpes vulpes (Red Fox)	Y		
798.		Vulpia bromoides (Squirrel Tail Fescue)	Ŷ		
-			643	nent of Biodiversity,	
					WEST



	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
799.	11137	Vulpia fasciculata	Y		
800.	724	Vulpia myuros (Rat's Tail Fescue)	Y		
801.	33101	Vulpia myuros forma myuros	Y		
802.	7389	Wahlenbergia preissii			
803.	6939	Westringia dampieri			
804.	1398	Wurmbea monantha			
805.	1256	Xanthorrhoea preissii (Grass tree, Palga)			
806.	6289	Xanthosia huegelii			
807.	25765	Zosterops lateralis (Grey-breasted White-eye, Silvereye)			
808.	36218	Zygodon menziesii			

Conservation Codes T - Rare or likely to become extinct X - Presume dextinct IA - Protected under international agreement S - Other specially protected fauna 1 - Priority 1 2 - Priority 2 3 - Priority 2 4 - Priority 4 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 8

APPENDIX 3 Conservation Codes

Conservation Codes for Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. Conservation codes have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018*.

T Threatened species – Schedules 1-4

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

- **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.
- **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

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 as detailed below.

CR Critically endangered species

Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "facing a high risk of extinction in the wild in the mediumterm future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife*

Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

EX Presumed extinct species

Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation* (Specially Protected Fauna) Notice 2018.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation* (Specially Protected Fauna) Notice 2018.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority 4: Rare, Near Threatened and other species in need of monitoring

- (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
- (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
- (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Western Australian Ecological Communities

Threatened Ecological Communities

The BC Act provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and 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. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally \leq 5 occurrences or a total area of \leq 100ha).

Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;
- (iii) munities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

- (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.
- (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Commonwealth of Australia Conservation Codes

Threatened Flora and Fauna

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following six categories:

Extinct

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

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

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a high risk of extinction in the wild.

Conservation dependent

A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

- a) 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; or
- b) the following subparagraphs are satisfied:
 - i. the species is a species of fish;

- ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;
- iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory;
- iv. cessation of the plan of management would adversely affect the conservation status of the species.

The EPBC Act does not provide for listing in a data deficient category. Where sufficient data (evidence) is unavailable to allow assessment by the Threatened Species Scientific Committee against the criteria for listing, the species are found to be ineligible. A recommendation is made to the Minister to not include the species in any category under the EPBC Act. For reasons of transparency and to inform future research, the Threatened Species Scientific Committee publishes the names of those species found to be data deficient. As data deficient is not a listing category under the EPBC Act, this has no statutory implications and the species is not considered to be listed under the EPBC Act.

Threatened Ecological Communities

Threatened Ecological communities under the EPBC Act are listed in three categories.

Critically endangered

If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 8

APPENDIX 4 Species List

SPECIES LIST – Golden Bay LPA

GYMNOSPERMS

CUPRESSACEAE *Callitris preissii

MONOCOTYLEDONS

ASPARAGACEAE Acanthocarpus preissii *Agave americana Lomandra maritima Thysanotus sparteus

ASPHODELACEAE *Trachyandra divaricata

COLCHICACEAE Wurmbea monantha

CYPERACEAE Isolepis marginata Lepidosperma calcicola Lepidosperma gladiatum Schoenus grandiflorus

HAEMODORACEAE Conostylis candicans

HEMEROCALLIDACEAE Tricoryne tenella

ORCHIDACEAE Caladenia latifolia

POACEAE

*Anthoxanthum odoratum Austrostipa flavescens *Avena fatua *Bromus diandrus *Ehrharta calycina *Ehrharta longiflora *Lagurus ovatus *Lolium perenne Poa porphyroclados RESTIONACEAE Desmocladus flexuosus

DICOTYLEDONS

ANACARDIACEAE *Schinus terebinthifolius

APIACEAE Daucus glochidiatus

APOCYNACEAE Alyxia buxifolia *Gomphocarpus fruticosus

ARALIACEAE Hydrocotyle intertexta Trachymene pilosa

ASTERACEAE Asteridea pulverulenta *Gazania linearis Leptorhynchos scaber Olearia axillaris *Osteospermum ecklonis Pithocarpa cordata Senecio pinnatifolius *Sonchus oleraceus

BRASSICACEAE *Diplotaxis muralis *Heliophila pusilla

CAPRIFOLIACEAE *Centranthus macrosiphon

CARYOPHYLLACEAE *Minuartia mediterranea

CHENOPODIACEAE Rhagodia baccata CONVOLVULACEAE *Cuscuta epithymum CRASSULACEAE *Crassula glomerata

DILLENIACEAE Hibbertia cuneiformis

ERICACEAE Leucopogon parviflorus

EUPHORBIACEAE *Euphorbia terracina

FABACEAE Acacia cochlearis Acacia rostellifera Acacia saligna Gompholobium tomentosum Hardenbergia comptoniana Jacksonia furcellata

GERANIACEAE *Pelargonium capitatum

GOODENIACEAE Scaevola thesioides

LAMIACEAE Hemiandra pungens

LAURACEAE Cassytha flava Cassytha racemosa

LOBELIACEAE Lobelia tenuior

MONTIACEAE Calandrinia brevipedata Calandrinia liniflora

MYRTACEAE *Chamelaucium uncinatum Melaleuca systena ONAGRACEAE *Oenothera drummondii

OROBANCHACEAE *Bellardia trixago *Bellardia viscosa *Orobanche minor *Parentucellia latifolia

OXALIDACEAE *Oxalis pes-caprae

PAPAVERACEAE *Fumaria capreolata

PHYLLANTHACEAE Phyllanthus calycinus Poranthera microphylla

PRIMULACEAE *Lysimachia arvensis

PROTEACEAE Hakea prostrata

RANUNCULACEAE Clematis linearifolia

RHAMNACEAE Cryptandra mutila Trymalium ledifolium Spyridium globulosum

RUBIACEAE Opercularia vaginata

RUTACEAE Diplolaena dampieri

SANTALACEAE Exocarpos sparteus Santalum acuminatum

Appendix 8

SCROPHULARIACEAE *Dischisma arenarium Eremophila glabra

SOLANACEAE *Solanum nigrum

TROPAEOLACEAE *Tropaeolum majus

URTICACEAE Parietaria debilis

Appendix 8

APPENDIX 5 Quadrat Data

50 383848 E 6411647 N

Vegetation:	<i>Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa</i> Open Low Heath
Condition:	Very Good
Soil Type:	Light brown sand
Landform:	Steeply sloping down to the north-east
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	20
Melaleuca systena	1	15
Austrostipa flavescens	1.1	2
Spyridium globulosum	0.8	1
Acacia lasiocarpa	0.5	10
Cryptandra mutila	0.5	1
*Bromus diandrus	0.4	10
*Euphorbia terracina	0.4	2
*Lagurus ovatus	0.4	1
*Lolium perenne	0.4	1
Phyllanthus calycinus	0.4	<1
*Pelargonium capitatum	0.4	<1
Asteridea pulverulenta	0.4	<1
Acanthocarpus preissii	0.3	5
Lomandra maritima	0.3	2
Conostylis candicans	0.3	1
Senecio pinnatifolius	0.3	1
Scaevola thesioides	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
Leptorhynchos scaber	0.3	<1
Lobelia tenuior	0.3	<1
*Diplotaxis muralis	0.3	<1
*Lysimachia arvensis	0.2	1
*Sonchus oleraceus	0.2	<1
*Bellardia trixago	0.2	<1
Desmocladus flexuosus	0.1	1
Calandrinia liniflora	0.1	<1
Calandrinia brevipedata	0.1	<1
Trachymene pilosa	<0.1	1
Parietaria debilis	<0.1	<1
*Crassula glomerata	<0.1	<1
Isolepis marginata	<0.1	<1
Cassytha flava	Climber	2

50 383770 E 6411530 N

Vegetation:	Acacia rostellifera/Spyridium globulosum/Diplolaena dampieri	
	Closed Heath over Lepidosperma gladiatum Sedgeland	
Condition:	Very Good	
Soil Type:	Light brown sand	
Landform:	Steeply sloping down to the south	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1.8	40
Spyridium globulosum	1.8	30
Santalum acuminatum	1.1	2
Lepidosperma gladiatum	0.8	5
Senecio pinnatifolius	0.8	<1
Diplolaena dampieri	0.6	20
Austrostipa flavescens	0.6	<1
Acanthocarpus preissii	0.4	5
Rhagodia baccata	0.4	2
*Bromus diandrus	0.4	1
*Lolium perenne	0.3	2
Lomandra maritima	0.3	1
*Lagurus ovatus	0.3	1
Conostylis candicans	0.3	<1
*Sonchus oleraceus	0.3	<1
Daucus glochidiatus	0.2	10
Parietaria debilis	0.2	<1

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nber 2

50 383692 E 6411552 N

Vegetation:	Spyridium globulosum/Acacia rostellifera Open Heath over weeds
Condition:	Degraded
Soil Type:	Dark brown-black sand
Landform:	Depression between dunes
Date:	16.10.20
Recorder:	Paul van der Moezel



Quadrat (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Spyridium globulosum	1.9	40
Acacia rostellifera	1.5	5
Austrostipa flavescens	0.7	2
*Bromus diandrus	0.4	50
*Lolium perenne	0.4	20
Melaleuca systena	0.4	1
Diplolaena dampieri	0.4	1
Acanthocarpus preissii	0.4	1
Olearia axillaris	0.4	<1
Rhagodia baccata	0.3	1
Senecio pinnatifolius	0.3	1
Parietaria debilis	0.3	1
Lobelia tenuior	0.3	<1
*Sonchus oleraceus	0.3	<1
Caladenia latifolia	0.2	<1
Opercularia vaginata	0.2	<1
Daucus glochidiatus	0.1	1
*Dischisma arenarium	0.1	1
Tricoryne tenella	0.1	<1

Calandrinia brevipedata	<0.1	2
Isolepis marginata	<0.1	<1
*Crassula glomerata	<0.1	<1
Hardenbergia comptoniana	Climber	1

50 383693 E 6411284 N

Vegetation:	Acacia rostellifera/Spyridium globulosum Open Heath over weeds
Condition:	Good
Soil Type:	Cream sand
Landform:	Upper slope of low dune
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1.5	60
Santalum acuminatum	1	1
*Ehrharta calycina	0.8	<1
Austrostipa flavescens	0.7	1
Poa porphyroclados	0.7	<1
Melaleuca systena	0.6	5
Spyridium globulosum	0.5	2
*Bromus diandrus	0.4	40
*Lolium perenne	0.4	20
Opercularia vaginata	0.4	10
Conostylis candicans	0.4	<1
Parietaria debilis	0.3	5
Phyllanthus calycinus	0.4	<1
Caladenia latifolia	0.4	<1
*Lagurus ovatus	0.3	<1
*Trachyandra divaricata	0.3	<1
Daucus glochidiatus	0.2	<1
*Sonchus oleraceus	0.2	<1
*Bellardia viscosa	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
Hydrocotyle intertexta	0.1	1
*Cerastium glomeratum	0.1	<1
*Crassula glomerata	<0.1	1
Isolepis marginata	<0.1	<1
Calandrinia liniflora	<0.1	<1
*Dischisma arenarium	<0.1	<1
Cassytha racemosa	Climber	10
Hardenbergia comptoniana	Climber	<1

50 383673 E 6411225 N

Vegetation:	Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/
	Lomandra maritima Open Low Heath
Condition:	Very Good
Soil Type:	Brown sand, some surface limestone
Landform:	Lower slope of tall dune
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Santalum acuminatum	0.8	10
Austrostipa flavescens	0.8	1
*Ehrharta longiflora	0.7	<1
Poa porphyroclados	0.6	<1
Melaleuca systena	0.5	30
Trymalium ledifolium	0.5	5
Hakea prostrata	0.5	2
Acanthocarpus preissii	0.4	10
Acacia lasiocarpa	0.4	5
Gompholobium tomentosum	0.4	4
Senecio pinnatifolius	0.4	<1
*Diplotaxis muralis	0.4	<1
Schoenus grandiflorus	0.4	<1
Lomandra maritima	0.3	30
Opercularia vaginata	0.3	2
*Lolium perenne	0.3	1
Thysanotus sparteus	0.3	<1
Lobelia tenuior	0.3	<1

SPECIES	HEIGHT (m)	COVER (%)
*Pelargonium capitatum	0.3	<1
Conostylis candicans	0.2	1
*Heliophila pusilla	0.2	1
*Lagurus ovatus	0.2	<1
Lepidosperma calcicola	0.2	<1
Desmocladus flexuosus	0.1	10
Spyridium globulosum	0.1	<1
Calandrinia liniflora	0.1	<1
Scaevola thesioides	0.1	<1
*Sonchus oleraceus	0.1	<1
*Minuartia mediterranea	<0.1	4
Poranthera microphylla	<0.1	<1
*Crassula glomerata	<0.1	<1
Cassytha racemosa	Climber	<1
Hardenbergia comptoniana	Climber	<1
Clematis linearifolia	Climber	<1

50 384026 E 6411054 N

Vegetation:	Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low
	Heath
Condition:	Very Good
Soil Type:	Light brown sand
Landform:	Mid-slope, sloping down to the north-west
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	20
Austrostipa flavescens	0.6	1
*Avena fatua	0.6	<1
*Bromus diandrus	0.5	<1
Thysanotus sparteus	0.5	<1
Lomandra maritima	0.4	30
Acacia lasiocarpa	0.4	10
Melaleuca systena	0.4	5
*Lolium perenne	0.4	5
Trymalium ledifolium	0.4	5
*Anthoxanthum odoratum	0.4	2
Gompholobium tomentosum	0.4	<1
Phyllanthus calycinus	0.4	<1
Poa porphyroclados	0.4	<1
Acanthocarpus preissii	0.3	10
Lepidosperma calcicola	0.3	2
Cryptandra mutila	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
Scaevola thesioides	0.3	<1
Senecio pinnatifolius	0.3	<1
Conostylis candicans	0.3	<1
*Sonchus oleraceus	0.3	<1
*Pelargonium capitatum	0.3	<1
Desmocladus flexuosus	0.2	1
Lobelia tenuior	0.2	<1
Hydrocotyle intertexta	0.2	<1
Leptorhynchos scaber	0.2	<1
Wurmbea monantha	0.2	<1
*Heliophila pusilla	0.2	<1
Tricoryne tenella	0.1	<1
*Lysimachia arvensis	0.1	<1
Poranthera microphylla		
*Minuartia mediterranea	0.1	<1
Trachymene pilosa	<0.1	1
Cassytha flava	Climber	5
Hardenbergia comptoniana	Climber	<1

50 383752 E 6411036 N

Vegetation:	Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low
	Heath
Condition:	Very Good
Soil Type:	Grey sand
Landform:	Upper slope of tall dune
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	15
Olearia axillaris	0.8	1
Austrostipa flavescens	0.7	1
Poa porphyroclados	0.6	<1
Rhagodia baccata	0.5	2
Lomandra maritima	0.4	20
*Bromus diandrus	0.4	10
Acacia lasiocarpa	0.4	5
Melaleuca systena	0.4	5
Spyridium globulosum	0.4	<1
Acanthocarpus preissii	0.3	20
Opercularia vaginata	0.3	10
*Lolium perenne	0.3	5
Conostylis candicans	0.3	2
Thysanotus sparteus	0.3	<1
Parietaria debilis	0.3	<1
Scaevola thesioides	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
Senecio pinnatifolius	0.3	<1
Desmocladus flexuosus	0.1	1
Hemiandra pungens	0.1	1
*Pelargonium capitatum	0.1	<1
Lepidosperma calcicola	0.1	<1
Calandrinia liniflora	0.1	<1
*Sonchus oleraceus	0.1	<1
Poranthera microphylla	<0.1	<1
Trachymene pilosa	<0.1	<1
*Crassula glomerata	<0.1	<1
Clematis linearifolia	Climber	5
Hardenbergia comptoniana	Climber	1

50 383791 E 6411017 N

Vegetation:	Acacia rostellifera/Spyridium globulosum Closed Heath
Condition:	Good
Soil Type:	Grey sand
Landform:	Mid-slope, steeply sloping down to the south
Date:	16.10.20
Recorder:	Paul van der Moezel



SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1.8	70
Olearia axillaris	1	10
Spyridium globulosum	0.6	10
Austrostipa flavescens	0.6	1
Rhagodia baccata	0.5	5
*Lolium perenne	0.5	2
Poa porphyroclados	0.5	<1
Scaevola thesioides	0.5	<1
*Bromus diandrus	0.4	20
Melaleuca systena	0.4	2
Trymalium ledifolium	0.4	1
Acanthocarpus preissii	0.4	1
*Pelargonium capitatum	0.4	1
Parietaria debilis	0.3	2
*Centranthus macrosiphon	0.3	2
Conostylis candicans	0.3	1
*Sonchus oleraceus	0.3	<1
*Lagurus ovatus	0.3	<1
Daucus glochidiatus	0.2	2

SPECIES	HEIGHT (m)	COVER (%)
*Heliophila pusilla	0.2	2
*Dischisma arenarium	0.1	1
*Bellardia viscosa	0.1	<1
Clematis linearifolia	Climber	10
Hardenbergia comptoniana	Climber	1

APPENDIX 9

LANDSCAPE PROTECTION AREA MANAGEMENT PLAN

GOLDEN BAY LANDSCAPE PROTECTION AREA

MANAGEMENT PLAN

Prepared for:	Peet Golden Bay Pty Ltd
	Department of Communities
Report Date:	16 August 2023
Version:	3
Report No.	2021-597





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1 INTRODUCTION

1.1 Background

The urban development of Lots 2 and 3 Warnbro Sound Avenue, Golden Bay was subject to a Public Environmental Review (EPA Assessment 604) and was approved through Ministerial Statement 297 (MS 297) in January 1993 (Appendix 1). Condition 4 of the Ministerial Statement 297 relates to landscape protection and states the following:

4. Landscape Protection

The landscape value of the parabolic dune ridge on the eastern edge of Golden Bay should be recognised.

4-1 Prior to subdivision approval, the proponent shall liaise with the Department of Planning and Urban Development and the City of Rockingham to incorporate planning measures which recognise and protect the landscape value of the parabolic dune ridge on the eastern edge of Golden Bay, to the requirements of the Minister for the Environment and the Minister for Planning on the advice of Department of Planning and Urban Development, the City of Rockingham and the Environmental Protection Authority.

The Minister for the Environment determined that a committee should be set up to inform the Minister for Planning and himself with advice regarding the clearance of the condition. The Minson Committee was established with six members who met three times to determine the landscape value of the parabolic dune ridge based on the following:

- Its physical shape, size, form, vegetation and the aesthetic appeal which derives from these features;
- The conspicuous relief it provides in the generally flat Rockingham topography; and
- Its protective buffer qualities (in terms of development).

The proponent at that time, H and B Developments, was asked to provide a number of options which could achieve the intent of the environmental condition. Four options were provided to the committee for deliberation. Each committee member consulted extensively with their respective agencies and were asked to each provide a report with their preferred option.

The committee came to an agreed position and provided a report to the Minister for the Environment and the Minister for Planning. It was agreed by the committee that appropriate management would be required to ensure that the are set aside for landscape protection is managed for that purpose and that this matter would be addressed at the time of subdivision by the planning process.

The Minister for the Environment approved the landscape protection area as the 'area of agreement' and the land identified as the 'area of disagreement' was considered suitable for residential development and did not need to be protected for its landscape features (Appendix 2). Condition 4 was cleared by the Minister on 25 November 1993.

The proponent moved forward with preparing a Golden Bay Comprehensive Development Plan (CDP) to guide the future development of Lots 2 and 3. The CDP retained the landscape protection area as



required under Condition 4 of the Ministerial Statement. As directed by the Minister for Environment the management of the landscape protection area was to be addressed though the planning process, as such a Landscape Protection Area Management Plan (LPA MP) was submitted as part of the CDP. The LPA MP addressed the physical retention of the landforms and the management of access and their use. To retain the central landforms there were substantial level changes to be managed and modifications to the lower slopes of the dunes were detailed to reduce the need for retaining structures and to allow for public access in the form of a small park.

The CDP was approved by the City of Rockingham (City) on 25 August 1994 and by the State Planning Commission on 29 September 1994. The CDP retained the landscape protection areas in accordance with MS 297. The City approved the LPA MP that was submitted by Mitchell Goff and Associates in November 1994 (Appendix 3).

Given the nearly 27-year age of the LPA MP, the developers have committed to preparing an updated Management Plan for the Landscape Protection Area (LPA). As part of the preparation of the updated Management Plan, a Baseline Flora, Vegetation and Weed Survey was undertaken in 2020 to provide a description of the status of the vegetation in the LPA and to assist in identifying any management actions to be included in the Management Plan.

A Landscape Masterplan for the LPA and adjacent Public Open Space (POS) has been approved by the City in 2021 (Appendix 4). The masterplan provides the framework for public access and recreation associated with the LPA.

1.2 Location

Lot 9027 (part of original Lot 3) Dampier Drive Golden Bay is located approximately 20km south of the Rockingham City Centre (Figure 1) in the City of Rockingham. Lot 9027 is bound by future development to the east, the existing Golden Bay to the south and west and the new Golden Bay development to the north (Figure 2).

The Lot is zoned for urban development in the Metropolitan Region Scheme and the City of Rockingham Town Planning Scheme No 2. A CDP has been approved for the Lot with modifications to the southern area through a subdivision approval (WAPC 158634) on 4 November 2019. The CDP includes a mix of residential lots, Public Open Space and the LPA.

1.3 Scope of Work

PGV Environmental were engaged by Peet Golden Bay Pty Ltd to revise the 1994 LPA MP which was a commitment made during the revision to the CDP over Lot 9027. The LPA MP is to provide for the ongoing management of the LPA and will address the following in accordance with the CDP approval:

- revegetation areas and priorities (based on Landscape Masterplan V14);
- the extent of any weed species that may be present and any weed control measures that may be required;
- any feral animal control measures that may be required;
- any measures that may need to be put in place to control access (fencing, gates, and consolidated tracks) by pedestrians, maintenance, and emergency response;
- any signage that may be required (for educational and/or safety purposes);



- Implementation schedule and reporting for the three stages of development (pre works, during works, post works) and
- any monitoring/contingency measures that may be required and any key performance indicators that may apply; and responsibilities and timeframes.



2 LANDSCAPE PROTECTION AREAS

2.1 General Description

The areas of the LPA were chosen for a number of reasons, primarily for the retention of significant landscape features and also to provide a buffer to the existing houses in Golden Bay (as they were in 1994). The LPA contains four areas, described in the original Management Plan as (Figure 2):

- The retained Central Dune;
- The Western Interface Reserve;
- The South Western Face or Southern Boundary; and
- The Mandurah Hill Area

These names have been retained with slight modification in this report.

Additional Public Open Space (POS) has been added to the eastern side of the Central Dune and to the northern side of the South Western Face that effectively enlarges the LPA from its original approved size.

Some sections of the LPA required vegetation to be cleared to provide a stable interface between the residential development and the steep dunes of the LPA. Some earthworks into the LPA were deemed to be acceptable in the original Management Plan. These areas on the northern and eastern side of the LPA adjacent to the first stages of development will be cleared, re-graded and revegetated. A second area to the south will require some clearing and earthworks to tie the LPA into the development levels (Figure 3). The earthworks were approved by the City through the engineering and landscape design (Appendices 4 and 7).

The total area of the LPA, including the adjacent Bushland POS in the South Western Area is around 15.5ha.

2.1.1 Central Dune

The Central Dune area contains the highest parts of the Lot with to peaks at 34-37m AHD. The land slopes down steeply to the north, east and south of the peaks. The area slopes more gently down to the west and joins up with the Western Interface part of the LPA.

2.1.2 Western Interface

The Western Interface area extends north-south along the central western boundary of the Lot for approximately 420m and varies in width from 60m - 150m. The landform is more undulating than the Central Dune area with some dune ridges and swales ranging in elevation from 11-22m AHD.

The northern end of the Western Interface area has already been ceded as a Conservation Reserve to the City of Rockingham.



2.1.3 South Western Interface

The South Western Interface extends along the south-western part of the Lot and includes a small original LPA section and a larger POS section. The LPA section is only about 30m wide from north to south and includes a narrow west-east ridge that slopes steeply down to the south and north. As a result of the steep contours an additional area of POS was added, making the area 80-120m wide.

2.1.4 Mandurah Hill Area

The south-east area of the LPA includes a portion of Mandurah Hill which has its peak at 42m AHD very close to the south-eastern boundary of the area. The Mandurah Hill area slopes down from the high point in the south-east corner to low points on the western and northern boundaries around 23m AHD.



3 EXISTING ENVIRONMENT

3.1 Topography and Landform

The topography of the LPA is highly undulating with significant peaks and valleys consistent with Quindalup Dune parabolic dune landforms. The highest point in the development is the Central Dune which peaks at 37m AHD (Figure 2).

Some earthworks will be required to tie the levels into the final development levels and to meet the minimum grade requirements set by the City.

3.2 Vegetation

3.2.1 Vegetation Complex

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle et al., 1980). The areas of remnant native vegetation on the site are part of the Quindalup Complex which is described as:

'Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of Melaleuca lanceolata (Rottnest Teatree) - Callitris preissii (Rottnest Island Pine), the closed scrub of Acacia rostellifera (Summer-scented Wattle) and the low closed Agonis flexuosa (Peppermint) forest of Geographe Bay (Heddle et al., 1980)'.

3.2.2 Vegetation Types

Three native vegetation types and one area of exotic species were described and mapped on the site during the baseline vegetation survey in 2020 (PGV Environmental, 2020). The vegetation types and description area are described below and shown in Figure 3:

• ArSg Acacia rostellifera/Spyridium globulosum Open to Closed Heath

This vegetation type commonly occurred on the mid- to lower slopes and swales on the site. Acacia rostellifera was the main shrub up to 2m high and 60-70% cover but Spyridium globulosum dominated some patches in the lower swales (photo 2 to the right). Diplolaena dampieri was a common tall shrub in some areas. Other common smaller species included Austrostipa flavescens, Melaleuca systena, Acanthocarpus preissii, Rhagodia baccata, Conostylis candicans, Daucus glochidiatus, Parietaria debilis, Hydrocotyle intertexta and Hardenbergia comptoniana.

ArMsAl Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low Heath

This vegetation type occurred in one small area that was the only area that contained some surface limestone. However, the plant species did not reflect a typical limestone substrate. *Santalum acuminatum* was the tallest shrub at only 1m and 10% cover with *Melaleuca systena, Acacia lasiocarpa, Acanthocarpus preissii* and *Lomandra maritima* common smaller shrubs around 0.3-0.5m high. *Desmocladus flexuosus* and *Opercularia vaginata* were common ground shrubs.



• SaMsAl Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/ Lomandra maritima Open Low Heath

This vegetation type occurred in one small area that was the only area that contained some surface limestone. However, the plant species did not reflect a typical limestone substrate. *Santalum acuminatum* was the tallest shrub at only 1m and 10% cover with *Melaleuca systena, Acacia lasiocarpa, Acanthocarpus preissii* and *Lomandra maritima* common smaller shrubs around 0.3-0.5m high. *Desmocladus flexuosus* and *Opercularia vaginata* were common ground shrubs.



Plate 1: Acacia rostellifera/Spyridium globulosum Open to Closed Heath

Plate 2: Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low Heath





Plate 3: Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/ Lomandra maritima Open Low Heath



3.2.3 Vegetation Condition

The condition of the vegetation was assessed according to the Keighery system described in Bush Forever (Government of Western Australia, 2000). Keighery's condition rating scale ranges from Pristine where the vegetation exhibits no visible signs of disturbance to Completely Degraded where the vegetation structure in no longer intact and without native plant species (Table 1).

Overall, the condition of the areas of native vegetation in the survey area was high, ranging from Very Good to Good (Figure 4). The number of introduced species throughout the site was relatively high and did not allow an Excellent condition rating to be assigned to any areas.

Some areas had a higher grassy weed understorey, especially in swales and under the *Acacia rostellifera* dense stands and were rated as Good.

Tracks and the western area of non-native tree and shrub plantings were rated as Completely Degraded.



Table 1: Vegetation Condition Rating Scale.

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
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.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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.
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.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These 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.

3.3 Conservation Significance of Flora and Vegetation

3.3.1 Flora

No Threatened or Priority species have been recorded on the site.

3.3.2 Vegetation

Vegetation Complex

The vegetation on the site is part of the Quindalup Complex (Heddle *et al.*, 1980). Approximately 60.49% of the pre-European vegetation extent of this complex remains, of which 9.01% is currently managed by DBCA (DBCA, 2018).

The percentage retention is above EPA's target for minimum 30% retention of vegetation complexes State-wide in the Perth and Peel Region Constrained Areas and the area in protection is just below the 10% minimum criteria for vegetation complexes.

Threatened and Priority Ecological Communities

The Floristic Community Type (FCT) for the three vegetation types was determined using the spreadsheet method which compares the species in the quadrats to the species found in each FCT (Table 12 in Gibson *et al.* 1994). The FCT of all three vegetation types had the highest correlation with FCT 29b 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. FCT 29b is a Priority 3 Ecological Community at State level.

3.4 Significant Weed Species

PGV Environmental mapped the significant weeds on the site in 2020 in accordance with *Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands*



(SOP 22.1) (DEC, 2011) and *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (Technical Guidance) (Government of Western Australia, 2016).

The results for the weed survey are provided in Appendix 5 and summarised below.

3.4.1 Mandurah Hill Area

There were no Declared Weed species recorded.

- Overall Weed Coverage in the POS is moderate with areas of heavy infestation along the boundary and a lower weed coverage along the ridge;
- Priority weeds identified in Landscape Protection Area A are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

3.4.2 South Western Interface

No Declared weed species were recorded in the South Western Interface area.

- Overall Weed Coverage is generally moderate to high with areas of less weed coverage in areas that have had less disturbance;
- Priority weeds identified in Landscape Protection Area B are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*);
 - Branched Onion Weed (*Trachyandra divaricata*);
 - Brazilian Pepper (*Schinus terebinthifolius*);
 - Century Plant (*Agave americium*); and
 - Geraldton Wax (*Chamelaucium uncinatum*).

3.4.3 Western Interface

No Declared weed species were recorded in the Western Interface Area.

- Overall Weed Coverage in the POS is moderate to high on the western side (>5%) and lower on the eastern side with the highest areas of weed coverage along the tracks;
- Priority weeds identified in Landscape Protection Area C are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

3.4.4 Central Dune

There was one Declared weed species recorded in the Central Dune being Narrow-leafed Cottonbush (*Gomphocarpus fruticosus*) with one individual being recorded in the central part of the site.

• Overall Weed Coverage in the POS is low with the highest areas of weed coverage associated with tracks;



- One Declared Pest under the BAM Act, Narrow-leafed Cottonbush (*Gomphocarpus fruticosus*) was recorded from a single location;
- Priority weeds identified in Landscape Protection Area D are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

3.5 Fauna

3.5.1 Fauna Habitat

There is one broad fauna habitat across the LPA which consists of a mix of *Acacia rostellifera* Closed Scrub (Plate 4) and *Melaleuca systena* Open Shrubland over *Lomandra maritima* Herbland.

Plate 4: Very Good Fauna Habitat

Fauna habitat can be assessed using a number of factors including, the size of the habitat, the level of habitat connectivity, availability of specific resources (e.g. tree hollows) and overall vegetation quality. The habitat was assessed according to the following categories:

High quality fauna habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.

Very good fauna habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally affected by disturbance.



Good fauna habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.

Disturbed fauna habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

Highly degraded fauna habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance. (Coffey Environments, 2009).

The fauna habitat across the LPA is mostly Very Good for areas containing Very Good condition native vegetation with some Disturbed habitat along the cleared areas and tracks.

3.5.2 Fauna Species

Terrestrial vertebrate species listed in Table 2 are taken from Terrestrial Ecosystems' fauna survey database for surveys in the Rockingham and Mandurah areas. Terrestrial Ecosystems' fauna survey database includes records from the Atlas of Living Australia which includes records from the Western Australian Museum plus other vertebrate fauna surveys in nearby areas. Some of these species will occur in the project area, but because of the highly degraded nature of the area and the presence of feral cats and foxes, many of these species will not be present and those that are present are likely to be in low abundance.

Таха	Family	Species	Common Name
	Uulidaa	Litoria adelaidensis	Slender Tree Frog
	Hylidae	Litoria moorei	Motorbike Frog
Amphibians	Limpodypactidoo	Heleioporus eyrei	Moaning Frog
	Limnodynastidae	Limnodynastes dorsalis	Western Banjo Frog
	Muchatrashidaa	Crinia glauerti	Glauert's Frog
	Myobatrachidae	Crinia insignifera	Squelching Froglet
	Agamidaa	Ctenophorus adelaidensis	Western Heath Dragon
	Agamidae	Pogona minor	Dwarf Bearded Dragon
	Diplodactulidae	Strophurus spinigerus	South-western Spiny-tailed
	Diplodactylidae		Gecko
		Demansia psammophis	Yellow-faced Whipsnake
Doutiles		Elapognathus coronatus	Crowned Snake
Reptiles		Neelaps calonotos	Black-striped Burrowing Snake
	Elapidae	Parasuta gouldii	Gould's Snake
		Pseudonaja affinis	Dugite
		Pseudonaja mengdeni	Gwardar
		Simoselaps bertholdi	Jan's Banded Snake
	Gekkonidae	Christinus marmoratus	Marbled Gecko

Table 2: Vertebrate fauna caught in previous trapping programs in the region



Таха	Family	Species	Common Name				
		Gehyra variegata	Tree Dtella				
		Aprasia repens	Sedgelands Worm-lizard				
		Delma concinna	Javelin Lizard				
		Delma fraseri	Fraser's Delma				
	Ducenedidee	Delma grayii	Side-barred Delma				
	Pygopodidae	Lialis burtonis	Burton's Snake-lizard				
		Pletholax gracilis	Keeled Legless Lizard				
		Pygopus lepidopodus	Common Scaly-foot				
		Pygopus nigriceps	Western Hooded Scaly-foot				
		Acritoscincus trilineatus	Western Three-lined Skink				
		Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink				
		Ctenotus australis	Western Limestone Ctenotus				
		Ctenotus fallens	West-coast Laterite Ctenotus				
		Ctenotus gemmula	Jewelled South-west Skink				
		Egernia napoleonis	South-western Crevice-skink				
		Hemiergis initialis	South-western Earless Skink				
		Hemiergis peronii	Lowlands Earless Skink				
	Scincidae	Hemiergis quadrilineatum	Two-toed Earless Skink				
		Lerista elegans	Elegant Slider				
		Lerista lineata	Perth Slider				
		Lerista praepedita	Blunt-tailed West-coast Slider				
		Menetia greyii	Common Dwarf Skink				
		Morethia lineoocellata	West Coast Morethia Skink				
		Morethia obscura	Shrubland Morethia Skink				
		Tiliqua occipitalis	Western Blue-tongued Lizard				
		Tiliqua rugosa	Bobtail				
	Typhlopidae	Anilios australis	Austral Blind Snake				
) (ananiala a	Varanus gouldii	Gould's Goanna				
	Varanidae	Varanus tristis	Black-headed Monitor				
	Canidae	Vulpes	Red Fox				
	Felidae	Felis catus	House Cat				
		Chalinolobus gouldii	Gould's Wattled Bat				
	Vespertilionidae	Nyctophilus major	Greater Long-eared Bat				
		Vespadelus regulus	Southern Forest Bat				
Mammals	Dasyuridae	Phascogale tapoatafa	Brush-tailed Phascogale				
warmais	Macropodidae	Macropus fuliginosus	Western Grey Kangaroo				
	Leporidae	Oryctolagus cuniculus	European Rabbit				
	Peramelidae	Isoodon fusciventer	Quenda				
		Hydromys chrysogaster	Water Rat				
	Muridae	Mus musculus	House Mouse				
		Rattus rattus	Black Rat				

There are several pest species that may be present on the site outlined in Table 3.

Table 5. Terarana pest sp	celes likely to occur on the site	
Таха	Species Name	Common Name
	Vulpes vulpes	Red fox
	Felis catus	Feral cat
Mammalia	Oryctolagus cuniculus	European Rabbit
	Mus musculus	House Mouse
	Rattus rattus	Black Rat

Table 3: Feral and pest species likely to occur on the site



3.5.3 Southern Brown Bandicoot

Quenda are listed as a Priority 4 species with the DBCA and are known to occur in the area. The Quenda was recently renamed and is now a species, *Isoodon fusciventer*, rather than a subspecies. Multiple Quenda have been relocated from areas adjacent to the LPA in earlier relocation programs.



Plate 5: Juvenile Quenda (photo source: Terrestrial Ecosystems)



4 MANAGEMENT PLAN

4.1 Landscape Master Plan

The Landscape Masterplan for Lot 3 (9027) has been prepared by the developer and approved by the City of Rockingham (Appendix 5). The Landscape Master Plan includes the four LPA areas, adjoining areas of POS outside the LPA, and the City of Rockingham conservation reserve.

The approved Landscape Master Plan identifies the location of footpaths, rest spots, a 5m firebreak on the western interface, recreational facilities, areas that will require rehabilitation post construction of paths and drainage basins.

The Landscape Masterplan provides the construction design for this Management Plan. The construction of infrastructure and rehabilitation after construction of stabilising batters and retaining walls are not subject to this Management Plan.

This Management Plan largely focuses on the management of the LPAs however in some instances there is a cross over between the two plans, for example fencing and rehabilitation of native vegetation.

4.2 Objective

The objective of this LPA MP is to provide a framework of actions which are appropriate to manage, maintain and enhance the conservation values of the LPA. The LPA will also provide passive recreational and educational opportunities for the local residents.

The LPA MP will be successful when the LPA is ceded to the City of Rockingham and:

- The priority weeds in the LPAs are reduced;
- The native vegetation extent of the LPAs that require rehabilitation meets the completion criteria (note this does not include revegetation of batters as this comes under the Landscape Masterplan); and
- The overall condition of the LPA is maintained to its baseline levels surveyed in 2020, or better.

4.3 Timeframes

It is anticipated that the LPA will be under the control and responsibility of the City by practical completion of the adjacent subdivision.

Rehabilitation works (in accordance with the approved Landscape Master Plan V14) covering the degraded vegetation and provision of passive recreation infrastructure (paths, seating, lookout points, boardwalks) will be completed prior to the areas being ceded to the City.

4.4 Responsibilities

Ownership and management responsibilities of the LPA will remain with the landowner until they are ceded to the City.



Management of the LPA sections will be handed over to the City as the development proceeds in line with the maintenance obligations agreed with the City.

4.5 Management Actions

The following management actions are largely relevant to the LPAs and the adjacent bushland POS. The stabilising batters and landscaped areas are not included as they are part of the Landscape scope of works. Figure 2 clearly identifies the areas that are relevant to this management plan.

4.5.1 Access

The more accessible parts of the LPAs will be used for passive recreational uses by the existing and future local residents. As a result, some of the existing tracks will be upgraded to shared pathways. The routes of the pedestrian/bicycle access pathways have been selected to have minimal impact on the remnant vegetation and landscape.

Access to some of the more fragile areas, particularly steep sections of the LPA will be discouraged. As a result, the South Western LPA and Mandurah Hill LPA are not proposed to have any formal public access into the bushland areas.

The Landscape Masterplan (Appendix 4) provides the approved design for paths, rest points, recreation equipment and educational signage will be constructed as part of the subdivision process to provide residents with passive recreation opportunities.

There will be no additional vegetation cleared in the LPAs other than what is noted within the detailed design drawings approved by the City of Rockingham. The LPAs and path locations will be surveyed and demarcated with bunting to ensure that clearing does not impact on the surrounding native vegetation.

<u>Actions</u>

The Landscape Masterplan is the guiding document for the design of the infrastructure in the LPAs, adjacent POS and the City's conservation POS.

The subdivision has been planned with a road and footpath adjacent to and outside of the LPAs and POS areas. No garden beds or turfed areas will be established directly adjacent to the LPAs without a hard surface providing separation along the interface.

The following actions will be implemented:

- 1. Implement the Landscape Masterplan as per Appendix 4.
- 2. Survey the LPAs, adjacent bushland POS and path locations and demarcate with bunting to prevent any inadvertent clearing.
- 3. Retain the vegetation in the LPAs and adjacent POS as shown in Figure 5 and manage for conservation. Within these areas, no clearing of trees or understorey will be permitted other than those approved by the City of Rockingham in the detailed design such as stabilisation works, paths, seating, lookout points and educational signage which where possible will be established on existing tracks.



4.5.2 Habitat Rehabilitation

A vegetation and flora survey were undertaken in each of the LPA areas in spring 2020 to provide baseline information on the number of flora species present, identify key weed species and to set up long term monitoring quadrats (Appendix 5). The location of the eight quadrats is provided in Table 4.

The baseline vegetation and weed survey identified the areas in the LPAs and adjacent bushland POS that require weed control and rehabilitation. These areas are shown on Figure 5.

Table 4: Permanent Quadrat Locations

Quadrat Number	Easting	Northing
1	50 383848 E	6411647 N
2	50 383770 E	6411530 N
3	50 383692 E	6411552 N
4	50 383693 E	6411284 N
5	50 383673 E	6411225 N
6	50 384026 E	6411054 N
7	50 383752 E	6411036 N
8	50 383791 E	6411017 N

Species to be used in the rehabilitation works are provided in Table 5.

Table 5: Golden	Bay LPA	Bushland	Rehabilitation	Species	List -	Tubestock	Mix B	(Landscape
Masterplan)								

Species	Common Name
Acacia cochlearis	Rigid Wattle
Acacia cyclops	Coastal Wattle
Callitris preissii	Rottnest Island Pine
Eremophila glabra	Tar Bush
Ficinia nodosa	Knotted Club Rush
Lepidosperma gladiatum	Coast Sword Sedge
Leucophyta brownii	Cushion Bush
Leucopogon parviflorus	Coastal Beard Heath
Lomandra maritima	Lomandra
Myoporum insulare	Boobiala
Nitraria billardierei	Nitre Bush
Olearia axillaris	Native Rosemary
Rhagodia baccata	Seaberry Saltbush
Scaevola crassifolia	Thick Leaved Fan Flower
Spinifex hirsutus	Hairy Spinifex
Spyridium globulosum	Basket Bush
Templetonia retusa	Cockies Tongue
Tetragonia implexicoma	Bower Spinach

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The LPAs do not have any evidence of dieback. To protect the LPAs from dieback any additional soil brought into the development will be dieback free and vehicle and pedestrian access to the LPAs will be restricted and managed during construction to minimise the risk of introducing dieback or spreading the disease from areas that are infested via tyres and footwear and by eliminating the dumping of refuse and soil.

Individual species will be planted irregularly to reflect the distribution found in natural areas. Tubestock will be planted during late autumn to winter, following the first 100mL of rainfall, to allow maximum root growth and plant establishment before summer. If required, Tree guards will be erected around each plant to protect them from rabbit grazing.

<u>Actions</u>

- 4. Set up eight permanent quadrats based on the locations (Table 3) used in the baseline monitoring survey in 2020 in each area of the LPAs for annual vegetation/weed monitoring.
- 5. A qualified rehabilitation and revegetation contractor is engaged to undertake onrevegetation works in the areas identified in Figure 5.
- 6. Prepare revegetation site works plan, schedule and costs.
- 7. Collect seed for propagation (if required).
- 8. Undertake rehabilitation using the species provided in Table 2.
- 9. Tubestock will be sourced from accredited nurseries and planted according to the densities outlined within this report.
- 10. Planting of tubestock is the preferred method of revegetation.
- 11. Tubestock will be irregularly planted during late autumn to winter following the first 100mL of rainfall to allow maximum root growth and plant establishment before summer.
- 12. Follow standard dieback protocols.
- 13. The environmental consultant will monitor the permanent quadrats each year and progressively reduce the monitoring as each of the individual LPA's are handed to the City.

4.5.3 Weed Control

The baseline Flora and Vegetation survey undertaken in 2020 mapped the weeds in each of the LPAs as discussed in section 3 and mapped in Appendix 5.

One declared pest under the *Biosecurity Agricultural Management Act 2007* (BAM Act) *Gomphocarpus fruticosus* (Narrow-leafed Cottonbush) was recorded from a single location.



Plate 7: Gomphocarpus fruticosus (Narrow-leafed Cottonbush) Source Florabase 2021

The Priority weeds mapped are:

- Geraldton Carnation Weed (Euphorbia terracina);
- Rose Pelargonium (*Pelargonium capitatum*);
- Branched Onion Weed (Trachyandra divaricata);
- Brazilian Pepper (Schinus terebinthifolius);
- Century Plant (Agave americium); and
- Geraldton Wax (*Chamelaucium uncinatum*).

The weed control program will be focussed towards eradicating the Declared and Priority weed species.

The Narrow-leafed Cotton Bush, Brazilian Pepper, Geraldton Wax and Century Plant have the greatest potential to invade other areas and compete with native species. These species should be removed as a high priority. The location of these weed species is recoded in Appendix 5.

Rose Pelargonium, Geraldton Carnation Weed and Branched Onion Weed occur in each of the LPAs. Although Geraldton Carnation Weed is not a Declared Weed it is increasingly invasive in the Swan Natural Resource Management (NRM) Region. These three weeds are considered to be Priority species and therefore will be targeted in a control program while still managing other weed species.

Initial weed control will be implemented prior to planting of tubestock. The recommended methods and optimum timing for controlling specific weed species present on the site is outlined in Table 6.

To minimise soil erosion brush-wood will be utilised if necessary if weed eradication results in areas of bare sand.

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Management Actions

- 14. The weed control program will increase resources to eradicate the Priority species as outlined in Table 6.
- 15. A suitably qualified weed contractor will need to be engaged to carry out the weed management and they will need to be familiar with the herbicide use in the City of Rockingham conservation areas.
- 16. The landscape maintenance contractor will undertake quarterly visual assessment of the listed priority weeds in the LPAs and inform the project Environmental Consultants.
- 17. Based on the visual assessment weed management including spot spraying and hand weeding will be undertaken as required by landscape maintenance contractor.
- 18. Based on the visual assessment the mulch or brushing will be topped up to control weed growth and sand drift by the landscape maintenance contractor.
- 19. The environmental consultant will undertake weed monitoring during the annual vegetation monitoring program in the LPAs.



Table 6: Optimum Weed Control and Timing for the Specific Weed Species on the Site

Species	Methods	Jan	Feb	Mar	Apr	May	Jun	Inf	Aug	Sep	Oct	Νον	Dec
Declared Species	reclared Species												
Narrow Leafed Cotton Bush (Gomphocarpus fruticosus)	*Hand pull small plants, ensuring removal of as much root material as possible. Hand removing plants with mature fruits can lead to release and rapid spread of wind dispersed seed. Foliar spray with 1.5% glyphosate or try cut and paint using 50% glyphosate. Read the manufacturers' labels and material safety data sheets before using herbicides.	x	x	x	x	x	x	x	x	x	x	x	x
Priority Species	·					•							
Geraldton Carnation Weed (Euphorbia terracina)	Logran [®] at 12.5g/100L + the penetrant Pulse [®]						x	x	x				
Rose Pelargonium (Pelargonium capitatum)	Spray metsulfuron methyl 5 g/ha + Pulse®						x	x	x	x	x		
Branched Onion Weed (Trachyandra divaricata)	Spray 0.4g chlorosulfuron + 25mL wetting agent in 10L of water or manual removal of small infestations.						x	x	x				
Century Plant (Agave americana)	*Dig out and/or hand remove small infestations. Stem inject into base of leaves 1 part Tordon®/5 parts diesel. Read the manufacturers' labels and material safety data sheets before using herbicides	x	x	x	x	x	x	x	x	x	x	x	x
Other Weed Species													
Cape Weed (<i>Arctotheca calendula</i>)	Chip out small infestations, ensuring root is severed well below ground level to prevent re-sprouting from the crown. For large infestations apply Lontrel [®] 6 ml/10 L (300 ml/ha) or spray glyphosate at 10 ml/L.						x	x	x	x	x	x	
Hottentot Fig (Carpobrotus edulis)	Manual methods are most effective. Remove all roots and stem fragments and follow up with removal of any germinating plants or spray with glyphosate at 2% + surfactant.						x	x	x	x	x		



Couch Grass (Cynodon dactylon)	Spray Fusilade [®] Forte at 13 ml/L + wetting agent or for generic fluazifop-p (212g/L active ingredient) 8mL/L + wetting agent or 1% glyphosate. Almost always requires follow-up treatment.	x	x									х	x
African Lovegrass	Spray with 1-2% glyphosate or cut out small	x	x	x	x	x						x	х
(Eragrostis curvula) Perennial Veldt Grass (Ehrharta calycina)	infestations. Always requires follow-up treatment. Spray with Fusilade® Forte 13 ml/L or 6.5 L/ha + wetting agent. Follow-up in subsequent years. For small infestations, cut out plants ensuring crown removal. Do not slash.						x	x	x				
Treasure Flower (Gazania linearis)	 ^Spray with 50mL glyphosate (450g/L) in 10 L water. In bushland areas use 4g of Lontrel®750 + 25 mL Pulse® in 10 L water to reduce damage to companion plants. 200 g/ha of Lontrel®750 + 0.25% wetting agent can be used for roadside and overall spraying. 			x	x	x				x	x	x	
Beach Evening Primrose (Oenothera drummondii)	Control in seedling stage, as older plants resistant to herbicide. Relatively resistant to glyphosate. Hand remove small populations in areas not susceptible to erosion. Spot spray chlorsulfuron 0.4 g/10 L + spray oil.							x	x	x	x		
- Note: This table ind	base (DPaW, 2015) and also *Sydney Weeds Committees, 20 dicates the optimum timing to implement weed control for sp is table may be used as a guide for determining timing of we	oecific s	species	, indic	ating th		ths that	t contr	ol wou	ld achie	eve the	best r	esults



4.5.4 Fauna Management

Quenda (*Isoodon fusciventer*) will be managed in accordance with the Ministerial Statement 297. If any areas of native vegetation are required to be cleared to implement the Landscape Masterplan a Quenda relocation program will be carried out by the project zoologist. The Quenda trapping program will pick up other fauna such as reptiles all of which will be relocated. Any cats trapped during the program will be checked for microchips and delivered to the cat haven for collection by their owner. Any feral cats will be euthanised humanely.

- 20. Undertake Quenda relocation program as required for any areas identified to be cleared in accordance with the Landscape Masterplan.
- 21. If an injured wildlife is encountered, the nominated carer or Wildlife Hotline shall be called to rescue the animal.

4.5.5 Feral Fauna Management

Rabbits are highly likely to pose a threat to revegetation success by grazing on the planted tubestock. The proximity of the site to residential housing restricts the use of chemical control and due to the size of the site and density of vegetation exclusion via construction of a rabbit-proof fence is not a viable option. Therefore, revegetation works will consist of tubestock as opposed to seeding which would leave the seedlings vulnerable and exposed. If required, tree guards will be installed if rabbit grazing is limiting tubestock survival.

Management Actions

- 22. Install tree guards when required to protect tubestock from grazing.
- 23. Check tree guards during monthly weed inspection and replace where required.
- 24. Remove tree guards when vegetation has established.
- 25. Dispose of food waste into covered waste facilities to ensure that feral or other animals are not attracted to the site.

4.5.6 Fencing

Farm style fencing (as approved by the City) is being installed on a staged basis in areas as shown in Figure 5. The fencing is to be constructed to the City's requirements as shown in at Appendix 6. The fence will be 1.2m high with four strand post and wire.

Management Actions

26. Construct fencing around the LPAs and POS as shown in Figure 5 prior to handover to the City.

4.5.7 Firebreak

A 5m wide firebreak is required by the City to be constructed along part of the western boundary of the Western LPA in accordance with the Landscape Master Plan and Bushfire Management Plan. The firebreak will be constructed on an already cleared track.



Any other firebreaks will be constructed in accordance with the Bushfire Management Plan.

Management Actions

27. Construct the 5m fire break along the western interface as shown on Figure 5.

4.5.8 Post Construction

The LPAs and adjacent Bushland POS will require maintenance post construction until the sections are handed to the City. Educational signage will be installed to inform the residents on the environmental values associated with the LPA.

ACTIONS

- 28. Site maintenance to be carried out. This will include maintenance of tree guards and perimeter fence, weed management and rabbit control as required.
- 29. Install educational signage that clearly states that access is restricted to defined pathways, fauna/flora interpretation and importance of domestic animal control and include a contact number to report any dumping or inappropriate activity.



Table 7: Management Actions Summary

Торіс	Actio	on	Timing	Responsibility			
Access							
	1	Implement the Landscape Masterplan as per Appendix 4.	Pre-construction	Developer			
	2	Survey the LPAs, adjacent bushland POS and path locations and demarcate with bunting to prevent any inadvertent clearing.	During Construction	Developer			
	3	Retain the vegetation in the LPAs and adjacent POS as shown in Figure 5 and manage for conservation. Within these areas, no clearing of trees or understorey will be permitted other than those approved in the Landscape Masterplan such as stabilisation works, paths, seating, lookout points and educational signage which where possible will be established on existing tracks.	Pre-construction	Developer			
Habitat Reha	bilitation		<u> </u>	ł			
	4	Set up eight permanent quadrats based on the locations (Table 3) used in the baseline monitoring survey in 2020 in each area of the LPAs for annual vegetation/weed monitoring.	Pre-construction	Environmental Consultant			
	5	Contract a qualified rehabilitation and revegetation contractor to undertake on-ground planning and revegetation works in the areas identified in Figure 5.	Pre-construction	Environmental Consultant			
	6	Prepare revegetation site works plan, schedule and costs.	Pre-construction	Environmental Consultant			
	7	Collect seed for propagation (if required).	Pre- construction	Environmental Consultant			
	8	Undertake rehabilitation using the species provided in Table 2.	Pre-construction	Rehabilitation Contractor			
	9	Tubestock will be sourced from accredited nurseries and planted according to the densities outlined within this report.	Construction	Rehabilitation Contractor			
	10	Planting of tubestock is preferred method of planting.	Construction	Rehabilitation Contractor			



Торіс	Actio	n	Timing	Responsibility		
	11	Tubestock will be irregularly planted during late autumn to winter following the first 100mL of rainfall to allow maximum root growth and plant establishment before summer.	Construction	Rehabilitation Contractor		
	12	Follow standard dieback protocols.	Construction	Rehabilitation Contractor		
	13	The environmental consultant will commence monitoring the permanent quadrats one year from planting to ensure completion criteria are met. Monitoring will continue until the LPAs are handed to the City.	Ongoing	Environmental Consultant		
Weed Control	1					
	14	The weed control program will increase resources to eradicate the Priority species as outlined in Table 6.	During construction	Environmental Consultant/Site Manager		
	15	A suitably qualified weed contractor will need to be engaged to carry out the weed management and they will need to be familiar with the herbicide use in the City of Rockingham conservation areas.	Pre-construction	Site Manager		
	16	The landscape maintenance contractor will undertake monthly visual assessment of the listed priority weeds in the LPAs and inform the project Environmental Consultants.	During Construction	Site Manager		
	17	Based on the visual assessment weed management including spot spraying and hand weeding will be undertaken as required by landscape maintenance contractor.	During Construction	Site Manager		
	18	Based on the visual assessment the mulch or brushing will be topped up to control weed growth and sand drift by the landscape maintenance contractor.	During Construction	Site Manager		
	19	The environmental consultant will undertake weed monitoring during the annual vegetation monitoring program in the LPAs.	During Construction	Environmental Consultant		



Торіс	Actio	on	Timing	Responsibility		
2		Undertake Quenda relocation program as required for any areas identified to	Post construction	Rehabilitation		
		be cleared in accordance with the Landscape Masterplan.		Contractor		
	21	If an injured wildlife is encountered, the nominated carer or Wildlife Hotline	Post construction	Developer		
		shall be called to rescue the animal.				
Feral Fauna	Manageme	ent				
	22	If required, install tree guards when required to protect tubestock from	During construction	Environmental		
		grazing.		Consultant/Rehabilit		
				ation Contractor		
	23	Check tree guards during monthly weed inspection and replace where	Pre-construction	Site Manager		
		required.				
	24	Remove tree guards when vegetation has established.	During Construction	Site Manager		
	25	Dispose of food waste into covered waste facilities to ensure that feral or other	During Construction	Site Manager		
		animals are not attracted to the site.				
Fencing						
	26	Construct fencing around the LPAs and POS as shown in Figure 5 prior to	Post Construction	Site Manager		
		handover to the City.				
Firebreak						
	27	Construct the 5m fire break along the western interface as shown on Figure 5.	Post Construction	Site Manager		
Post Constru	ction					
	28	Site maintenance to be carried out. This will include maintenance of tree	Post Construction	Rehabilitation		
		guards and perimeter fence, weed management and rabbit control as required.		Contractor		
	29	Install educational signage that clearly states that access is restricted to defined	Post Construction	Rehabilitation		
		pathways, fauna/flora interpretation and importance of domestic animal		Contractor		
		control and include a contact number to report any dumping or inappropriate				
		activity.				



4.6 Monitoring

Table 8 details the monitoring program for rehabilitation works in the LPA and adjacent Bushland areas. It consists of a program of:

- Vegetation and weed monitoring; and
- Inspection of bushland rehabilitation within the LPA.

For the vegetation monitoring, the eight 10m x 10m quadrats established in the baseline flora, vegetation and weed survey (PGV Environmental, 2020) will be monitored. These will be surveyed annually in late September/early October (mid-Spring) for tree health, species richness, percentage cover of natives, and percentage cover of weeds. Monitoring effort will progressively decrease as the LPA sections are handed to the City of Rockingham.

Parameter	Purpose	Location	Frequency	Responsibility
Species richness,	To monitor	Eight permanent	Annually, in LPA	Environmental
percentage cover	condition of LPAs	quadrats have	and Adjacent	Consultant
and plant health	and Adjacent	been set up in	Bushland POS	
within	Bushland POS	the LPAs and	until handed to	
monitoring	following clearing	Adjacent	the City of	
quadrats	of surrounding	Bushland POS	Rockingham	
	vegetation.			
Percentage cover	To identify any	Eight permanent	Annually, in LPA	Environmental
of weeds in	new infestations	quadrats within	and Adjacent	Consultant
quadrats.	of significant	LPAs and	Bushland POS	
	weeds.	Adjacent	until handed to	
		Bushland POS.	the City of	
			Rockingham	
Emergence of	To determine	Rehabilitation	Annually, in LPA	Rehabilitation
seedlings in	success of	areas within the	and Adjacent	Contractor
rehabilitated	rehabilitation	POS conservation	Bushland POS	
areas.		areas	until handed to	
			the City of	
			Rockingham	
Occurrence of	To establish need	Rehabilitation	Annually, in LPA	Rehabilitation
weeds in	for weed control	areas within the	and Adjacent	Contractor
landscaped areas	as required	LPAs and	Bushland POS	
		Adjacent	until handed to	
		Bushland POS	the City of	
			Rockingham	

Table 8: Monitoring Program

4.7 Targets and Performance Indicators

A number of environmental targets, based on the management objective, have been developed for the management of the LPAs and adjacent Bushland POS. Performance indicators have also been developed for use in assessing the achievement of these targets (Table 9).



Table 9: Management Plan Targets and Performance Indicators

Objective	Target	Performance Indicator
The objective of this LPA MP is to provide a framework of actions which are appropriate to manage, maintain and enhance the native vegetation in the LPA.	No clearing or disturbance within the LPA other than that approved by the City through the detailed design plans and Civil Design for the development interface.	No evidence of unauthorised clearing activities within the LPAs and Adjacent Bushland POS No evidence of unauthorised access to LPAs and Adjacent Bushland POS.
The LPA will also provide passive recreational and educational opportunities for the local residents.	Permanent fencing installed post development to the standard required by the City of Rockingham.	Post development check of permanent fencing.
	No decline in the number of species, percentage cover and condition of vegetation within the LPAs and Adjacent Bushland POS	Results of annual vegetation monitoring quadrats in the LPAs and Adjacent Bushland POS.
	At least 75% survival of planted tubestock within each revegetation area	Results of annual vegetation monitoring quadrats in the LPAs and Adjacent Bushland POS
	No invasive Century Plant or Narrow-leafed Cottonbush within the LPAs and Adjacent Bushland POS	Results of annual weed monitoring in the LPAs and Adjacent Bushland POS.
	Significant reduction of other Priority weeds the LPAs and Adjacent Bushland POS	Results of annual weed monitoring in the LPAs and Adjacent Bushland POS.

4.8 Contingencies

The following contingency measures will be put in place if monitoring indicates that management measures have not been effective and/or targets are not being achieved (Table 9).

Trigger		Action	Responsibility
Significant decrease in	1	Investigate cause	Environmental Manager
species richness,	2	Undertake remediation works	Rehabilitation
percentage cover or			Contractor
plant health within the	3	Plant additional tubestock.	Rehabilitation
eight monitoring			Contractor
quadrats.			
Poor	1	Undertake top-up broadcast-seeding	Rehabilitation
emergence/survival in		and/or infill planting with seedlings.	Contractor
rehabilitated areas in			
LPAs and Adjacent Bushland POS.			
	1	lavesticate seves	
Significant increase in	1	Investigate cause	Environmental Manager
percentage covers of	2	Implement measures to prevent	Rehabilitation
		further weed infestations and carry	Contractor

Table 9: Contingency Measures



invasive weed density in monitoring quadrats		out weed control activities as required	
Weed infestation in	1	Investigate cause	Environmental Manager
rehabilitated areas	2	Implement measures to prevent	Rehabilitation
		further infestation (e.g. weed control, screening to stop airborne weed vectors)	Contractor
Impacts form	1	Investigate cause	Environmental Manager
uncontrolled pedestrian	2	Implement access controls and install	Rehabilitation
access		additional signage.	Contractor

4.9 Implementation Schedule

Rehabilitation within the LPAS and adjacent Bushland POS will be undertaken through a staged approach in parallel with the development stages of Lot 3 and implementation of the Landscape Masterplan.

Indicative timeframes for construction work are as follows:

- Stage5G construction Jan 22 to Jun 22;
- Stage 5F construction Dec 22 to Jun 23;
- Stage 5E Sep 23 to Mar 24;
- Stage 5H -Jan 24 to Jul 24; and
- Stage 5I Jun24 to Dec24.

The rehabilitation works will be staged similarly to the construction timeframes.

4.10 Reporting

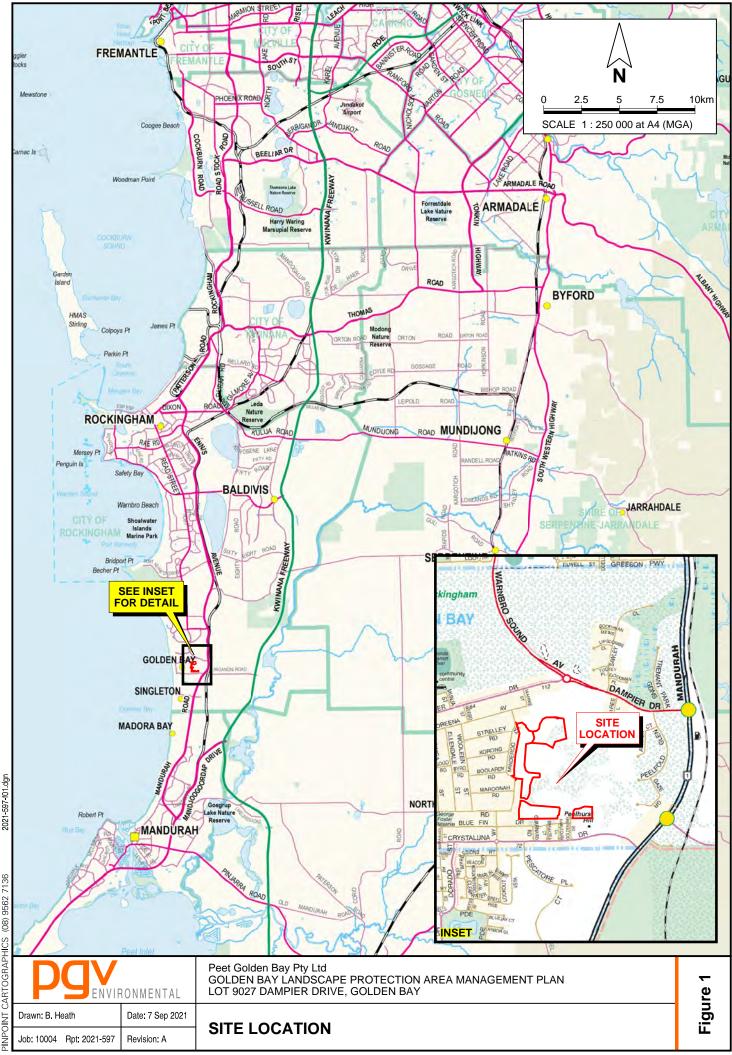
Implementation status and monitoring results for this management plan will be provided in an annual report provided to the City of Rockingham in March each year until the LPAs and Bushland POS are handed to the City.



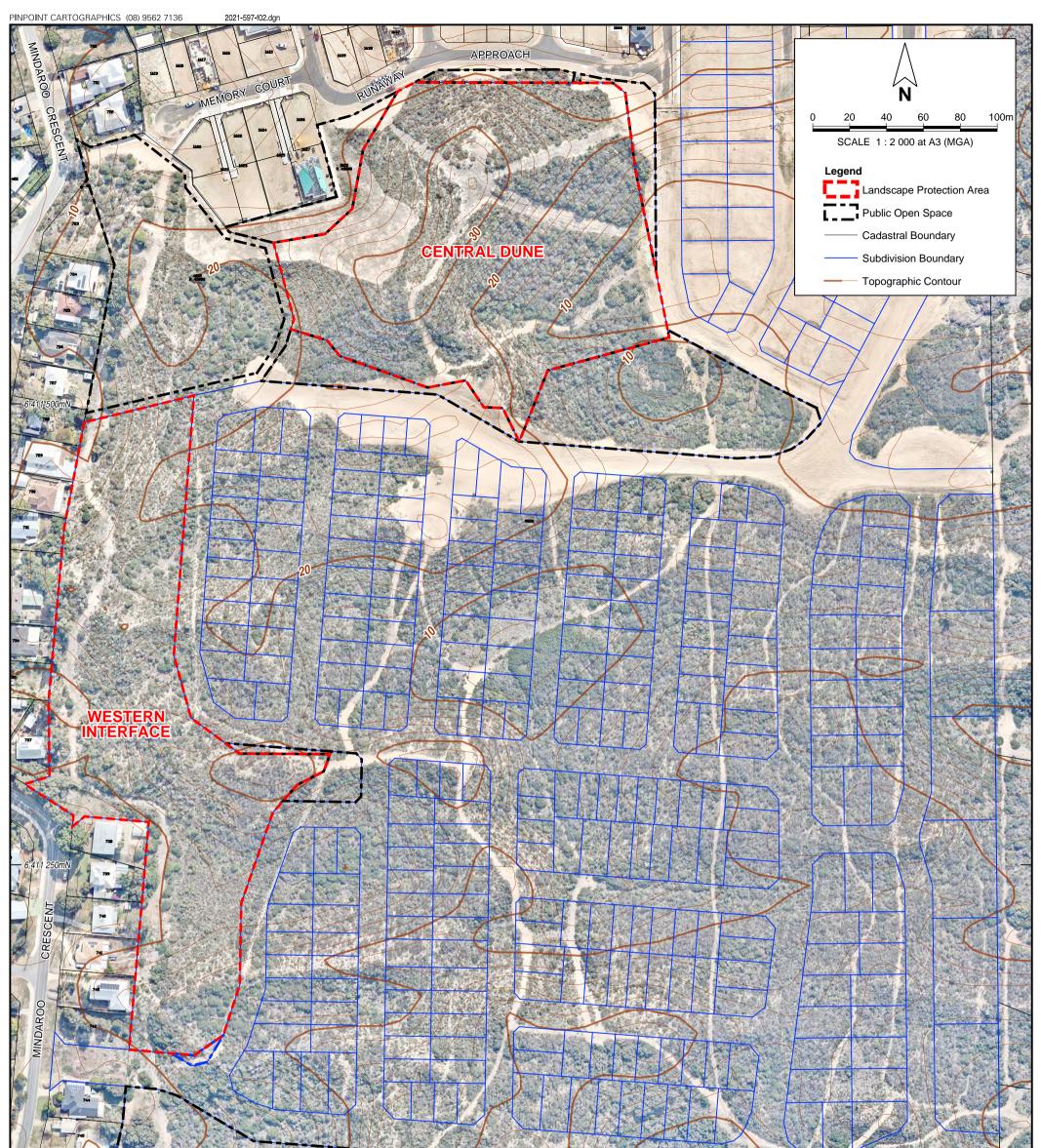
5 **REFERENCES**

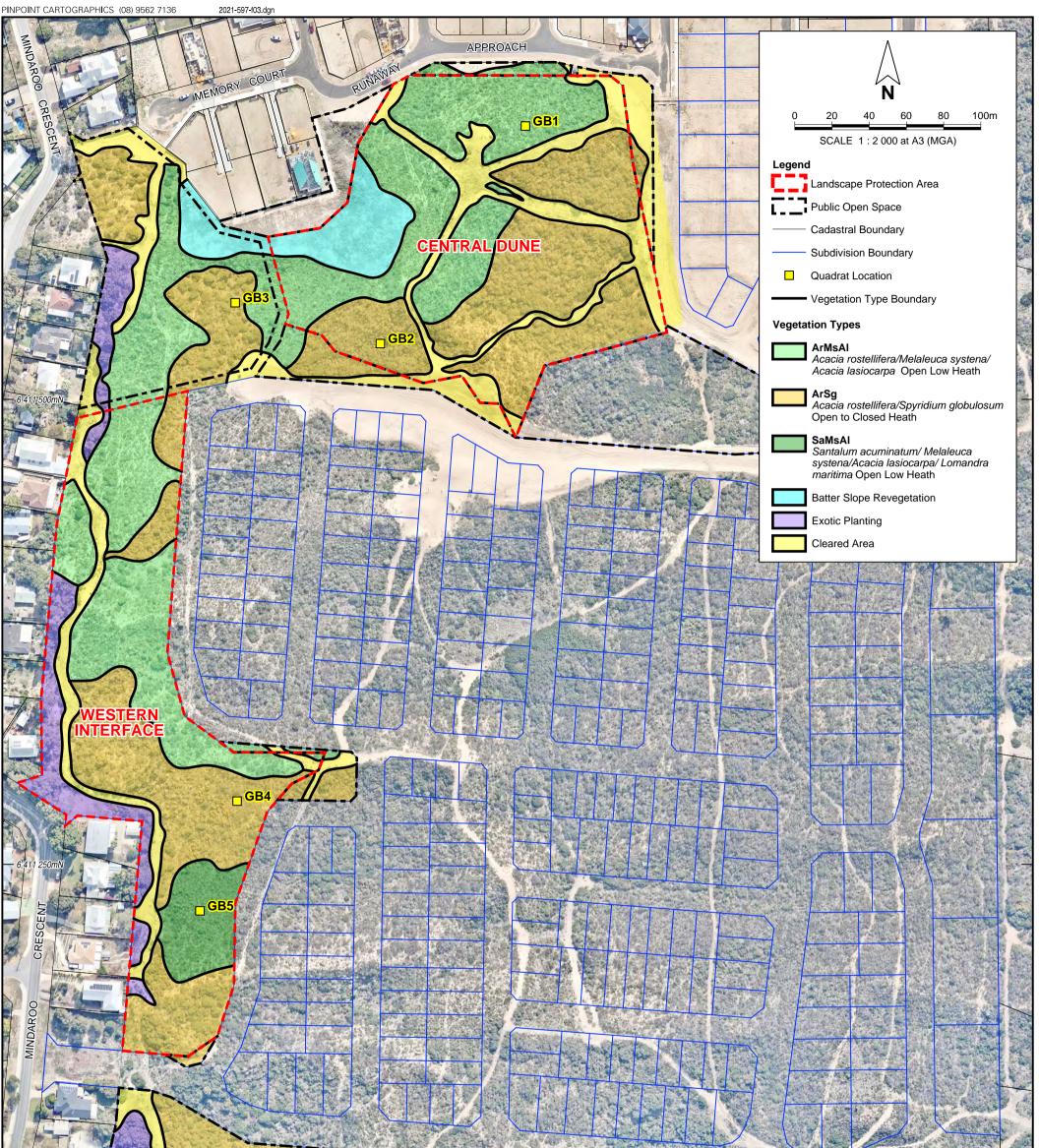
- Brown, K., Cullity, J., Paczkowska, G. and Bettink, K. (2013) Managing Geraldton carnation weed (*Plate*), in the woodlands, wetlands and heathlands of the Swan Coastal Plain. Department of Environment and Conservation Government of Western Australia, Perth
- Department of Environment and Conservation (DEC) (2011) Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands Government of Western Australia, Perth
- Department of Parks and Wildlife (DPaW) (2021) Florabase https://florabase.dpaw.wa.gov.au/ Accessed January 2015 Government od Western Australia Perth.
- Environmental Protection Authority (EPA) (2016) Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment Perth Western Australia
- Government of Western Australia (2000) Bush Forever Keeping the Bush in the City. Volume 2: Directory of Bush Forever Sites. Perth, Western Australia.
- Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980) Vegetation complexes of the Darling System,
 Western Australia. In Atlas of Natural Resources of the Darling System of Western Australia.
 Department of Conservation and Environment. Perth, Western Australia.
- PGV Environmental (2020). Baseline Landscape Protection Area Baseline Flora, Vegetation and Weed Survey Golden Bay.

FIGURES

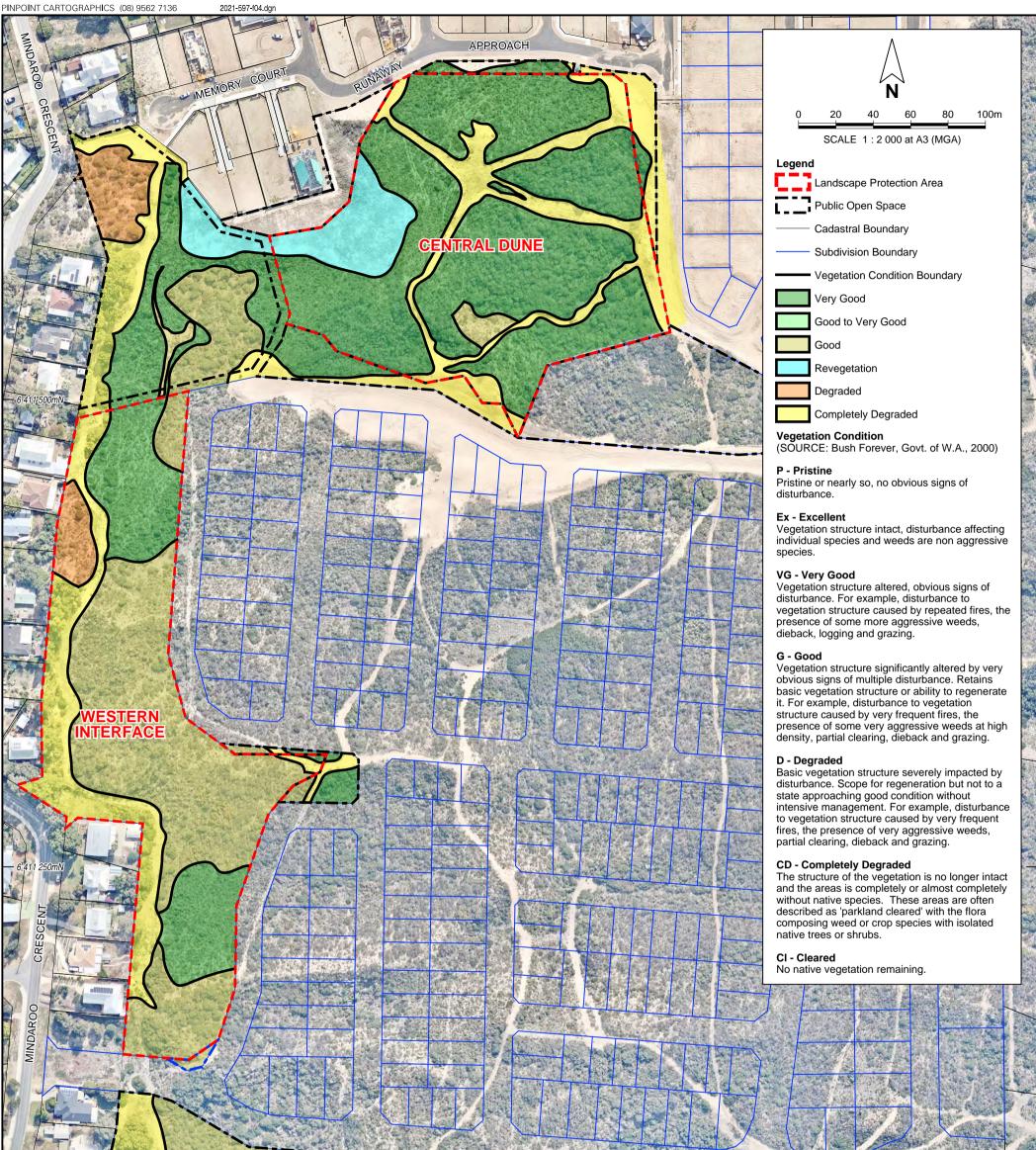


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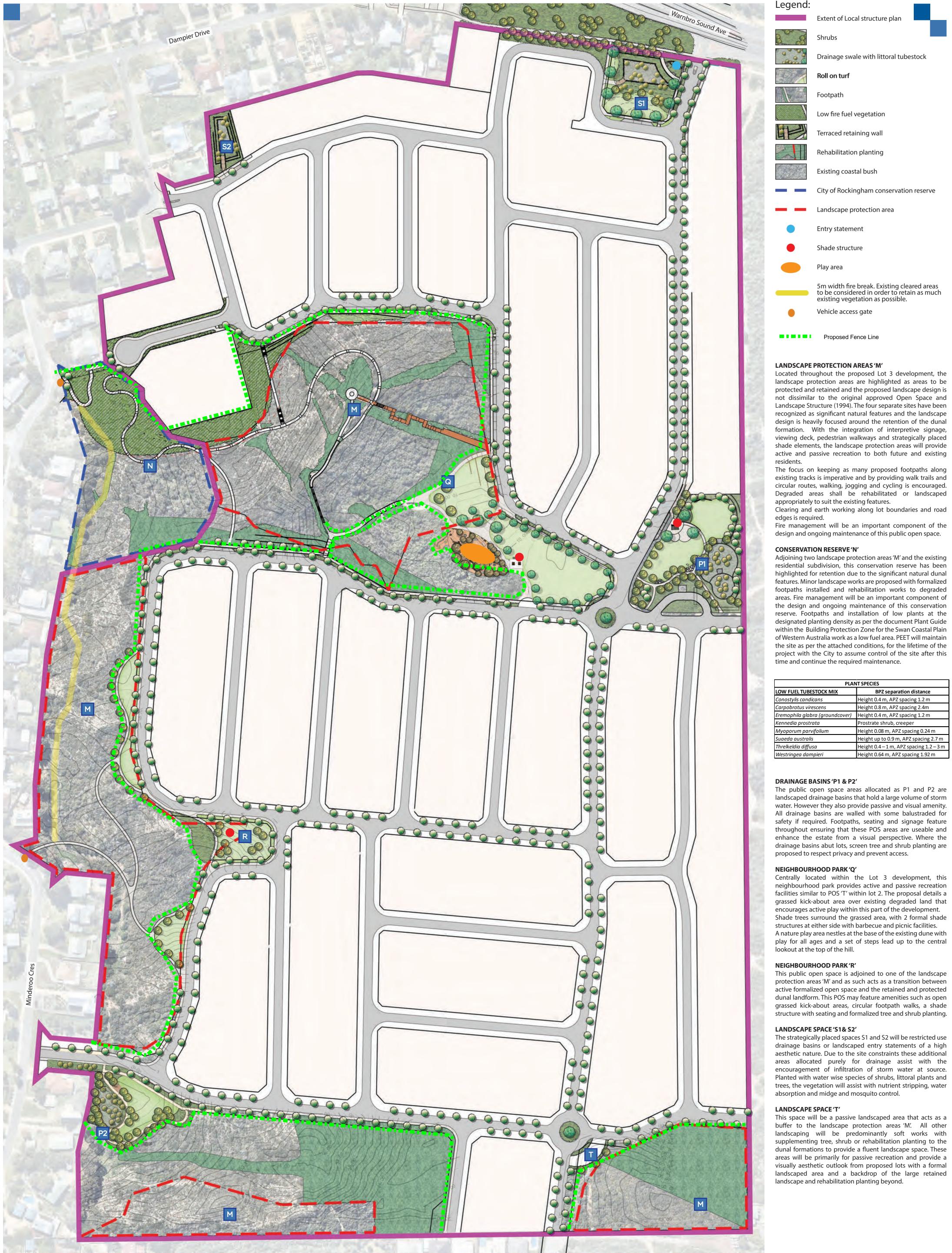




6 4,11,000ml	- 383/scoure	BLUE	GB6 MANDURAH HILL FIN DRIVE	
		RONMENTAL	Peet Golden Bay Pty Ltd GOLDEN BAY LANDSCAPE PROTECTION AREA MANAGEMENT PLAN LOT 9027 DAMPIER DRIVE, GOLDEN BAY	re 3
CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: EPCAD, Lot 3 Landscape Mater Plan, 06-07-20.	Drawn: B. Heath Job: 10004 Rpt: 2021-597	Date: 5 Apr 2021 Revision: A	VEGETATION TYPES	Figure



6 4,11,000mN		BLUE	EIN DRIVE	
		RONMENTAL	Peet Golden Bay Pty Ltd GOLDEN BAY LANDSCAPE PROTECTION AREA MANAGEMENT PLAN LOT 9027 DAMPIER DRIVE, GOLDEN BAY	re 4
CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Drawn: B. Heath	Date: 7 Sep 2021 Revision: A	VEGETATION CONDITION	Figure
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Job: 10004 Rpt: 2021-597			



PLANT SPECIES				
LOW FUEL TUBESTOCK MIX	BPZ separation distance			
Conostylis candicans	Height 0.4 m, APZ spacing 1.2 m			
Carpobrotus virescens	Height 0.8 m, APZ spacing 2.4m			
Eremophila glabra (groundcover)	Height 0.4 m, APZ spacing 1.2 m			
Kennedia prostrata	Prostrate shrub, creeper			
Myoporum parvifolium	Height 0.08 m, APZ spacing 0.24 m			
Suaeda australis	Height up to 0.9 m, APZ spacing 2.7 m			
Threlkeldia diffusa	Height 0.4 – 1 m, APZ spacing 1.2 – 3 m			
Westringea dampieri	Height 0.64 m, APZ spacing 1.92 m			



APPENDIX 1



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WESTERN AUSTRALIA MINISTER FOR THE ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

URBAN DEVELOPMENT OF PART LOT 12 & RESERVE 34664 (AFFECTING PART OF SYSTEM SIX RECOMMENDATION M107), GOLDEN BAY (604)

H & B DEVELOPMENTS PTY LTD

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Consultative Environmental Review and included in Environmental Protection Authority Bulletin 648. (A copy of the commitments is attached.)

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

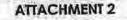
- 2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.
- 3 Foreshore Reserve

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- 3-1 The proponent shall provide a foreshore reserve for conservation and recreation which:
 - protects the Peelhurst wetlands and the Southern Brown Bandicoot (Isoadon obesulus) population; and
 - 2 includes landscape and recreation values at least equivalent to the area affected by this proposal which is within System 6 Recommendation M107 Area.
- 3-2 Prior to the lifting of Urban Deferment, the proponent shall identify the foreshore reserve as required by condition 3-1, and at subdivision the proponent shall transfer to public ownership the proposed foreshore reserve, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

Published on 1 2 JAN 1993

18th FLOOR, ALLENDALE SQUARE 77 ST GEORGE'S TERRACE, PERTH, W 4, 6000 TELEPHONE 325 9422 FAX 325 5621



TO:61 8 9222 4533

PAGE: 03/09

- Landscape Protection The landscape value of the parabolic dune ridge on the eastern edge of Golden Bay 4 should be recognised.
- Prior to subdivision approval, the proponent shall liaise with the Department of Planning and Urban Development and the City of Rockingham to incorporate planning measures 4-1 which recognise and protect the landscape value of the parabolic dune ridge on the eastern edge of Golden Bay, to the requirements of the Minister for the Environment and the Minister for Planning on advice of the Department of Planning and Urban Development. the City of Rockingham and the Environmental Protection Authority.
- Southern Brown Bandicoot (Isoodon obesulus) The population of the Southern Brown Bandicoot (Isoodon abesulus) at Golden Bay 5 requires special consideration.
- 5-1 Prior to the commencement of development and in consultation with the Department of Conservation and Land Management, the proponent shall establish the regional implications of disturbing the population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay and shall initiate management of the population, to the requirements of the Minister for the Environment on advice of the Department of Conservation and Land Management
- 5-2 The proponent shall carry out the on-going management of the population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay to the requirements of the Department of Conservation and Land Management.
- 6 Proponent These conditions legally apply to the nominated proponent.
- 6-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.
- Time Limit on Approval 7 The environmental approval for the proposal is limited.
- If the proponent has not substantially commenced the project within five years of the date 7-1 of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

ATTACHMENT 2

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8-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

-mig-

Jim McGinty, MLA MINISTER FOR THE ENVIRONMENT

12 JAN 1993



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PROPONENT'S COMMITMENTS

URBAN DEVELOPMENT OF PART LOT 12 & RESERVE 34664 (AFFECTING PART OF SYSTEM SIX RECOMMENDATION M107) GOLDEN BAY (604)

H & B DEVELOPMENTS PTY LTD

The proponent has made the following environmental commitments:

ATTACHMENT 2

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FROM: WADEP POL PREVENTION 61 8 9222 7157

TO:61 8 9222 4533

PAGE: 06/09

CONSOLIDATED LIST OF COMMITMENTS FOR GOLDEN BAY

1. The proponent will provide, in exchange for the development of the currently proposed System 6 Area M107, additional Regional and Public Open Space adjacent to the Coastal Reserve as shown in the Structure Plan, in excess to that which would normally be required by DPUD. This will be done to the satisfaction of the EPA, DPUD and the Local Authority at the rezoning stage.

2. The proponent will prepare a Management Plan for the Coastal Reserve at Golden Bay prior to development commencing. This will be done to the satisfaction of DPUD and the Local Authority.

3. The proponent will include an historic aboriginal camping site within the proposed Public Open Space for the development. This will be done to the satisfaction of the Local Authority.

4. The proponent will continue to provide and maintain a network of firebreaks and access tracks to protect against bushfire until the Local Authority takes on this responsibility. This will be done to the satisfaction of the Local Authority.

5. The proponent will provide reticulated sewerage and will design the development so that stormwater drainage is disposed of on site. This will be done during the installation of services within the development to the satisfaction of DPUD and the Local Authority.

6. The proponent will liaise with CALM regarding the presence of bandicoots at Golden Bay and if required by CALM will examine the feasibility of relocating the bandicoots to an appropriate location elsewhere. This will be done prior to any disturbance of the vegetation at Golden Bay and will be done to the satisfaction of both CALM and the EPA.

APPENDIX 2

ATT	Ά	СН	M	EΝ	IL	3

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	MINIS Our Ref: ENV934818	WESTERN AUSTRALIA	211000 AC
	Town Clerk City of Rockingham PO Box 42 ROCKINGHAM WA	25 NOV	1993 A Jower A Jower A Jower A Jower A Jower A Jower A Jower A Jower

CLEARANCE OF ENVIRONMENTAL CONDITION 4-1 PERTAINING TO THE URBAN DEVELOPMENT OF PART LOT 12 AND RESERVE 34664, GOLDEN BAY

Having examined the matter carefully and assessed the arguments put forward by the Consultative Committee which consisted of representatives of the Department of Planning and Urban Development, the City of Rockingham, the Environmental Protection Authority and the Golden Bay Progress Association, the Minister for Planning and myself are in agreement on the requirements to clear Condition 4-1 as outlined below.

The area presented for protection of the landscape features, identified on Plan 2 as the "Area of Agreement" is acceptable and the land identified on Plan 2 as the "Area of disagreement" is suitable for residential development and need not be protected for landscape features,

These requirements should now be implemented through the final stages of zoning, subdivision and design.

Kevin Minson MLA MINISTER FOR THE ENVIRONMENT



APPENDIX 3



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-CITY OF RO

Civic Boulevard, Rockingham, Western Australia

OUR REF: 28/2794 & 94569 PM:slr YOUR REF:

ENQUIRIES TO: Mr Monks

KINGHAM

21st December 1994

Mr P Goff Mitchell Goff & Associates 28 Mayfair Street WEST PERTH WA 6005

Dear Sir

Re: Proposed Landscape Protection Area Management Plan - Pt Lot 12 Dampier Drive, Golden Bay

I refer to your application dated 9 September 1994 concerning the above proposal and advise that it was considered by Council at its ordinary Meeting held on 20th December 1994.

Council resolved that you be advised that it generally supports the proposed Management Plan for the Landscape Protection Area at Pt Lot 12 Dampier Drive, Golden Bay, subject to the following conditions:

- 1. Detailed plans for the proposal indicating finished ground levels, heights of retaining walls, fencing types and location, access path location, viewing deck details, rehabilitation of 'blow out' areas and landscaping details shall be submitted to Council in the form of a separate development application for approval prior to any works commencing.
- 2. Two additional access paths shall be provided from Minderoo Crescent to the Western Interface Reserve and one additional access path shall be provided from the recreation area at the base of Mandurah Hill to the path proposed by Council on the Mandurah Hill reserve itself.
- 3. The extent of the clearing on the eastern face of the 37m Central Dune shall be determined on-site at the time that the subdivision works are progressing in order to get a clearer understanding of the implications of the proposal.
- 4. The works undertaken in the landscape protection area shall be maintained by the developer to the satisfaction of the Council for a period of three years from the time the works were undertaken.

OFFICE HOURS MONDAY TO FRIDAY 9AM to 4PM

TELEPHONE 525 0333

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ATTACHMENT 7

Yours faithfully

G G HOLLAND CHIEF EXECUTIVE OFFICER



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ATTACHMENT 7

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JJEELJJJ

GOLDEN BAY LANDSCAPE PROTECTION MANAGEMENT PLAN

For

H & B DEVELOPMENTS PTY LTD

November 1994

Prepared by

MITCHELL GOFF & ASSOCIATES

- 1. INTRODUCTION
- 2. THE COMPREHENSIVE DEVELOPMENT PLAN

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ATTACHMENT 7

3. MANAGEMENT OBJECTIVES

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- 4. EXISTING STATE
- 5. THE STRATEGY
 - 5.1 THE RETAINED CENTRAL DUNE
 - 5.2 THE WESTERN INTERFACE
 - 5.3 THE MANDURAH HILL AREA
 - 5.4 THE SOUTHERN BOUNDARY
 - 5.5 THE SUBDIVISION STREETSCAPE

FIGURES:

- 1. Retained Dunes and Landscape Reserve
- 2. Landform Integration
- 3. Open Space and Landscape Structure

APPENDICES:

1.

3.

- List of Proposed Species for Revegetation/Consolidation.
- 2. List of Proposed Species for General Landscape works.
 - Schedule of Commitments for Public Open Space.

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INTRODUCTION

This report describes the approach being adopted for the retention and management of those areas of the site which constitute protected 'landscape features'.

The Ministerial condition placed upon the rezoning/subdivision of Golden Bay, for the "protection of the landscape features" seeks to conserve the landscape character of the area and specifically the height of certain dune formations.

Those areas of dunes to be retained are shown on Figure 1.

The strategy adopted to comply with the conditions, is to have an overall landscape plan addressing constraints and opportunities of the site.

The strategy has arisen from our analysis of the site and discussion with both the City of Rockingham Planning and Landscape Officers and also the Progress Association. The approach that is illustrated by the concept landscape master plan fully addresses the Ministerial condition for the "protection of the landscape features". The landscape proposals also comply with the City of Rockingham's Landscape Policy for New Subdivisions.

THE COMPREHENSIVE DEVELOPMENT PLAN 2.

The Comprehensive Development Plan (CDP) was approved by the City of Rockingham Council on 23rd August 1994, subject to a number of conditions, four of which are addressed by this document. Condition 2, 3, 4 and 7 related to the protection of landscape features, their identification on site and the requirement for the preparation of management plans.

The CDP illustrated the general approach to the retention of features and the integration of such features into the development plans for the area.

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5. THE STRATEGY

The incorporation of substantial landforms and their associated vegetation into the development requires two main issues to be addressed:

- i) the physical retention
- ii) the management of access and use

These two issues are related in so far as by their retention, the landforms become a focus for recreation and in turn their well being must be provided for by the management of access.

i) Physical Retention

In retaining the dunes, substantial level changes occur between lots, roads and landform. On the central dune, south of Noreena Avenue, the change of level is quite extreme and without manipulation of the lower slopes creates a potentially inhospitable and incongruous situation.

It is proposed that modification of the lower section of the dune is undertaken so that the landform relates more closely to the adjacent roads. This reduces the need for retaining structures and allows for controlled and limited access for passive recreational purposes. See Figure 2.

The positioning of retaining structures away from the road edge allows the rising landform to be graded in such a manner as not to present a prohibitive face to neighbouring areas.

The reserves to the south and west of the site do not have the same problems of retention and level juxtaposition.

Management of Access and Use

The retained dunes are a focus for recreation and therefore are liable to suffer from erosion through pedestrian traffic. The central high dune is most likely to suffer more than other areas due to its location and being surrounded by residential blocks.

MITCHELL GOFF & ASSOCIATES

ATTACHMENT 7

It will be important therefore to manage access to the dune and control the way people use the area. It is proposed that the lower slopes are modified to allow public access and by doing so, encourage use to one particular area in the form of a small park.

The peak of the dune is a goal for walkers and it is proposed that routes are identified and 'way marked'. The peak itself can be protected by the incorporation of a small viewing deck to prevent destabilisation of the high point. Pathways would be low key incorporating log steps and 'kick rails' to encourage users to stay on track. The further definition of routes through the planting of scrub vegetation, Tuart and Tea trees in selected locations aids in stabilisation and integration with the surrounding areas.

The dunes forming the western boundary with the existing settlement will be retained as they exist with limited planting to reinforce the existing vegetation, help define the reserve's eastern boundary and to clarify limited access routes. Traffic regulation devices such as raised kerbs and bollards will be used to prevent vehicles accessing the area direct from the adjacent road.

The two southernmost reserves are very steep inclines and will be retained as coastal heath with supplementary planting to the lower edges. An area will be created on the lowest slopes which will be predominantly grass allowing local incidental play space. Access to the remaining areas will be discouraged by the use of dwarf rail fencing to the heath edge.

The plan is illustrated in Figure 3.

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The proposals fall into five categories:

- the retained Central Dune
- the Western Interface Reserve
- the Mandurah Hill area
- the South Western face
- the Subdivision Streetscape

MITCHELL GOFF & ASSOCIATES

5.1 The retained Central Dune

The retained Central Dune forms the highest point on the development rising to 37 metres. The dune forms part of the public open space reserve amounting to 6.272 hectares, which also runs north-south down the western boundary of the site.

The dune forms a dominating focal point in the area and is a feature which will become an attraction to local residents due to the potential lookout from its summit. Changes of levels between roadways and the edge of the dune up to 6 metres have the potential to visually separate this feature from the surrounding development.

The approach therefore has been to modify the lower slopes of the dune reducing the need to create potentially unsightly engineered structures. See Figure 2.

Such modification also allows for public access and use to be managed to focused areas thus relieving pressure on the "natural" areas of the dune. It is proposed that as well as creating local maintained areas around the base of this feature, access paths will be designed to take people to the summit and along desire lines. These paths will be sited to minimise disruption to the dune vegetation and located in such a manner as to deter access to other dune areas. The plan therefore promotes an enhanced landscape around the base, offering local passive recreation facilities and managed access to the summit.

On completion of the landscape works, this area will form two distinct yet related zones; the lower terraced park and the upper dune and summit.

The lower terraced park will incorporate limestone block walling, grassed areas, tree planting for shade and low key park facilities such as play equipment and seating. Planting in this area will utilise a mix of species tolerant of the site conditions which will also complement the retained coastal heath.

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The upper dune and summit will incorporate low timber posts and rails, decking to the summit, fencing to prevent access and localised new planting of coastal heath species. Additionally, footpaths will be identified by way mark posts and the path itself stabilised. Stabilisation will take numerous forms including timber steps, crushed limestone surface with bituminous emulsion and localised timber decking. Where required, the dune will be stabilised with pegged brush and limited seeding or planting of indigenous species to localised areas in need of rehabilitation.

5.2 The Western Interface Reserve

This stretch of land linked to the main dune, runs north-south between existing development and the proposed new subdivision.

The proposal in this area is to retain the area as it presently exists with only minor manipulation of its edges where they front onto the new subdivision. Such minor modifications are in the form of landscape enhancement where limited strategic use of indigenous planting will reinforce the existing vegetation, and screen and manage particular views. It is also proposed to manage the vegetation to allow access to areas but deterning free access throughout this zone. The selective thinning of vegetation to allow access will be carried out in consultation with the Council. The routes will be planned to ensure that privacy to adjacent blocks is preserved. Access will be managed using timber post and rail fencing to key locations in association with 'way mark' posts.

5.3 The Mandurah Hill Area

On the south-eastern comer of the site lies an area of bush which forms the lower dune formation to the Mandurah Hill. This .79 hectare public open space will be treated in a similar fashion to the retained Central Dune. It is proposed that the area is generally retained and conserved as it exists, but that a zone close to the new road system is designed to accommodate local low key passive recreation. New plantings of indigenous trees and shrubs will be used to articulate space and provide a setting for local play facilities. The remaining areas will have a level of reinstatement planting to reinforce existing vegetation and provide a more robust edge treatment where public access is to be deterred. In all the dune reserves, fencing will be sensitively incorporated to manage access.

MITCHELL GOFF & ASSOCIATES

5.4 The Southern Boundary

This severely sloping dune area will be fenced off around its base with timber post, rail and wire. The area is unlikely to tolerate access of any nature and its retention will be for visual amenity purposes only. It may be appropriate to further reinforce the edges of the reserve with dense shrub material which is complementary to the heath vegetation. This will help prohibit access.

5.5 The Subdivision Streetscape

The retention and enhancement of key landscape features on the site must be seen as an integral part of an overall approach to the landscape design of the area. The design of the neighbourhood incorporates landscape framework of street tree planting. The street trees will play an important part in the integration of residential development in the area.

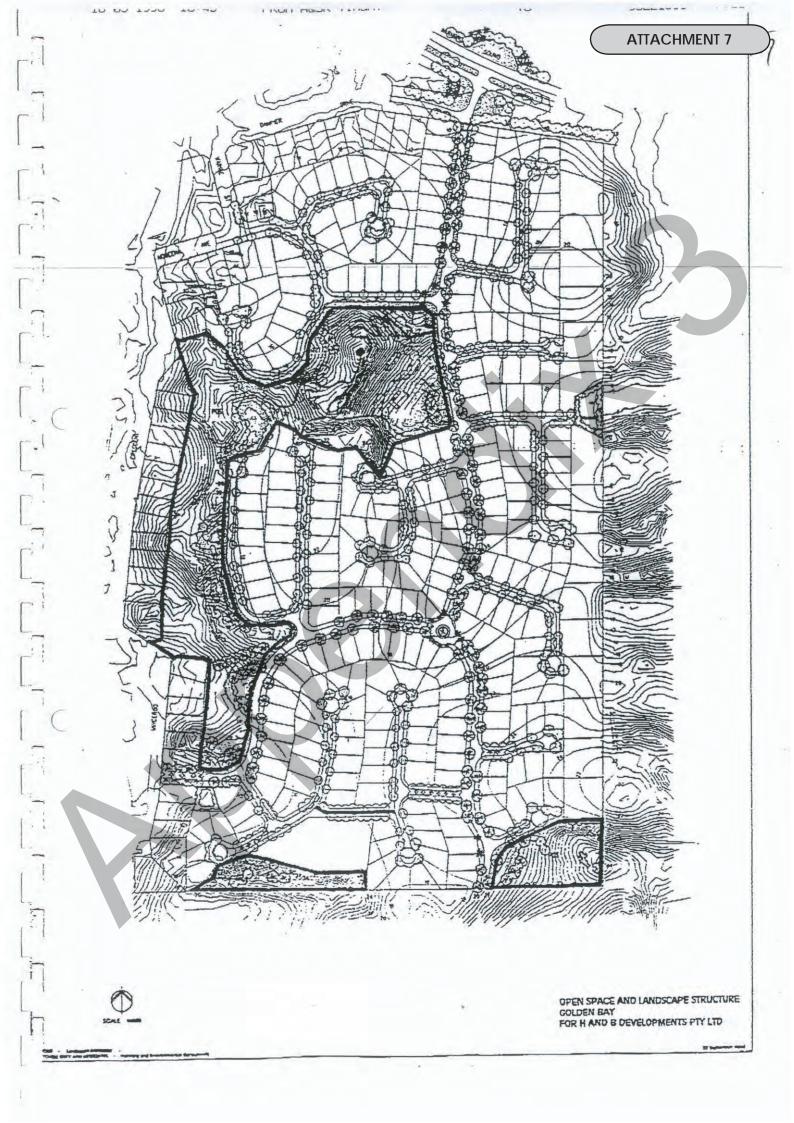
Street trees will include nature species such as:

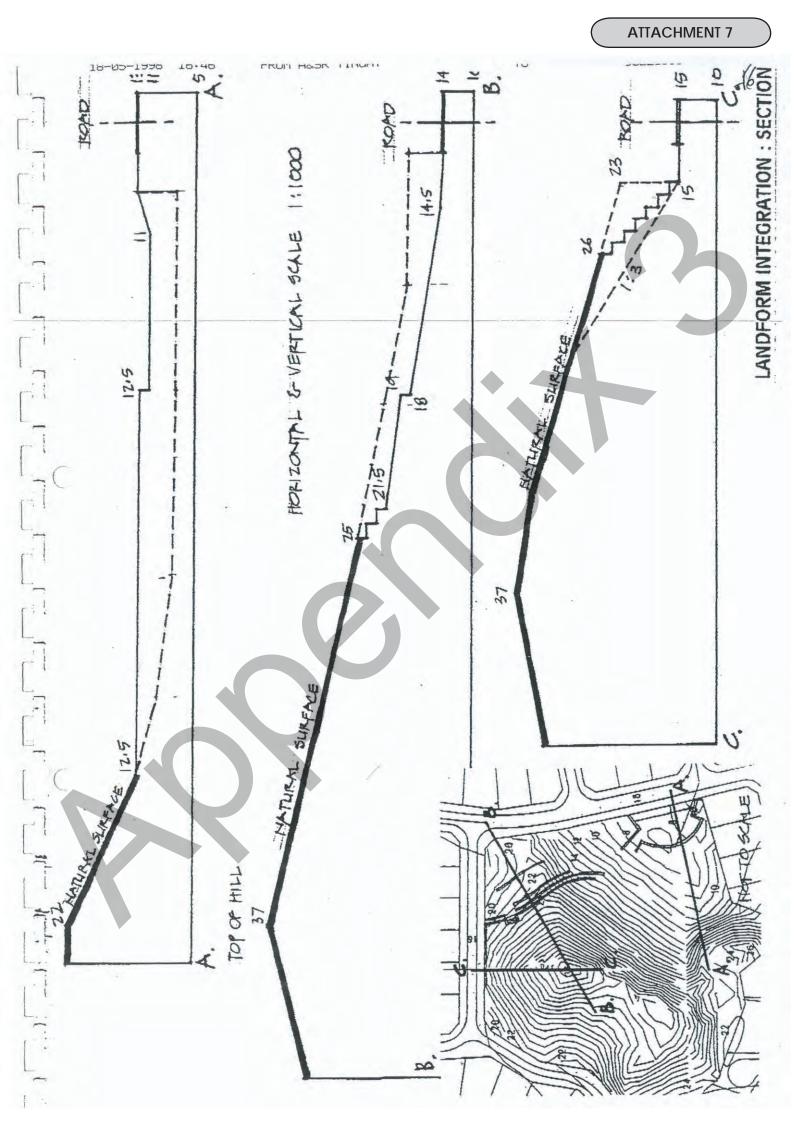
Agonis flexuosa

Eucalyptus maculata

Casuarina equiestifolia

Introduced species which are characteristic of the area such as Araucania, will also be incorporated extending the existing character of neighbouring areas.







APPENDIX 4

Our Ref:

LUP/1469-11 - AD21/19346

Golden Bay Estate, Central POS - Landscape Approval Letter

Your Ref:

Enquiries to: Ms N Watkinson - 9527 0742



where the coast comes to life

24th February 2021

Mr Tiago Martins EPCAD Pty Ltd 28-30 Mayfair Street WEST PERTH WA 6872



Dear Mr Martins

Re: Golden Bay Estate Lot 3 – Central/Landscape Protection Public Open Space (POS), Elvina Vista and Runaway Approach, Golden Bay, Landscape Approval Letter

The City of Rockingham approves in principle the landscape / development proposal for Golden Bay Estate Central POS design in accordance with:

Landscape Drawings (CoR Ref: D21/27168):

- B0740/GB/ST5CP/L101-L106 Rev B
- B0740/GB/ST5CP/L201-L203 Rev B
- B0740/GB/ST5CP/L204-L206 Rev A
- B0740/GB/ST5CP/L207-L209 Rev B
- B0740/GB/ST5CP/L215 Rev A
- B0740/GB/ST5CP/L301-L303 Rev A

Irrigation Drawings (CoR Ref: D21/20264):

18172-01 to 18172-05 Date 4/02/21

The approval is given subject to the following issues being addressed to the satisfaction of the City of Rockingham:

General

- 1. Prior to commencement of on-ground works the applicant must forward the successful contractors certificates of currency for Public Liability.
- 2. It is the responsibility of the applicant to co-ordinate with all other consultants/contractors involved in the development works covered under this approval. The applicant is responsible for liaising with architects, civil and hydrologic engineers, electricians, irrigation consultants during the design and construction process to ensure that the landscape works are consistent with the various disciplines to create a holistic outcome. If the delivery of the work is divided between various contractors (Landscape and Civil Contractors), it remains the applicants responsibility to oversee the outcome and update where required to meet the conditions of the Landscape approval. Importantly, being cognisant of existing site conditions, proposed and/or retained overland flow paths, including function of bio filtration swales or conveyance requirements.



www.rockingham.wa.gov.au

B0740/GB/ST5CP/L210-L211

B0740/GB/ST5CP/L212 Rev B

B0740/GB/ST5CP/L213-L214

B0740/GB/ST5CP/L216-217

B0740/GB/ST5CP/L400-406

Failure to accommodate required levels to kerbs, footpaths, pavements, structures may require modification prior to handover.

- 3. All required Building Licences and Structural Engineer Certifications must be obtained for all structures including:
 - All retaining walls above 500 mm in height
 - All structures this includes all bespoke play equipment items, stairs, handrails and balustrades etc.

Management

- 4. The Landscape Protection Area (LPA) was set aside in accordance with condition 4 of Ministerial Statement 297. The existing LPA Management Plan was prepared in accordance with the original CDP approved in 1994. The management plan is to be contemporised to reflect current management practice and submitted to the City for approval prior to handover.
- 5. In accordance with the LPA Management Plan 1994 intent, the applicant is to submit signage plan, outlining wayfinding to the top of the dune and other walking trails.

Irrigation

- 6. The mainline is to be PN10 Poly for portions of mainline within road reserve adjacent to residential properties (for the length of mainline within Israelite Ave). The applicant is to provide confirmation of each fusion welded join and photos of installation, prior to back filling installation.
- 7. The applicant must install an inline water meter at the first point irrigation enters the reserve to monitor water usage at the respective location. The connection must be made before the first solenoid valve and be installed in a rectangular valve box for ease of access.
- 8. The irrigation system must be installed as per the 'City of Rockingham' Specifications, (Rev 12, June 2019). The applicant is requested to familiarise themselves with this document to ensure strict compliance.

The applicant is also advised that irrigation mainline is not accepted within the road reserve without prior approval from the City of Rockingham. Locations illustrated on the approved drawings are supported, provided that all road crossings are sleeved/ducted in accordance with the City's standard irrigation specifications.

Solenoid valve control cables must be Tyflo multi-strand copper conductors sheathed in polyethylene suitable for direct burial.

All Solenoid control cables must then be installed in light duty (LD) grey electrical conduit. The contractor must size the conduit to suit the number of cables to be installed. Inspection junctions must be used at each change in direction and inspection tees at each solenoid valve.

Failure to comply may result in the applicant having to retro-fit all solenoid wiring in accordance with the above directive.

- 9. The applicant is required to submit service records for both the bore pump and iron filter systems three (3) months prior to handover. This includes, but not limited to the following; pump flow and pressure tests, dated annual pump/motor/iron filter service reports and chemical water analysis. The findings and recommendations of the reports are to be addressed by the applicant to the satisfaction of the City, prior to handover. The works may include; replacement pump/motor parts, bore developing, column inspection and/or bore dosing for iron bacteria etc.
- 10. All planting is to be offset a minimum 300mm from all sprinklers with consideration to mature plant growth.
- 11. All tree irrigation supply is to be balanced independently from any other station to enable future disconnection if required.
- 12. Where the proposed mainline extends from the POS and enters the road reserve and associated verge areas adjoining residential properties, the applicant must inform the residential property owners of the proposed works and reinstate the verge areas accordingly.
- 13. All sprinklers on the road kerb line, within median islands, roundabouts and adjacent to car parking bays are to have concrete surrounds installed.

Accessibility

- 14. All universal access issues being addressed as defined by the *Disability Discrimination Act* 1992.
- 15. All paths identified to be universally accessible must be designed in accordance with AS1428.1 (2009), including all handrails, balustrades, kerb ramps, landings and gradients.
- 16. All steps and handrails systems in public areas must comply with the Australian Building code. Detail 1: Step Section A, Sheet 204 does not show handrail extending past the last step or on the landing Sheet 205.
- 17. Tactile ground surface indicators must be provided in accordance with AS/NZS 1428.4.1:2009 and the Australian Building Code.

Underground Services

18. The applicant is responsible to undertake all necessary checks, i.e '*Dial before you Dig*' to identify and protect underground services at all times, prior to works commence.

Landscape Hard Works

- 19. All path networks within the road reserve must be approved under the Civil Engineering approval and subject to the respective approval conditions.
- 20. Any footpaths constructed must comply with the City's standard specifications and any pram ramps must be installed in accordance with the City's engineering standard details. Pram ramps are to be installed on both sides of the carriageway where paths meet the road reserve.

- 21. Concrete footpath construction joint details must be in accordance with the City's standard engineering specifications. Note: Preference is to use a 'Lock joint' type system rather than 'canite' joint products.
- 22. Applicant to complete the interface with Minderloo Crescent, this includes installing required pram ramps (on both sides of the road, to the City's standard specifications), bollards, fencing (including replacing the boundary fence to neighbouring, number 50 Minderoo Cr, if necessary) and low fuel planting with mulch. Pram ramps must be perpendicular to the road centreline to minimise the crossing distance.
- 23. All pavements, surfaces including exposed aggregate surfaces must be installed as per manufacturer's specification. All exposed aggregated surfaces must have appropriate expansion joints installed to industry standards, including full cut joints to avoid cracking.
- 24. 'Insitu Asphalt Paving' detail for the all abilities access path to the dune summit is to be submitted to the City for approval prior to construction. A formed concrete edge beam is required or similar to retain the asphalt surface.
- 25. Proposed footpath east to west (connecting to the Strategic Firebreak) is to be bitumen stabilised limestone 2.0m wide, with a swinging pedestrian access gate (currently shown only 1.5m wide). This is to be installed regardless of the timing of the Strategic Firebreak, as it defines low threat vegetation areas.
- 26. Proposed north south stairs from the corner of Runaway Approach are to be pegged out on site and reviewed with consideration to avoid unnecessary clearing, duplication of pathways and possible alternatives.



Landscape Drawing - Cover Sheet

- 27. All proposed stairs to be certified by a structural engineer, noting that the current drawings suggest post centre spacing's that exceeding the labelled 2000mm centres see Detail 2 Sheet L205. Material colours and finishes of decking and balustrades to be circulated to the City, prior to installation.
- 28. Supply and install 200mm (W) x 150mm (D) extruded flush concrete kerb between all turf and garden and/or mulch only areas (colour to match plain grey concrete footpaths).

29. Any proposed stone pitching must be securely fastened with a commercial cement bonding agent or similar, with no gaps for weed growth to the satisfaction of the City.

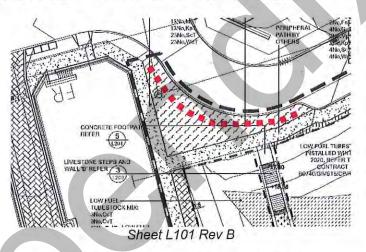
Infrastructure

30. Bollards must be installed at 1.5 metre centres in areas where unauthorised access is likely to occur and/or on the boundary of the public open space. Timber Bollards to be 125mm diameter dome topped, unpainted finish. All timbers to be appropriately treated suitable for in-ground use, CCA pressure treated H4 minimum standard.

The City endeavours to standardise the bollard style across the City and failure to comply with the condition may result in the applicant having to retro-fit non-compliant bollards to meet the above directive.

Bollards placed within the centre of footpaths that limited the width of footpath are not supported and should be placed either side of the footpath. Removable bollards within footpaths may be considered on request.

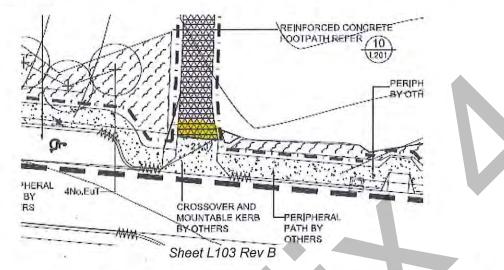
31. The applicant is to underwrite the installation of bollards if necessary to protect the vegetation proposed within the verge area illustrated below.



- 32. All retaining walls and vertical surfaces must be anti graffiti coated.
- 33. All structural steel work to be Hot Dipped Galvanised (HDG). Powered coating is generally not supported and where practical must be galvanised with a 2-pack paint system and non-sacrificial Wattyl anti-graffiti coated.
- 34. Pedestrian swinging gates are to be in accordance with City standard specifications being RSD-517 Rev 3.
- 35. A service gate keyed to the City of Rockingham locking system must be installed, accompanied by a 150mm reinforced concrete ramp (crossover) from the road carriageway including appropriate flush/mountable kerb and reinforced concrete footpath section.

This includes providing two (2) vehicle cross overs and gates to the strategic firebreak, at the end of Minderoo Crescent and south of Minderoo Reserve. Cross overs must be installed in accordance with the City's standard engineering drawing for 'commercial crossovers'.

36. Suitable removable lockable bollards are required at the trafficable vehicle access south of the site.



37. Root control barriers such as the 'Root Director' by StrataGreen or approved equivalent shall be installed to all trees, where trees are located closer than 1.5 metres of any hardstand surface including all trees within playground area.

Furniture

38. Any drinking fountain or potable (scheme) water facility where the water service size is greater than 25mm must be assessed for a risk rating for a backflow prevention device in accordance with Water Corporation Building and Plumbing Handbook. Results of this assessment (from Water Corporation) must be circulated to the City prior to install. In the case that a back flow prevention device is require it must be installed in accordance with water corporation specifications including all required testing, with a copy of the results provided to Water Corporation and the City.

An anti-tamper isolation valve must be installed no greater than one (1) meter from the base of any water facility i.e. a drinking fountain, water fountain in an accessible location and housed in lockable unit.

Potable water facilities must be tested and confirmed lead free prior to the Developers practical completion.

All associated fixtures and fittings must be stainless steel and not anodised brass. Taps that are readily accessible by children (and in play areas) must have an antitamper or switch-off mechanism.

New drinking fountains and/or any new plumbing works must be installed by a Licensed Plumber, in accordance with advice received from the Department of Commerce, Building Commission.

The Licensed Plumber must provide a copy of the compliance certificate for the works carried out to assure the plumbing work is in accordance with all the necessary regulations/standards and warrants the works.

A detailed drawing showing the location of the water service, isolation valve and connection points must also be provided prior to the Developers practical completion.

This information must also be submitted on the combined Irrigation, Electrical and Water - As Constructed Drawing.

- 39. Two (2) waste enclosures including the 240 litre wheeled bin insert are to be provided at central locations and accessible for maintenance. The City of Rockingham approved styles are Street Furniture Australia, model (WBE-F240) and Landmark Engineering model Norfolk 240 Lt or an approved equivalent, which must be installed to the satisfaction of the City of Rockingham. Natural timber enclosure panels will not be supported. All enclosures must be accompanied with a roof cover.
- 40. Applicant to inform the City's Waste Services of any Dog Bag Dispensers installed. The City of Rockingham approved style is the 'Exteria' Dog Bag Dispenser with key lock. Any variations are to be approved by the City, prior to installation.
- 41. All park furniture and elements must be installed and maintained (for period of 24 months) to the manufacturer's specifications and recommendations, in accordance with the product warranty, including application of anti-graffiti coatings or comparable approved product. All park furniture and elements are preferred to be surface mounted unless otherwise specified.

Playground Equipment

42. All playground installations must be installed and <u>maintained</u> in accordance with all relevant Australian Standards AS 4685:2014 1-6, 11 and all relevant amendments including additional criteria outlined in the following; AS 4685.0:2017 Playground equipment and surfacing Part 0: Development, installation, inspection, maintenance and operation.

The applicant must provide evidence of 'Operational' and 'Comprehensive' playground inspections in accordance AS 4685.0:2017 and supply copies of inspections quarterly to the City's Senior Landscape Architect, for the duration of the maintenance period or until agreed handover to the City.

- 43. Suitable impact absorbing surfacing, termed soft-fall must be installed, wherever falls from fixed or portable playground equipment is possible. All playground softfall installations must be installed in accordance with Australian standards AS/NZS 4422:1996 Playground Surfacing Specifications, Requirements & Test Methods.
- 44. The applicant is to provide an independent comprehensive playground safety inspection (including all natural play elements) at the time of the Developer's practical completion; annually and again no later than one (1) month prior to the POS handover date. All remediation work required as a consequence of the inspections must be undertaken by the Developer to the satisfaction of the City of Rockingham.
- 45. Boulders and natural logs to be installed within the playground must be sized to prevent movement or alternatively must be securely fasted / mortared in place to the satisfaction of the City.
- 46. Proposed 'River Bed Section' detail on sheet L215 Rev A is to be updated to state that the base of the river bed is to be 'Liquid Limestone', as per the plan view – sheet L106 Rev B. Ensure that the fall height from the balance log does not exceed 550mm.
- 47. Proposed locations of 'Tree Poles' Sheet L216 within the playground must be approved by the City, prior to installation.

- 48. The Cubby House finishes and colours are to be provided to the City for information, prior to construction. The decorative panels on cubby one will be monitored during the maintenance period and if they are found to deteriorate, create on-going compliance issues or difficult to source replacement parts, they are to be removed and replaced with modwood timber panels, prior to handover.
- 49. The proposed trampolines are to be replaced with an alternative play equipment item. Proposed substitution equipment is to be submitted to the City for approval prior to ordering equipment.

Lighting and Electrical

- 50. The electrical drawings for the installation of the BBQ and cubical, <u>must be submitted</u> <u>for approval prior construction</u>. Following installation the electrical safety certification and as constructed drawings (amalgamated with irrigation drawings), must be submitted prior to the developer's practical completion.
- 51. The electrical BBQ must be keyed to the City of Rockingham locking system prior to handover.
- 52. A robust pole mounted security light fitting is to be provided to support the install and use of the BBQ. Recommended pole and fitting as follows:

Green Frog Systems; Pole - GFS-6MMH-60GP (6M Mid-hinge HDG pole) and GFS-Guardian-25-4K - GFS Guardian 25 Solar light 4K CCT or an approved equivalent must be approved by the City prior to purchasing the light fitting.

Lighting poles are to be a minimum of 4.5 metres in height and be installed in accordance with manufacturer's guidelines and a copy of the structural certification for the light pole and foundation must be submitted to the City prior to Developers Practical Completion.

- 53. Due to the City's concern with the limited aesthetic level of the proposed lighting 'Lumorail LED' installed within the stair handrail. The lighting must be provided on both sides of the stair handrails. Additionally a singular robust pole mounted solar panel security light fitting is to be provided at the top of the stairs to deter anti-social behaviour. This solar light could be on a motion sensor.
- 54. The lighting control is to be operated by a photo electrical cell (PE) attached to the side of an appropriately sized electrical control cabinet.
- 55. The electrical cubical is to be similar freestanding unit as the Irrigation Cubical Design. All designs should be circulated to the City for review, prior to installation.
- 56. All electrical installations must comply with all relevant Australian standards, i.e AS/NZS 3000, AS/NZS 1158:2010 Lighting for Roads and Public Spaces, AS/NZS 5033 Installation and Safety Requirements for photovoltaic (PV) arrays and all relevant amendments.
- 57. The City will engage an independent Electrical contractor to undertake an electrical audit within the public open space and the applicant must rectify all defects or omissions identified prior to handover. The audit will be at the cost of the City, any required works will be at the cost of the applicant.

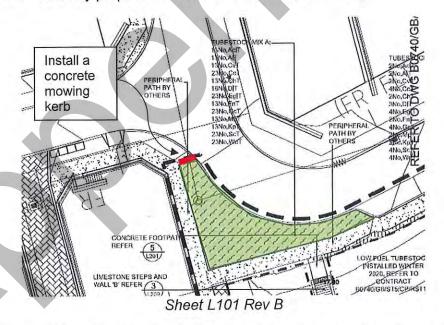
Landscape Soft Works

2

58. The north eastern boundary batter is currently approximately 1: 2.5 grade, which is recommended to be modified to accommodate a planted, maintainable slope. The City's preference is to either achieve a 1:4 batter or maximum 1:3 batter, or revert to the original concept which was including some stone wall retaining, where necessary. The treatment should be resolved on site with the City's Senior Landscape Architect.

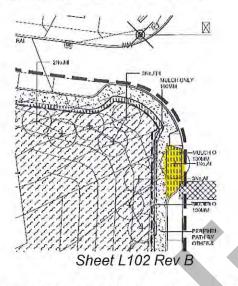


59. The POS development and maintenance must adhere to the Estate Fire Management Plan requirements, including planting the area below with low threat vegetation – currently proposed to be 'Mixed Tubestock Planting'.



- 60. Existing areas of low fuel planting, identified on the plans as 'Stage 5 Revegetation installed winter 2020', are to be infill planted with additional approved species to recover plant loss and install species that could not be sourced in 2020.
- 61. Low Fuel Tubestock Mix, is to incorporate a greater percentage of *Carpoborotus virescens* i.e minimum of 25% coverage.

62. Large street roadside nib on Elvina Vista as shown below, is to be planted with' Low Fuel Tubestock'. Proposed street tree is to be located further south of the pram ramp to avoid impact on trafficable sightlines to pram ramp.



- 63. Plant spacings must be no less than <u>800mm</u> centres, to allow for future mature plant growth and prevent plant overcrowding which is likely to cause disease and/or plant removal.
- 64. No street tree must be planted any closer than five (5) metres from any overhead service pole or street lamp. No street tree must be planted closer than two (2) metres from any side entry drainage pit or service chamber located within road reserve.
- 65. Street trees must be installed in accordance with the Utility's Providers Code of Practice for Western Australia, 1 June 2015.
- 66. All street trees planted in verges are to be mulched at the base, to prevent damage and retain moisture. The stem is to be kept clear of mulch to prevent fungal attack.
- 67. All trees in *garden* areas are to be a minimum of 1.5-2.0 metres from hardstand areas and infrastructure such as retaining walls, to protect infrastructure from upheaval and damage.
- 68. All trees within the playground area are to be sufficiently spaced for mature growth, include tree root barriers and separation from edge treatments and/or soft fall areas. See below area where the number of trees are to be reduced.



- 69. All trees planting in *grassed* areas to be mulched at the base to prevent mowing damage. The stem is also to be clear of mulch to prevent fungal attack. Trees to be planted in clusters or groups within turf areas must be spaced no less than 2.5 metres apart (measurement is from the outside of the mulched tree ring) to allow for efficient mowing practices between the individual trees.
- 70. Plant location adjacent to any footpath and/or traffic intersections within road reserve (garden beds at the back of kerb) should be placed to allow for the expected plant growth, ie not exceed 600mm height to affect safety zones, and not require continuous pruning to prevent overhanging onto footpaths.
- 71. Organic mulch material must be applied to all garden beds and importantly all nonirrigated tube stock planting to the minimum compacted depth of 75 -100 mm. The mulch must be free of weeds, seeds and other propagates and must be capable of decomposing into humus in time, but able to maintain a reasonably persistent site, and be resistant to wind scour.

A uniformly graded material having a nominal diameter of 25 mm, (not greater than 50 mm and not less than 19 mm in any one dimension), must be acceptable.

The applicant may, unless otherwise specified, substitute other materials, provided that in the opinion of the City of Rockingham, the characteristics of type, quality, finish, appearance, and/or performance are not less than specified.

The supplier's delivery docket for bark mulch must be retained by the applicant and a copy may be requested by the City prior to handover.

- 72. Turf must be 'Pennisetum clandestinum' (Kikuyu grass) (Roll On Instant) free from weeds, fungus, insect pests, or other deleterious material. Turf must be certified free of the Sting nematode (*Ibipora Iolii*). The applicant must provide evidence to the City, based on independent nematode testing by a recognised laboratory within the previous three months, that no Sting nematode's have been detected on the production area of the turf farm where the turf is sourced, prior to Developers practical completion.
- 73. All grass mowing slopes must be no greater than 1:6.

As – Constructed Information

- 74. The applicant must provide all as constructed drawings and associated data/ reports in the following formats, CAD (dwg, dgn), PDF prior to the City attending the Developer's practical completion meeting, which includes, but not limited to the following:
 - landscape, building licence/structural certification.
 - Include scheme water supply and isolation valves paint colours (on dwg or asset register) for repair/re-painting purposes.
 - playground equipment including a parts list/maintenance, warranty information, and manufactures certificate of compliance, installer and dates
 - irrigation (amalgamate electrical data, scheme water supply on the irrigation drawings).
 - electrical drawings including cubical and electrical certificate of compliance.
- 75. **Please Note:** As constructed open space data must be provided in A-Spec three weeks after the Developers practical completion. As-constructed data (A-Spec) must include all elements within the POS including any civil engineering aspects such as footpaths, retaining walls and stormwater drainage elements implemented as part of this approval. All A-spec data must be supplied in GIS ready format (Mapinfo, TAB, SHP, MID/MIF) in accordance with the A-Spec digital data specification.
- 76. The applicant must complete the attached 'Quantity Register' for all elements within the POS. The information is for the purpose of fair value assessment, maintenance, replacement forecasting and insurance. It must be provided at the time of the Developer's practical completion.

Landscape Practical Completion and Maintenance Period

As part of the landscape approval process the applicant is required to inform the City of Rockingham of the Landscape Contractor's date of practical completion. It is also customary for the applicant to invite a City representative to a meeting following this date to establish that all landscape treatments have been installed per the agreed conditions, and confirm the commencement date of the **three (3) year maintenance period** in accordance with Condition 4 of the Approved GB Landscape Protection Plan Dec 1994. The applicant is also required to confirm that the respective public open space parcel(s) have been created and a Management Order issued in favour of the City.

The applicant is required to arrange an onsite meeting with a City Parks Services representative, 18 (eighteen) months after recognising the applicant's practical completion. This meeting is to identify any defects or omissions which may impact on the future handover of the public open space (POS) asset.

Handover Process

Three (3) months prior to the anticipated handover dated of the respective works, a detailed inspection of the POS is to be carried out in the presence of the applicant and/or representative. The applicant is responsible to contact the City's Parks Services representative to arrange this inspection. Any unacceptable or incomplete works identified during this inspection must be rectified prior to the final handover to the City. Failure to complete the works will result in an extension of the maintenance period.

All conditions within the official approval must be addressed prior to proposed handover. In cases where conditions have not been addressed, the City will not accept care and control until such time they have been completed.

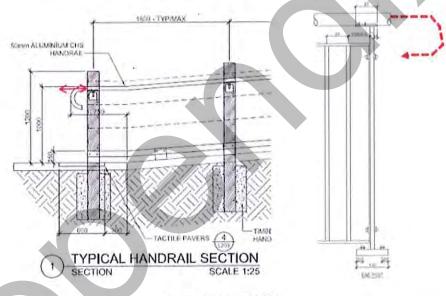
Approval Timeframes

If the development subject of this landscape approval has not substantially commenced within a period of two years from the date of this letter, the approval must lapse and be of no further effect. Where an approval has lapsed, no development must be carried out without the further approval of the City having first been sought and obtained.

Advice Notes:

Condition (3) The City of Rockingham's Building Department can be contacted on 9528 0333 to discuss any issues relating to the Building Licence Approvals.

Condition (15) The 'Typical Handrail Section' (Detail 1, Sheet 211) is currently not compliant as a ramp handrail must extend 300mm to the surface below. Additionally the Balustrade Post Detail 'End Post' (Detail 1, Sheet 203), does not show how the handrail terminates, it must turn down in accordance with the standards.

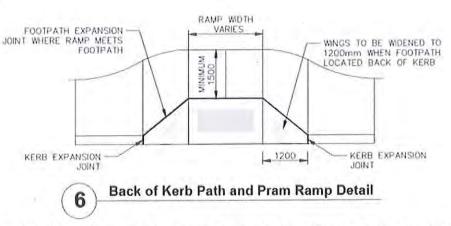


Sheets L211 and L203

Condition (17) AS/NZS 1428.4.1:2009 Design for access and mobility - Means to assist the orientation of people with vision impairment - Tactile ground surface indicators

Condition (20) Standard footpath and pram ramp construction drawings can be found on the City of Rockingham website: <u>https://rockingham.wa.gov.au/planning-and-building/development/subdivisions</u>

Condition (22) Pram ramps must be perpendicular to the road centreline to minimise the crossing distance and the minimum distance behind the ramp is incorporated as illustrated below. For standard Pram ramp details refer to the City's website: https://rockingham.wa.gov.au/planning-and-building/development/subdivisions

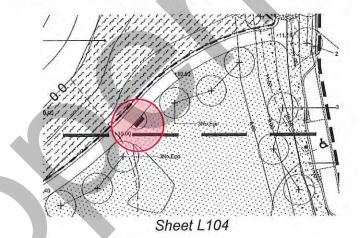


Number, 50 Minderoo Crescent is currently owned by Housing Authority. PEET are to confirm the intentions (if known) for this land and for the proposed boundary fencing treatment with Minderoo Reserve.

Condition (35) With regards to locking systems requirements contact the City of Rockingham Asset Maintenance on 9528 8630 during office hours.

Condition (39) the applicant is advised that the location of the waste receptacle/s is to be determined following consultation with the City of Rockingham's Waste Service Coordinator. Contact can be made on 9528 8550 during office hours.

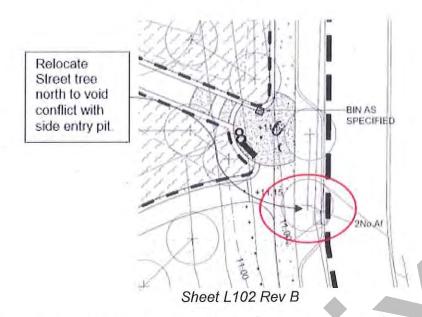
Condition (41) The plans do not currently label proposed bench seats. Consider switching out bench seat for picnic setting in the below area. This is to provide variety of users the opportunity to use the site and not necessarily be associated with the Playground area.



Condition (55) Standard electrical cubical drawings can be found on the City's website: https://rockingham.wa.gov.au/planning-and-building/development/subdivisions

Condition (64) Sheet L02 Rev B, Street tree conflicts with side entry drainage pits see below.

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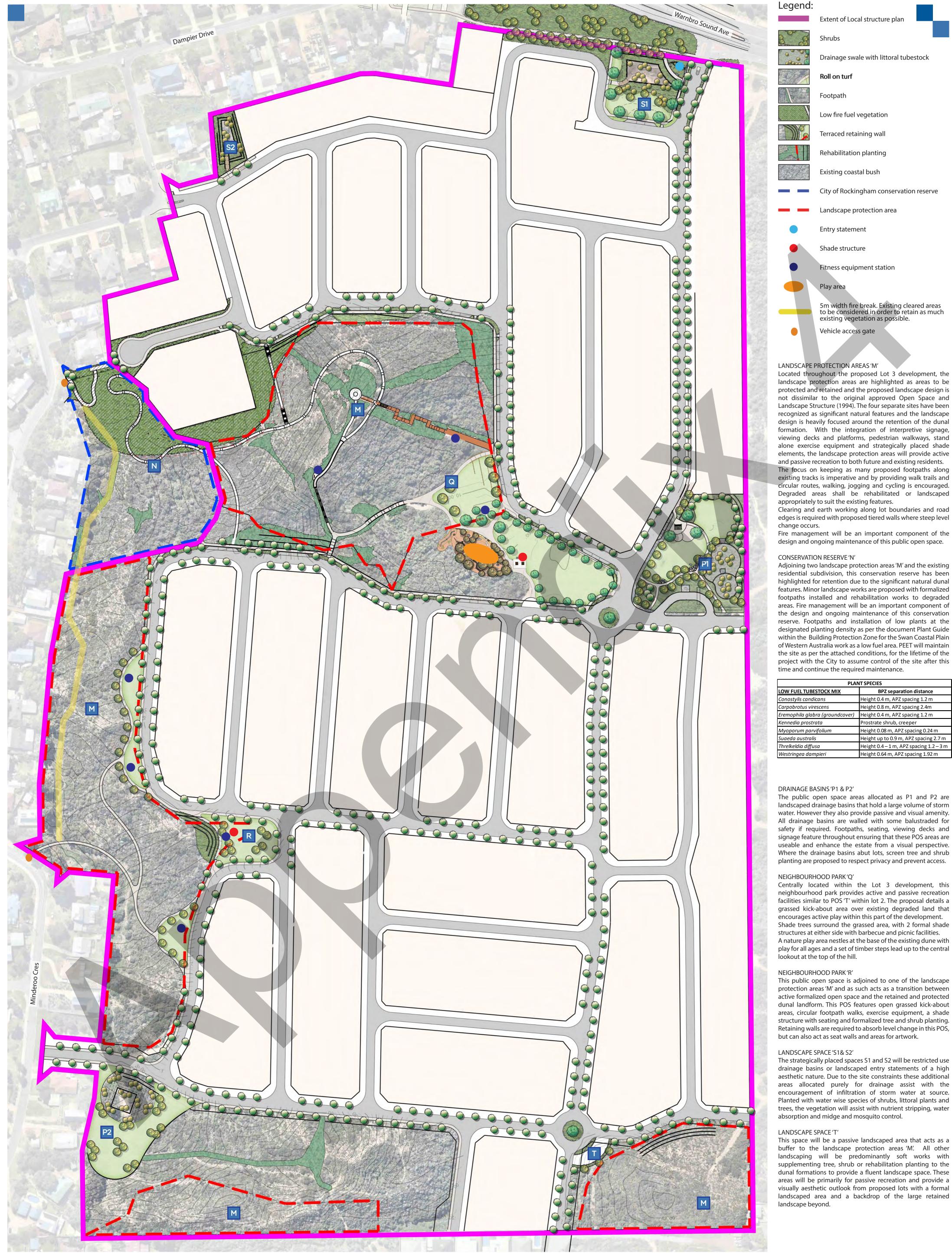


If you have any questions regarding any of the above please contact Natalie Watkinson on 9527 0742 during office hours.

Yours faithfully

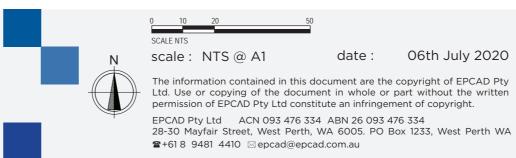
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JAMES HENSON MANAGER LAND & DEVELOPMENT INFRASTRUCTURE



PLAI	NT SPECIES
LOW FUEL TUBESTOCK MIX	BPZ separation distance
Conostylis candicans	Height 0.4 m, APZ spacing 1.2 m
Carpobrotus virescens	Height 0.8 m, APZ spacing 2.4m
Eremophila glabra (groundcover)	Height 0.4 m, APZ spacing 1.2 m
Kennedia prostrata	Prostrate shrub, creeper
Myoporum parvifolium	Height 0.08 m, APZ spacing 0.24 m
Suaeda australis	Height up to 0.9 m, APZ spacing 2.7 m
Threlkeldia diffusa	Height 0.4 – 1 m, APZ spacing 1.2 – 3 m
Westringea dampieri	Height 0.64 m, APZ spacing 1.92 m

GOLDEN BAY Lot 3: Landscape Master Plan Version 14





APPENDIX 5

LOT 9027 DAMPIER DRIVE, GOLDEN BAY

LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY

Prepared for:

Peet Golden Bay Pty Ltd Department of Communities

Report Date: 27 April 2021

1

Version:

Report No. 2021-564



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- Figure 13: Rose Pelargonium (*Pelargonium capitatum*) in South Western Interface
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Weed (Euphorbia terracina) in Central Dune
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Appendices

- Appendix 1: Weed Mapping Grids
- Appendix 2: Naturemap Report
- Appendix 3: Conservation Codes
- Appendix 4: Species List
- Appendix 5: Quadrat Data

1 INTRODUCTION

Lot 9027 Dampier Drive Golden Bay is located approximately 20km south of the Rockingham City Centre (Figure 1) in the City of Rockingham.

The Lot is zoned for urban development in the Metropolitan Region Scheme and the City of Rockingham Town Planning Scheme No 2. A Structure Plan has been approved for the Lot with modifications to the southern area through a subdivision approval in 2019. The Plan includes a mix of residential lots, Public Open Space and a Landscape Protection Area.

The requirement to include a Landscape Protection Area in the development of the Lot dates back to the original environmental approval for development in the early 1990s. Urban development of the Lot (formerly called Lot 3 Dampier Drive) was assessed by the Environmental Protection Authority (EPA) in 1992 and granted environmental approval through Ministerial Statement (MS) 297 in January 1993. Condition 4-1 of MS 297 required planning measures to recognise and protect the landscape value of the parabolic dune ridge on the Lot. To meet the condition, the Golden Bay Landscape Protection Management Plan was prepared by Mitchell Goff and Associates in November 1994. The Management Plan was approved by the EPA and other agencies.

Given the nearly 25-year date of the Landscape Protection Management Plan, the developers have committed to preparing an updated Management Plan for the Landscape Protection Area (LPA). The updated plan is currently being prepared. This Baseline Flora, Vegetation and Weed Survey report has been prepared to provide a description of the current status of the vegetation in the LPA and to assist in identifying any management actions to be included in the Management Plan.

2 LANDSCAPE PROTECTION AREAS

2.1 General Description

The boundary of the Landscape Protection Area (LPA) included in the Concept Development Plan is generally in accordance with the boundaries of the LPA as approved in 1994.

The LPA was chosen for a number of reasons, but primarily for the retention of significant landscape features but also to provide a buffer to existing housing development as it was in 1994. The LPA contains four areas, described in the original Management Plan as:

- The retained Central Dune;
- The Western Interface Reserve;
- The South Western Face or Southern Boundary; and
- The Mandurah Hill Area (Figure 2)

These names have been retained with slight modification in this report.

A review of the LPA by the developer's civil engineers identified some significant topographical constraints with respect to being able to develop residential lots and streets adjacent to some of the steeper sections of the LPA. As a result, some additional Public Open Space (POS) has been added to the South Western area that effectively enlarges the LPA in this area by a considerable amount.

Some other part of the LPA required vegetation to be cleared in the LPA to provide a stable interface between the residential development and the steep dunes of the LPA. Some earthworks into the LPA were deemed to be acceptable in the original Management Plan. These areas on the northern side of the LPA adjacent to the first stages of development on the Lot and have been cleared, re-graded and revegetated.

The total area of the LPA, including the additional POS in the South Western Area is around 15.5ha.

2.2 Central Dune

The Central Dune area contains the highest parts of the Lot with to peaks at 34-37m AHD. The land slopes down steeply to the north, east and south of the peaks. The area slopes more gently down to the west and joins up with the Western Interface part of the LPA.

2.3 Western Interface

The Western Interface area extends north-south along the central western boundary of the Lot for approximately 420m and varies in width from 60m – 150m. The landform is more undulating than the Central Dune area with some dune ridges and swales ranging in elevation from 11-22m AHD.

The northern end of the Western Interface area has already been ceded as a Conservation Reserve to the City of Rockingham.

2.4 South Western Interface

The South Western Interface extends along the south-western part of the Lot and includes a small original LPA section and a larger POS section. The LPA section is only about 30m wide from north to south and includes a narrow west-east ridge that slopes steeply down to the south and north. As a result of the steep contours an additional area of POS was added, making the area 80-120m wide.

2.5 Mandurah Hill Area

The south-east area of the LPA includes a portion of Mandurah Hill which has its peak at 42m AHD very close to the southeastern boundary of the area. The Mandurah Hill area slopes down from the high point in the south-east corner to low points on the western and northern boundaries around 23m AHD.

3 METHODOLOGY

3.1 Flora and Vegetation Survey

A Detailed Flora and Vegetation Survey was undertaken in accordance with the *EPA Technical Guidance: Flora and Vegetation Surveys* (EPA, 2016). The survey included the following:

- Review of previous flora and vegetation reports for Golden Bay;
- Desktop search and review of the Department of Biodiversity, Conservation and Attractions (DBCA) Naturemap database to determine if any species that have been listed since the previous studies were completed have been recorded in the area;
- Examination of historic and recent aerial photography and contour and soil maps to provisionally identify vegetation types and condition;
- Field survey using quadrats to record native and introduced species as well as a thorough site walkover of any areas of native vegetation;
- Recording of any significant plant species using a hand-held GPS;
- Description and mapping of vegetation types and vegetation condition; and
- Compilation of a flora list.

3.2 Weed Survey

A weed survey was undertaken using a 20m x 20m grid pattern, recording significant weed species and coverage at each intersecting point (Appendix 1).

Significant weeds were those that are:

- Weeds listed under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- Weeds of National Significance (WoNS);
- Priority weeds identified as being priority weeds in their reserves as identified in the *Reserve Prioritisation Report* (City of Rockingham, 2015); or
- Weeds listed in Environmental weed census and prioritisation, Swan NRM Region 2008.

Significant Weeds were recorded and mapped in accordance with *Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands* (SOP 22.1) (DEC, 2011) and *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (Technical Guidance) (Government of Western Australia, 2016). Weed occurrences were captured using a hand-held GPS.

The coverage of the significant weeds was rated using the Braun-Blanquet scale as per the SOP 22.1 as follows:

- 1 = Less than 5% cover
- 2 = 6 75 % cover
- 3 = 76 100 % cover

4 RESULTS

4.1 Timing

The 2020 flora and vegetation survey was undertaken on 16 October 2020 and the weed survey was undertaken on 19 October 2020.

4.2 Survey Conditions

The conditions that the survey was undertaken in are presented in Table 1 in order to assess the adequacy of the survey. In summary there were no constraints to the survey.

Issue	Constraints (Y/N)*	Comment
Competency/experience of the consultant conducting the survey	No	Dr Paul van der Moezel has extensive botanical survey experience in the Perth Metropolitan Region, including previous surveys on the subject land
Proportion of the flora identified [^]	Yes	The timing of the survey in mid-October was optimal to identify all flora species on the site.
Sources of information (historic/recent or new data)	No	The flora in the Perth Metropolitan Region is well documented.
Proportion of the task achieved and further work that may need to be undertaken	No	No follow-up survey required as no conservation significant flora expected to occur in other seasons
Timing/weather/season/cycle	No	The survey was undertaken in mid- spring. 2020 was a good year for ephemeral species despite slightly lower rainfall in the region.
Disturbances (Fire)	No	The fire age of the vegetation was mostly greater than 5 years with some areas burnt less than 5 years ago but recovering well.
Intensity of survey (e.g. In retrospect was the intensity adequate)	No	The time spent on the site (approx. 7hr) was considered adequate for the size of
Completeness (e.g. was relevant area fully surveyed)	No	the site (15.5ha), ease of access and low diversity of species and vegetation types.
Resources (e.g. degree of expertise available for plant identification)	No	Experienced botanist undertook plant identifications on site.
Remoteness and/or access problems	No	Easily accessible site in the Perth Metropolitan Region.
Availability of contextual (e.g. bioregional) information for the study area.	No	Bush Forever

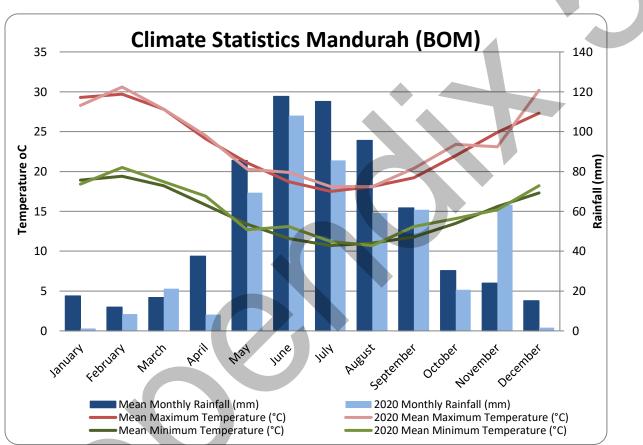
Table 1: Statement of Botanical Survey Conditions

*Constraints have been rated as Significant, Moderate or No constraints

[^]Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not specifically surveyed for during the survey.

4.3 Climate

Western Australia experiences a Mediterranean climate with warm dry summers and wet cool winters. Peak rainfall periods are between May and September. Climate statistics from the Bureau of Meteorology (BOM, 2020) can be used to compare the survey climatic conditions to mean values for temperature maximum, minimum and rainfall (Graph 1). The statistics have been measured on the Mandurah Site (BOM Site Number 009977), which has been collecting data from 2001 (BOM, 2021).



Graph 1: Mean climate statistics compared to 2020

Comparatively, the seasonal conditions for the 2020 monitoring were drier than average from April to August, similar in September and slightly below average in October. The 2020 temperatures were generally slightly higher than the average minimum temperatures with average maxima similar (Graph 1).

4.4 Naturemap Database Search

A search of the Naturemap Database (Appendix 2) indicates that a number of species that are listed as Endangered, Threatened or Priority have been located within a 10km radius of the site (Table 2).

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act	Habitat*	Likelihood to occur on the site
Drakaea elastica	Glossy-leafed Hammer Orchid	Schedule 1	Endangered	The Glossy-leafed Hammer Orchid prefers low-lying situations adjoining winter-wet swamps. This species does not survive in disturbed areas.	No – no winter wet habitat
Diuris drummondii	Tall Donkey OrchidSchedule 3VulnerableThe Tall Donkey Orchid grows in low-lying depressions, swamps, in areas that contain surface water well into summer (Brown et al., 2013).		No – no swamp habitat		
Acacia benthamii		Priority 2		Acacia benthamii grows on sand, typically on limestone breakaways	Highly Unlikely – no breakaway habitat
Cardamine paucijuga		Priority 2		<i>Cardamine paucijuga</i> is found on moist flats in calcareous clay over limestone.	No – not moist calcareous habitat
Beyeria cinerea subsp. cinerea		Priority 3		<i>Beyeria cinerea</i> subsp. <i>cinerea</i> grows in sand over limestone on road verges, gullies	Unlikely – not known from m dune habitat
Calandrinia oraria	Priority 3		Highly Unlikely – too far from the coast		
Dillwynia dillwynioides		Priority 3		<i>Dillwynia dillwynioides</i> occurs in sandy soils in winter-wet depressions.	No – no winter wet habitat
Lasiopetalum membranaceum		Priority 3		Lasiopetalum membranaceum grows in sand over limestone.	Unlikely – not known from dune habitat
Pimelea calcicola		Priority 3		<i>Pimelea calcicola</i> occurs in sand on coastal limestone ridges.	Highly Unlikely – no limestone ridges

Scientific Name	Common Name	Conservation Status (WA)	Status under EPBC Act	Habitat*	Likelihood to occur on the site
Schoenus capillifolius		Priority 3		Schoenus capillifolius grows in brown mud on claypans.	No – no claypan habitat
Sphaerolobium calcicola		Priority 3		Sphaerolobium calcicola grows in white-grey-brown sand, sandy clay over limestone, black peaty sandy clay on tall dunes, winter-wet flats, interdunal swamps, low-lying areas.Highly Unlikel suitable habita	
Caladenia speciosa	Sandplain White Spider Orchid	Priority 4		Sandplain White Spider Orchid occurs in white, grey or black sand in Banksia or Jarrah Woodland (Brown <i>et al.</i> , 2013).	Highly Unlikely – not woodland habitat
Conostylis pauciflora subsp. pauciflora		Priority 4		<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i> occurs in grey sand, limestone on hillslopes, consolidated dunes in coastal areas.	Possible
Jacksonia sericea	Waldjumi	Priority 4		Waldjumi grows in calcareous and sandy soils.Unlikely – habitat pressspecies	
Parsonsia diaphanophleba		Priority 4		Parsonsia diaphanophleba occurs in alluvial soils along rivers.	No – not alluvial habitat
Stylidium Iongitubum	Jumping Jacks	Priority 4		Jumping Jacks prefer sandy clay, clay in seasonal wetlands. No – no wetland	

* Habitat description from Florabase (DPaW, 2016) or SPRAT (DoEE, 2017) unless otherwise denoted

Conservation Codes are shown in Appendix 3

4.5 TEC and PEC Desktop Search

The Threatened (TEC) and Priority Ecological Communities (PEC) that may occur on the site are outlined in Table 3.

Ecological Community	Description	Conservation Status WA	Status under the EPBC Act	Potential to occur
SCP19a	Sedgelands in Holocene dune swales of the southern Swan Coastal Plain.	Critically Endangered	Endangered (Listed as FCT19)	Unlikely
SCP19b	Woodlands over sedgelands in Holocene dune swales of the southern Swan Coastal Plain.	Critically Endangered	Endangered (Listed as FCT19)	No - no woodland vegetation
Banksia WL SCP	Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region	Priority 3	Endangered	No – no Banksias on site
Tuart woodlands	Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain	Priority 3	Critically Endangered	No – no Tuarts on site
SCP29a	Coastal shrublands on shallow sands, southern Swan Coastal Plain	Priority 3		Possible
SCP29b	Acacia shrublands on taller dunes, southern Swan Coastal Plain	Priority 3		Likely

Table 3: Threatened and Priority Ecological Communities likely to occur within 5km of the Site

4.6 Flora

A total of 88 plant species were recorded in the survey area (Appendix 4). The total consisted of 53 native and 35 introduced species. The number of native species is low but typical for Quindalup sand dunes and a survey area of only 15.5ha. The percentage of introduced species, 40% is relatively high due to the adjoining residential development and long-term use of the dunes for recreation by pedestrians and off-road bikes.

The dominant plant Families were the Poaceae (Grass family – 9 species, including 2 native and 7 introduced), Asteraceae (Daisy family – 8 species, 5 native and 3 introduced) and the Fabaceae (Wattle and Pea family, 6 species, all native). The low number of species from the Myrtaceae and Proteaceae families reflects the nature of the Quindalup dune soils which typically have low representation of these families.

None of the species are Threatened (Declared Rare) or Priority species.

Non-native species were common along the western boundary of the site adjacent to the existing housing, and many appear to have been planted. Common tree and shrub species include WA Peppermint (*Agonis flexuosa*), Rottnest Island Pine (*Callitris preissii*), Geraldton Wax (*Chamelaucium uncinatum*) and Brazilian Pepper (*Schinus terebinthifolius*).

The batter slopes in the northern part of the survey area have been stabilised with mulch and revegetated with native shrub species.

A total of eight 10mx10m quadrats were sampled in the survey area (Appendix 5). Species richness in the quadrats ranged from 19-35 which is typical for Quindalup dune vegetation. The percentage of introduced species recorded in the quadrats averaged 27.3%.

4.7 Vegetation

4.7.1 Vegetation Complex

Vegetation Complexes are a broad level of vegetation description which is based on the underlying geomorphology and rainfall (Heddle *et al.,* 1980). The areas of remnant native vegetation on the site is part of the Quindalup Complex which is described as:

'Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay (Heddle *et al.,* 1980)'

4.7.2 Vegetation Type

For small scale sites, such as the survey area, vegetation mapping can be further refined by using vegetation types which are described by the composition and structure of the dominant species rather than based on geomorphology.

Three native vegetation types and one area of exotic species were described and mapped on the site. Vegetation descriptions are provided in Table 4. Vegetation types are mapped in Figure 3.

ArSg Acacia rostellifera/Spyridium globulosum Open to Closed HeathThis vegetation type commonly occurred on the mid- to lower slopes and swales on the site. Acacia rostellifera was the main shrub up to 2m high and 60-70% cover but Spyridium globulosum dominated some patches in the lower swales (photo 2 to the right). Diplolaen areas. Other common smaller species included Austrostipa flavescens, Melaleuca systema, Acanthocarpus preissii, Rhagodia baccata, Conostylis candicans, Daucus glochidiatus, Parietaria debilis, Hydrocotyle intertexta and Hardenbergia comptoniana.Image: Comparison of the systema comptoniana in the series of this vegetation type.	Vegetation Type	Description	Photograph
	ArSg Acacia rostellifera/Spyridium	 slopes and swales on the site. Acacia rostellifera was the main shrub up to 2m high and 60-70% cover but Spyridium globulosum dominated some patches in the lower swales (photo 2 to the right). Diplolaena dampieri was a common tall shrub in some areas. Other common smaller species included Austrostipa flavescens, Melaleuca systena, Acanthocarpus preissii, Rhagodia baccata, Conostylis candicans, Daucus glochidiatus, Parietaria debilis, Hydrocotyle intertexta and Hardenbergia comptoniana. The soils brown to grey sands. Quadrats GB2, 3, 4 and 8 are representative of this vegetation 	<image/>

X

Vegetation Type	Description	Photograph
ArMsAl <i>Acacia rostellifera/Melaleuca</i> <i>systena/Acacia lasiocarpa</i> Open Low Heath	This vegetation type commonly occurred on the upper slopes and ridges on the site. Acacia rostellifera was the tallest species but low (1m) and not very dense (15-20%). Common species included Melaleuca systena, Acacia lasiocarpa, Lomandra maritima, Austrostipa flavescens, Acanthocarpus preissii, Conostylis candicans, Senecio pinnatifolius, Scaevola thesioides, Desmocladus flexuosus, Trachymene pilosa and Calandrinia liniflora. Climbing species were often common including Hardenbergia comptoniana, Cassytha flava and Clematis linearifolia. The soils were light brown sands. Quadrats GB1, 6 and 7 are representative of this vegetation	
SaMsAl Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/ Lomandra maritima Open Low Heath	 type. This vegetation type occurred in one small area that was the only area that contained some surface limestone. However, the plant species did not reflect a typical limestone substrate. Santalum acuminatum was the tallest shrub at only 1m and 10% cover with Melaleuca systena, Acacia lasiocarpa, Acanthocarpus preissii and Lomandra maritima common smaller shrubs around 0.3-0.5m high. Desmocladus flexuosus and Opercularia vaginata were common ground shrubs. The soils were orange-brown sand with some surface limestone. Quadrats GB5 is representative of this vegetation type. 	
10004_183_jc V1.docx	14	

4.7.3 Vegetation Condition

The condition of the vegetation for each quadrat was assessed according to the Keighery system described in Bush Forever (Government of Western Australia, 2000). Keighery's condition rating scale ranges from Pristine where the vegetation exhibits no visible signs of disturbance to Completely Degraded where the vegetation structure in no longer intact and without native plant species (Table 5).

Condition	Description	
Pristine	Pristine or nearly so, no obvious signs of disturbance.	
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.	
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.	
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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.	
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.	
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.	

Table 5: Vegetation Condition Rating Scale.

Source: Government of Western Australia, 2000.

Overall, the condition of the areas of native vegetation in the survey area was high, ranging from Very Good to Good (Figure 4). The number of introduced species throughout the site was relatively high and did not allow an Excellent condition rating to be assigned to any areas.

Some areas had a higher grassy weed understorey, especially in swales and under the Acacia rostellifera dense stands and were rated as Good.

Tracks and the western area of non-native tree and shrub plantings were rated as Completely Degraded.

4.8 Conservation Significance of Flora and Vegetation

4.8.1 Flora

No Threatened or Priority species were recorded during the survey.

4.8.2 Vegetation

Vegetation Complex

The vegetation on the site is part of the Quindalup Complex (Heddle *et al.*, 1980). Approximately 60.49% of the pre-European vegetation extent of this complex remains, of which 9.01% is currently managed by DBCA (DBCA, 2018).

The percentage retention is above EPA's target for minimum 30% retention of vegetation complexes State-wide in the Perth and Peel Region Constrained Areas and the area in protection is just below the 10% minimum criteria for vegetation complexes.

Threatened and Priority Ecological Communities

The Floristic Community Type (FCT) for the three vegetation types was determined using the spreadsheet method which compares the species in the quadrats to the species found in each FCT (Table 12 in Gibson *et al.* 1994). The FCT of all three vegetation types had the highest correlation with FCT 29b 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. FCT 29b is a Priority 3 Ecological Community at State level.

4.9 Weed Density

4.9.1 Mandurah Hill Area

The overall weed coverage in the Mandurah Hill Area was moderate with 59% of the quadrats recording between 6 and 75% coverage and 22% having greater than 75% coverage (Table 6).

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	19%
6–75% coverage	59%
76–100% coverage	22%

Table 6: Quadrat percentage coverage in the Mandurah Hill Area

The total weed coverage recorded was used to develop a weed map for the Mandurah Hill Area (Figure 5). The highest density of weeds is located on the south-western and north-eastern corners with a small area in the central part of the southern boundary. The lowest density of weeds is through the central part of the site (Figure 5).

4.9.2 South West Interface

The overall weed coverage in South West Interface is moderate with 38% of the quadrats recording 6-76% coverage and 33% with a coverage greater than 76% (Table 7).

Table 7: Proportion of a	quadrats with each pe	ercentage coverage i	n the South West Interface
		creentage coverage n	

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	28%
6–75% coverage	38%
76–100% coverage	33%

The weed map for South West Interface (Figure 6) on the western boundary and scattered areas through the site. The areas that have a moderate coverage of 5-76% are mostly concentrated around areas associated with tracks through the site (Figure 6).

4.9.3 Western Interface

The overall weed coverage in the Western Interface is high with 43% of the quadrats sampled having a weed coverage of >75% (Table 8).

Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	28%
6–75% coverage	29%
76–100% coverage	43%

Table 8: Proportion of quadrats with each pe	rcentage coverage in the Western Interface
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The weed map for the Western Interface (Figure 7) shows that the areas with higher weed densities are mostly associated with tracks. The ridge in the central parts of the Landscape Protection Area contains very few weeds and small areas in the densest vegetation that contain a low weed coverage (Figure 7).

4.9.4 Central Dune

The overall weed coverage in the Central Dune area is lower than other LPAs with 60% of quadrats having a coverage <5% (Table 6). Only 10% had a weed coverage >75% (Table 9).

Table 9: Proportion of quadrats with each perc	centage coverage in the Central Dune Area
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Braun-Blanquet Scale	Proportion quadrats with coverage
<5% coverage	60%
6–75% coverage	30%
76–100% coverage	10%

The weed map for the Central Dune area (Figure 8) shows that the areas with higher weed densities are mostly associated with tracks. The less disturbed areas in the Landscape Protection Area contains very few weeds (Figure 8).

4.10 Significant Weed Species

4.10.1 Mandurah Hill Area

There were no Declared Weed species recorded.

Geraldton Carnation Weed (*Euphorbia terracina*) is classified as one of the 30 priority weeds on the Swan Coastal Plain (Bettink and Keighery, 2008). This species was recorded in 56% of quadrats and is generally associated with the track to the north of the site but does extend in low densities to the south-eastern corner of the site. There is a higher density infestation in the south-eastern part of the site (Figure 9). It is recommended that Geraldton Carnation Weed be targeted in weed control efforts as it is known to be highly invasive.

Rose Pelargonium (*Pelargonium capitatum*) was recorded in only 17% of quadrats and is located in the south-western part of the site with small dense infestation to the north-west, south-western

corner and a small, isolated patch in the eastern part of the site (Figure 10). Rose Pelargonium is considered to be a significant environmental weed (Queensland Government, 2015).

Branched Onion Weed (*Trachyandra divaricata*) was present in 12% of quadrats in low densities, mainly in the eastern part of the site and a small infestation on the western boundary (Figure 11). and is considered to be a high priority weed.

4.10.2 South Western Interface

No Declared weed species were recorded in the South Western Interface area.

Geraldton Carnation weed (*Euphorbia terracina*) is a priority species present in the South Western Interface area. Recorded in 27% of the quadrats this species is concentrated along tracks in the Landscape Protection Area (Figure 12) in low (<5%) to moderate densities (6-75% coverage). There are small areas that have a moderate coverage on the western boundary and on the southern boundary in the eastern part (Figure 12).

Rose Pelargonium (*Pelargonium capitatum*) was recorded in 37% of quadrats, mostly in low densities (<5% coverage) associated with the tracks through the site (Figure 13). There was one moderately dense (6-75% coverage) area of this weed in the south-eastern part of the site (Figure 13).

Branched Onion Weed (*Trachyandra divaricata*) occurs in scattered areas in the eastern and southern parts of the site (Figure 14) and was recorded in 22% of quadrats. There is one area in which this species was moderately dense (6-75% coverage) along the track in the central eastern part of the site (Figure 14).

There were three woody weeds recorded on the site. Brazilian Pepper (*Schinus terebinthifolius*) was recorded from three locations and is a Priority Weed in the Swan Natural Resource Management (NRM) Area (DEC, 2016). This species is located in the south-western part of the site (Figure 15). Century Plant (*Agave americana*) and Geraldton Wax (*Chamelaucium uncinatum*) are large weeds that could be prioritised for removal. These species were recorded in the south-western corner of the site (Figure 16).

4.10.3 Western Interface

No Declared weed species were recorded in the Western Interface Area.

Geraldton Carnation Weed (*Euphorbia terracina*) occurred in 39% of quadrats, mainly on the western side of the site at low densities (<5% coverage) (Figure 17). There were two areas that had a higher coverage of 6-75% on the western part of the site and one of high (6-75% and >75% coverage respectively) to the north along the western boundary (Figure 17).

Rose Pelargonium (*Pelargonium capitatum*) was recorded in 36% of the quadrats in scattered areas on the site (Figure 18). There were three infestations that had a coverage of 6-75%, one in the central-western part of the site and one on the eastern boundary in the central part of the site and one area of high density (>75% coverage) in the north-western part of the site (Figure 18).

Trachyandra divaricata (Branched Onion Weed), occurs in scattered areas in the northern part of the site in low densities (<5% coverage) with four areas of higher density (6-75% coverage) in scattered parts of the site (Figure 19). The species was recorded in 19% of quadrats.

4.10.4 Central Dune

There was one Declared weed species recorded in the Central Dune being *Gomphocarpus fruticosus* (Narrow-leafed Cottonbush) with one individual being recorded in the central part of the site (Figure 20).

Geraldton Carnation Weed (*Euphorbia terracina*) occurred in 26% of quadrats mostly along tracks (Figure 20) in low (<5% coverage) densities. There were four areas of moderate density (6-75% coverage) in the central and eastern part of the site.

Rose Pelargonium (*Pelargonium capitatum*) was present in 36% of quadrats, around tracks and extending into the bushland (Figure 21). The coverage of this species is mostly <5%, however there are two small areas with a coverage between 6 and 75% to the south and in the central part of the site (Figure 21).

Trachyandra divaricata (Branched Onion Weed occurs in areas near tracks (Figure 34) and was present in 5% of quadrats. The coverage is mostly low (<5%) with one area recorded with a moderate coverage between 6 and 75% in the central cleared part of the site (Figure 22).

5 SUMMARY AND CONCLUSION

5.1 Flora and Vegetation Survey

5.1.1 Flora

A total of 88 species were recorded in the Landscape Protection Area and adjoining POS to be retained as natural bushland. The list included 53 native and 35 introduced species (40% of the total).

No Threatened (Declared Rare) or Priority flora species were recorded on the site.

5.1.2 Vegetation

Three native vegetation types were described and mapped on the site and are typical of Quindalup dunes in the Perth Metropolitan Region with *Acacia rostellifera* the dominant taller shrub and *Melaleuca systena, Acacia lasiocarpa* and *Lomandra maritima* common shrub species.

The Floristic Community Types of all three vegetation types had the highest correlation with FCT 29b 'Acacia shrublands on taller dunes, southern Swan Coastal Plain'. FCT 29b is a Priority 3 Ecological Community at State level.

Most of the areas of native vegetation were rated in Very Good to Good condition. Some vegetation in swales and close to urban development were rated as Degraded due to the higher density of weed species. Tracks and areas of non-native vegetation were rated as Completely Degraded.

5.2 Weed Survey

Mandurah Hill Area

- Overall Weed Coverage in the POS is moderate with areas of heavy infestation along the boundary and a lower weed coverage along the ridge;
- Priority weeds identified in Landscape Protection Area A are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (Trachyandra divaricata).

South Western Interface

- Overall Weed Coverage is generally moderate to high with areas of less weed coverage in areas that have had less disturbance;
- Priority weeds identified in Landscape Protection Area B are:
 - Geraldton Carnation Weed (Euphorbia terracina);
 - Rose Pelargonium (Pelargonium capitatum);
 - Branched Onion Weed (*Trachyandra divaricata*);
 - Brazilian Pepper (Schinus terebinthifolius);
 - Century Plant (Agave americium); and
 - Geraldton Wax (Chamelaucium uncinatum).

Western Interface

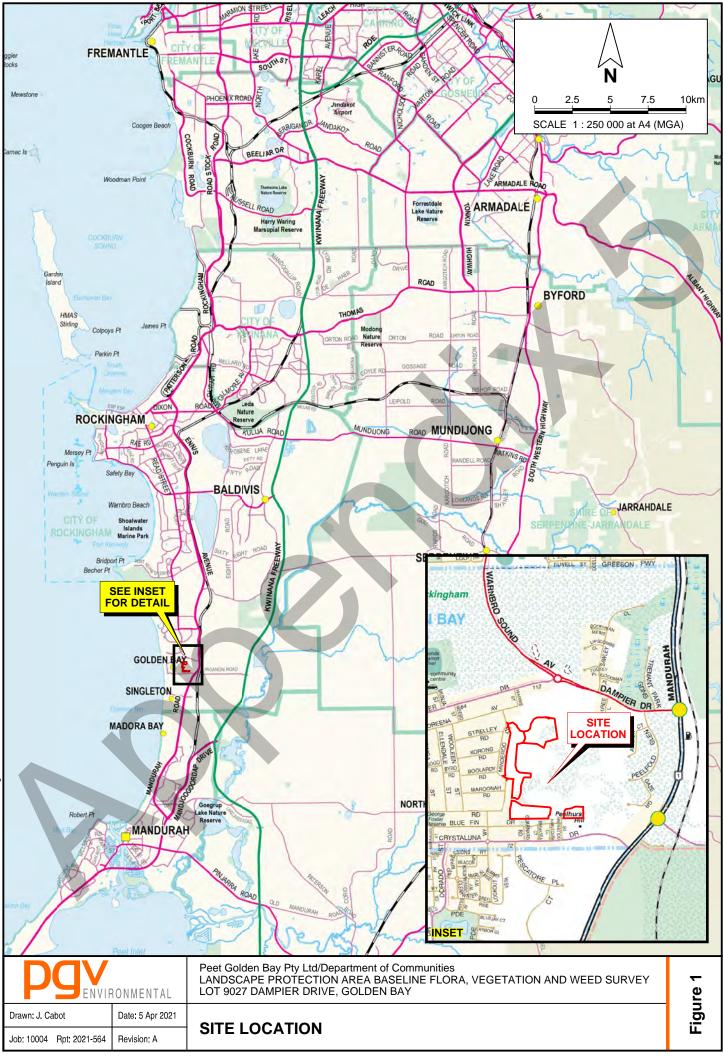
- Overall Weed Coverage in the POS is moderate to high on the western side (>5%) and lower on the eastern side with the highest areas of weed coverage along the tracks;
- Priority weeds identified in Landscape Protection Area C are:
 - Geraldton Carnation Weed (*Euphorbia terracina*);
 - Rose Pelargonium (*Pelargonium capitatum*); and
 - Branched Onion Weed (*Trachyandra divaricata*).

Central Dune

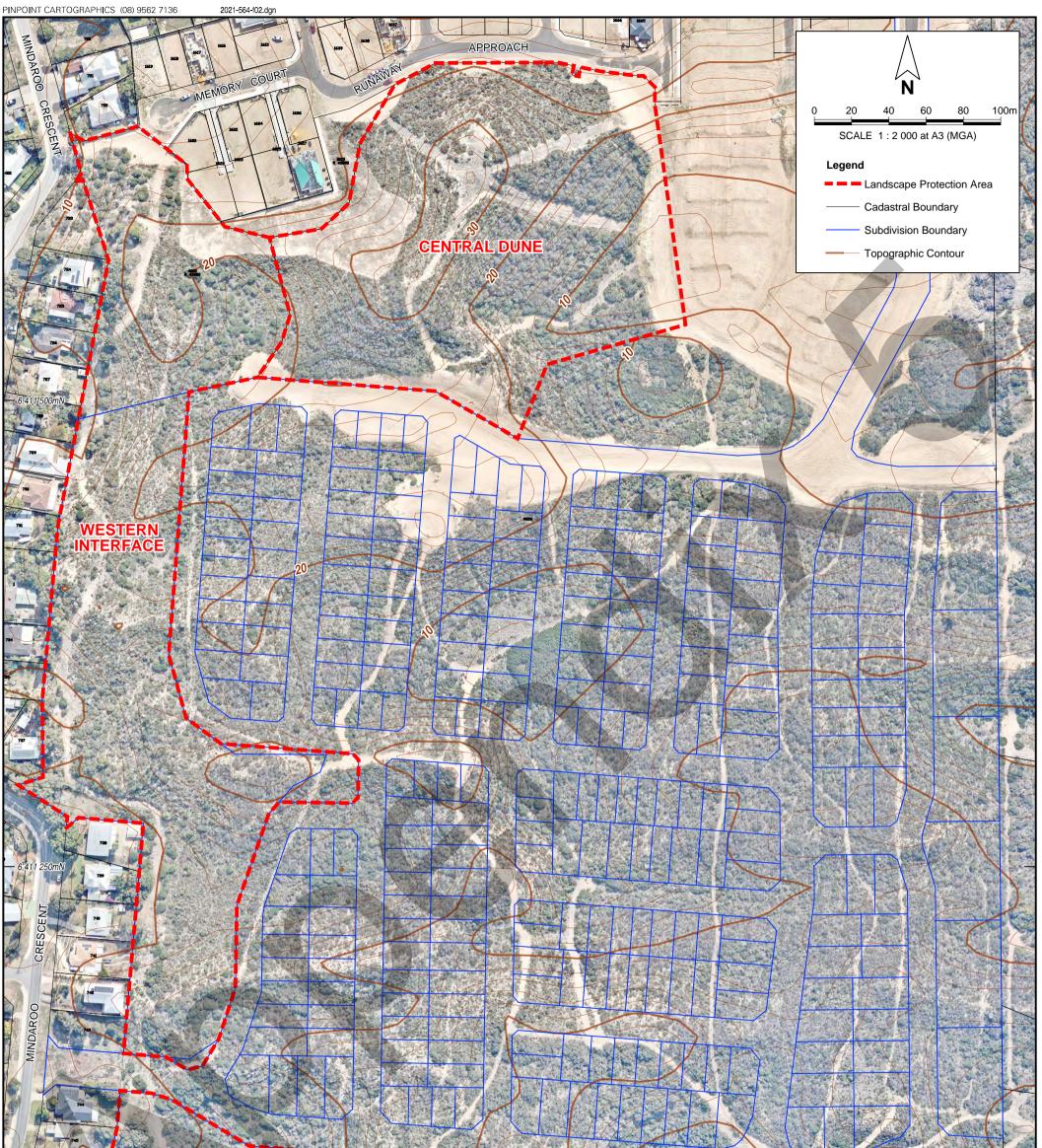
- Overall Weed Coverage in the POS is low with the highest areas of weed coverage associated with tracks;
- One Declared Pest under the BAM Act, *Gomphocarpus fruticosus* (Narrow-leafed Cottonbush) was recorded from a single location;
- Priority weeds identified in Landscape Protection Area D are:
 - Geraldton Carnation Weed (Euphorbia terracina);
 - Rose Pelargonium (Pelargonium capitatum); and
 - Branched Onion Weed (Trachyandra divaricata).

- Bettink, K and Keighery, G (2008) Environmental weed census and prioritisation, Swan NRM Region Swan Catchment Council (SCC) and Department of Environment and Conservation (DEC) Perth Western Australia
- Brown, A., Dixon, K., French, C and Brockman, G. (2013) *Field Guide to the Orchids of Western Australia* Simon Nevill Publications Perth, Western Australia
- Brown, K., Cullity, J., Paczkowska, G. and Bettink, K. (2013) *Managing Geraldton carnation weed* (*Euphorbia terracina*), in the woodlands, wetlands and heathlands of the Swan Coastal Plain. Department of Environment and Conservation Government of Western Australia, Perth
- Department of Environment and Conservation (DEC) (2011) Standard Operating Procedure Techniques for mapping weed distribution and cover in bushland and wetlands Government of Western Australia, Perth
- Department of Parks and Wildlife (DPaW) (2015) *Florabase* <u>https://florabase.dpaw.wa.gov.au/</u> Accessed January 2015 Government od Western Australia Perth.
- Environmental Protection Authority (EPA) (2016) *Technical Guidance: Flora and Vegetation Surveys* for Environmental Impact Assessment Perth Western Australia
- Government of Western Australia (2000) Bush Forever *Keeping the Bush in the City. Volume 2:* Directory of Bush Forever Sites. Perth, Western Australia.
- Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980) Vegetation complexes of the Darling System,
 Western Australia. In Atlas of Natural Resources of the Darling System of Western Australia.
 Department of Conservation and Environment. Perth, Western Australia.
- Obbens, F.J. (2014) Two new species of *Calandrinia* (Portulacaceae) from southern Western Australia *Nuytsia* 24: 37-43 Perth Western Australia
- Western Australian Planning Commission (WAPC) (2003) *Coastal Planning and Management Manual* Government of Western Australia Perth.

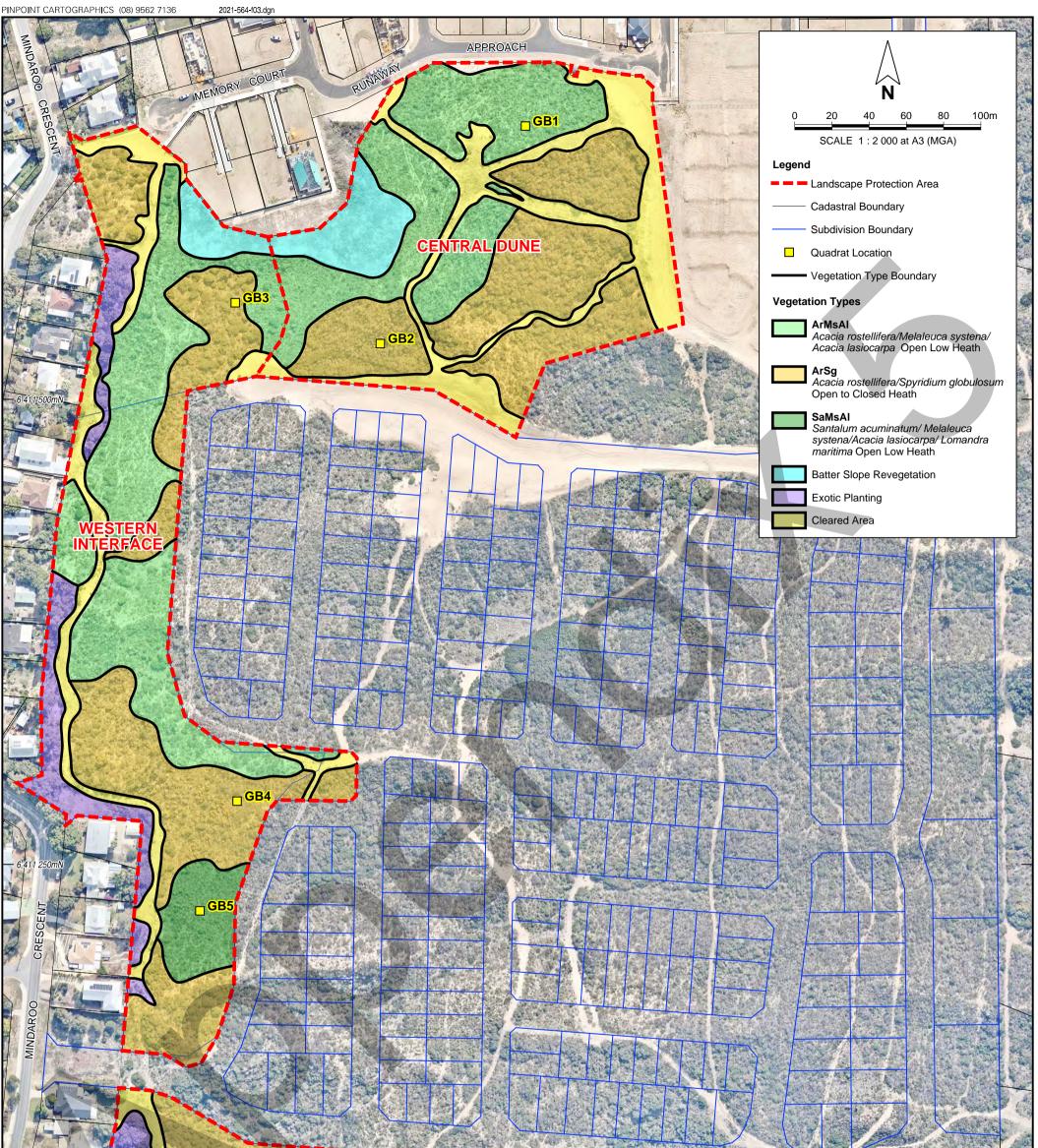
FIGURES





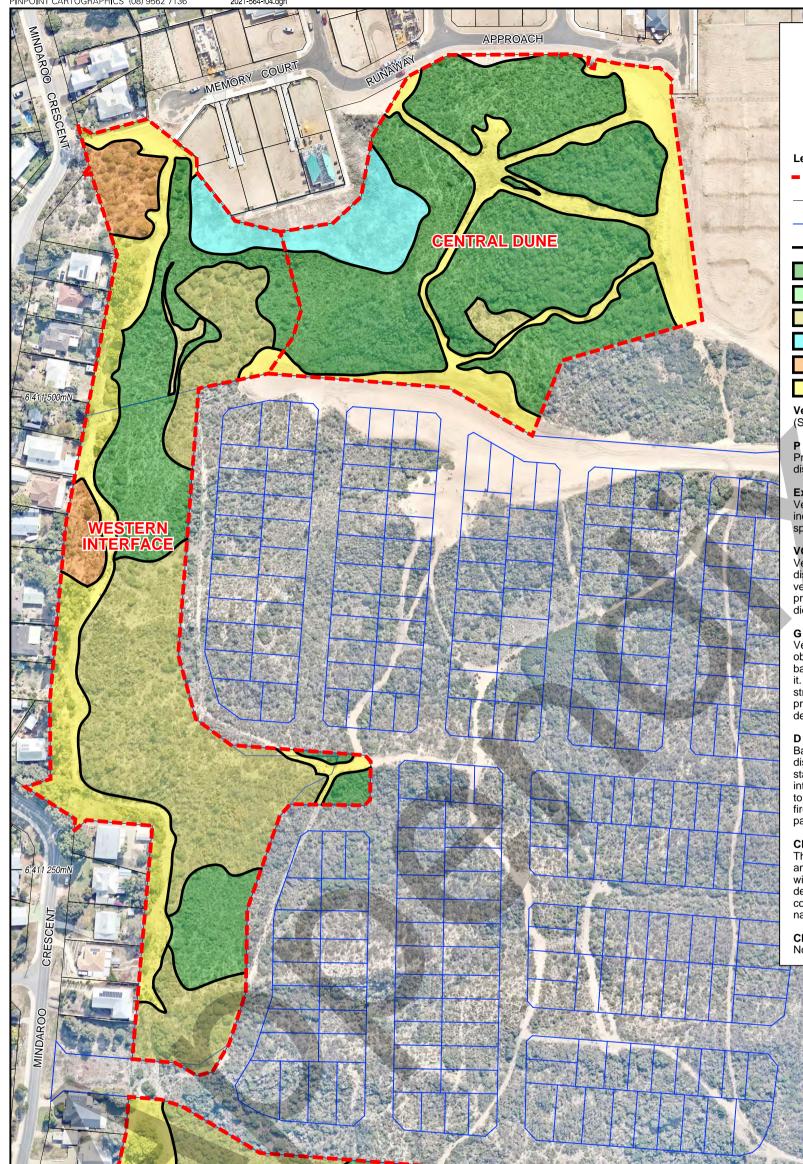


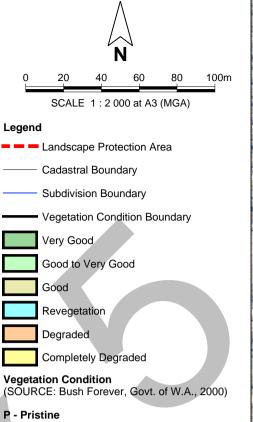
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SOUTH WESTER			MANDURAH HILL	
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CADASTRAL SOURCE: Landgate, August 2020. CONTOURS SOURCE: Dept. of Agriculture, 2000. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Drawn: J. Cabot Job: 10004 Rpt: 2021-564	Date: 5 Apr 2021 Revision: A	LANDSCAPE PROTECTION AREA BOUNDARIES	Figure



6 4;1; 000mN	RN INTERFAC		BIN DRIVE	
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AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Job: 10004 Rpt: 2021-564	Revision: A	VEGETATION TYPES	ш

2021-564-f04.dgn





Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent

Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - 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.

G - Good

G - **Good** Vegetation structure significantly altered by very obvious signs of multiple disturbance. 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 densitive action leaves density, partial clearing, dieback and grazing.

D - 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.

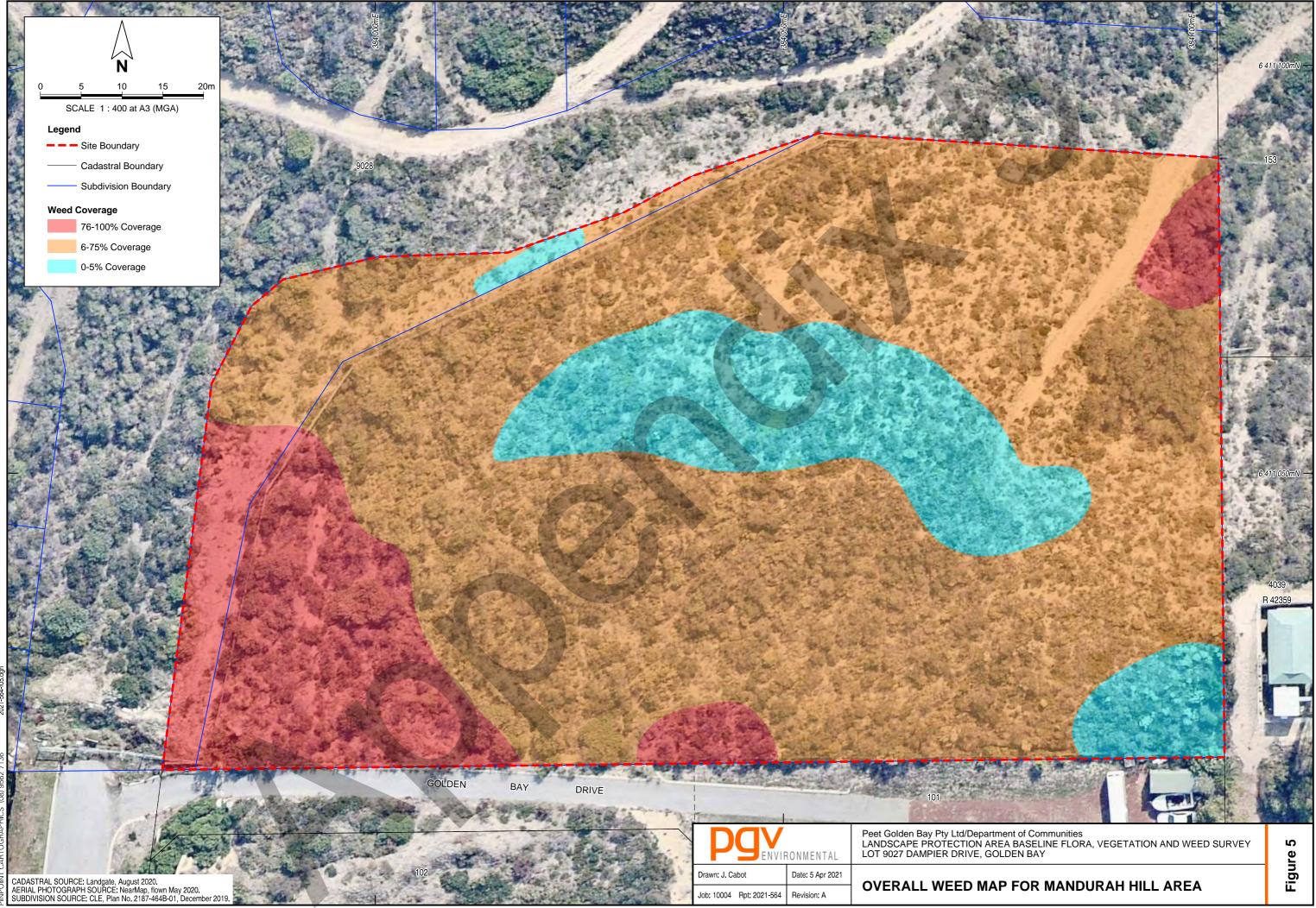
CD - Completely Degraded The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

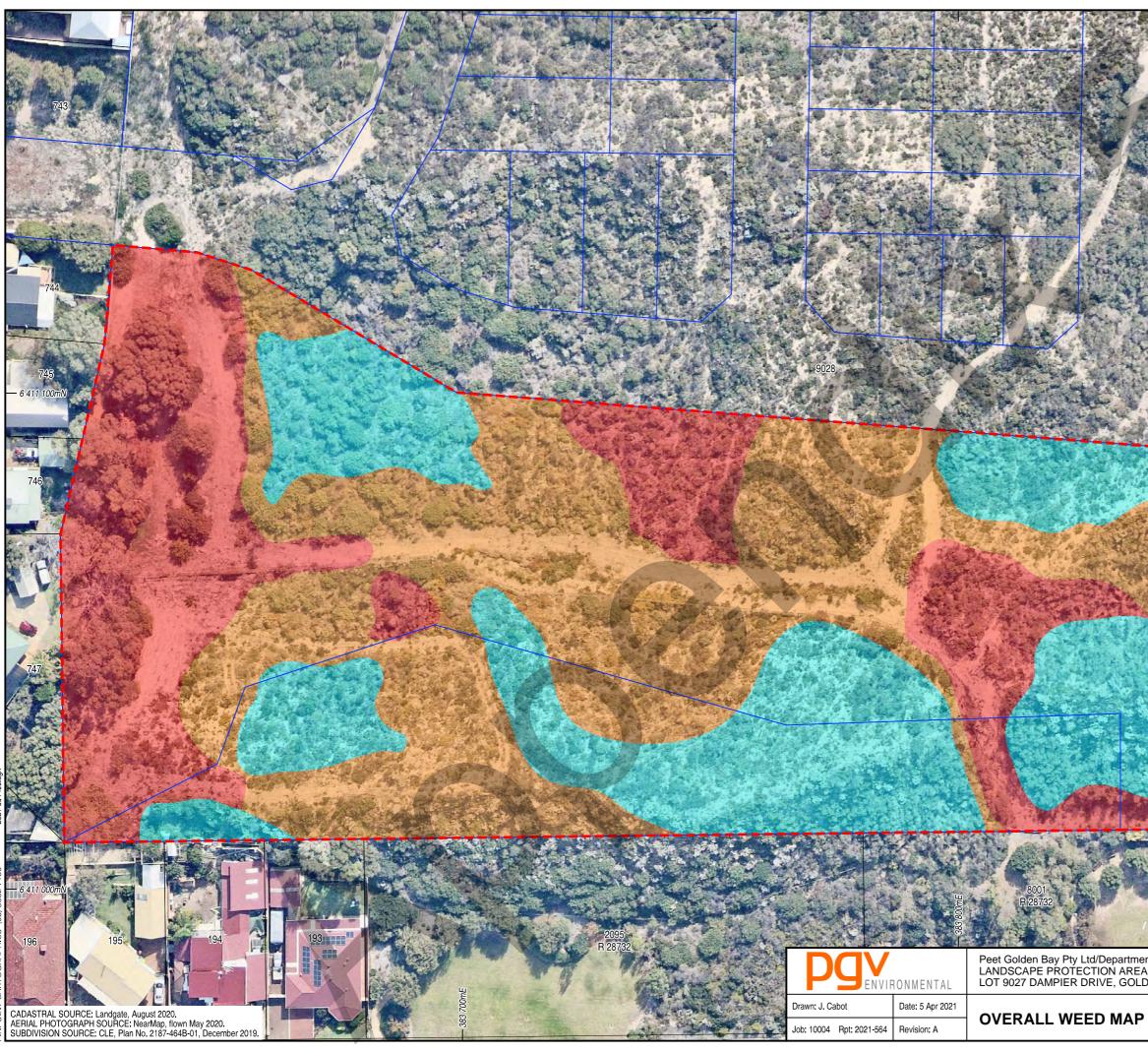
CI - Cleared

No native vegetation remaining.



6 4.11. 000mN	RN INTERFAC	BLUE	Image: market intervention	
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CADASTRAL SOURCE: Landgate, August 2020.	Drawn: J. Cabot	Date: 5 Apr 2021	VEGETATION CONDITION	Figure
CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Job: 10004 Rpt: 2021-564	Revision: A	VEGETATION CONDITION	ш



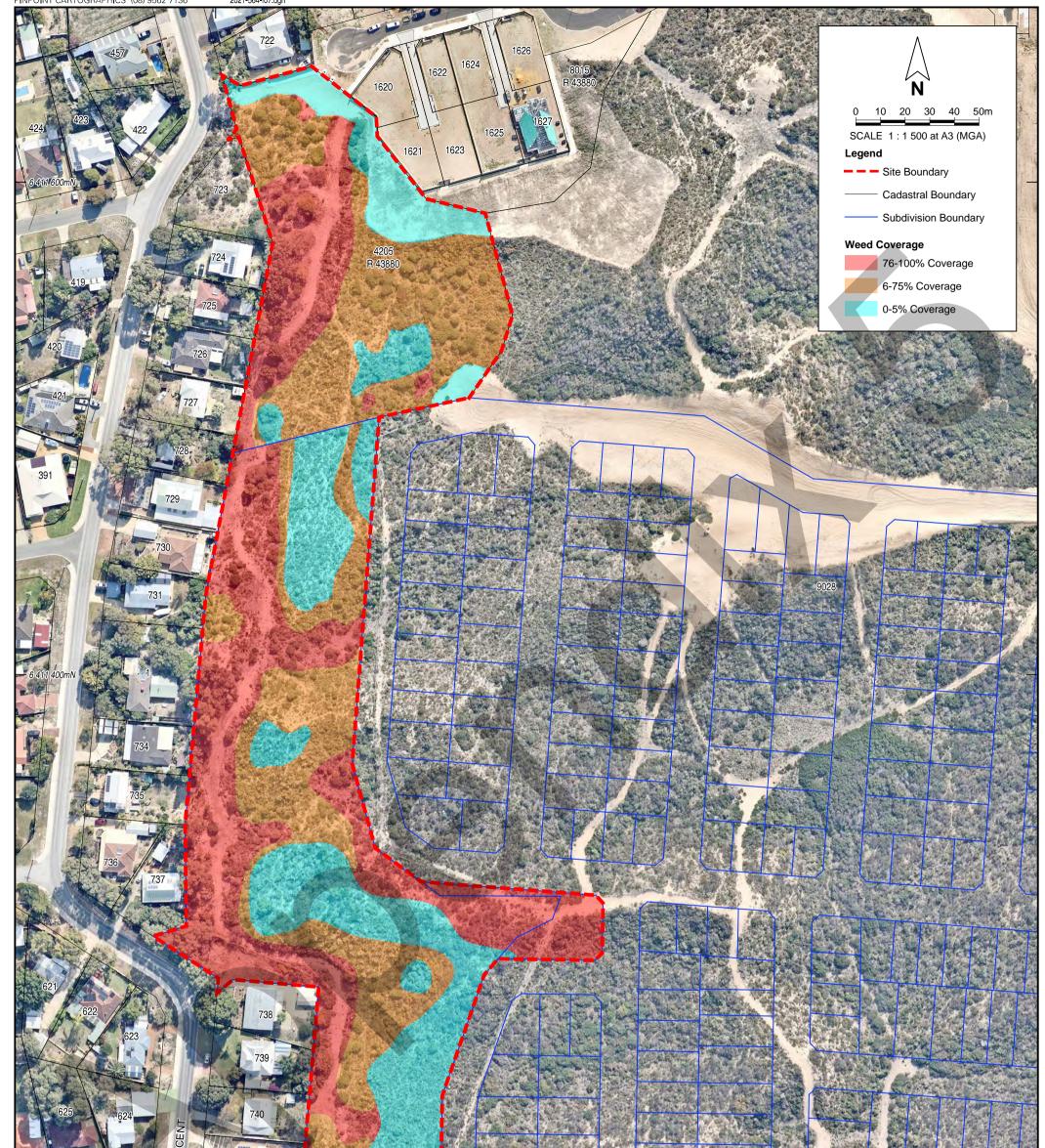


OVERALL WEED MAP FOR SOUTH WESTERN INTERFACE

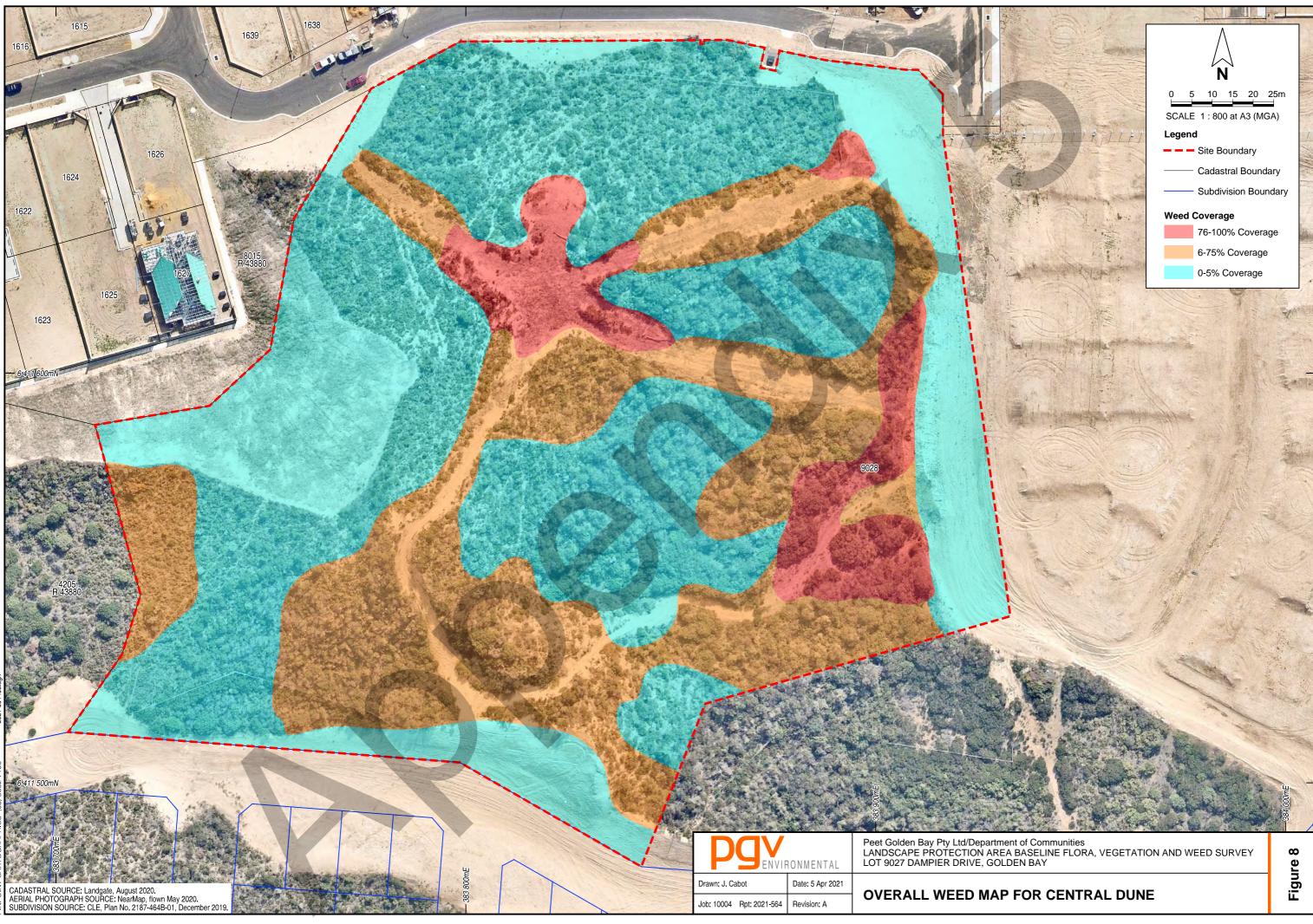
Figure 6

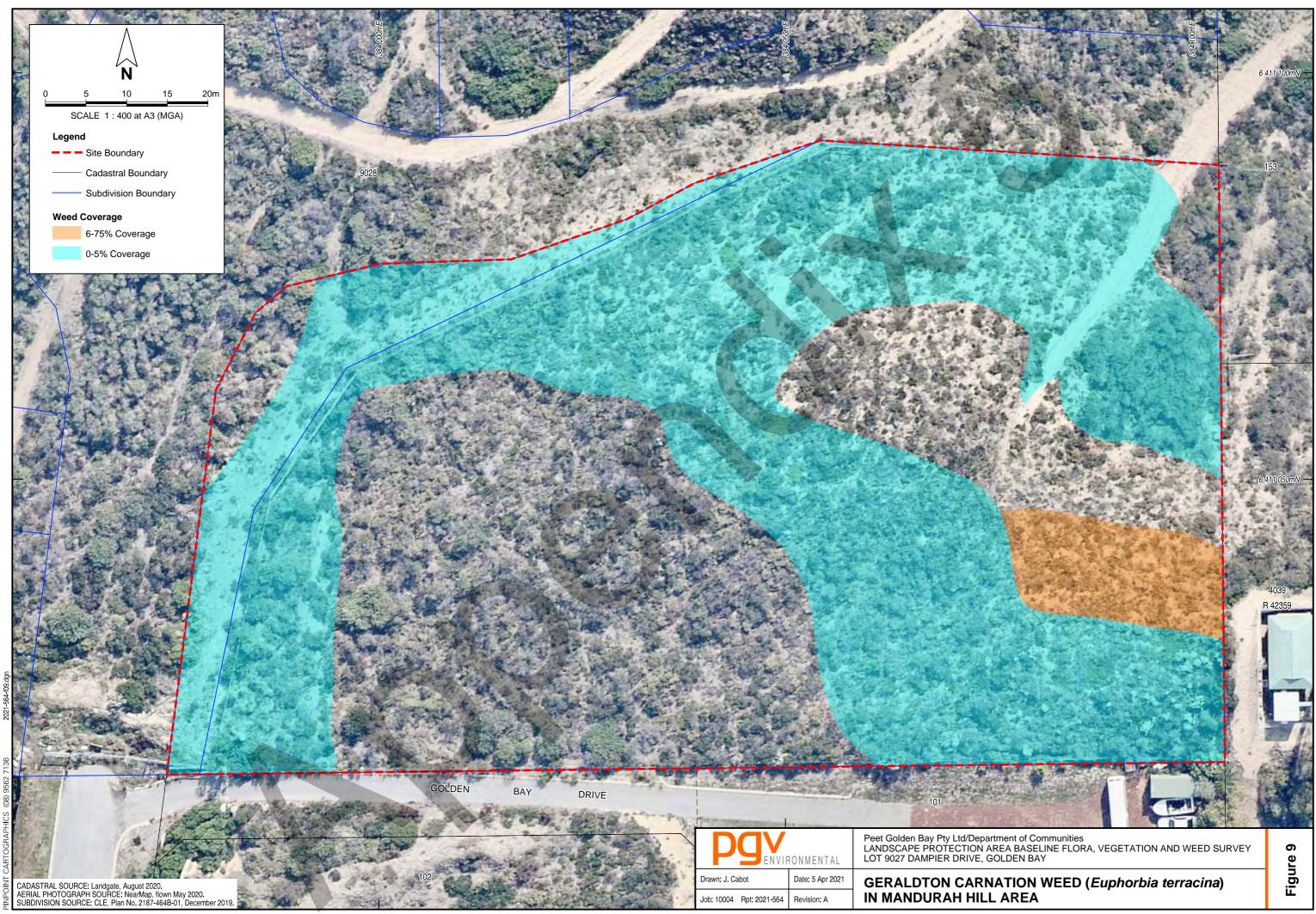
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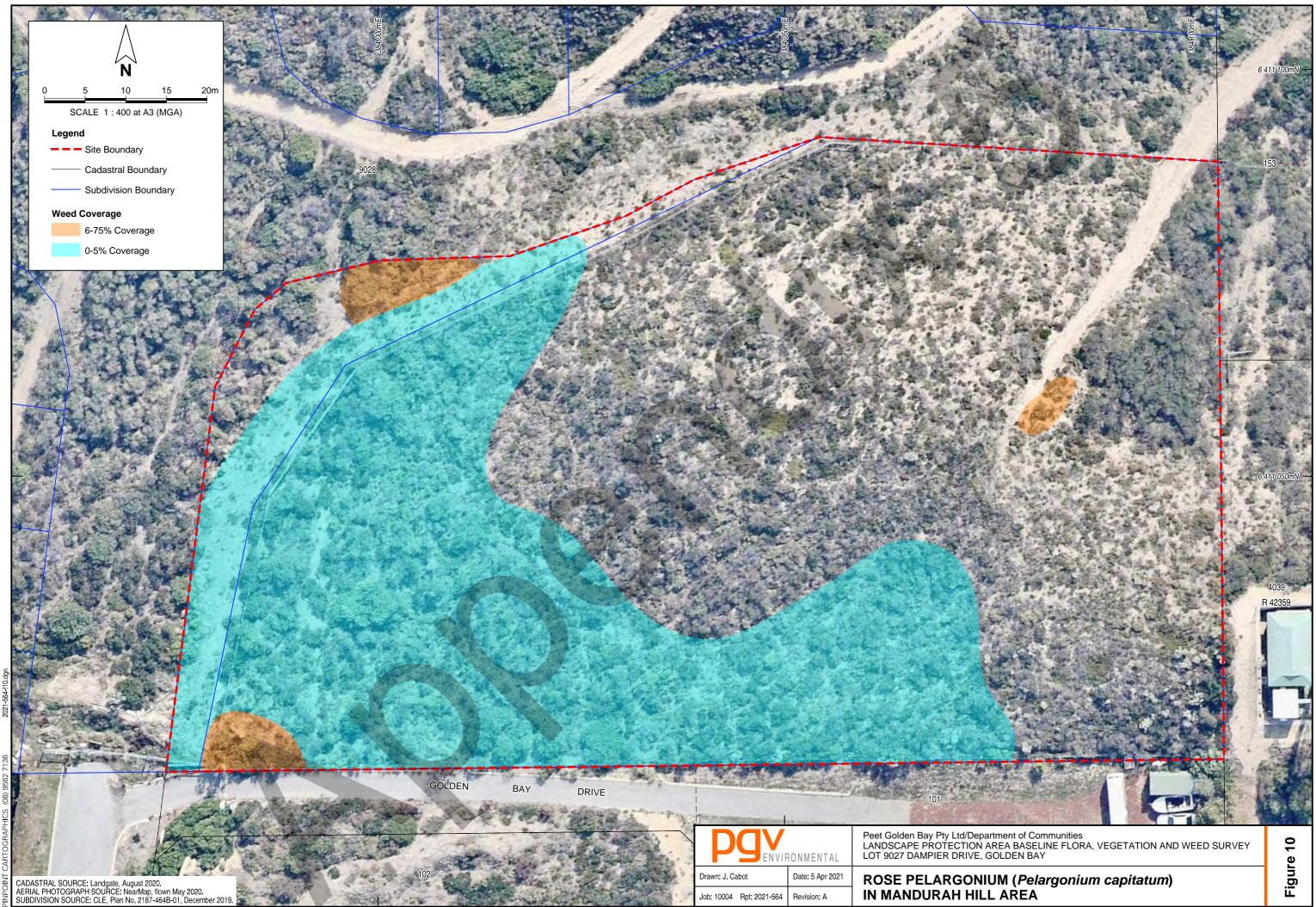
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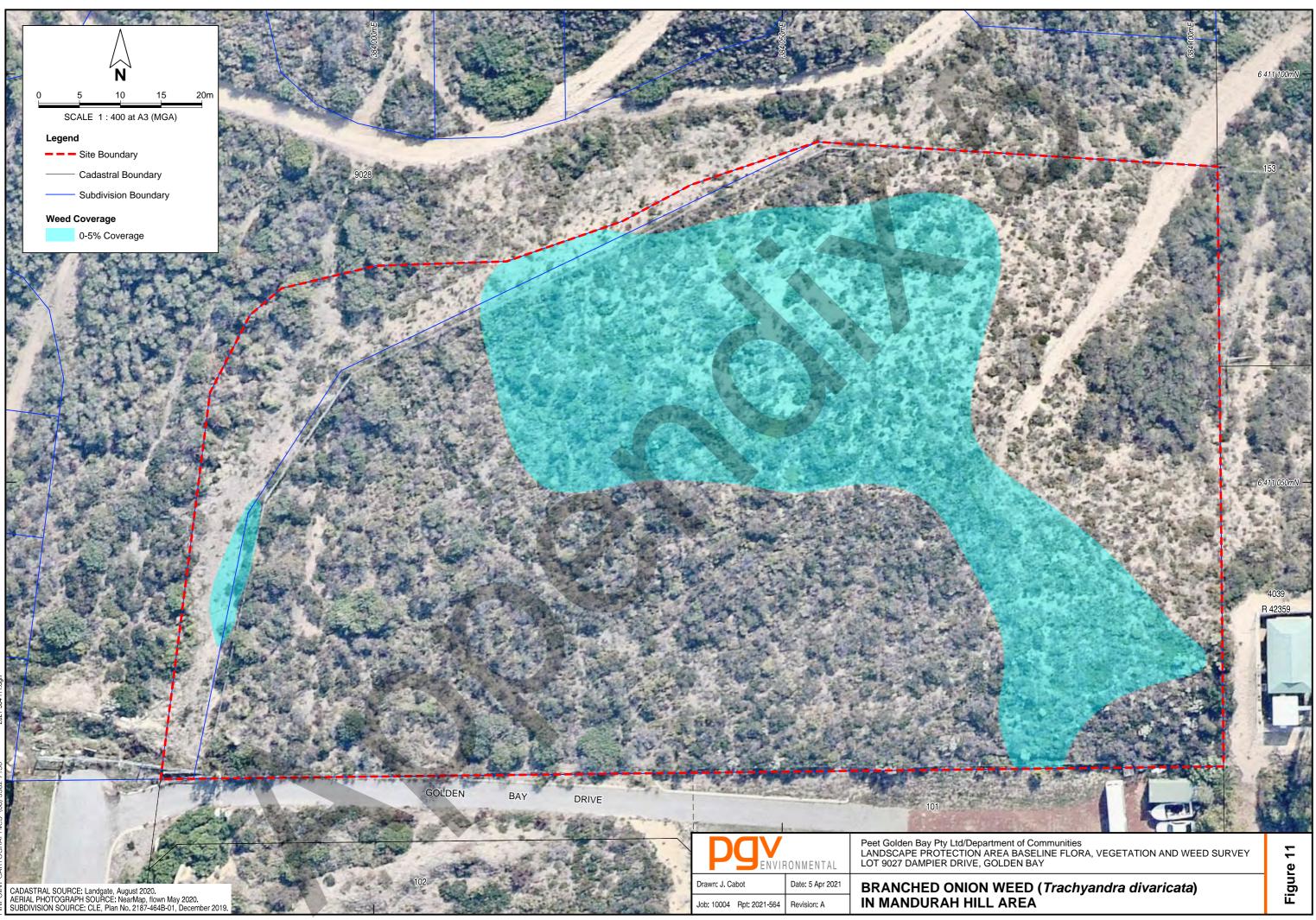


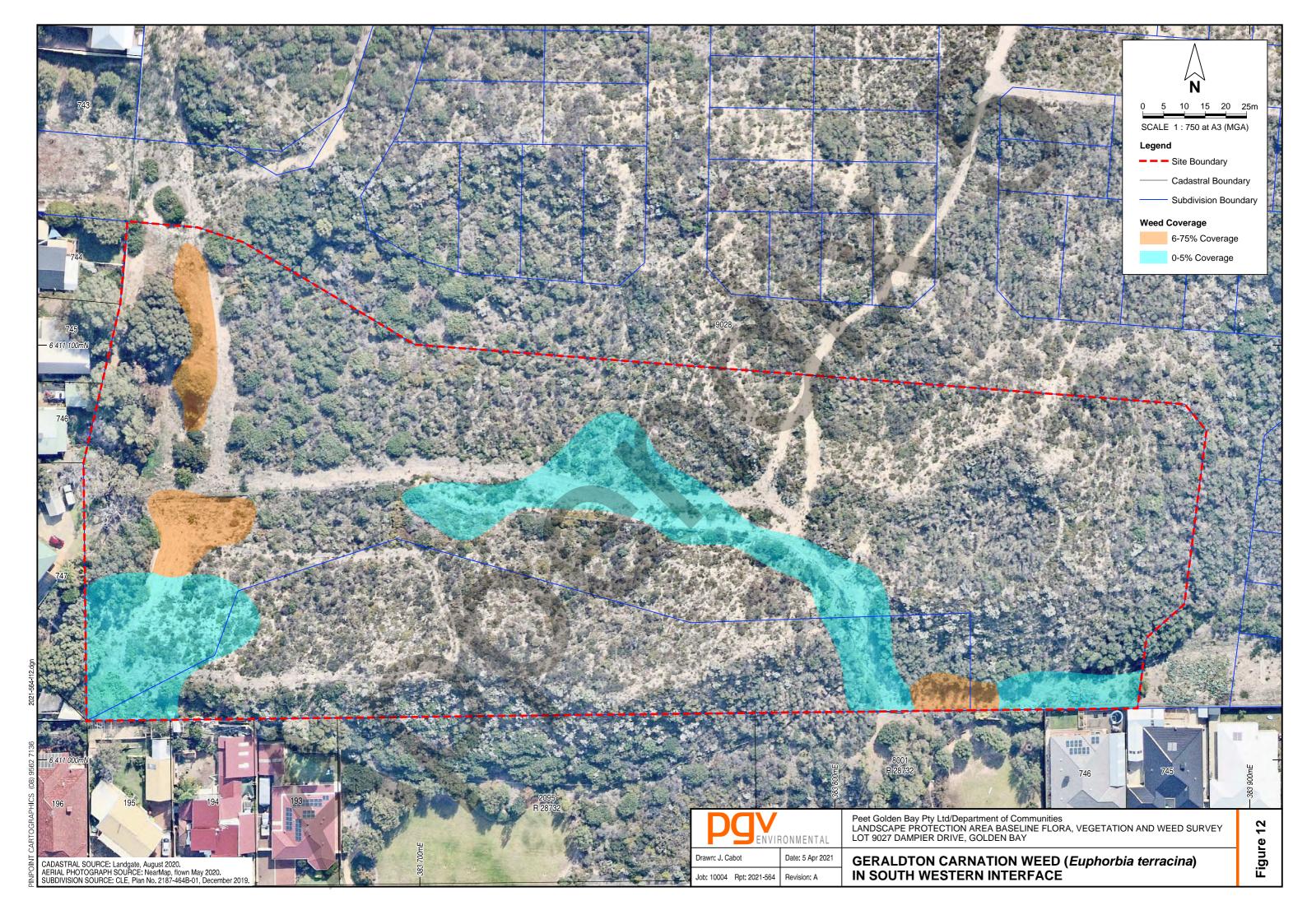
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CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Drawn: J. Cabot Job: 10004 Rpt: 2021-564	Date: 5 Apr 2021 Revision: A	OVERALL WEED MAP FOR WESTERN INTERFACE	Figu

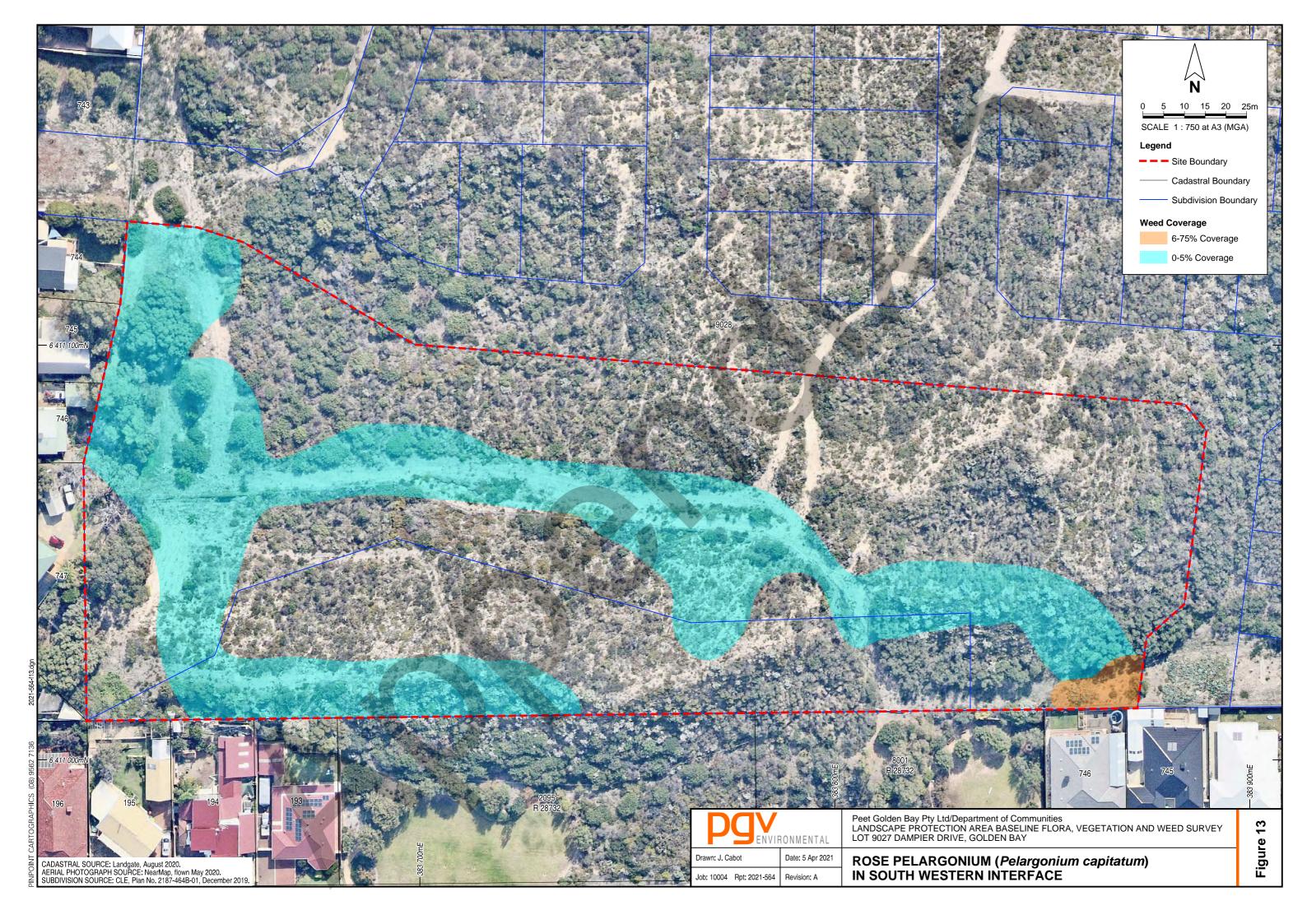


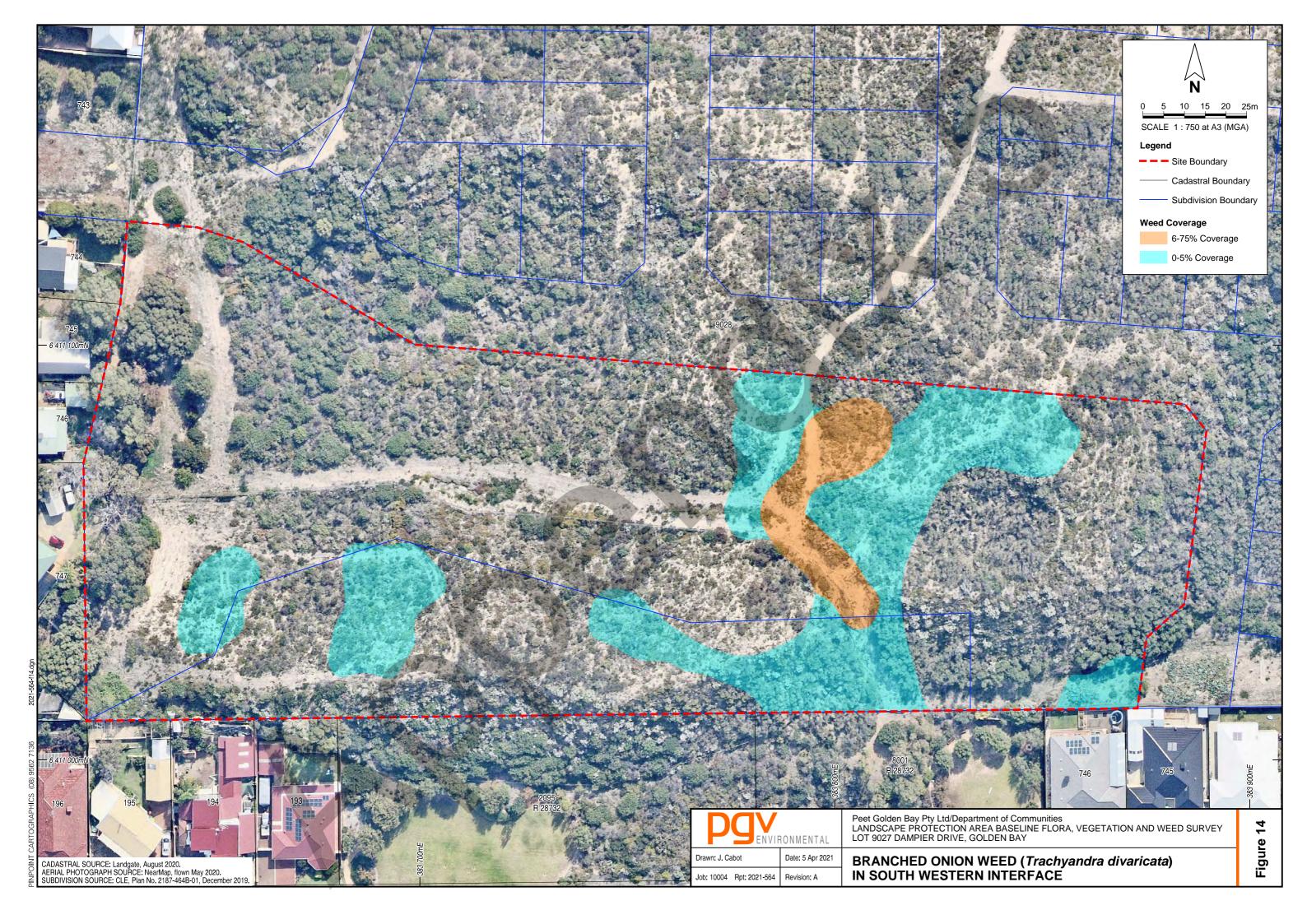


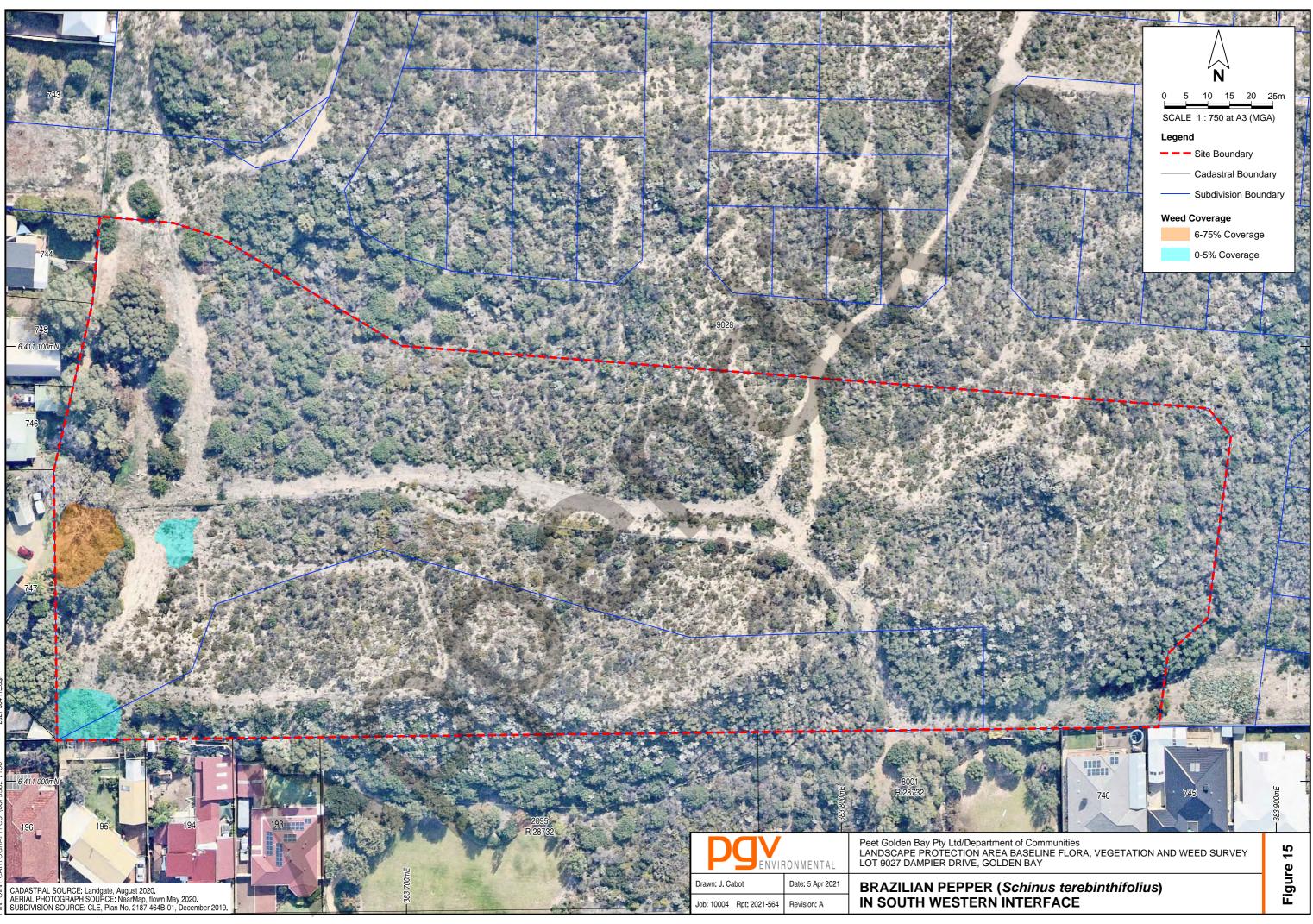


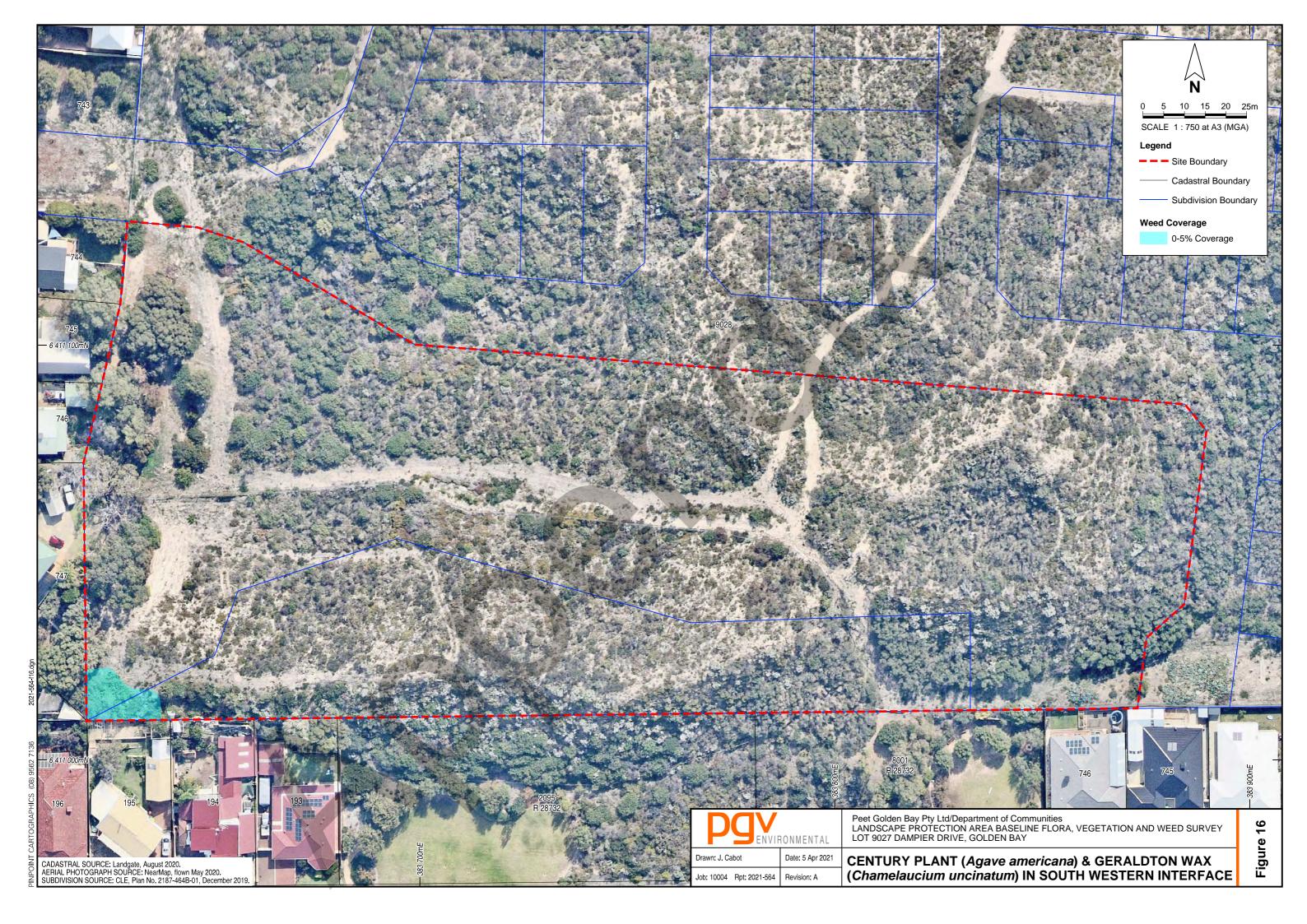


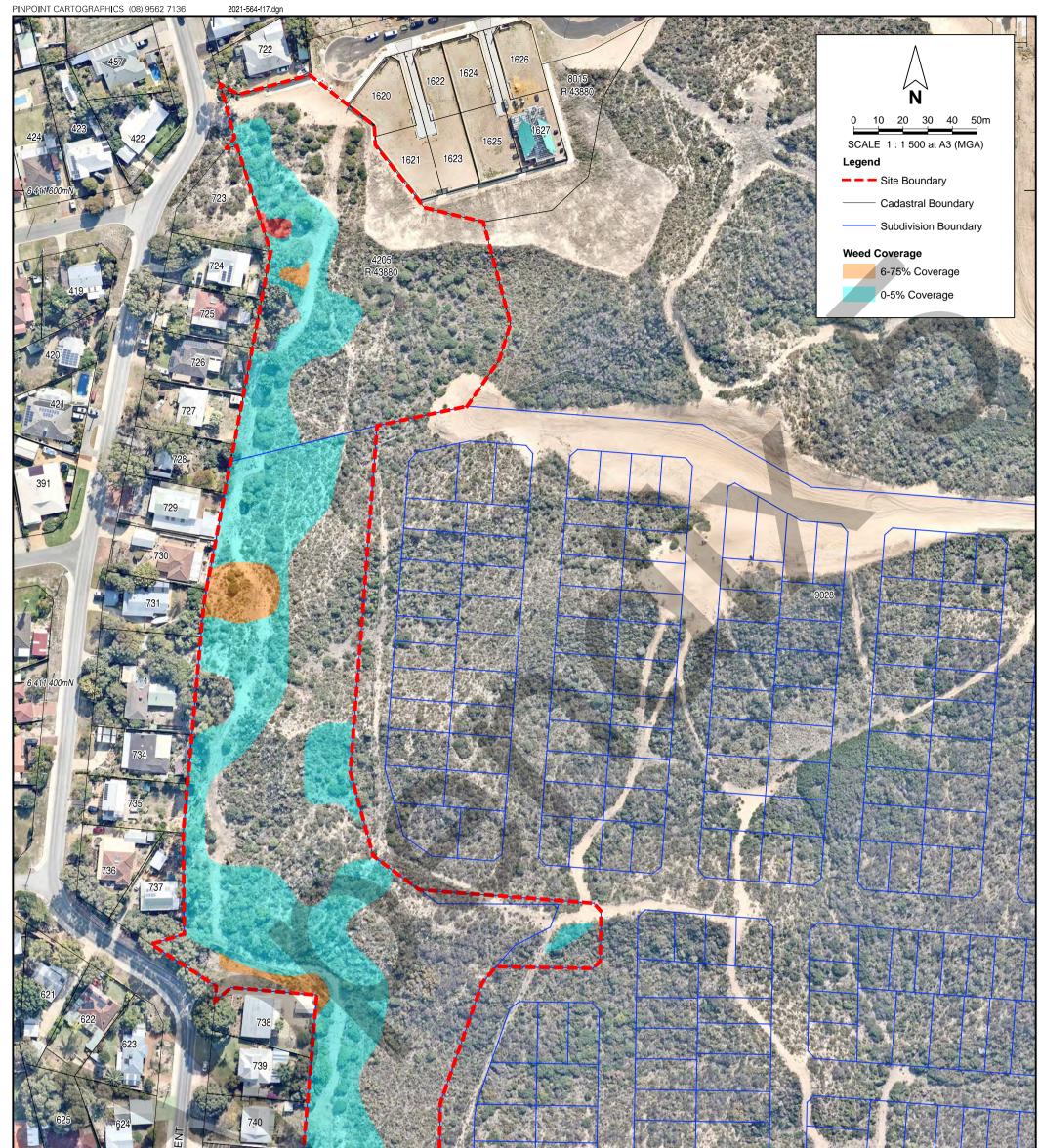




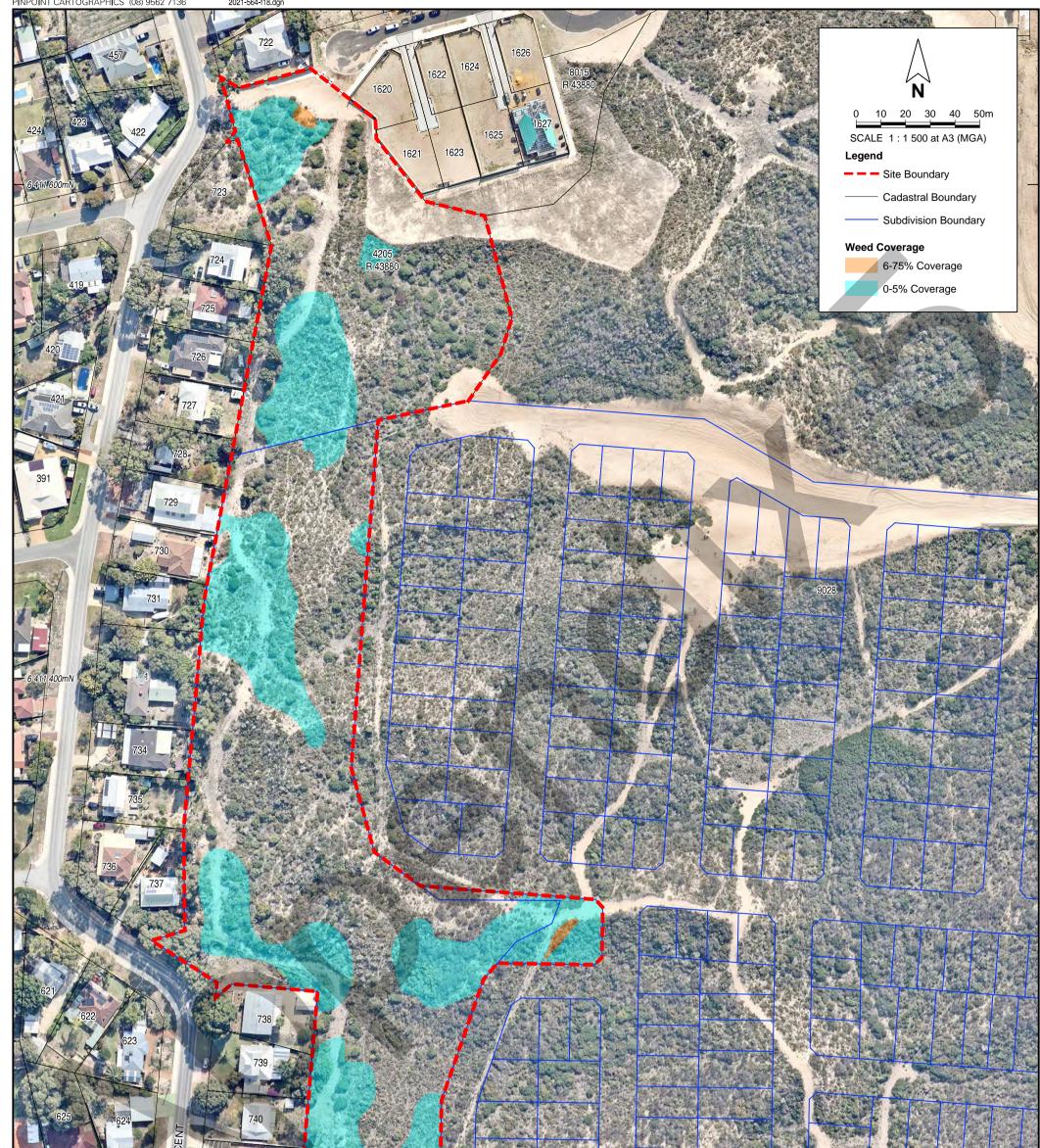




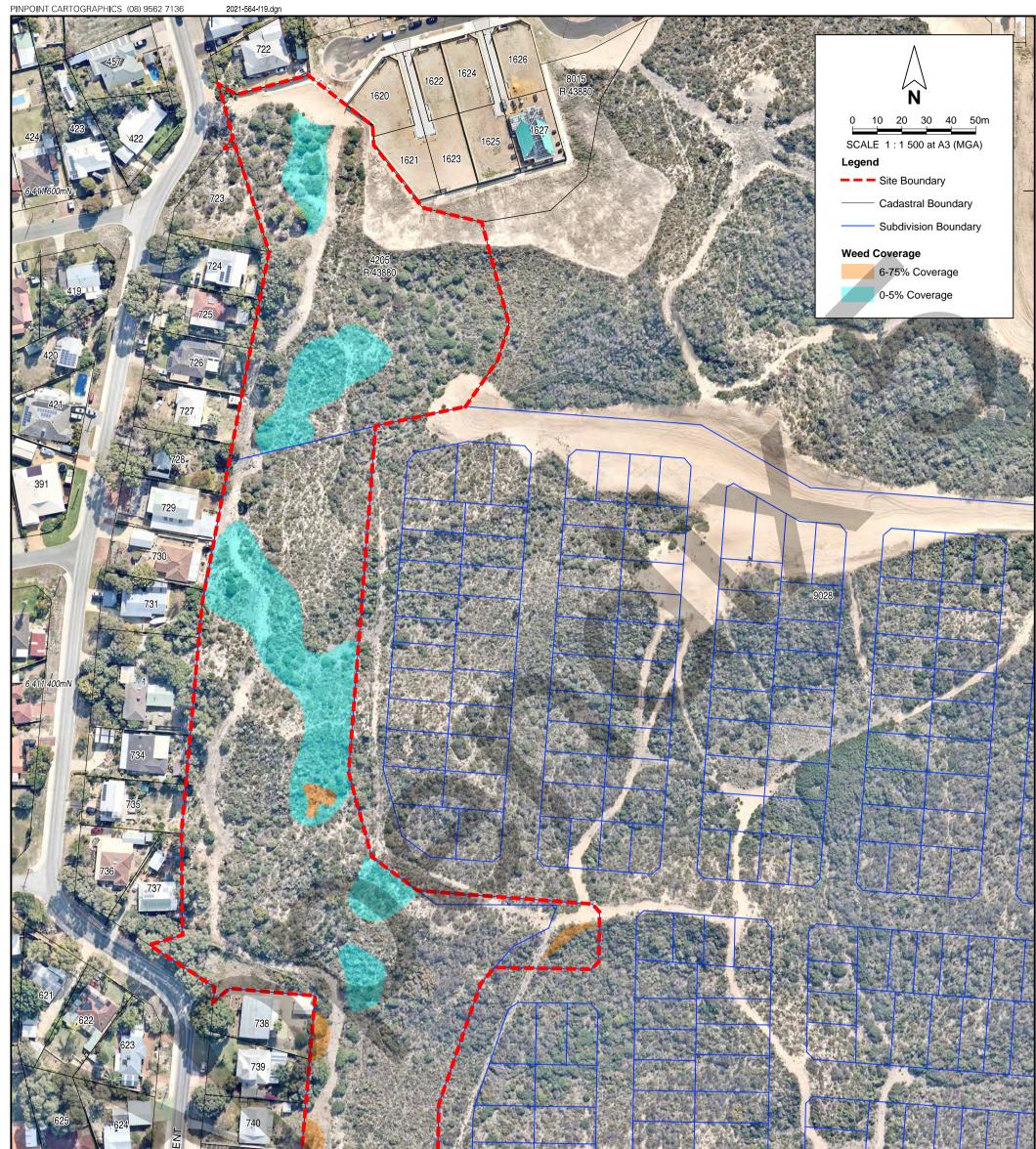




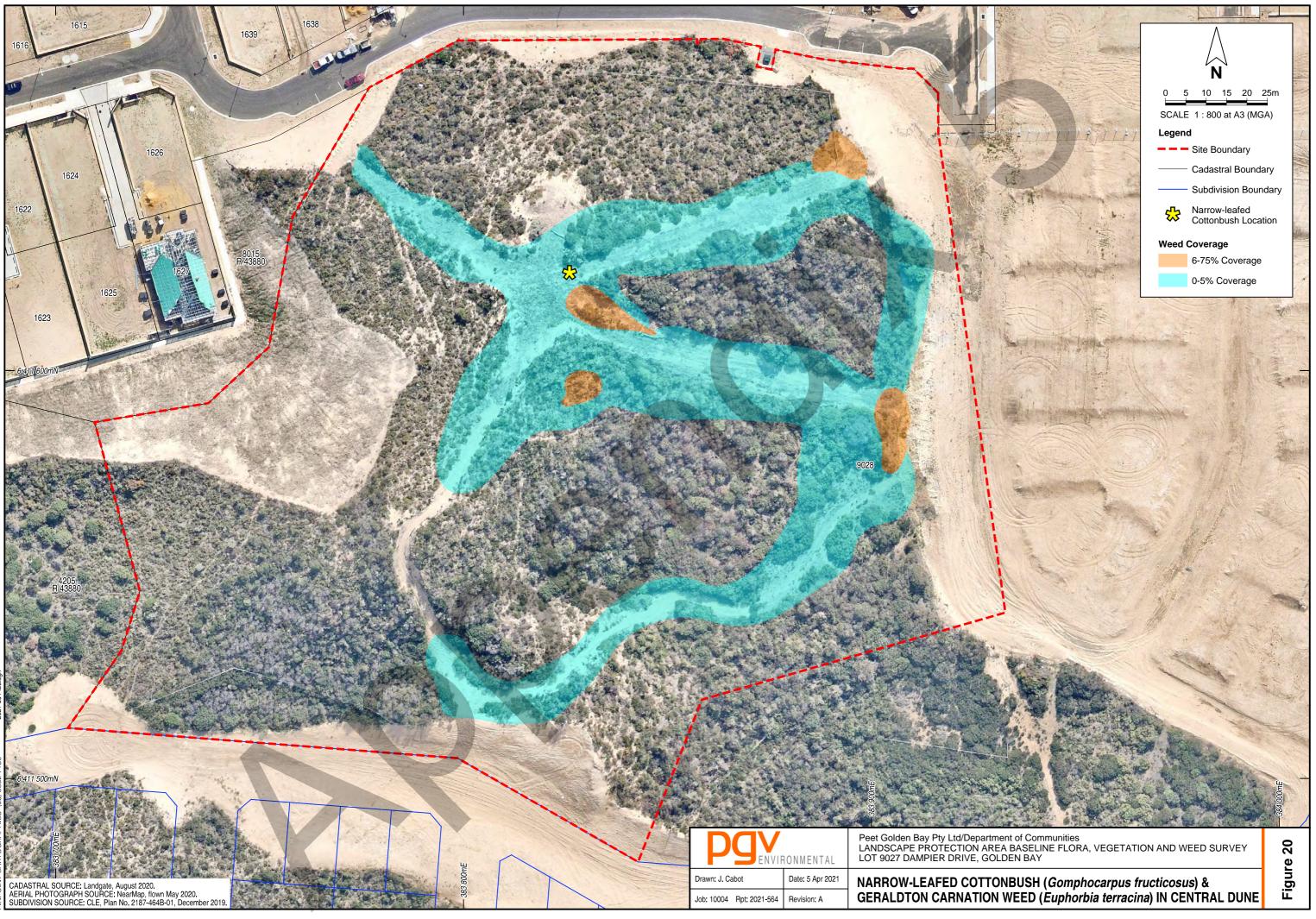
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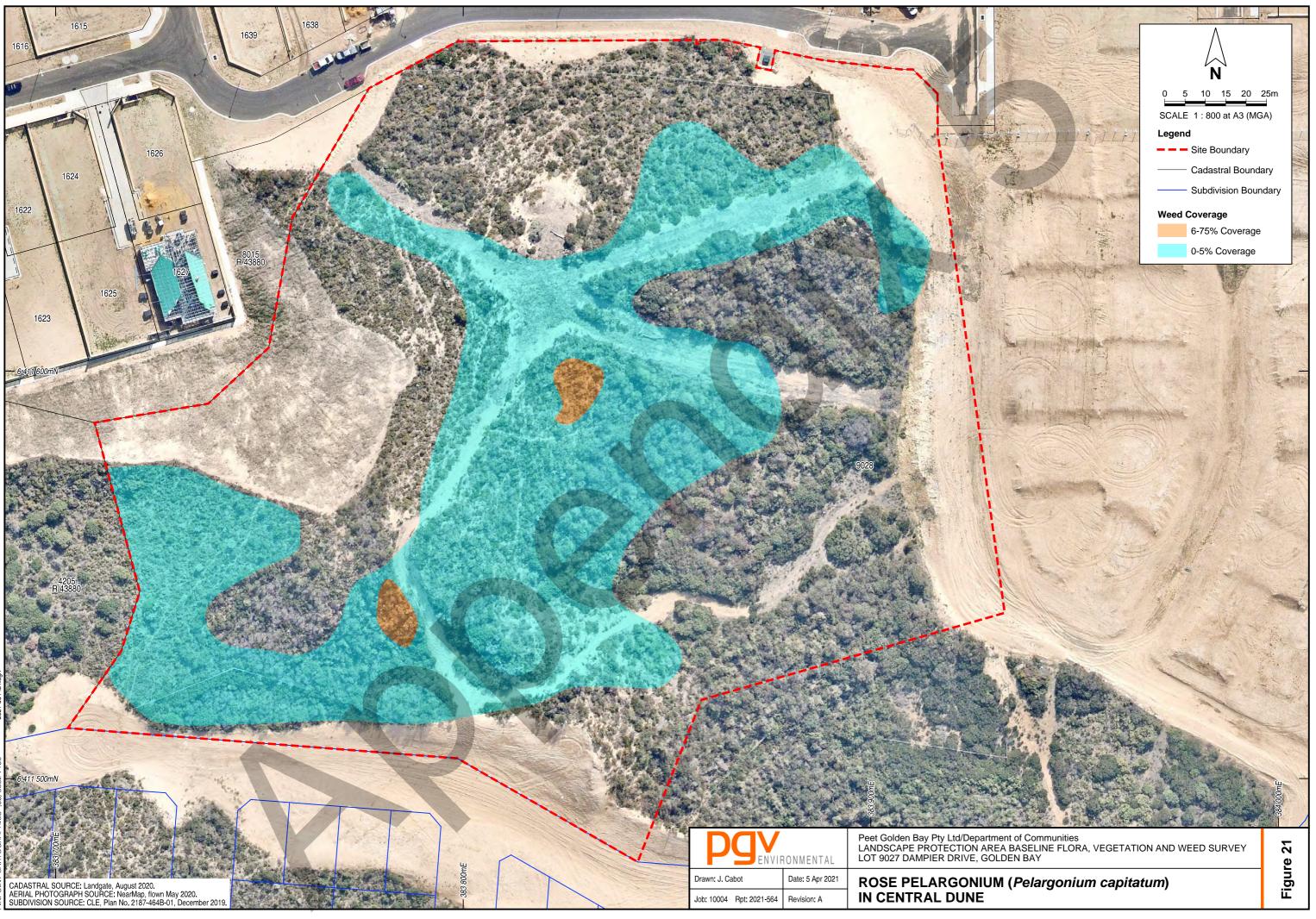


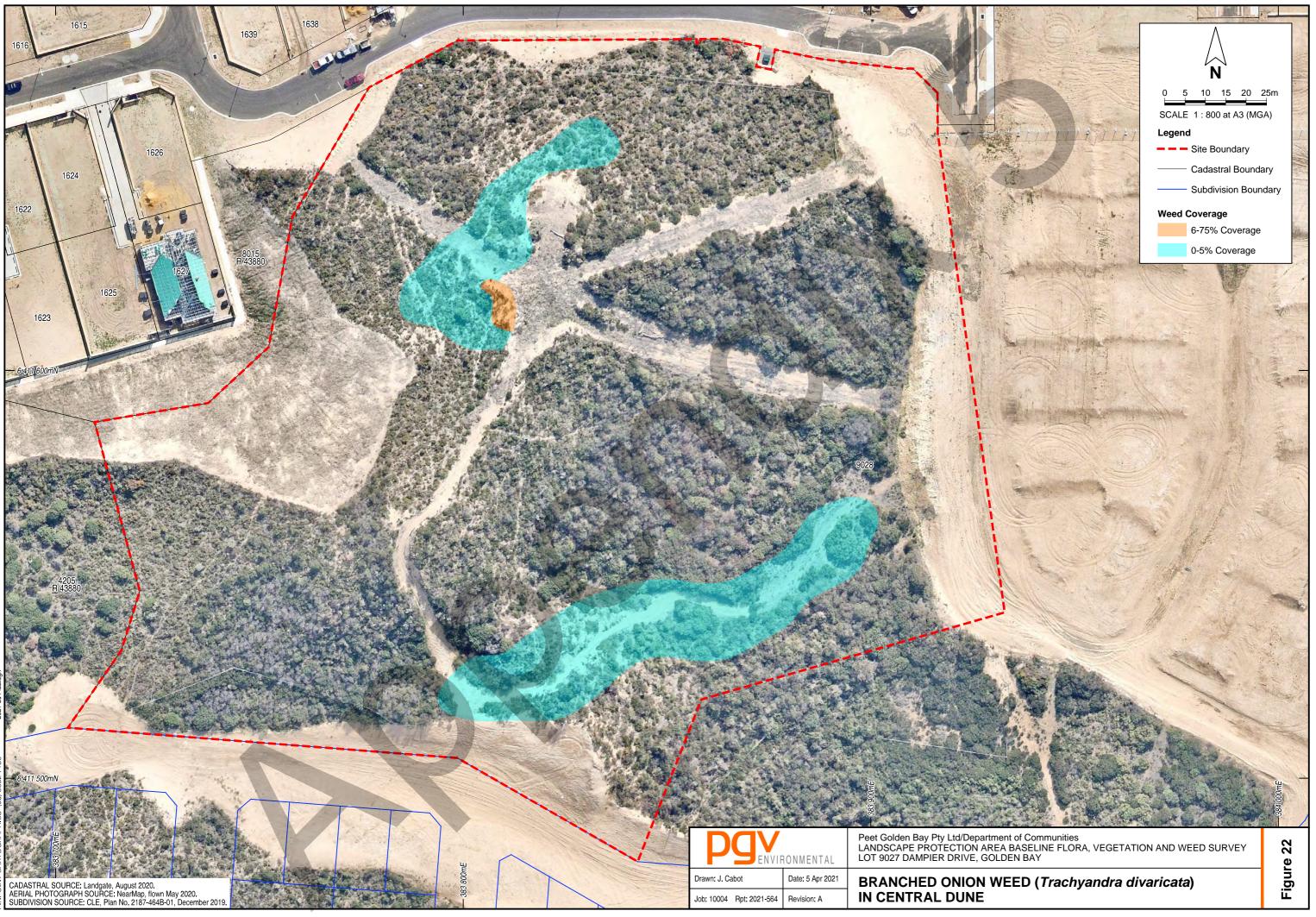
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CADASTRAL SOURCE: Landgate, August 2020. AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020. SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.	Drawn: J. Cabot Job: 10004 Rpt: 2021-564	Date: 5 Apr 2021 Revision: A	BRANCHED ONION WEED (<i>Trachyandra divaricata</i>) IN WESTERN INTERFACE	Figu

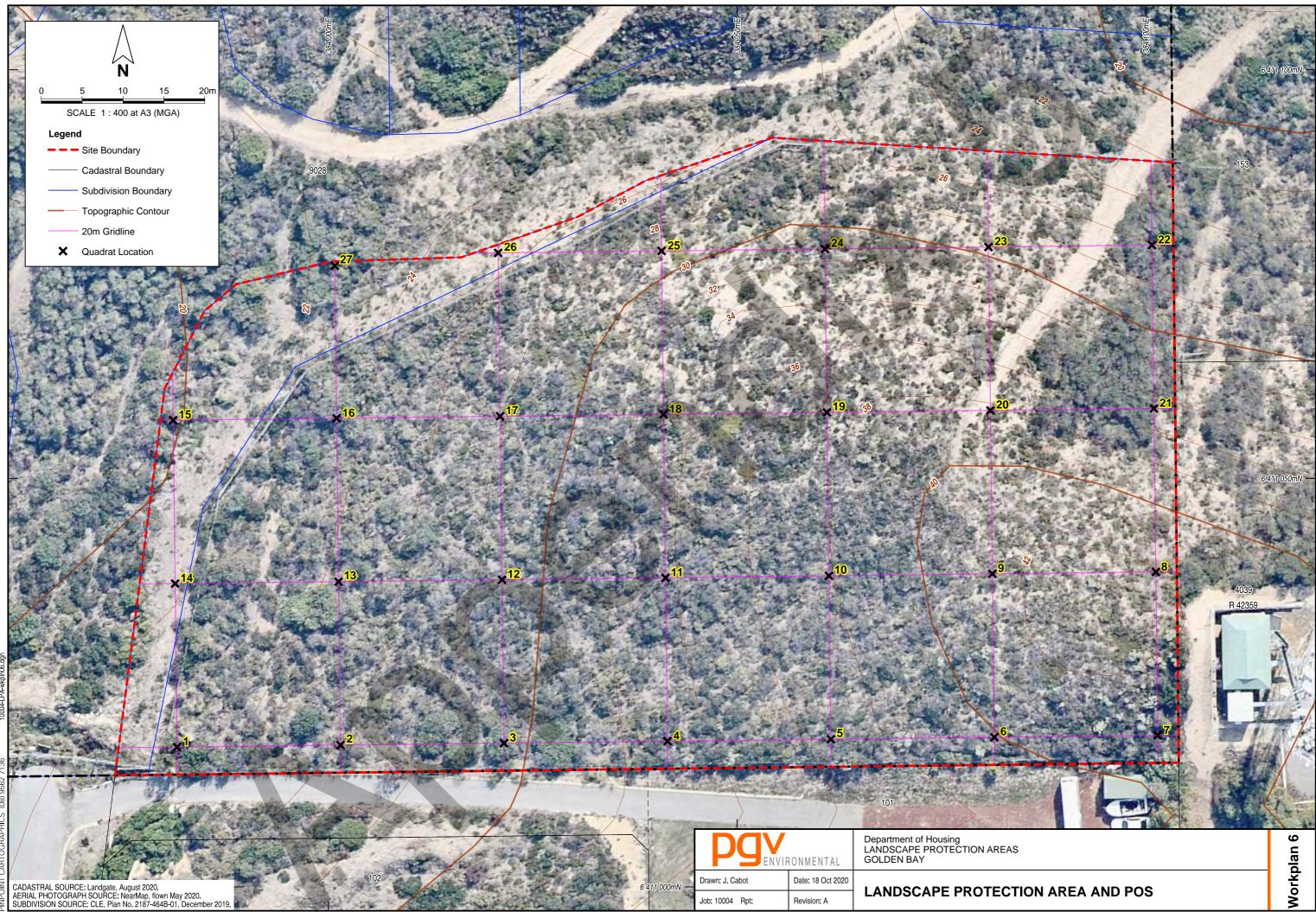


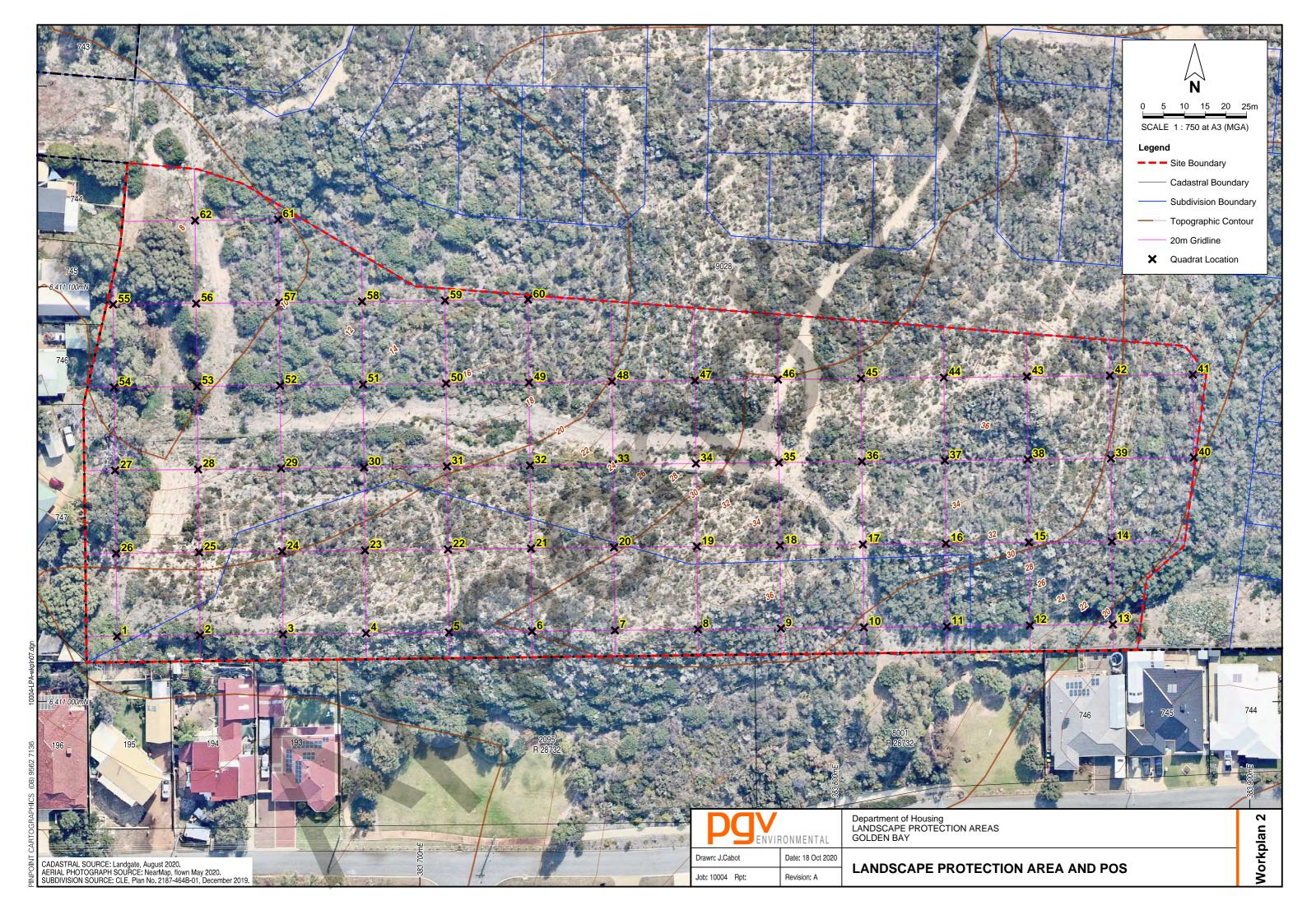


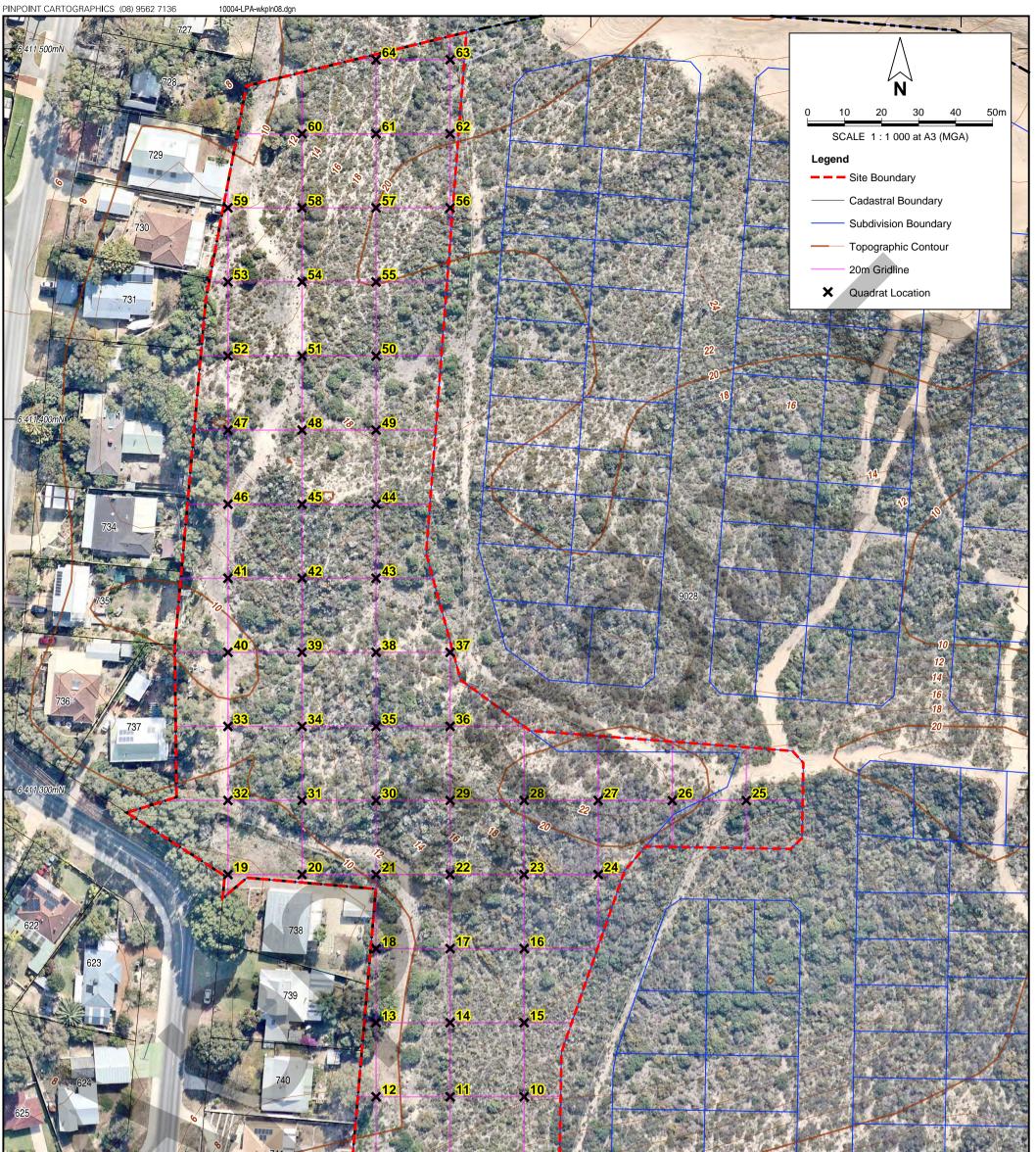


APPENDIX 1

Weed Mapping Grids



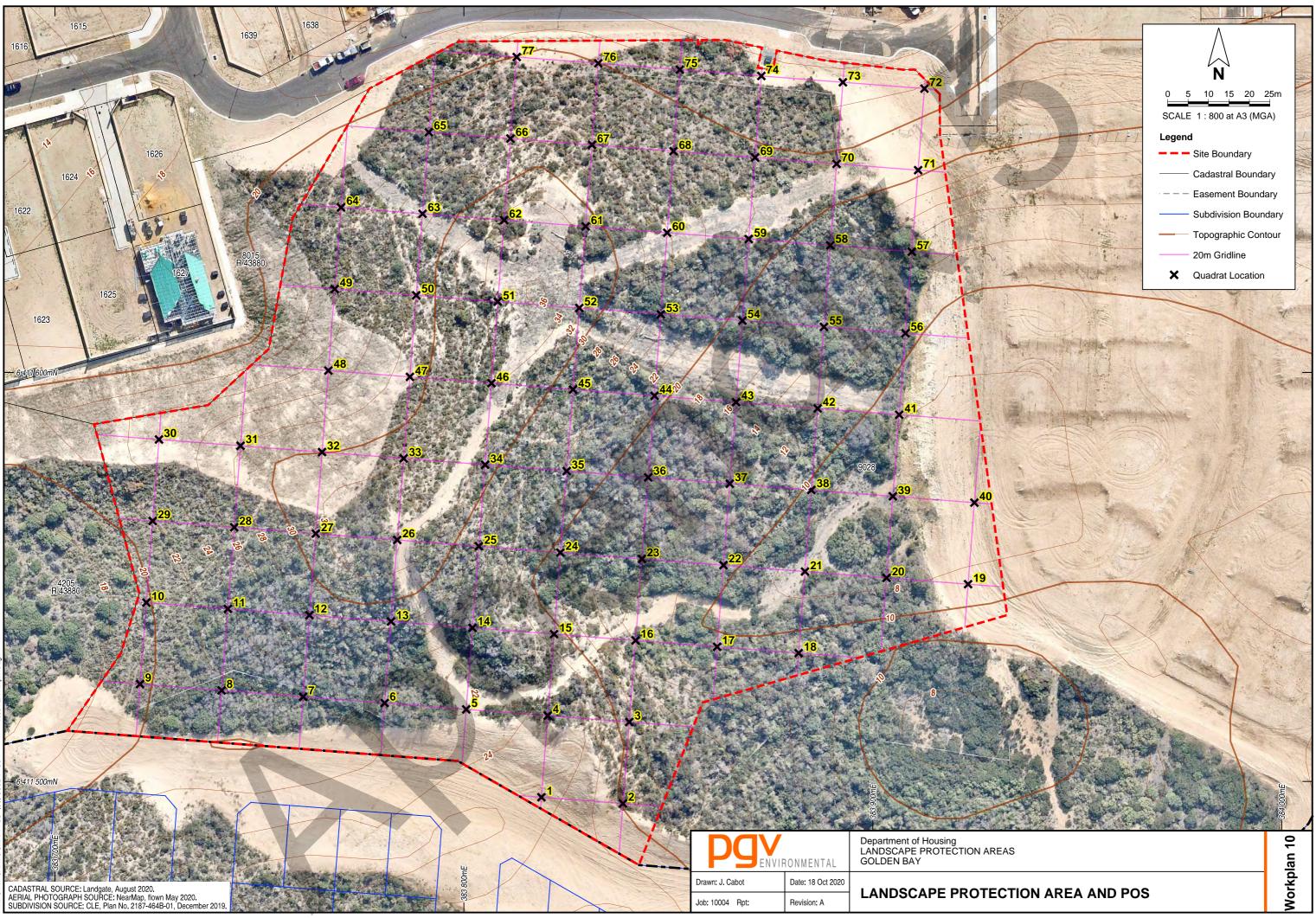




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APPENDIX 2

Naturemap Report



NatureMap Species Report

Created By Guest user on 11/03/2021

Current Names Only Y	'es
Core Datasets Only Y	'es
Method 'B	3y Circle'
Centre 1	15° 45' 55" E,32° 25' 43" S
Buffer 10	0km
Group By C	Conservation Status

Conservation Code ¹Endemic To Query Area

Naturalised

Conservation Status	Species	Records
Non-conservation taxon	753	6530
Other specially protected fauna	2	10
Priority 2	2	8
Priority 3	10	53
Priority 4	8	89
Protected under international agreement	22	188
Rare or likely to become extinct	11	312
TOTAL	808	7190

Name ID Species Name

re or likely	y to become extinct		
1.	24162 Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)	т	
2.	24784 Calidris ferruginea (Curlew Sandpiper)	Т	
3.	24790 Calidris tenuirostris (Great Knot)	Т	
4.	24731 Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)	Т	
5.	24734 Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)	т	
6.	48400 Calyptorhynchus sp. (white-tailed black cockatoo)	т	
7.	25335 Caretta caretta (Loggerhead Turtle)	T	
8.	25575 Charadrius leschenaultii (Greater Sand Plover)	T	
9.	24092 Dasyurus geoffroii (Chuditch, Western Quoll)	T	
10.	10796 Diuris drummondii (Tall Donkey Orchid)	T	
11.	1639 Drakaea elastica (Glossy-leaved Hammer Orchid)	T	
		1	
	Ider international agreement		
12.	41323 Actitis hypoleucos (Common Sandpiper)	IA	
13.	25736 Arenaria interpres (Ruddy Turnstone)	IA	
14.	24779 Calidris acuminata (Sharp-tailed Sandpiper)	IA	
15.	24780 Calidris alba (Sanderling)	IA	
16.	24786 Calidris melanotos (Pectoral Sandpiper)	IA	
17.	24788 Calidris ruficollis (Red-necked Stint)	IA	
18.	24789 Calidris subminuta (Long-toed Stint)	IA	
19.	24481 Glareola maldivarum (Oriental Pratincole)	IA	
20.	48587 Hydroprogne caspia (Caspian Tern)	IA	
21.	30932 Limosa lapponica (Bar-tailed Godwit)	IA	
22.	24690 Macronectes giganteus (Southern Giant Petrel)	IA	
23.	25742 Numenius phaeopus (Whimbrel)	IA	
24.	48591 Pandion cristatus (Osprey, Eastern Osprey)	IA	
25.	24802 Philomachus pugnax (Ruff, reeve)	IA	
26.	24843 Plegadis falcinellus (Glossy Ibis)	IA	
27.	24382 Pluvialis fulva (Pacific Golden Plover)	IA	
28.	24383 Pluvialis squatarola (Grey Plover)	IA	
29.	24716 Puffinus pacificus (Wedge-tailed Shearwater)	IA	
30.	48593 Sternula albifrons (Little Tern)	IA	
31.	48597 Thalasseus bergii (Crested Tern)	IA	
32.	24806 Tringa glareola (Wood Sandpiper)	IA	
33.	24808 Tringa nebularia (Common Greenshank, greenshank)	IA	
her specia	Ily protected fauna		
34.	25624 Falco peregrinus (Peregrine Falcon)	S	
35.	48070 Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale,		
	Wambenger)	S	
	ve project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.	Department of Biodiversity, Conservation and Attractions	

NatureMap Mapping Western Australia's biodiversity

Priority 2	Name ID	Species Name	Naturalised Conservation Code ¹ Endemic To Query Area
36.	3237	Acacia benthamii	P2
37.	3006	Cardamine paucijuga	P2
riority 2			
Priority 3	24226	Poverio disorgo auton disorgo	50
38. 39.		Beyeria cinerea subsp. cinerea Calandrinia oraria	P3
			P3
40.		Dillwynia dillwynioides	P3
41.		Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)	P3
42.		Lasiopetalum membranaceum	P3
43.		Lerista lineata (Perth Slider, Lined Skink)	P3
44.		Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)	P3
45.		Pimelea calcicola	P3
46.	980	Schoenus capillifolius	P3
47.	20348	Sphaerolobium calcicola	P3
Priority 4			
48.	13963	Caladenia speciosa	P4
49.		Conostylis pauciflora subsp. pauciflora	P4
50.		Isoodon fusciventer (Quenda, southwestern brown bandicoot)	P4
51.		Jacksonia sericea (Waldjumi)	P4
52.		Oxyura australis (Blue-billed Duck)	P4
53.		Parsonsia diaphanophleba	P4
54.	7756	Stylidium longitubum (Jumping Jacks)	P4
55.	33992	Synemon gratiosa (Graceful Sunmoth)	P4
lon-conse	wation to	avon	
56.		Acacia applanata	
57.		Acacia cochlearis (Rigid Wattle)	
58.		Acacia cyclops (Coastal Wattle)	
59.	3374	Acacia huegelii	
60.	3409	Acacia lasiocarpa (Panjang)	
61.	11611	Acacia lasiocarpa var. lasiocarpa	
62.	3502	Acacia pulchella (Prickly Moses)	
63.	15481	Acacia pulchella var. glaberrima	
64.	3525	Acacia rostellifera (Summer-scented Wattle)	
65.		Acacia saligna (Orange Wattle, Kudjong)	
66.		Acacia saligna subsp. lindleyi	
67.		Acacia saligna subsp. saligna	
68.		Acacia stenoptera (Narrow Winged Wattle)	
69.		Acacia truncata	
70.		Acacia willdenowiana (Grass Wattle)	
71.			
		Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)	
72.		Acanthiza chrysorrhoa (Yellow-rumped Thornbill)	
73.		Acanthiza inornata (Western Thornbill)	
74.		Acanthocarpus preissii	
75.	24560	Acanthorhynchus superciliosus (Western Spinebill)	
76.	25535	Accipiter cirrocephalus (Collared Sparrowhawk)	
77.	25536	Accipiter fasciatus (Brown Goshawk)	
78.	42368	Acritoscincus trilineatus (Western Three-lined Skink)	
79.	25755	Acrocephalus australis (Australian Reed Warbler)	
80.	6295	Acrotriche cordata (Coast Ground Berry)	
81.		Adenanthos meisneri	
82.		Adriana quadripartita (Bitter Bush)	
83.		Afurcagobius suppositus	
84.	17202	Agonis flexuosa var. flexuosa	
		-	Y
85. 96		Aira caryophyllea (Silvery Hairgrass)	ſ
86.		Allocasuarina fraseriana (Sheoak, Kondil)	
87.		Allocasuarina humilis (Dwarf Sheoak)	
88.		Alyxia buxifolia (Dysentery Bush)	
89.	35159	Ammophila arenaria subsp. arenaria	Y
90.	13101	Amperea simulans	
91.		Aname mainae	
92.		Aname tepperi	
93.	24310	Anas castanea (Chestnut Teal)	
94.		Anas gracilis (Grey Teal)	
95.		Anas platyrhynchos (Mallard)	
96.		Anas rhynchotis (Australasian Shoveler)	
97.		Anas superciliosa (Pacific Black Duck)	
98.		Anhinga novaehollandiae (Australasian Darter)	
99.	1409	Anigozanthos humilis (Catspaw)	
100.	11434	Anigozanthos humilis subsp. humilis	Department of Biodiversity, Conservation and Attractions
100.			

	Name ID	Species Name	Naturali	sed Conservation Code	¹ Endemic To Query Area
101.	1411	Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)			
102.		Anigozanthos viridis subsp. viridis			
103.		Anilios australis			
104.	11725	Anthocercis ilicifolia subsp. ilicifolia			
105.		Anthocercis littorea (Yellow Tailflower)			
106.		Anthochaera carunculata (Red Wattlebird)			
107.		Anthochaera lunulata (Western Little Wattlebird)			
108.		Anthotium junciforme			
109.		Anthoxanthum odoratum (Sweet Vernal Grass)	Y		
110.		Anthus australis (Australian Pipit)			
111.		Aotus gracillima			
112.	3692	Aotus procumbens			
113.	1117	Aphelia cyperoides			
114.	6210	Apium annuum			
115.	6211	Apium prostratum (Sea Celery)			
116.	12040	Apium prostratum subsp. prostratum var. prostratum (Sea Celery)			
117.	24991	Aprasia repens (Sand-plain Worm-lizard)			
118.	24285	Aquila audax (Wedge-tailed Eagle)			
119.	7838	Arctotheca calendula (Cape Weed, African Marigold)	Y		
120.	7840	Arctotis stoechadifolia (White Arctotis, Silver Arctotis)	Y		
121.	41324	Ardea modesta (great egret, white egret)			
122.	24340	Ardea novaehollandiae (White-faced Heron)			
123.	24341	Ardea pacifica (White-necked Heron)			
124.		Armillaria luteobubalina			
125.	1264	Arnocrinum preissii			
126.	25566	Artamus cinereus (Black-faced Woodswallow)			
127.	24353	Artamus cyanopterus (Dusky Woodswallow)			
128.	6580	Asclepias curassavica (Redhead Cottonbush)	Y		
129.	8779	Asparagus asparagoides (Bridal Creeper)	Y		
130.	1364	Asphodelus fistulosus (Onion Weed)	Y		
131.	20350	Astartea affinis (West-coast Astartea)			
132.		Astartea scoparia (Common Astartea)			
133.		Asteridea pulverulenta (Common Bristle Daisy)			
134.		Astroloma ciliatum (Candle Cranberry)			
135.		Astroloma pallidum (Kick Bush)			
136.		Atriplex prostrata (Hastate Orache)	Y		
137.		Atriplex suberecta			
138.		Auriscalpium barbatum			
139.		Austronomus australis (White-striped Free-tailed Bat)			
140. 141.		Austrostipa compressa Austrostipa exilis			
141.		Austrostipa flavescens			
142.		Avena barbata (Bearded Oat)	V		
144.		Aythya australis (Hardhead)	1		
145.		Banksia attenuata (Slender Banksia, Piara)			
146.		Banksia dallanneyi subsp. dallanneyi var. dallanneyi			
147.		Banksia grandis (Bull Banksia, Pulgarla)			
148.		Banksia littoralis (Swamp Banksia, Pungura)			
149.		Banksia menziesii (Firewood Banksia)			
150.		Banksia nivea (Honeypot Dryandra, Pudjarn)			
151.		Barnardius zonarius			
152.	741	Baumea articulata (Jointed Rush)			
153.	743	Baumea juncea (Bare Twigrush)			
154.	744	Baumea laxa			
155.	748	Baumea vaginalis (Sheath Twigrush)			
156.	7046	Bellardia trixago (Bellardia)	Y		
157.	48868	Bellardia viscosa	Y		
158.	24319	Biziura lobata (Musk Duck)			
159.	749	Bolboschoenus caldwellii (Marsh Club-rush)			
160.		Boletus sp.			
161.	3710	Bossiaea eriocarpa (Common Brown Pea)			
162.	6341	Brachyloma preissii (Globe Heath)			
163.	8661	Brachypodium distachyon (False Brome)	Y		
164.	7878	Brachyscome iberidifolia			
165.		Briza maxima (Blowfly Grass)	Y		
166.		Briza minor (Shivery Grass)	Y		
167.		Bromus arenarius (Sand Brome)			
168.		Bromus diandrus (Great Brome)	Y		
169.		Burchardia bairdiae			
170.	12770	Burchardia congesta	, historia	Department of Bindiversity	

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	Name ID	Species Name	Naturalise	d Conservation Code	¹ Endemic To Query
171.	1385	Burchardia multiflora (Dwarf Burchardia)			Alea
171.		Cacatua pastinator (Western Long-billed Corella)			
173.		Cacatua roseicapilla (Galah)			
174.		Cacatua sanguinea (Little Corella)			
175.		Cacatua tenuirostris (Eastern Long-billed Corella)	Y		
176.		Cacomantis flabelliformis (Fan-tailed Cuckoo)	•		
177.		Caesia micrantha (Pale Grass Lily)			
178.		Cakile maritima (Sea Rocket)	Y		
179.		Caladenia arenicola			
180.		Caladenia flava (Cowslip Orchid)			
181.		Caladenia latifolia (Pink Fairy Orchid)			
182.		Caladenia longicauda subsp. calcigena			
183.		Caladenia occidentalis			
184.		Caladenia vulgata			
185.		Calandrinia brevipedata (Short-stalked Purslane)			
186.		Calandrinia corrigioloides (Strap Purslane)			
187.		Calandrinia granulifera (Pygmy Purslane)			
188.		Calandrinia liniflora (Parakeelya)		4	
189.		Calandrinia tholiformis			
190.		Calyptorhynchus banksii (Red-tailed Black-Cockatoo)			
191.		Calyptorhynchus latirostris?			Y
192.	5439	Calytrix angulata (Yellow Starflower)			
193.		Calytrix flavescens (Summer Starflower)			
194.		Candelariella sp.			
195.	48920	Canis familiaris (Dog, Dingo)	Y		
196.		Cardamine hirsuta (Common Bittercress)	Ŷ		
197.		Carduelis carduelis (Goldfinch, European Goldfinch)	Ý		
198.		Carex thecata			
199.		Carpobrotus virescens (Coastal Pigface, Kolboko, Bain)			
200.		Cartonema philydroides			
201.		Cassytha flava (Dodder Laurel)			
202.		Cassytha racemosa (Dodder Laurel)			
203.		Cassytha racemosa forma racemosa			
204.		Cenchrus echinatus (Burrgrass)	Y		
205.		Centaurea melitensis (Maltese Cockspur, Malta Thistle)	Y		
206.		Centaurium tenuiflorum	Y		
207.	6214	Centella asiatica			
208.	35322	Centranthus ruber subsp. ruber	Y		
209.	1120	Centrolepis alepyroides			
210.	1121	Centrolepis aristata (Pointed Centrolepis)			
211.	2889	Cerastium glomeratum (Mouse Ear Chickweed)	Y		
212.	24186	Chalinolobus gouldii (Gould's Wattled Bat)			
213.	1280	Chamaescilla corymbosa (Blue Squill)			
214.	24377	Charadrius ruficapillus (Red-capped Plover)			
215.	43380	Chelodina colliei (South-western Snake-necked Turtle)			
216.	24321	Chenonetta jubata (Australian Wood Duck, Wood Duck)			
217.	2490	Chenopodium glaucum (Glaucous Goosefoot)	Y		
218.		Cherax destructor			
219.		Cherax quinquecarinatus			
220.		Chloris gayana (Rhodes Grass)	Y		
221.		Chorizandra enodis (Black Bristlerush)			
222.	24980	Christinus marmoratus (Marbled Gecko)			
223.		Chroicocephalus novaehollandiae			
224.		Chrysococcyx basalis (Horsfield's Bronze Cuckoo)			
225.		Circus approximans (Swamp Harrier)			
226.		Circus assimilis (Spotted Harrier)			
227.		Cladorhynchus leucocephalus (Banded Stilt)			
228.		Clematis linearifolia			
229. 230.		Colluricincla harmonica (Grey Shrike-thrush)			
		Columba livia (Domestic Pigeon)	Y		
231.		Comesperma calymega (Blue-spike Milkwort)			
232.		Comesperma confertum			
233. 234.		Comesperma integerrimum			
		Conesperma virgatum (Milkwort)			
235. 236.		Conospermum capitatum subsp. glabratum Conospermum triplinervium (Tree Smokebush)			
236. 237.		Conospermum tripinervium (Tree Smokebusn) Conostephium preissii			
237.		Conostylis aculeata (Prickly Conostylis)			
238.		Conostylis aculeata (Prickly Conostylis) Conostylis aculeata subsp. aculeata			
239. 240.		Conostylis acuieata subsp. acuieata Conostylis candicans (Grey Cottonhead)			
240.	1427		Keet Door	artment of Biodiversity.	WESTERN
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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
241.	12027	Conostylis candicans subsp. calcicola			
242.	1436	Conostylis juncea			
243.		Conostylis pauciflora (Dawesville Conostylis)			
244.		Coracina novaehollandiae (Black-faced Cuckoo-shrike)			
245. 246.		Corvus coronoides (Australian Raven)			
246.		Corynotheca micrantha (Sand Lily) Cotula coronopifolia (Waterbuttons)	Y		
248.		Coturnix pectoralis (Stubble Quail)	1		
249.		Cracticus tibicen (Australian Magpie)			
250.		Cracticus torquatus (Grey Butcherbird)			
251.		Crapatalus sp.			Y
252.	42009	Craspedia sp. Yalgorup National Park (G.J. Keighery 14449)			
253.	3137	Crassula colorata (Dense Stonecrop)			
254.		Crassula colorata var. acuminata			
255.		Crassula colorata var. colorata			
256.		Crassula glomerata	Y		
257. 258.		Crassula natans var. minus Crinia glauerti (Clicking Frog)	Y		
258.		Crinia insignifera (Squelching Froglet)			
260.		Cryptandra mutila			
261.		Cryptoblepharus buchananii			
262.	30899	Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)			
263.	25027	Ctenotus australis			
264.	25039	Ctenotus fallens			
265.		Cuscuta epithymum (Lesser Dodder, Greater Dodder)	Y		
266.		Cuscuta planiflora	Y		
267. 268.		Cyathochaeta avenacea			
269.		Cycnogeton lineare Cygnus atratus (Black Swan)			
270.		Cymbalaria muralis subsp. muralis	Y		
271.		Cynosurus echinatus (Rough Dogstail)	Y		
272.	783	Cyperus congestus (Dense Flat-sedge)	Y		
273.	816	Cyperus tenuiflorus (Scaly Sedge)	Y		
274.	10916	Cyrtostylis huegelii			
275.		Dacelo novaeguineae (Laughing Kookaburra)	Y		
276.		Dampiera linearis (Common Dampiera)			
277. 278.		Dampiera trigona (Angled-stem Dampiera) Daphoenositta chrysoptera (Varied Sittella)			
279.		Darwinia neildiana (Fringed Bell)			
280.		Dasypogon bromeliifolius (Pineapple Bush)			
281.		Daucus glochidiatus (Australian Carrot)			
282.	15505	Daviesia incrassata subsp. incrassata			
283.		Daviesia physodes			
284.		Daviesia triflora			
285.		Delma fraseri (Fraser's Legless Lizard)			
286. 287.		Delma grayii Demansia psammophis (Yellow-faced Whipsnake)			
288.		Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)			
289.		Desmocladus asper			
290.	17691	Desmocladus fasciculatus			
291.	16595	Desmocladus flexuosus			
292.		Deyeuxia quadriseta (Reed Bentgrass)			
293.		Dicaeum hirundinaceum (Mistletoebird)			
294. 295.		Dichelachne crinita (Longhair Plumegrass) Dichopogon capillipes			
296.		Diplolaena dampieri (Southern Diplolaena)			
297.		Diplopeltis huegelii subsp. huegelii			
298.	7054	Dischisma arenarium	Y		
299.	7055	Dischisma capitatum (Woolly-headed Dischisma)	Y		
300.		Diuris longifolia (Common Donkey Orchid)			
301.		Dromaius novaehollandiae (Emu)			
302.		Drosera erythrorhiza (Red Ink Sundew)			
303. 304.		Drosera gigantea (Giant Sundew) Drosera glanduligera (Pimpernel Sundew)			
304.		Drosera menziesii (Pink Rainbow)			
306.		Drosera neesii (Jewel Rainbow)			
307.		Drosera nitidula (Shining Sundew)			
308.	3118	Drosera pallida (Pale Rainbow)			
309.		Drosera sp. Branched styles (S.C. Coffey 193)			
310.	3131	Drosera stolonifera (Leafy Sundew)	. <i>643</i>		
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	Name ID	Species Name		Naturalised	Conservation Code	¹ Endemic To Query Area
311. 312.		Drosera tubaestylis Egernia kingii (King's Skink)				
312.		Egernia napoleonis				
314.		Egretta garzetta				
315.		Egretta novaehollandiae				
316.	347	Ehrharta calycina (Perennial Veldt Grass)		Y		
317.		Elanus axillaris				
318.		Elanus caeruleus (Black-shouldered Kite)				
319. 320.		Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite) Elseyornis melanops (Black-fronted Dotterel)				
321.	47957	Eolophus roseicapillus				
322.	6131	Epilobium billardiereanum (Glabrous Willow Herb)				
323.		Epilobium hirtigerum (Hairy Willow Herb)				
324.	14289	Epilobium tetragonum subsp. tetragonum		Y		
325.		Epthianura albifrons (White-fronted Chat)				
326.		Eremophila glabra subsp. albicans				
327. 328.		Eriochilus dilatatus subsp. dilatatus Eriochilus dilatatus subsp. multiflorus				
329.		Erodium botrys (Long Storksbill)		Y		
330.		Erodium cicutarium (Common Storksbill)		Y		
331.		Eryngium pinnatifidum subsp. pinnatifidum				
332.	24379	Erythrogonys cinctus (Red-kneed Dotterel)				
333.	5649	Eucalyptus foecunda (Narrow-leaved Red Mallee)				
334.		Eucalyptus gomphocephala (Tuart, Duart)				
335.		Eucalyptus marginata (Jarrah, Djara)				
336. 337.		Eucalyptus marginata subsp. marginata (Jarrah) Eucalyptus petiolaris		Y		
338.		Eucalyptus periodans Eucalyptus rudis (Flooded Gum, Kulurda)				
339.		Eucalyptus rudis subsp. rudis				
340.	4636	Euphorbia paralias (Sea Spurge)		Y	>	
341.	4648	Euphorbia terracina (Geraldton Carnation Weed)		Y		
342.		Eutaxia virgata				
343.		Exocarpos sparteus (Broom Ballart, Djuk)				
344. 345.		Falco berigora (Brown Falcon) Falco cenchroides (Australian Kestrel, Nankeen Kestrel)				
346.		Falco longipennis (Australian Hobby)				
347.		Felis catus (Cat)		Y		
348.	20216	Ficinia nodosa (Knotted Club Rush)				
349.	25727	Fulica atra (Eurasian Coot)				
350.		Fulica atra subsp. australis (Eurasian Coot)				
351. 352.		Gahnia trifida (Coast Saw-sedge) Galaxias occidentalis (Western Minnow)				
353.		Gallinula tenebrosa (Dusky Moorhen)				
354.	24763	Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)				
355.	20473	Gastrolobium ebracteolatum				
356.		Gastrolobium nervosum				
357.		Geranium molle (Dove's Foot Cranesbill) Geranium retrorsum		Y		
358. 359.		Geranium retrorsum Geranium solanderi (Native Geranium)				
360.		Gerygone fusca (Western Gerygone)				
361.	1520	Gladiolus caryophyllaceus (Wild Gladiolus)		Y		
362.	24054	Globicephala macrorhynchus (Short-finned Pilot Whale)				
363.		Gompholobium confertum				
364. 365.		Gompholobium tomentosum (Hairy Yellow Pea) Goodenia pulchella				
366.		Goodenia puichena Grallina cyanoleuca (Magpie-lark)				
367.		Grevillea crithmifolia				
368.	15839	Grevillea preissii subsp. preissii				
369.	12824	Grevillea vestita subsp. vestita				
370.		Gymnopilus allantopus				
371.	24497	Gymnothorax prasinus				
372. 373.		Haematopus longirostris (Pied Oystercatcher) Haemodorum laxum				
374.		Haemodorum simplex				
375.		Hakea prostrata (Harsh Hakea)				
376.		Hakea varia (Variable-leaved Hakea)				
377.		Haliaeetus leucogaster (White-bellied Sea-Eagle)				
378.		Haliastur sphenurus (Whistling Kite)				
379. 380.		Halobaena caerulea (Blue Petrel)				
360.	3901	Hardenbergia comptoniana (Native Wisteria)		Departmen	t of Biodiversity,	M WESTERN
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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
381.	25410	Heleioporus eyrei (Moaning Frog)			7.1.04
382.	25412	Heleioporus psammophilus (Sand Frog)			
383.	3016	Heliophila pusilla	Y		
384.	16933	Hemiandra glabra			
385.	6839	Hemiandra pungens (Snakebush)			
386.	25232	Hemidactylus frenatus (Asian House Gecko)	Y		
387.		Hemiergis quadrilineata			
388.		Hibbertia cuneiformis (Cutleaf Hibbertia)			
389.		Hibbertia hypericoides (Yellow Buttercups)			
390. 391.		Hibbertia hypericoides subsp. hypericoides			
391.		Hibbertia racemosa (Stalked Guinea Flower) Hibbertia stellaris (Orange Stars)			
393.		Hibbertia vaginata			
394.		Hieraaetus morphnoides (Little Eagle)			
395.		Himantopus himantopus (Black-winged Stilt)			
396.		Hirundo neoxena (Welcome Swallow)			
397.		Histiopteris incisa			
398.	445	Holcus setiger (Annual Fog)	Y		
399.	6222	Homalosciadium homalocarpum			
400.	3968	Hovea trisperma (Common Hovea)			
401.	12859	Hovea trisperma var. trisperma			
402.		Hybanthus calycinus (Wild Violet)			
403.		Hydrocotyle diantha			
404.		Hydrocotyle pilifera var. glabrata			
405.		Hydrocotyle tetragonocarpa			
406.		Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)	, v		
407. 408.		Hyparrhenia hirta (Tambookie Grass)	Y		
408.		Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777) Hypochaeris glabra (Smooth Catsear)	×		
410.		Hypolaena exsulca			
411.		Hypolaena pubescens			
412.		Idiommata blackwalli			
413.	48504	Inocybe acaciae			
414.	48545	Inocybe sabulosa			
415.	910	Isolepis cernua (Nodding Club-rush)			
416.	20200	Isolepis cernua var. setiformis			
417.		Isolepis marginata (Coarse Club-rush)			
418.	921	Isolepis producta			
419.	0000	Isopeda leishmanni			
420. 421.		Isotropis cuneifolia (Granny Bonnets)			
421.		Isotropis cuneifolia subsp. cuneifolia Ixiolaena viscosa (Sticky Ixiolaena)			
423.		Jacksonia furcellata (Grey Stinkwood)			
424.		Juncus acutus subsp. acutus	Y		
425.		Juncus bufonius (Toad Rush)	Y		
426.	1185	Juncus kraussii (Sea Rush)			
427.	11922	Juncus kraussii subsp. australiensis			
428.	1188	Juncus pallidus (Pale Rush)			
429.	4044	Kennedia prostrata (Scarlet Runner)			
430.		Kunzea ericifolia (Spearwood, Pondil)			
431.		Kunzea glabrescens (Spearwood)			
432.		Lachenalia aloides	Y		
433. 434.		Lachnagrostis filiformis Lagurus ovatus (Hare's Tail Grass)	V		
434. 435.		Larus novaehollandiae (Silver Gull)	Y		
436.		Laxmannia squarrosa			
437.		Lechenaultia expansa			
438.		Leontodon rhagadioloides	Y		
439.	925	Lepidosperma angustatum			
440.	42742	Lepidosperma calcicola			
441.	932	Lepidosperma effusum (Spreading Sword-sedge)			
442.		Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)			
443.		Lepidosperma longitudinale (Pithy Sword-sedge)			
444.	940	Lepidosperma pubisquameum			
445.		Lepidosperma sp.			
446.		Lepidosperma squamatum			
447.		Leporella fimbriata (Hare Orchid)			
448. 449.		Leptocarpus coangustatus			
449. 450.		Leptocarpus decipiens Leptocarpus roycei			
-50.	40302	201000.000	Department	of Biodiversity,	MESTERN
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451.	1080	Leptocarpus scariosus			
452.	15418	Leptoceras menziesii			
453.	2344	Leptomeria empetriformis			
454.	2352	Leptomeria preissiana			
455.	17852	Leptorhynchos scaber (Lanky Buttons)			
456.	5850	Leptospermum laevigatum (Coast Teatree)	Y		
457.	1085	Lepyrodia glauca			
458.	1088	Lepyrodia macra (Large Scale Rush)			
459.	1090	Lepyrodia muirii			
460.	25133	Lerista elegans			
461.	6360	Leucopogon australis (Spiked Beard-heath)			
462.	6427	Leucopogon parviflorus (Coast Beard-heath)			
463.	6436	Leucopogon propinquus			
464.	7677	Levenhookia stipitata (Common Stylewort)			
465.	25005	Lialis burtonis			
466.	25661	Lichmera indistincta (Brown Honeyeater)			
467.	24582	Lichmera indistincta subsp. indistincta (Brown Honeyeater)			
468.	25415	Limnodynastes dorsalis (Western Banjo Frog)			
469.	7075	Linaria maroccana	Y		
470.	36160	Liparophyllum capitatum			
471.	36179	Liparophyllum violifolium			
472.	25378	Litoria adelaidensis (Slender Tree Frog)			
473.	25388	Litoria moorei (Motorbike Frog)			
474.	9289	Lobelia anceps (Angled Lobelia)			
475.	7408	Lobelia tenuior (Slender Lobelia)			
476.		Logania vaginalis (White Spray)			
477.	476	Lolium perenne (Perennial Ryegrass)	Y		
478.		Lolium rigidum (Wimmera Ryegrass)	Y		
479.		Lolium sp.			
480.	11073	Lolium x hybridum	Y		
481.	1223	Lomandra caespitosa (Tufted Mat Rush)			
482.		Lomandra hermaphrodita			
483.	1231	Lomandra maritima			
484.	1232	Lomandra micrantha (Small-flower Mat-rush)			
485.		Lomandra micrantha subsp. micrantha			
486.		Lomandra preissii			
487.		Lomandra sericea (Silky Mat Rush)			
488.		Lomandra suaveolens			
489.		Lophoictinia isura			
490.	8564	Lotus subbiflorus	Y		
491.	1198	Luzula meridionalis (Field Woodrush)			
492.	1097	Lyginia barbata			
493.		Lyginia imberbis			
494.	36375	Lysimachia arvensis (Pimpernel)	Y		
495.		Macarthuria australis			
496.		Macrolepiota clelandii			
497.	24132	Macropus fuliginosus (Western Grey Kangaroo)			
498.		Macrozamia riedlei (Zamia, Djiridji)			
499.		Malacorhynchus membranaceus (Pink-eared Duck)			
500.		Malurus splendens (Splendid Fairy-wren)			
501.		Malurus splendens subsp. splendens (Splendid Fairy-wren)			
502.		Malva parviflora (Marshmallow)	Y		
503.		Malva pseudolavatera	Y		
503.		Medicago polymorpha (Burr Medic)	Y		
505.		Medicago sativa (Alfalfa)	Y		
506.		Megalurus gramineus (Little Grassbird)			
507.		Meionectes brownii (Swamp Raspwort)			
508.		Melaleuca incana (Grey Honeymyrtle)			
508.		Melaleuca incana subsp. incana			
509. 510.					
510.		Melaleuca lateritia (Robin Redbreast Bush) Melaleuca preissiana (Moonah)			
		Melaleuca preissiana (Moonah) Melaleuca thaphiophulla (Swamp Paparbark)			
512.		Melaleuca rhaphiophylla (Swamp Paperbark)			
513.		Melaleuca systema			
514.		Melaleuca teretifolia (Banbar)			
515.		Melaleuca thymoides			
516.		Melaleuca viminea (Mohan)			
517.		Melaleuca viminea subsp. viminea			
518.		Melilotus indicus	Y		
519.		Menetia greyii			
520.	6886	Mentha x piperita	Y		Y
		he Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.	Con	artment of Biodiversity, servation and Attractions	WESTERI AUSTRA

	Name ID	Species Name	Naturalise	d Conservation Code	¹ Endemic To Query Area
521.	24598	Merops ornatus (Rainbow Bee-eater)			
522.		Mesomelaena pseudostygia			
523.	957	Mesomelaena tetragona (Semaphore Sedge)			
524. 525.	25602	Microcarbo melanoleucos Microeca fascinans (Jacky Winter)			
525. 526.		Microlaena stipoides (Weeping Grass)			
527.		Microtis media subsp. media			
528.		Microtis orbicularis (Dark Mignonette Orchid)			
529.	8105	Millotia myosotidifolia			
530.	16693	Minuartia mediterranea	Y		
531.		Missulena granulosa			
532.	07440	Missulena hoggi			
533. 534.		Monopsis debilis var. depressa Morelia spilota subsp. imbricata (Carpet Python)	Y		
535.		Morethia lineoocellata			
536.		Morus serrator (Australasian Gannet)			
537.		Muehlenbeckia adpressa (Climbing Lignum)			
538.	24223	Mus musculus (House Mouse)	Y		
539.	38811	Mycena clarkeana			
540.		Mycena nargan			
541.	7289	Myoporum caprarioides (Slender Myoporum)			
542. 543.	2/738	Nannoperca vittata Neophema elegans (Elegant Parrot)			
544.	24750	Nicodamus mainae			
545.	25252	Notechis scutatus (Tiger Snake)			
546.		Nuytsia floribunda (Christmas Tree, Mudja)			
547.	25564	Nycticorax caledonicus (Rufous Night Heron)			
548.		Ocyphaps lophotes (Crested Pigeon)			
549.		Oenothera drummondii subsp. drummondii	Y		
550.		Oenothera lindheimeri	Y		
551. 552.		Olearia axillaris (Coastal Daisybush) Omphalotus nidiformis		•	
553.		Opercularia hispidula (Hispid Stinkweed)			
554.		Opercularia vaginata (Dog Weed)			
555.	4113	Ornithopus compressus (Yellow Serradella)	Y		
556.	7122	Orobanche minor (Lesser Broomrape)	Y		
557.		Oryctolagus cuniculus (Rabbit)	Y		
558.		Oxalis exilis			
559. 560.		Oxalis perennans Pachycephala rufiventris (Rufous Whistler)			
561.		Pachyptila desolata (Antarctic Prion)			
562.		Paracaleana nigrita (Flying Duck Orchid)			
563.	25253	Parasuta gouldii			
564.	25681	Pardalotus punctatus (Spotted Pardalote)			
565.		Pardalotus striatus (Striated Pardalote)			
566. 567.		Parentucellia latifolia (Common Bartsia)	Y		
568.		Parietaria judaica (Pellitory) Patersonia occidentalis (Purple Flag, Korna)	Y		
569.		Pelargonium capitatum (Rose Pelargonium)	Y		
570.		Pelargonium littorale			
571.		Pelecanus conspicillatus (Australian Pelican)			
572.		Pericalymma ellipticum (Swamp Teatree)			
573.		Pericalymma ellipticum var. floridum			
574. 575.		Petrochelidon nigricans (Tree Martin) Petroica boodang (Scarlet Robin)			
575. 576.		Petrophile axillaris			
577.		Petrophile linearis (Pixie Mops)			
578.		Petrorhagia dubia	Y		
579.	25697	Phalacrocorax carbo (Great Cormorant)			
580.	25698	Phalacrocorax melanoleucos (Little Pied Cormorant)			
581.		Phalacrocorax sulcirostris (Little Black Cormorant)			
582. 583	-	Phalacrocorax varius (Pied Cormorant) Phalaris aquatica (Phalaris)	V		
583. 584.		Phalaris aquatica (Phalaris) Phaps chalcoptera (Common Bronzewing)	Y		
585.		Pheladenia deformis			
586.		Philotheca spicata (Pepper and Salt)			
587.	1478	Phlebocarya ciliata			
588.		Phylidonyris niger (White-cheeked Honeyeater)			
589.		Phylidonyris novaehollandiae (New Holland Honeyeater)			
590.	16177	Phyllangium paradoxum	, failt ,	inartment of Biodiversity	WEETERN
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			WESTERN AUSTRALIA		

Name ID Species Name

Naturalised Conservation Code ¹ Endemic To C

		Species Name Naturalised Conservation Code 'Endemic To Area	
591.	4675	Phyllanthus calycinus (False Boronia)	
592.	4010	Phyllichthys punctatus	
593.	4	Phylloglossum drummondii (Pigmy Clubmoss)	
593. 594.	4	Phytophthora cinnamomi	
595.	1/1370	Picris angustifolia subsp. angustifolia	
596.		Pimelea lanata	
596.		Pimelea rosea (Rose Banjine)	
598.		Pimelea rosea subsp. rosea	
599.		Pinus pinaster (Pinaster Pine) Y	
600.		Pithocarpa cordata	
601.		Platalea flavipes (Yellow-billed Spoonbill)	
602.		Platycercus icterotis (Western Rosella)	
603.	24747	Platycercus spurius (Red-capped Parrot)	
604.	25721	Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)	
605.	24750	Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)	
606.	38823	Pleuroflammula praestans	
607.	571	Poa annua (Winter Grass) Y	
608.	573	Poa drummondiana (Knotted Poa)	
609.	577	Poa poiformis (Coastal Poa)	
610.	578	Poa porphyroclados	
611.		Podiceps cristatus (Great Crested Grebe)	
612.		Podolepis gracilis (Slender Podolepis)	
613.		Podotheca angustifolia (Sticky Longheads)	
614.		Podotheca chrysantha (Yellow Podotheca)	
615.		Podotheca gnaphalioides (Golden Long-heads)	
616.	0104	Podotheca sp.	
617.	05540		
		Pogona minor (Dwarf Bearded Dragon)	
618.		Pogona minor subsp. minor (Dwarf Bearded Dragon)	
619.		Poliocephalus poliocephalus (Hoary-headed Grebe)	
620.		Polypogon monspeliensis (Annual Beardgrass) Y	
621.		Polytelis anthopeplus (Regent Parrot)	
622.	25731	Porphyrio porphyrio (Purple Swamphen)	
623.	24767	Porphyrio porphyrio subsp. bellus (Purple Swamphen)	
624.	1668	Prasophyllum brownii	
625.	1670	Prasophyllum drummondii (Swamp Leek Orchid)	
626.	1672	Prasophyllum fimbria (Fringed Leek Orchid)	
627.	1674	Prasophyllum giganteum (Bronze Leek Orchid)	
628.	1676	Prasophyllum hians (Yawning Leek Orchid)	
629.		Pseudonaja affinis (Dugite)	
630.		Pseudonaja affinis subsp. affinis (Dugite)	
631.		Pseudonaja nuchalis (Gwardar, Northern Brown Snake)	
632.	24702	Pterodroma brevirostris (Kerguelen Petrel)	
633.		Pterodroma macroptera (Great-winged Petrel)	
634.		Pterostylis aff. nana	
635.	48678	Pterostylis angulata	
636.		Pterostylis barbata (Bird Orchid)	
637.			
		Pterostylis orbiculata	
638.			
639.		Pterostylis pyramidalis (Snail Orchid)	
640.	12217	Pterostylis sanguinea	
641.		Pterostylis sp.	
642.		Ptilotus drummondii (Narrowleaf Mulla Mulla)	
643.		Ptilotus polystachyus (Prince of Wales Feather)	
644.	2759	Ptilotus sericostachyus	
645.	15856	Ptilotus sericostachyus subsp. sericostachyus	
646.	24711	Puffinus assimilis subsp. assimilis (Little Shearwater)	
647.		Purpureicephalus spurius	
648.	8195	Quinetia urvillei	
649.	2935	Ranunculus pumilio (Smallflower Buttercup)	
650.		Ranunculus sessiliflorus var. sessiliflorus	
651.		Ranunculus trilobus (Buttercup) Y	
652.		Raphanus raphanistrum (Wild Radish) Y	
653.		Rattus fuscipes (Western Bush Rat)	
654.		Rattus rattus (Black Rat) Y	
	24240		
655.	0.4770	Raveniella peckorum Pequeritente percentellandiae (Ped pecked Avenue)	
656.		Recurvirostra novaehollandiae (Red-necked Avocet)	
657.		Resupinatus cinerascens	
658.		Retama raetam Y	
659.		Rhagodia baccata subsp. baccata	
	11930	Rhagodia baccata subsp. dioica (Sea Berry Saltbush)	
660.	11000		STER

NatureMap Mapping Western Australia's biodiversity

N	lame ID	Species Name	Naturalised	Conservation Code ¹ Endemic To Query Area
661.	48096	Rhipidura albiscapa (Grey Fantail)		Filou
662.		Rhipidura leucophrys (Willie Wagtail)		
663.	24454	Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)		
664.		Rhodanthe citrina		
665.		Rhycherus gloveri		
666.	1556	Romulea rosea (Guildford Grass)	Y	
667.		Rumex crispus (Curled Dock)	Y	
668.		Rumex pulcher (Fiddle Dock)	Y	
669.		Rytidosperma occidentale	1	
670.		Salicornia quinqueflora		
671.		Salicornia quinqueflora subsp. quinqueflora (Beaded Glasswort)		
672.		Samolus junceus		
673.		Scabiosa atropurpurea (Purple Pincushion)	Y	
674.		Scaevola anchusifolia		
675.		Scaevola canescens (Grey Scaevola)		
676.		Scaevola crassifolia (Thick-leaved Fan-flower)		
677.	7614	Scaevola globulifera		
678.	13152	Scaevola thesioides subsp. thesioides		
679.	48834	Schinus terebinthifolia	Y	
680.	48356	Schoenoplectus tabernaemontani		
681.	978	Schoenus brevisetis		
682.	986	Schoenus efoliatus		
683.		Schoenus grandiflorus (Large Flowered Bogrush)		
684.		Schoenus nitens (Shiny Bog-rush)		
685.		Schoenus odontocarpus		
686.		Schoenus subfascicularis		
687.		Scholtzia involucrata (Spiked Scholtzia)		
688.		Selaginella gracillima (Tiny Clubmoss)		
689.		Sematophyllum homomallum		•
690.		Senecio condylus		
691.		Senecio diaschides		
692.	20161	Senecio pinnatifolius		
693.	8218	Senecio ramosissimus (Auricled Groundsel)		
694.	25534	Sericornis frontalis (White-browed Scrubwren)		
695.	24279	Sericornis frontalis subsp. maculatus (White-browed Scrubwren)		
696.	2909	Silene gallica (French Catchfly)	Y	
697.	8224	Siloxerus filifolius		
698.	8225	Siloxerus humifusus (Procumbent Siloxerus)		
699.	25266	Simoselaps bertholdi (Jan's Banded Snake)		
700.	30948	Smicrornis brevirostris (Weebill)		
701.	8230	Sonchus asper (Rough Sowthistle)	Y	
702.		Sonchus hydrophilus (Native Sowthistle)		
703.	8231	Sonchus oleraceus (Common Sowthistle)	Y	
704.		Sowerbaea laxiflora (Purple Tassels)		
705.		Sphyraena obtusata		
706.	624	Spinifex hirsutus (Hairy Spinifex)		
707.		Spinifex Iongifolius (Beach Spinifex)		
707.			Y	
		Sporobolus africanus (Parramatta Grass)	T	
709.		Sporobolus virginicus (Marine Couch)		
710.	4028	Spyridium globulosum (Basket Bush)		
711.		Squatina australis		
712.		Stackhousia huegelii		
713.		Stackhousia monogyna		
714.		Stellaria media (Chickweed)	Y	
715.		Stenella coeruleoalba (Striped Dophin)		
716.		Sterna bergii (Crested Tern)		
717.	24533	Sterna paradisaea (Arctic Tern)		
718.	48594	Sternula nereis (Fairy Tern)		
719.	24554	Stipiturus malachurus subsp. westernensis (Southern Emu-wren)		
720.	2316	Stirlingia latifolia (Blueboy)		
721.	25597	Strepera versicolor (Grey Currawong)		
722.		Streptopelia senegalensis (Laughing Turtle-Dove)	Y	
723.		Strophurus spinigerus		
724.		Stylidium brunonianum (Pink Fountain Triggerplant)		
725.		Stylidium calcaratum (Book Triggerplant)		
123.				
726		Stylidium despectum (Dwarf Triggerplant)		
726.		Stylidium dichotomum (Pins-and-needles)		
727.				
727. 728.	7717	Stylidium divaricatum (Daddy-long-legs)		
727. 728. 729.	7717 25829	Stylidium neurophyllum (Coastal Plain Triggerplant)		
727. 728.	7717 25829			
727. 728. 729. 730.	7717 25829 7774	Stylidium neurophyllum (Coastal Plain Triggerplant)	Department	of Biodiversity.

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	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Que Area
731.	7785	Stylidium repens (Matted Triggerplant)			
732.	7798	Stylidium schoenoides (Cow Kicks)			
733.	2639	Suaeda australis (Seablite)			
734.	2329	Synaphea spinulosa			
735.	25705	Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)			
736.	24682	Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black- throated Grebe)			
737.	25552	Tadorna radjah (Radjah Shelduck)			
738.	24331	Tadorna tadornoides (Australian Shelduck, Mountain Duck)			
739.	20135	Taxandria linearifolia			
740.	4256	Templetonia retusa (Cockies Tongues)			
741.	2791	Tersonia cyathiflora (Button Creeper)			
742.	2820	Tetragonia decumbens (Sea Spinach)	Y		
743.	1036	Tetraria octandra			
744.		Thelymitra aff. pauciflora			
745.	1701	Thelymitra antennifera (Vanilla Orchid)			
746.	10856	Thelymitra benthamiana (Leopard Orchid)			
747.	1705	Thelymitra crinita (Blue Lady Orchid)			
748.	1707	Thelymitra flexuosa (Twisted Sun Orchid)			
749.	1708	Thelymitra fuscolutea (Chestnut Sun Orchid)			
750.	20730	Thelymitra paludosa			
751.		Thelymitra sp.			
752.	2644	Threlkeldia diffusa (Coast Bonefruit)			
753.	24845	Threskiornis spinicollis (Straw-necked Ibis)			
754.	1318	Thysanotus arbuscula			
755.	1319	Thysanotus arenarius			
756.	1338	Thysanotus manglesianus (Fringed Lily)			
757.	1339	Thysanotus multiflorus (Many-flowered Fringe Lily)			
758.	1354	Thysanotus tenellus			
759.	25203	Tiliqua occipitalis (Western Bluetongue)			
760.	25519	Tiliqua rugosa			
761.	25207	Tiliqua rugosa subsp. rugosa			
762.		Todiramphus sanctus (Sacred Kingfisher)			
763.	32445	Tortula muralis			
764.	1368	Trachyandra divaricata	Y		
765.		Trachymene coerulea (Blue Lace Flower)			
766.		Trachymene coerulea subsp. coerulea			
767.		Trachymene pilosa (Native Parsnip)			
768.	1481	Tribonanthes australis (Southern Tiurndin)			
769.		Trichoglossus haematodus (Rainbow Lorikeet)			
770.		Trichosurus vulpecula (Common Brushtail Possum)			
771.	24158	Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)			
772.		Tricoryne elatior (Yellow Autumn Lily)			
773.		Trifolium arvense (Hare's Foot Clover)	Y		
774.		Trifolium campestre (Hop Clover)	Y		
775.		Trifolium dubium (Suckling Clover)	Y		
776.		Trifolium glomeratum (Cluster Clover)	Y		
777.		Triglochin mucronata	·		
778.		Triglochin striata			
779.		Triglochin trichophora			
780.		Trygonoptera mucosa			
781.		Trygonoptera personata			
782.	11665	Trymalium ledifolium var. ledifolium			
783.		Turnix varius (Painted Button-quail)			
784.		Tyto alba subsp. delicatula (Barn Owl)			
785.		Urolophus lobatus			
786.	8255	Ursinia anthemoides (Ursinia)	Y		
787.		Vanellus tricolor (Banded Lapwing)	•		
788.		Varanus gouldii (Bungarra or Sand Monitor)			
789.		Varanus rosenbergi (Heath Monitor)			
789. 790.		Varanus rosenbergi (rieari monitor) Varanus tristis (Racehorse Monitor)			
790. 791.		Varanus tristis (Racenoise Monitor) Varanus tristis subsp. tristis (Racehorse Monitor)			
791.		Varanus tristis subsp. tristis (Racenorse Monitor) Verbascum virgatum (Twiggy Mullein)	Y		
792.			Y Y		
		Verbesina encelioides	Ŷ		
794.	46275	Verbesina encelioides var. encelioides (Crownbeard, Wild Sunflower, Goldweed,	Y		
705	04000	South African Daisy)			
795.		Vespadelus regulus (Southern Forest Bat)			
796.		Viminaria juncea (Swishbush, Koweda)			
797.		Vulpes vulpes (Red Fox)	Y		
700			Y		
798.	122	Vulpia bromoides (Squirrel Tail Fescue)	2.3	t of Biodiversity, ion and Attractions	WESTE

NatureMap

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
799.	11137	Vulpia fasciculata	Y		
800.	724	Vulpia myuros (Rat's Tail Fescue)	Y		
801.	33101	Vulpia myuros forma myuros	Y		
802.	7389	Wahlenbergia preissii			
803.	6939	Westringia dampieri			
804.	1398	Wurmbea monantha			
805.	1256	Xanthorrhoea preissii (Grass tree, Palga)			
806.	6289	Xanthosia huegelii			
807.	25765	Zosterops lateralis (Grey-breasted White-eye, Silvereye)			
808.	36218	Zygodon menziesii			

Conservation Codes T - Rare or likely to become extinct

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

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APPENDIX 3

Conservation Codes

Conservation Codes for Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. Conservation codes have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018*.

T Threatened species – Schedules 1-4

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

- **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.
- **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

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 as detailed below.

CR Critically endangered species

Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

Vulnerable species

VU

Threatened species considered to be "facing a high risk of extinction in the wild in the mediumterm future, as determined in accordance with criteria set out in the ministerial guidelines".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife*

Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

EX Presumed extinct species

Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation* (Specially Protected Fauna) Notice 2018.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority 4: Rare, Near Threatened and other species in need of monitoring

- (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.
- (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
- (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Western Australian Ecological Communities

Threatened Ecological Communities

The BC Act provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and 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. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally \leq 5 occurrences or a total area of \leq 100ha).

Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally \leq 10 occurrences or a total area of \leq 200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;
- (iii) munities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

- (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.
- (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Commonwealth of Australia Conservation Codes

Threatened Flora and Fauna

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following six categories:

Extinct

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

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

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a high risk of extinction in the wild.

Conservation dependent

A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

- a) 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; or
- b) the following subparagraphs are satisfied:
 - i. the species is a species of fish;

- ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;
- iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory;
- iv. cessation of the plan of management would adversely affect the conservation status of the species.

The EPBC Act does not provide for listing in a data deficient category. Where sufficient data (evidence) is unavailable to allow assessment by the Threatened Species Scientific Committee against the criteria for listing, the species are found to be ineligible. A recommendation is made to the Minister to not include the species in any category under the EPBC Act. For reasons of transparency and to inform future research, the Threatened Species Scientific Committee publishes the names of those species found to be data deficient. As data deficient is not a listing category under the EPBC Act, this has no statutory implications and the species is not considered to be listed under the EPBC Act.

Threatened Ecological Communities

Threatened Ecological communities under the EPBC Act are listed in three categories.

Critically endangered

If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

APPENDIX 4

Species List

SPECIES LIST – Golden Bay LPA

GYMNOSPERMS

CUPRESSACEAE *Callitris preissii

MONOCOTYLEDONS

ASPARAGACEAE Acanthocarpus preissii *Agave americana Lomandra maritima Thysanotus sparteus

ASPHODELACEAE *Trachyandra divaricata

COLCHICACEAE Wurmbea monantha

CYPERACEAE Isolepis marginata Lepidosperma calcicola Lepidosperma gladiatum Schoenus grandiflorus

HAEMODORACEAE Conostylis candicans

HEMEROCALLIDACEAE Tricoryne tenella

ORCHIDACEAE Caladenia latifolia

POACEAE

*Anthoxanthum odoratum Austrostipa flavescens *Avena fatua *Bromus diandrus *Ehrharta calycina *Ehrharta longiflora *Lagurus ovatus *Lolium perenne Poa porphyroclados RESTIONACEAE Desmocladus flexuosus

DICOTYLEDONS

ANACARDIACEAE *Schinus terebinthifolius

APIACEAE Daucus glochidiatus

APOCYNACEAE Alyxia buxifolia *Gomphocarpus fruticosus

ARALIACEAE Hydrocotyle intertexta Trachymene pilosa

ASTERACEAE Asteridea pulverulenta *Gazania linearis Leptorhynchos scaber Olearia axillaris *Osteospermum ecklonis Pithocarpa cordata Senecio pinnatifolius *Sonchus oleraceus

BRASSICACEAE *Diplotaxis muralis *Heliophila pusilla

CAPRIFOLIACEAE *Centranthus macrosiphon

CARYOPHYLLACEAE *Minuartia mediterranea

CHENOPODIACEAE Rhagodia baccata CONVOLVULACEAE *Cuscuta epithymum CRASSULACEAE *Crassula glomerata

DILLENIACEAE Hibbertia cuneiformis

ERICACEAE Leucopogon parviflorus

EUPHORBIACEAE *Euphorbia terracina

FABACEAE Acacia cochlearis Acacia rostellifera Acacia saligna Gompholobium tomentosum Hardenbergia comptoniana Jacksonia furcellata

GERANIACEAE *Pelargonium capitatum

GOODENIACEAE Scaevola thesioides

LAMIACEAE Hemiandra pungens

LAURACEAE Cassytha flava Cassytha racemosa

LOBELIACEAE Lobelia tenuior

MONTIACEAE Calandrinia brevipedata Calandrinia liniflora

MYRTACEAE *Chamelaucium uncinatum Melaleuca systena ONAGRACEAE *Oenothera drummondii

OROBANCHACEAE *Bellardia trixago *Bellardia viscosa *Orobanche minor *Parentucellia latifolia

OXALIDACEAE *Oxalis pes-caprae

PAPAVERACEAE *Fumaria capreolata

PHYLLANTHACEAE Phyllanthus calycinus Poranthera microphylla

PRIMULACEAE *Lysimachia arvensis

PROTEACEAE Hakea prostrata

RANUNCULACEAE Clematis linearifolia

RHAMNACEAE Cryptandra mutila Trymalium ledifolium Spyridium globulosum

RUBIACEAE Opercularia vaginata

RUTACEAE Diplolaena dampieri

SANTALACEAE Exocarpos sparteus Santalum acuminatum SCROPHULARIACEAE *Dischisma arenarium Eremophila glabra

SOLANACEAE *Solanum nigrum

TROPAEOLACEAE *Tropaeolum majus

URTICACEAE Parietaria debilis

APPENDIX 5

Quadrat Data

50 383848 E 6411647 N

Vegetation:	Acacia rostellifera/Melaleuca systena/Acacia lasiocarp	<i>a</i> Open Low
	Heath	A
Condition:	Very Good	
Soil Type:	Light brown sand	
Landform:	Steeply sloping down to the north-east	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	20
Melaleuca systena	1	15
Austrostipa flavescens	1.1	2
Spyridium globulosum	0.8	1
Acacia lasiocarpa	0.5	10
Cryptandra mutila	0.5	1
*Bromus diandrus	0.4	10
*Euphorbia terracina	0.4	2
*Lagurus ovatus	0.4	1
*Lolium perenne	0.4	1
Phyllanthus calycinus	0.4	<1
*Pelargonium capitatum	0.4	<1
Asteridea pulverulenta	0.4	<1
Acanthocarpus preissii	0.3	5
Lomandra maritima	0.3	2
Conostylis candicans	0.3	1
Senecio pinnatifolius	0.3	1
Scaevola thesioides	0.3	1

SPECIES	HEIGHT (m)	COVER (%)	
Leptorhynchos scaber	0.3	<1	
Lobelia tenuior	0.3	<1	
*Diplotaxis muralis	0.3	<1	
*Lysimachia arvensis	0.2	1	
*Sonchus oleraceus	0.2	<1	
*Bellardia trixago	0.2	<1	
Desmocladus flexuosus	0.1	1	
Calandrinia liniflora	0.1	<1	
Calandrinia brevipedata	0.1	<1	
Trachymene pilosa	<0.1	1	
Parietaria debilis	<0.1	<1	
*Crassula glomerata	<0.1	<1	
Isolepis marginata	<0.1	<1	
Cassytha flava	Climber	2	

50 383770 E 6411530 N

Vegetation:	Acacia rostellifera/Spyridium globulosum/Diplolaena dampieri	
	Closed Heath over Lepidosperma gladiatum Sedgeland	
Condition:	Very Good	
Soil Type:	Light brown sand	
Landform:	Steeply sloping down to the south	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1.8	40
Spyridium globulosum	1.8	30
Santalum acuminatum	1.1	2
Lepidosperma gladiatum	0.8	5
Senecio pinnatifolius	0.8	<1
Diplolaena dampieri	0.6	20
Austrostipa flavescens	0.6	<1
Acanthocarpus preissii	0.4	5
Rhagodia baccata	0.4	2
*Bromus diandrus	0.4	1
*Lolium perenne	0.3	2
Lomandra maritima	0.3	1
*Lagurus ovatus	0.3	1
Conostylis candicans	0.3	<1
*Sonchus oleraceus	0.3	<1
Daucus glochidiatus	0.2	10
Parietaria debilis	0.2	<1

HEIGHT (m)	COVER (%)
0.1	1
Climber	2
	0.1

50 383692 E 6411552 N

Vegetation:	Spyridium globulosum/Acacia rostellifera Open Heath	over weeds
Condition:	Degraded	
Soil Type:	Dark brown-black sand	
Landform:	Depression between dunes	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



Quadrat (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Spyridium globulosum	1.9	40
Acacia rostellifera	1.5	5
Austrostipa flavescens	0.7	2
*Bromus diandrus	0.4	50
*Lolium perenne	0.4	20
Melaleuca systena	0.4	1
Diplolaena dampieri	0.4	1
Acanthocarpus preissii	0.4	1
Olearia axillaris	0.4	<1
Rhagodia baccata	0.3	1
Senecio pinnatifolius	0.3	1
Parietaria debilis	0.3	1
Lobelia tenuior	0.3	<1
*Sonchus oleraceus	0.3	<1
Caladenia latifolia	0.2	<1
Opercularia vaginata	0.2	<1
Daucus glochidiatus	0.1	1
*Dischisma arenarium	0.1	1
Tricoryne tenella	0.1	<1

Calandrinia brevipedata	<0.1	2
Isolepis marginata	<0.1	<1
*Crassula glomerata	<0.1	<1
Hardenbergia comptoniana	Climber	1

50 383693 E 6411284 N

Vegetation:	Acacia rostellifera/Spyridium globulosum Open Heath o	over weeds
Condition:	Good	
Soil Type:	Cream sand	
Landform:	Upper slope of low dune	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1.5	60
Santalum acuminatum	1	1
*Ehrharta calycina	0.8	<1
Austrostipa flavescens	0.7	1
Poa porphyroclados	0.7	<1
Melaleuca systena	0.6	5
Spyridium globulosum	0.5	2
*Bromus diandrus	0.4	40
*Lolium perenne	0.4	20
Opercularia vaginata	0.4	10
Conostylis candicans	0.4	<1
Parietaria debilis	0.3	5
Phyllanthus calycinus	0.4	<1
Caladenia latifolia	0.4	<1
*Lagurus ovatus	0.3	<1
*Trachyandra divaricata	0.3	<1
Daucus glochidiatus	0.2	<1
*Sonchus oleraceus	0.2	<1
*Bellardia viscosa	0.2	<1

SPECIES	HEIGHT (m)	COVER (%)
Hydrocotyle intertexta	0.1	1
*Cerastium glomeratum	0.1	<1
*Crassula glomerata	<0.1	1
Isolepis marginata	<0.1	<1
Calandrinia liniflora	<0.1	<1
*Dischisma arenarium	<0.1	<1
Cassytha racemosa	Climber	10
Hardenbergia comptoniana	Climber	<1

50 383673 E 6411225 N

Santalum acuminatum/Melaleuca systena/Acacia lasiocarpa/	
Lomandra maritima Open Low Heath	
Very Good	
Brown sand, some surface limestone	
Lower slope of tall dune	
16.10.20	
Paul van der Moezel	
	Lomandra maritima Open Low Heath Very Good Brown sand, some surface limestone Lower slope of tall dune 16.10.20



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Santalum acuminatum	0.8	10
Austrostipa flavescens	0.8	1
*Ehrharta longiflora	0.7	<1
Poa porphyroclados	0.6	<1
Melaleuca systena	0.5	30
Trymalium ledifolium	0.5	5
Hakea prostrata	0.5	2
Acanthocarpus preissii	0.4	10
Acacia lasiocarpa	0.4	5
Gompholobium tomentosum	0.4	4
Senecio pinnatifolius	0.4	<1
*Diplotaxis muralis	0.4	<1
Schoenus grandiflorus	0.4	<1
Lomandra maritima	0.3	30
Opercularia vaginata	0.3	2
*Lolium perenne	0.3	1
Thysanotus sparteus	0.3	<1
Lobelia tenuior	0.3	<1

SPECIES	HEIGHT (m)	COVER (%)
*Pelargonium capitatum	0.3	<1
Conostylis candicans	0.2	1
*Heliophila pusilla	0.2	1
*Lagurus ovatus	0.2	<1
Lepidosperma calcicola	0.2	<1
Desmocladus flexuosus	0.1	10
Spyridium globulosum	0.1	<1
Calandrinia liniflora	0.1	<1
Scaevola thesioides	0.1	<1
*Sonchus oleraceus	0.1	<1
*Minuartia mediterranea	<0.1	4
Poranthera microphylla	<0.1	<1
*Crassula glomerata	<0.1	<1
Cassytha racemosa	Climber	<1
Hardenbergia comptoniana	Climber	<1
Clematis linearifolia	Climber	<1
* introduced encotes		

50 384026 E 6411054 N

Vegetation :	Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low	
	Heath	
Condition:	Very Good	
Soil Type:	Light brown sand	
Landform:	Mid-slope, sloping down to the north-west	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	20
Austrostipa flavescens	0.6	1
*Avena fatua	0.6	<1
*Bromus diandrus	0.5	<1
Thysanotus sparteus	0.5	<1
Lomandra maritima	0.4	30
Acacia lasiocarpa	0.4	10
Melaleuca systena	0.4	5
*Lolium perenne	0.4	5
Trymalium ledifolium	0.4	5
*Anthoxanthum odoratum	0.4	2
Gompholobium tomentosum	0.4	<1
Phyllanthus calycinus	0.4	<1
Poa porphyroclados	0.4	<1
Acanthocarpus preissii	0.3	10
Lepidosperma calcicola	0.3	2
Cryptandra mutila	0.3	1

SPECIES	HEIGHT (m)	COVER (%)	
Scaevola thesioides	0.3	<1	
Senecio pinnatifolius	0.3	<1	
Conostylis candicans	0.3	<1	
*Sonchus oleraceus	0.3	<1	
*Pelargonium capitatum	0.3	<1	
Desmocladus flexuosus	0.2	1	
Lobelia tenuior	0.2	<1	
Hydrocotyle intertexta	0.2	<1	
Leptorhynchos scaber	0.2	<1	
Wurmbea monantha	0.2	<1	
*Heliophila pusilla	0.2	<1	
Tricoryne tenella	0.1	<1	
*Lysimachia arvensis	0.1	<1	
Poranthera microphylla			
*Minuartia mediterranea	0.1	<1	
Trachymene pilosa	<0.1	1	
Cassytha flava	Climber	5	
Hardenbergia comptoniana	Climber	<1	

50 383752 E 6411036 N

Vegetation :	Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa Open Low	
	Heath	
Condition:	Very Good	
Soil Type:	Grey sand	
Landform:	Upper slope of tall dune	
Date:	16.10.20	
Recorder:	Paul van der Moezel	



QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Acacia rostellifera	1	15
Olearia axillaris	0.8	1
Austrostipa flavescens	0.7	1
Poa porphyroclados	0.6	<1
Rhagodia baccata	0.5	2
Lomandra maritima	0.4	20
*Bromus diandrus	0.4	10
Acacia lasiocarpa	0.4	5
Melaleuca systena	0.4	5
Spyridium globulosum	0.4	<1
Acanthocarpus preissii	0.3	20
Opercularia vaginata	0.3	10
*Lolium perenne	0.3	5
Conostylis candicans	0.3	2
Thysanotus sparteus	0.3	<1
Parietaria debilis	0.3	<1
Scaevola thesioides	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
Senecio pinnatifolius	0.3	<1
Desmocladus flexuosus	0.1	1
Hemiandra pungens	0.1	1
*Pelargonium capitatum	0.1	<1
Lepidosperma calcicola	0.1	<1
Calandrinia liniflora	0.1	<1
*Sonchus oleraceus	0.1	<1
Poranthera microphylla	<0.1	<1
Trachymene pilosa	<0.1	<1
*Crassula glomerata	<0.1	<1
Clematis linearifolia	Climber	5
Hardenbergia comptoniana	Climber	1

50 383791 E 6411017 N

Vegetation:	Acacia rostellifera/Spyridium globulosum Closed Heath
Condition:	Good
Soil Type:	Grey sand
Landform:	Mid-slope, steeply sloping down to the south
Date:	16.10.20
Recorder:	Paul van der Moezel

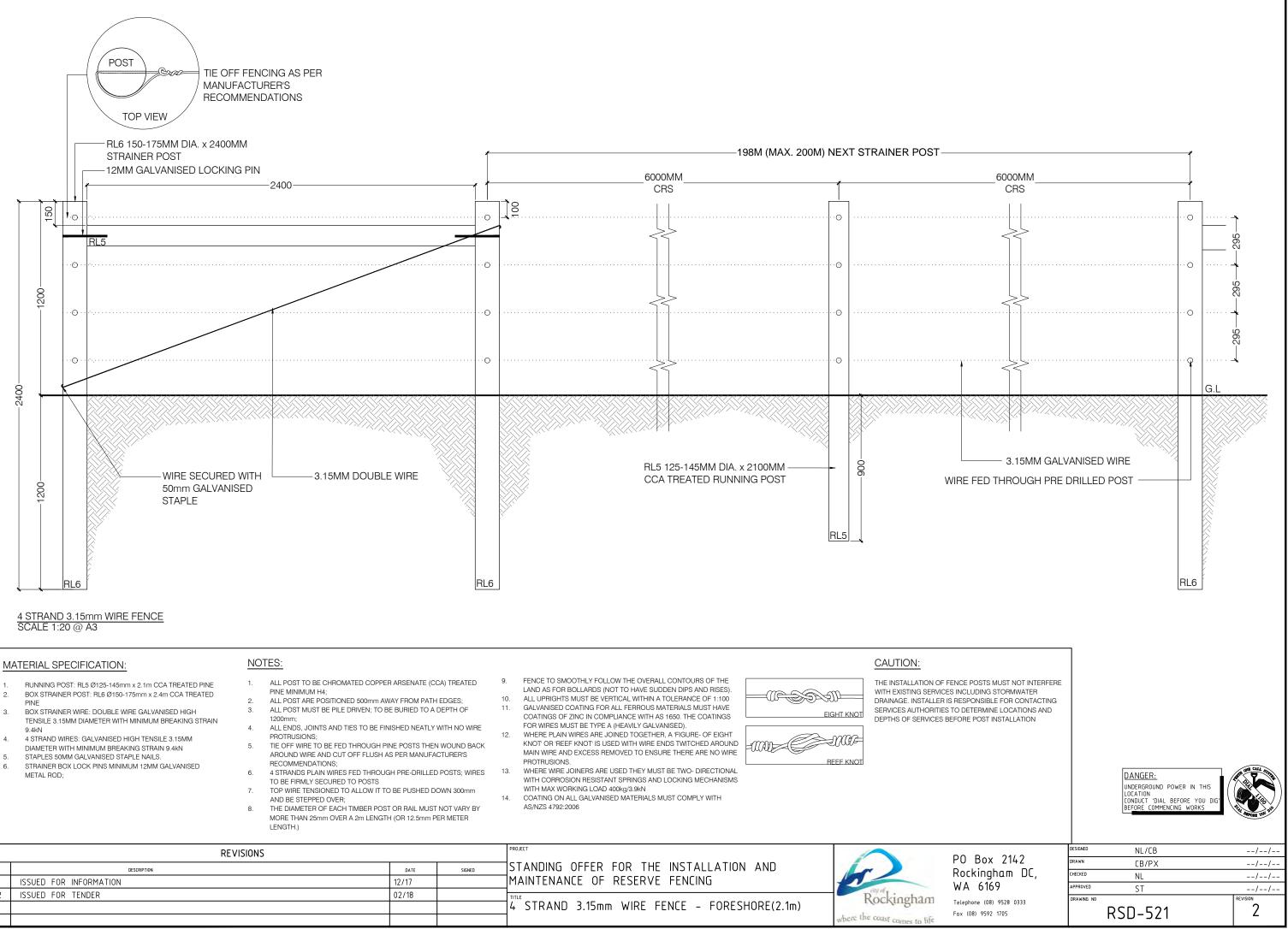


	SPECIES	HEIGHT (m)	COVER (%)
	Acacia rostellifera	1.8	70
	Olearia axillaris	1	10
	Spyridium globulosum	0.6	10
	Austrostipa flavescens	0.6	1
	Rhagodia baccata	0.5	5
	*Lolium perenne	0.5	2
	Poa porphyroclados	0.5	<1
	Scaevola thesioides	0.5	<1
	*Bromus diandrus	0.4	20
	Melaleuca systena	0.4	2
	Trymalium ledifolium	0.4	1
	Acanthocarpus preissii	0.4	1
	*Pelargonium capitatum	0.4	1
	Parietaria debilis	0.3	2
	*Centranthus macrosiphon	0.3	2
	Conostylis candicans	0.3	1
	*Sonchus oleraceus	0.3	<1
	*Lagurus ovatus	0.3	<1
	Daucus glochidiatus	0.2	2

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
*Heliophila pusilla	0.2	2
*Dischisma arenarium	0.1	1
*Bellardia viscosa	0.1	<1
Clematis linearifolia	Climber	10
Hardenbergia comptoniana	Climber	1

APPENDIX 6



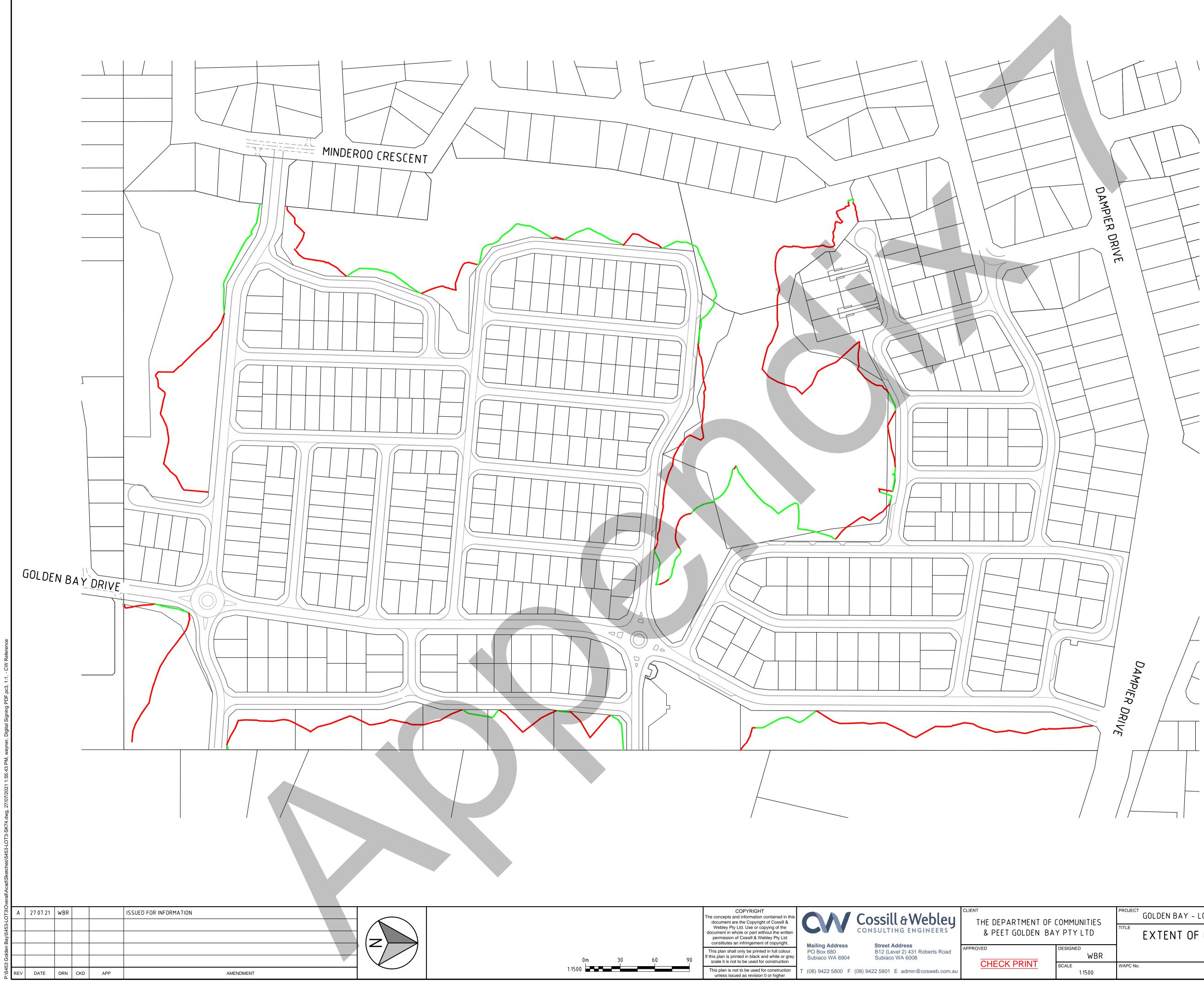
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REVISIONS			PROJECT	\wedge	PO	
	DESCRIPTION	DATE		STANDING OFFER FOR THE INSTALLATION AND	La)	Ro
	ISSUED FOR INFORMATION	12/17		MAINTENANCE OF RESERVE FENCING	1	W/
!	ISSUED FOR TENDER	02/18		TITLE	Rockingham	
				4 STRAND 3.15mm WIRE FENCE - FORESHORE(2.1m)	itocituigitain	Telej Fax
					where the coast comes to life	Fux

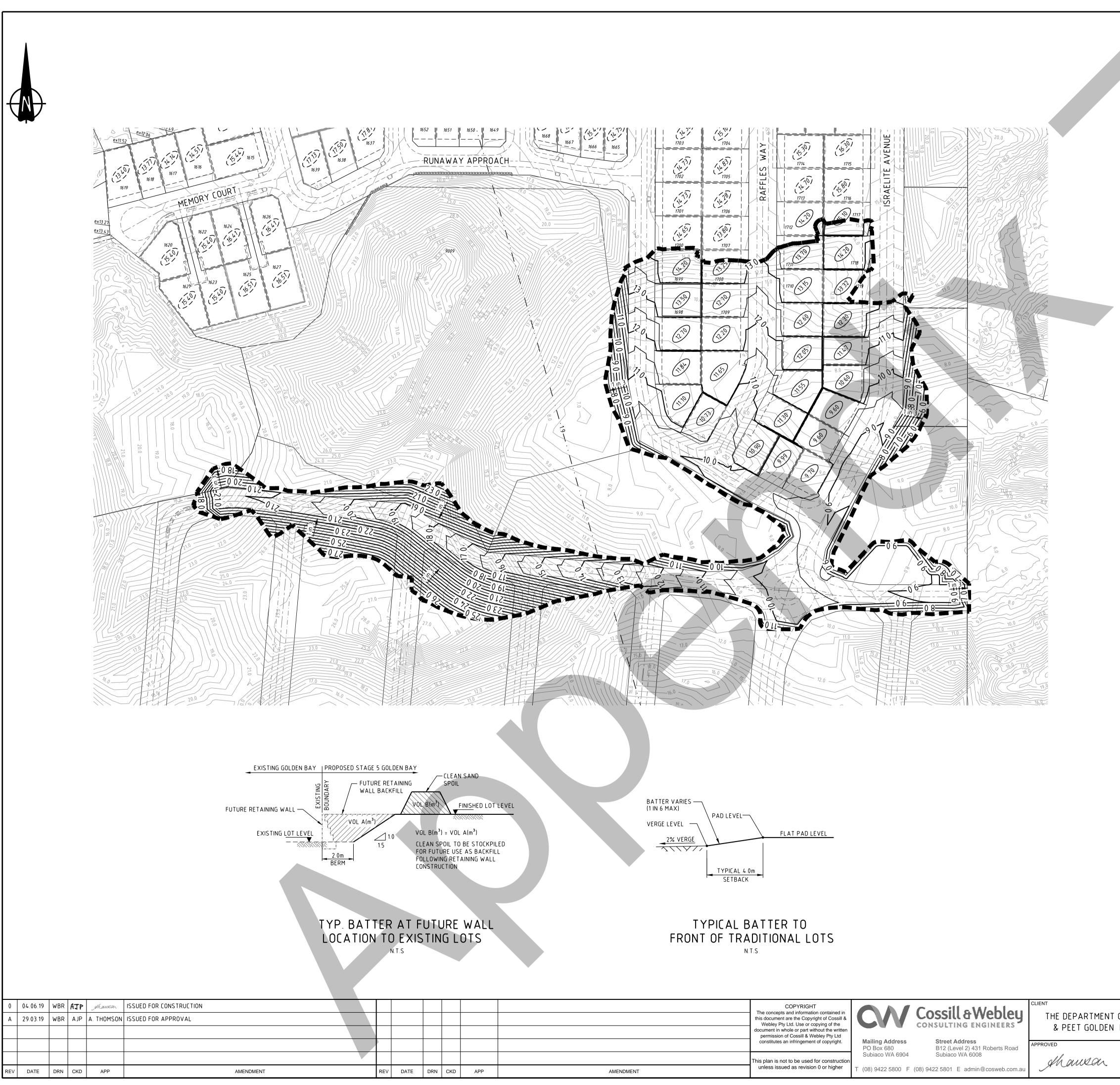
APPENDIX 7



MUNITIES	GOLDEN BAY - LOT 3	~
TY LTD	EXTENT OF CUT AND FILL BATTERS	A ^L
wBR		RIGIN/ SIZE
E 1:1500	WAPC NO. DRAWING NO. 5453-LOT3-SK74 A	ō

LEGEND

BATTER IN CUT BATTER IN FILL

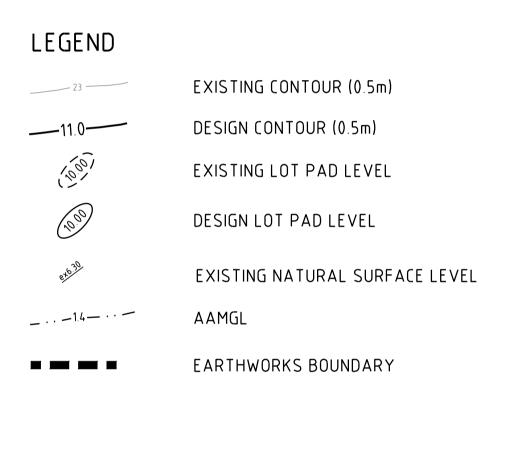


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	constitutes an infringement of copyright.	constitutes an infringement of copyright. Mailing Address PO Box 680	Street Address B12 (Level 2) 431 Roberts Road	APPROVED	DESIGNE
	This plan is not to be used for construction	Subiaco WA 6904	Subiaco WA 6008	Shausa	SCALE
AMENDMENT	unless issued as revision 0 or higher	T (08) 9422 5800 F	(08) 9422 5801 E admin@cosweb.com.au	Arconcerc	

GENERAL NOTES

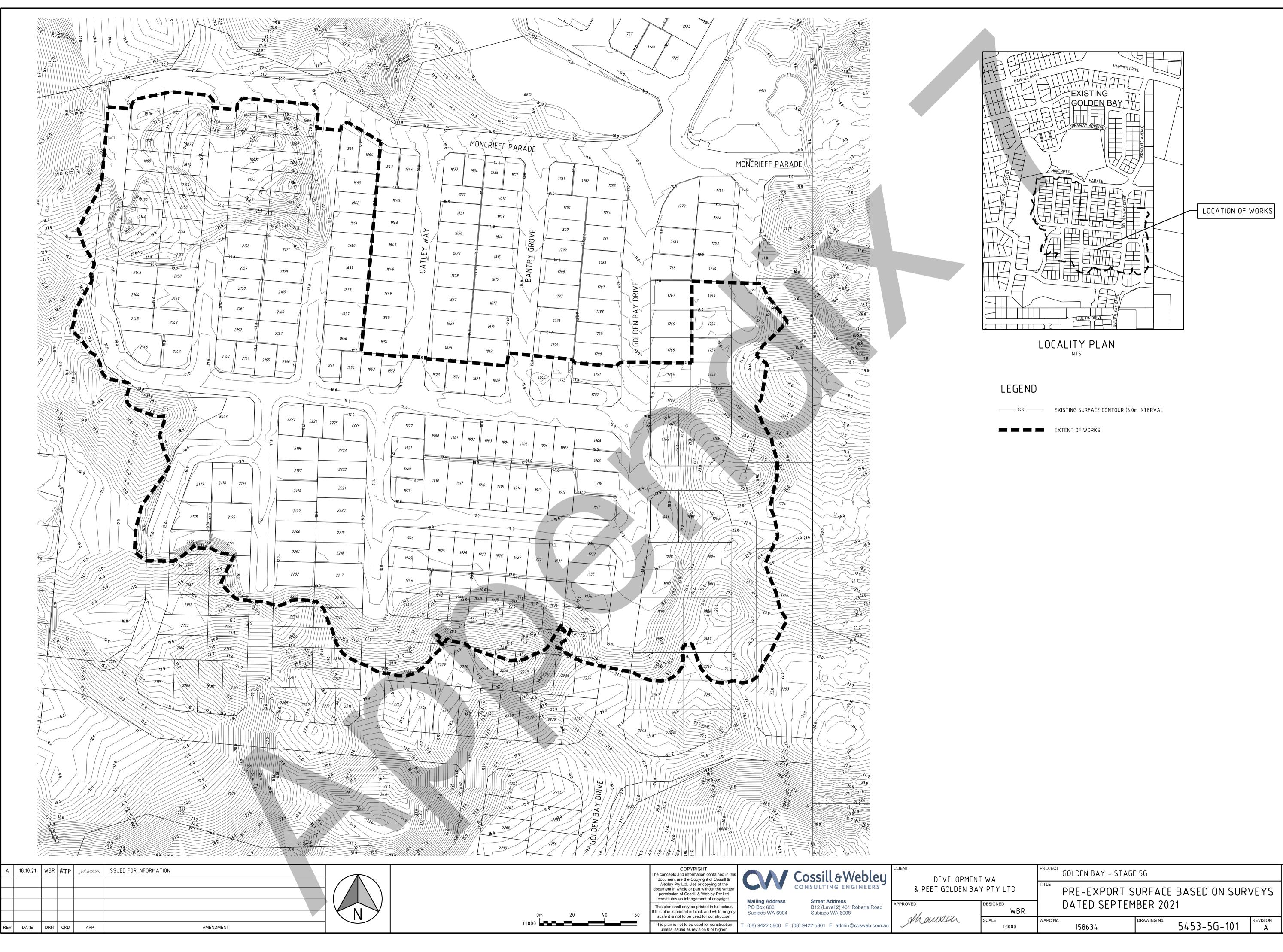
1. ALL LEVELS IN METRES TO AHD. EXISTING SURVEY BY MNG.

- 2. BATTERS TO EXISTING SURFACE AT 1:3 (CUT) 1:3 (FILL) UNLESS NOTED OTHERWISE.
- 3. BATTER POSITION FOR FUTURE WALLS TO ENSURE CUT TO FILL EARTHWORKS BALANCE.
- 4. ALL UNSUITABLE MATERIAL TO BE REMOVED BY THE CONTRACTOR TO APPROVED TIPPING SITE PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL FEES TO BE PAID BY CONTRACTOR.
- EXTENT OF EARTHWORKS TO BE LIMITED TO THE EARTHWORKS STAGE BOUNDARY UNLESS AGREED WITH THE SUPERINTENDENT.
- 6. ALL CLEARED MATERIAL TO BE MULCHED AND STOCKPILED ON SITE WHERE INDICATED.
- 7. CONTRACTOR TO LOCATE ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS ON SITE.
- 8. CONTRACTOR TO GRADE EVENLY BETWEEN DESIGN CONTOURS AND MATCH INTO EXISTING SURFACE AT LIMIT OF EARTHWORKS BOUNDARY WHERE APPROPRIATE.
- 9. EXCESS CUT FROM EARTHWORKS SHALL BE PLACED ON SITE AS DIRECTED BY THE SUPERINTENDENT.
- 10. WHERE LIMESTONE IS WITHIN 600mm OF THE FINAL SURFACE LEVEL THE CONTRACTOR SHALL TREAT THE SITE IN ACCORDANCE WITH THE SPECIFICATION.
- 11. DESIGN LEVELS SHOWN SHALL BE ON THE FINISHED SURFACE INCLUDING TOPSOIL WHERE SPECIFIED.
- 12. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND PERSONELL TO THE MINIMUM AREA NECESSARY AND PROTECT ALL VEGETATION AND EXISTING SERVICES ON SITE.



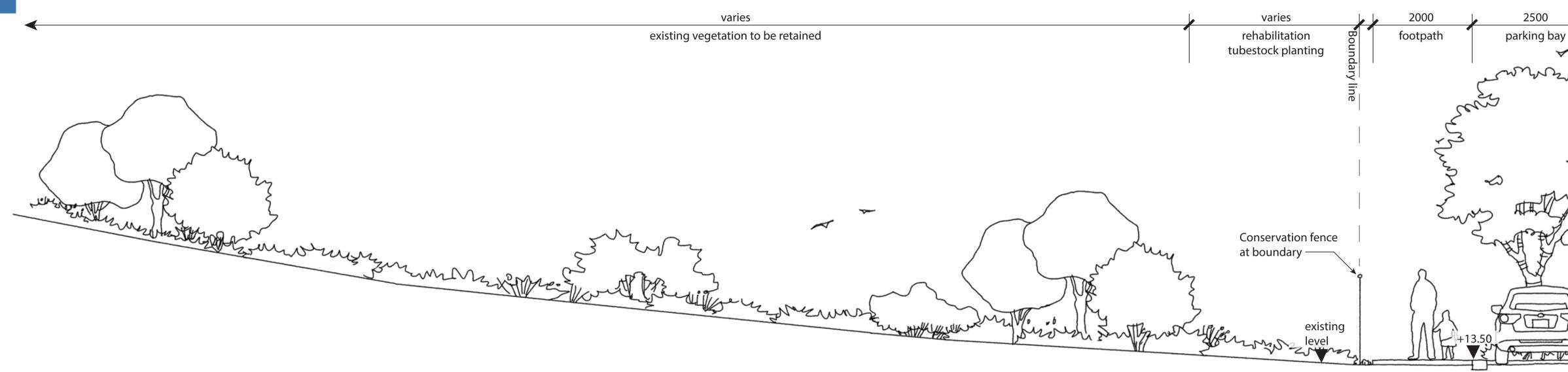


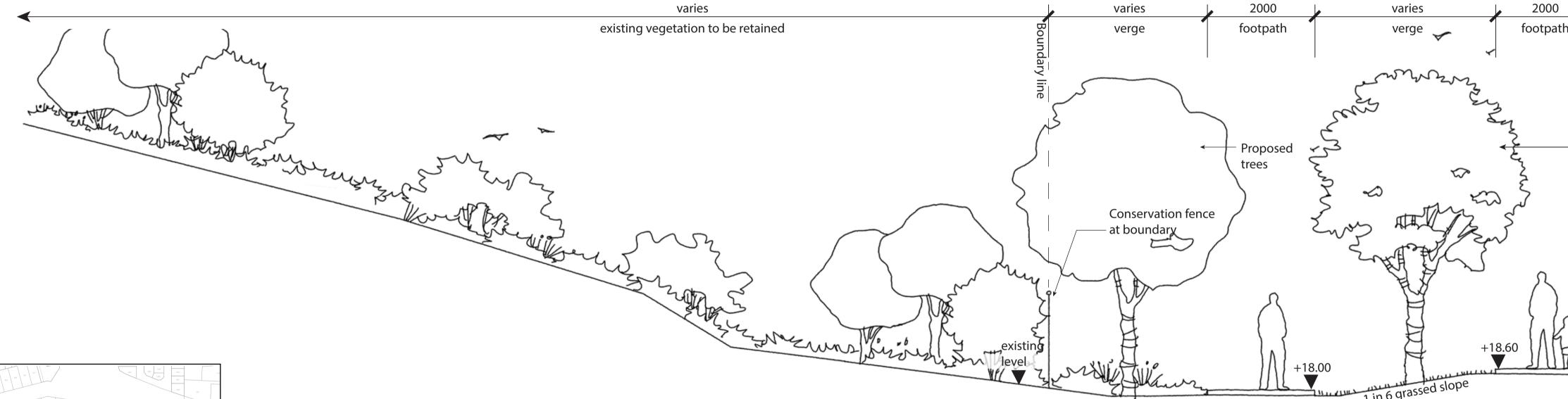
	ARNING TO CONTRACTOR	
1.	IT IS THE CONTRACTORS RESPONSIBILITY TO INVESTIGATE THE	
	NATURE AND LOCATION OF ALL SERVICES WHICH MAY BE ENCOUNTERED AND TO CONSULT WITH THE RELEVANT SERVICE	
	AUTHORITIES PRIOR TO COMMENCEMENT OF EXCAVATIONS.	
	FAILURE TO DO SO OR TO TAKE DUE CARE SHALL NOT LIMIT THE	
	CONTRACTORS LIABILITY FOR REPAIR OF ALL SERVICES DAMAGED	
	BY HIM. DURING CONSTRUCTION WORKS THE CONTRACTOR SHALL	
	TAKE ALL PRECAUTIONS NECESSARY FOR THE PROTECTION OF ALL	
	EXISTING SERVICES.	
2.	THE SITE IS IDENTIFIED AS POTENTIALLY HAVING UNEXPLODED	
ζ.	ORDNANCE. (NO EXCAVATION OR OTHER DISTURBANCE TO THE SOIL	
	ON THIS SITE SHOULD BE CARRIED OUT WITHOUT FIRST OBTAINING	
	CLEARANCE FROM THE UNEXPLODED ORDNANCE BRANCH OF THE	
	W.A. POLICE DEPARTMENT)	
L		
	0m 20 40	60m
	1:1000	
	GOLDEN BAY - STAGE 5C	
NITIES	TITLE	\neg
TD	BULK EARTHWORKS PLAN	
	STAGE 5C	RIGINA SIZE
WBR	WAPC No. DRAWING No. REVIS	
000		0

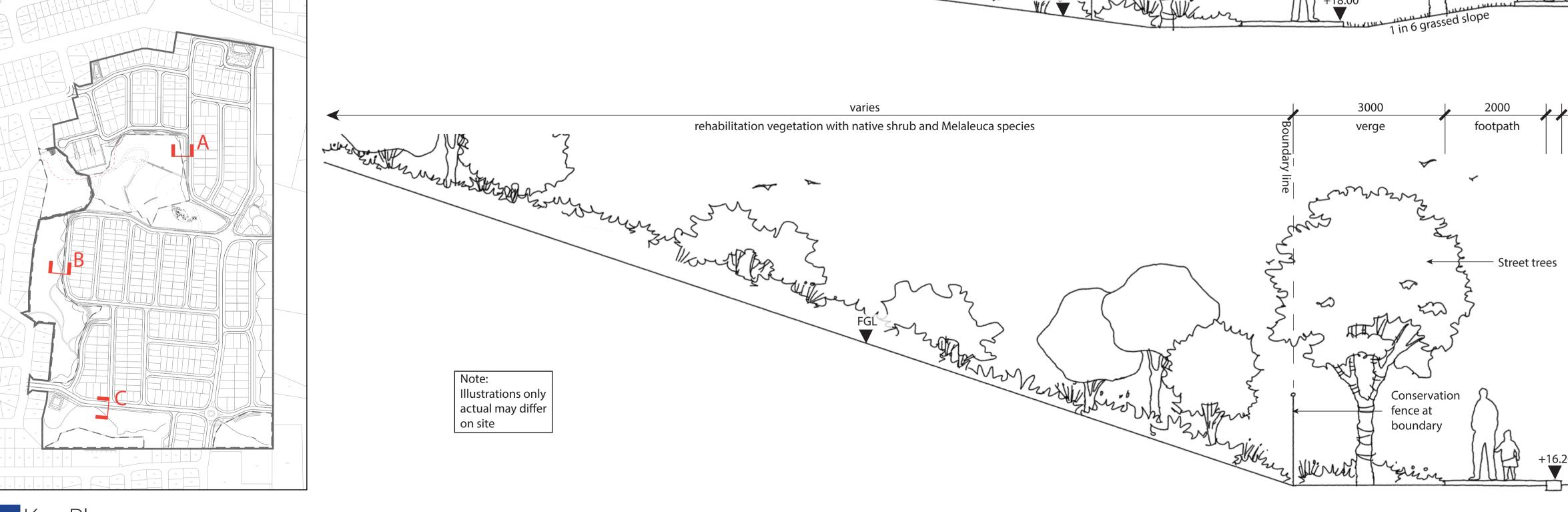


7	GOLDEN BAY - STAGE 5G			~
YLTD	PRE-EXPORT SURFACE BASED ON SURVEYS			A [⊥]
GNED WBR	DATED SEPTEMBER 2021			RIGIN ^A SIZE
E 1:1000	WAPC NO. 158634	DRAWING NO. 5453-5G-101	REVISION A	Ö

APPENDIX 8







Key Plan

GOLDEN BAY

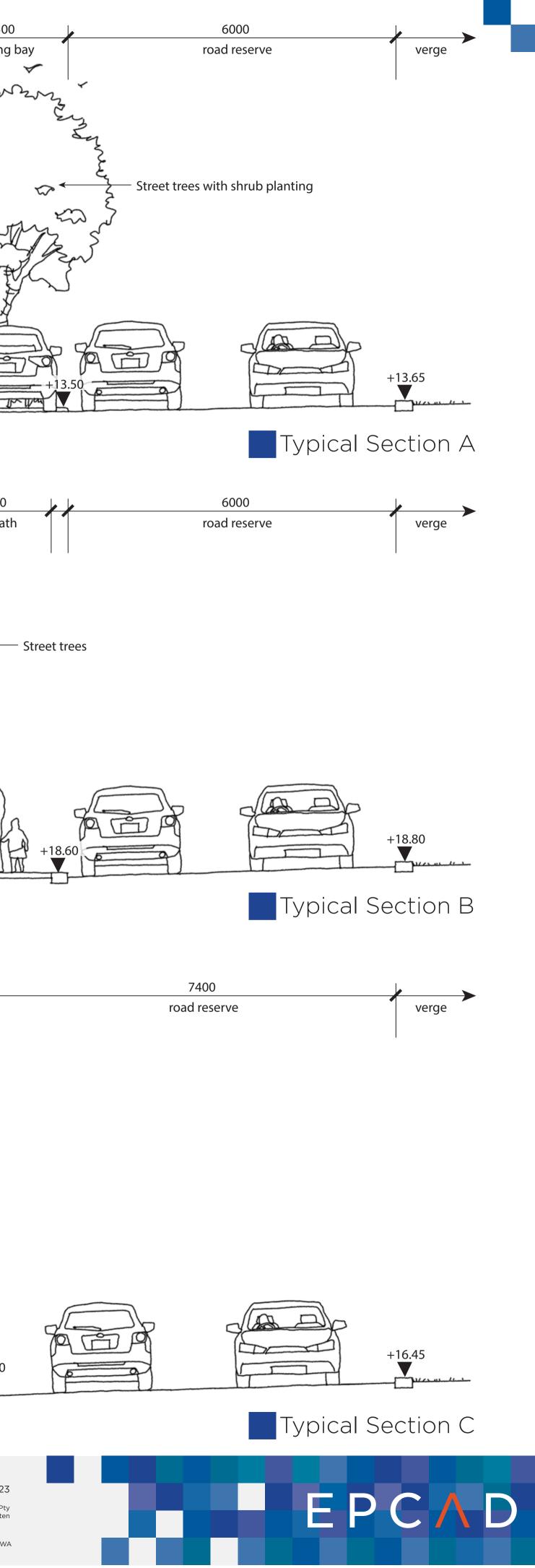
Stage 5: Typical sections - Sheet 001

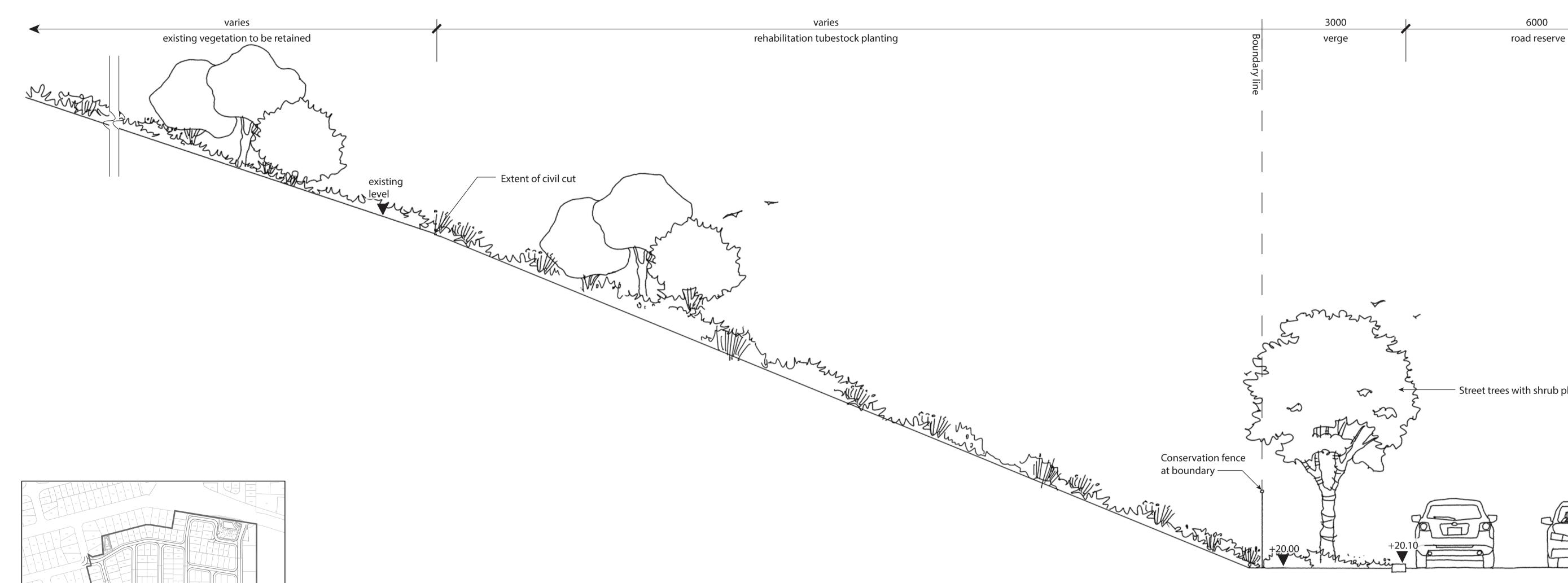
Version 15

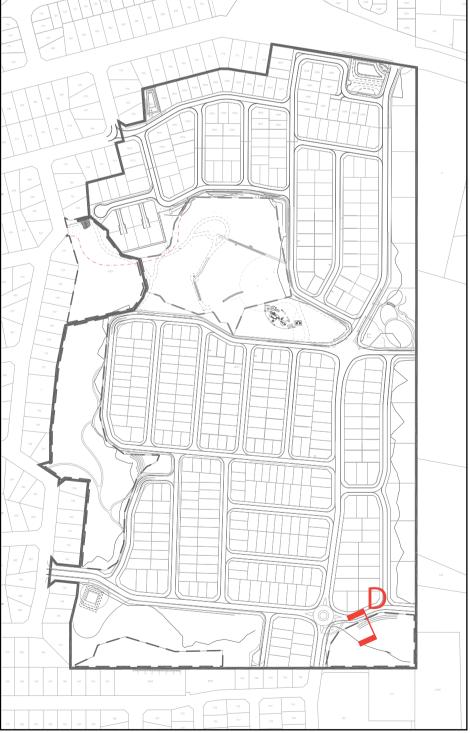


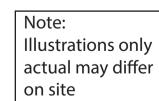
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SCALE 1:50					
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Key Plan



Stage 5: Typical sections - Sheet 002

Version 15



date : scale : 1 : 50 @ A1

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Typical Section D

+19.90

Street trees with shrub planting

verge