GOLDEN BAY

MINISTERIAL IMPLEMENTATION STATEMENT NO. 297 COMPLIANCE ASSESSMENT REPORT YEAR 2020

Prepared for:	Peet Golden Bay Pty Ltd/Department of Communities
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pgv ENVIRONMENTAL

CONTENTS

LIST OF ATTACHMENTS

Tables

Plates

Figures

Appendix

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 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 and Lot 3 Dampier Drive, 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 800m 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 OEPA (now DWER) on 1 August 2016.

1.4 Environmental Approval to Implement the Project

The proposal to develop the site was assessed through a Section 38 Public Environmental Review (PER) assessment process under the WA *Environmental Protection Act 1986* (EP Act). The project was approved through Ministerial Statement 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 report was due before clearing activities commenced and the second one year after the clearing had commenced. Thereafter the submission of compliance reports 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 ninth Compliance Assessment Report (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); and
- 30 August 2021(Report Period 2020).

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 MS297 and MS297 Audit Table. This CAR covers the period between January 2020 to December 2020.

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 Dampier Drive (Figure 3). The following tasks have been undertaken to date:

- Phase 1 works have been completed in the Foreshore Reserve in accordance with the 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 commenced in the southern portion of the foreshore reserve adjacent to the existing Golden Bay;
- 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 the Addendum 1 of the Foreshore Management Plan. A Regulation 10 was approved by the Department of Planning, Lands and Heritage for these works;
- Earthworks adjacent and in the landscape protection area have commenced to tie in the development levels and attain the maximum grades allowed by the City of Rockingham;
- 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 City of Rockingham. The masterplan will be incorporated into the Landscape Management Plan which is under revision; and
- Lot 3 Stage 5 earthworks have continued.

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 July 2021 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 *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 MS297 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	C	
297:M2-2	Seek approval for modifications to the Proposal	C	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 (*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.	CLD	4 June 1993
297:M3--2	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 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 (*Isoodon 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 (*Isoodon obesulus*) 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 (*Isoodon obesulus*) 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.	C	Proponents are DoC 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	Prepare a periodic 'Progress and Compliance Report' to help verify the environmental performance of this project.	C	OEPA has requested (Appendix 2) that from August 2016 compliance reports are to be submitted annually by 30 August for the previous calendar year.
297:P1	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 would normally be required by DPUD.	CLD	26 October 1995 Not Audited (duplicated by condition M3-1) – Audit Branch
297:P2	Prepare a Management Plan for the coastal reserve at Golden Bay.	CLD	Golden Bay Foreshore Management Plan approved by the OEPA on 30 March 2012 (on advice from DoP 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 City of Rockingham 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 Department of Water

			and the City of Rockingham. Urban Water Management Plans 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 bandicoots if required by CALM.	CLD	13 December 1995

5.4 Compliance with Management Plans

Commitment 2 of the Ministerial Statement required that a management plan be prepared for the foreshore reserve on advice from the Department of Planning and the City of Rockingham.

The Golden Bay Foreshore Management Plan was prepared in consultation with the Department of Planning and the City of Rockingham 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 Public Environmental Review.

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 seven years by Terrestrial Ecosystems. The monitoring reports for 2020 are provided at Appendix 6 and summarised below

Autumn Survey

The autumn survey caught thirty-one (31) individual Quenda (18 females and 13 Males). Six of the females had pouch young.

All caught Quenda appeared healthy. Of the thirty-one Quenda caught, nine were caught for the first time during this monitoring program and did not have a microchip, and five Quenda with microchips had been relocated from other trapping and relocation sites managed by Terrestrial Ecosystems. The remaining Quenda, except for one microchipped individual, had been caught during either the autumn or spring 2019 foreshore monitoring surveys. there was no evidence of Sarcoptic Mange in the Quenda population during the autumn survey, although a couple of adult males had scarring on the dorsal survey that may have been the result of fighting among males.

In addition to the Quenda, two cats (*Felis catus*), eight house mice (*Mus musculus*), two rats (*Rattus rattus)*, two white-browed scrubwren (*Sericornis frontalis*), seven silvereyes (*Zosterops lateralis*), two splendid wrens (*Malurus splendens*) and 13 bobtails (*Tiliqua rugosa*) were caught. Both cats had no collar, identification tags, microchips or ear tattoos.

Western Grey Kangaroos were observed on most 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, 2020a).

Spring Survey

The spring survey caught forty-four (44) individual Quenda (24 females and 19 males). Eleven of the females had pouch young.

Most caught Quenda appeared healthy. Of the 44 Quenda caught, 22 were caught for the first time during this monitoring program and did not have a microchip, and two Quenda with microchips had been relocated from other trapping and relocation sites managed by Terrestrial Ecosystems. The remaining Quenda had been caught during the autumn 2020 or autumn and spring 2019 monitoring surveys. There were two sick quenda that appeared to have the same illness as the males in spring 2019. Dr Meg Rodgers' (Native Arc veterinarian) confirmed that they were elderly health-compromised males that had over-exerted themselves defending their mates and territories during the breeding season. One male Quenda had what was thought to be Sarcoptic Mange which is caused by the parasitic burrowing mite *Sarcoptes scabiei*.

In addition to the Quenda, 77 bobtails (*Tiliqua rugosa*), 30 rats (*Rattus rattus*), 13 house mice (*Mus musculus*), 7 Dugites (*Pseudonaja affinis*), 4 Silvereyes (*Zosterops lateralis*), 1 Banjo frog (*Limnodynastes dorsalis*), 1 moaning frog (*Heleioporus eyrei),* 1 rabbit (*Oryctolagus cuniculus*) and 1 tiger snake (*Notechis scutatus*) were caught. The majority of the rats were euthanased.

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

Survey Summary

Quenda trapping success was higher than the two previous survey rates of 14.7% and 15.1%, (spring 2019 and autumn 2020 respectively) but lower than earlier surveys (18.6% and 21.6% for spring 2018 and autumn 2019 respectively). The results of this trapping program show an increase in recruitment in this population. The high number of juvenile Quenda indicates that predator control is having a positive effect, as predation by foxes and cats has previously been a major contributor to population decline in the reserve. The removal of two cats in autumn has reduced predation pressure on juveniles and young Quenda and should facilitate the juveniles surviving into adulthood (Terrestrial Ecosystems, 2020b).

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

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

Feral Animal Control

Terrestrial Ecosystems undertook a fox and cat management program in the foreshore reserve over a ten day period in Autumn. Eight Quenda, six rabbits, four *Tiliqua rugosa*, and one *Tiliqua occipitalis* were caught as by-catch. All fauna were released, except the rabbits which were euthanised. Although no cats or foxes were caught the outcomes are positive for the area, as the trapping program suggests there are few or no foxes and feral cats in the foreshore reserve and there are adult Quenda (and reptiles) present.

Rabbit and cat control was undertaken concurrently with the Quenda monitoring program in Spring 2020. RHDV1 K5 was deployed at multiple sites in sliced carrots. It is anticipated that this virus will have spread through the population and there would have been a reduction in the number of rabbits. No cats were trapped in Spring 2020.

Fauna Relocation

All stages of subdivision have included a quenda relocation program prior to any vegetation clearing on Lots 2 and 3.

5.4.3 Groundwater Levels Monitoring

The groundwater levels in the foreshore reserve are monitored each month. The levels for the period July 2012 to December 2020 are provided at Appendix 7.

Plate 3: Groundwater Monitoring Bore (WB02)

5.4.4 Landscape Protection Management Plan

Development on the northern end of Lot 3 Dampier Drive commenced in 2017.

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

The recently approved CDP 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

will inform 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 have commenced as part of subdivisional and landscape works.

6 REFERENCES

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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.

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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 (2020a). *Quenda Monitoring Golden Bay – Autumn 2020. Report prepared for Peet Limited.*

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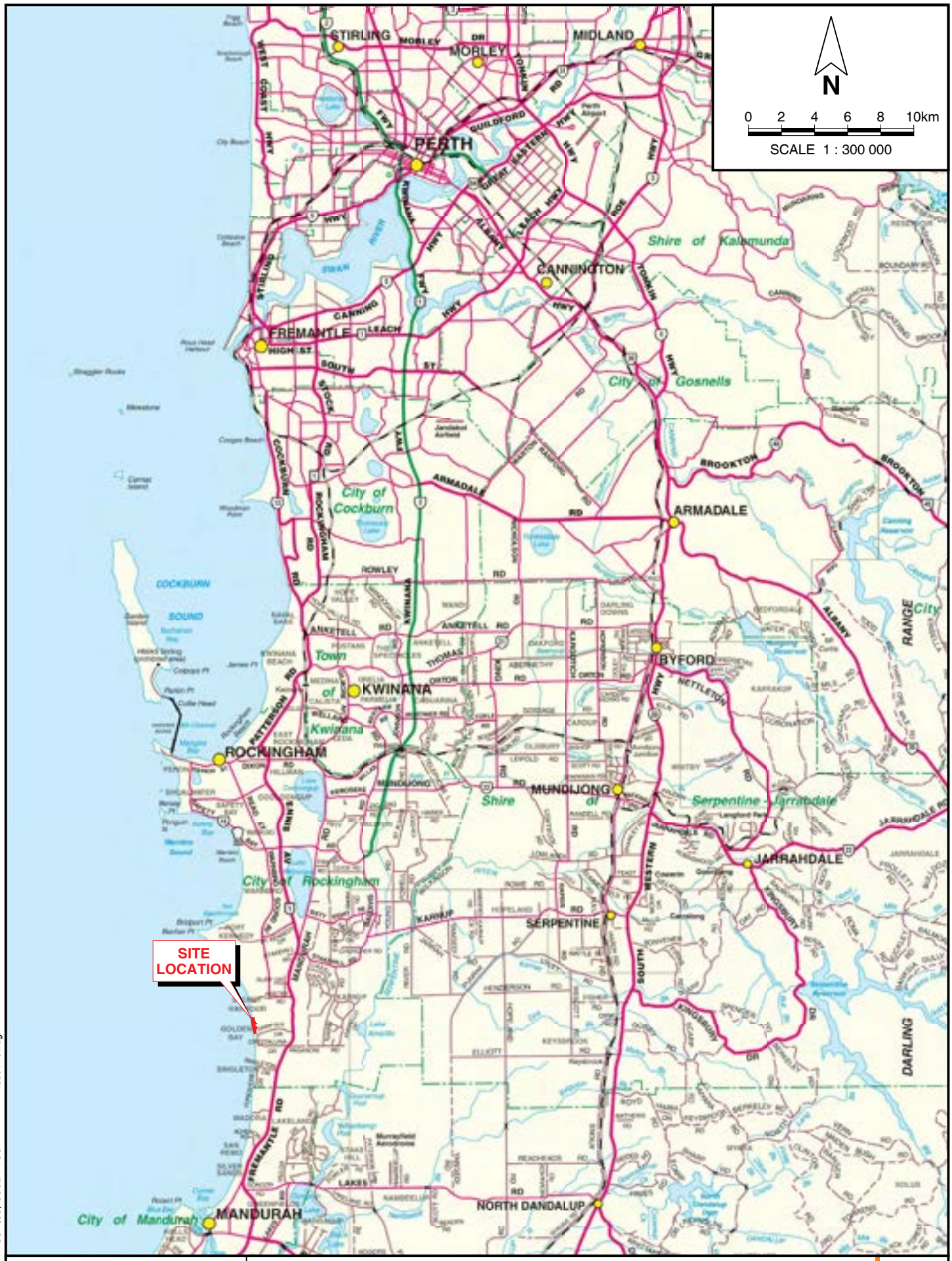
FIGURES



pgv ENVIRONMENTAL

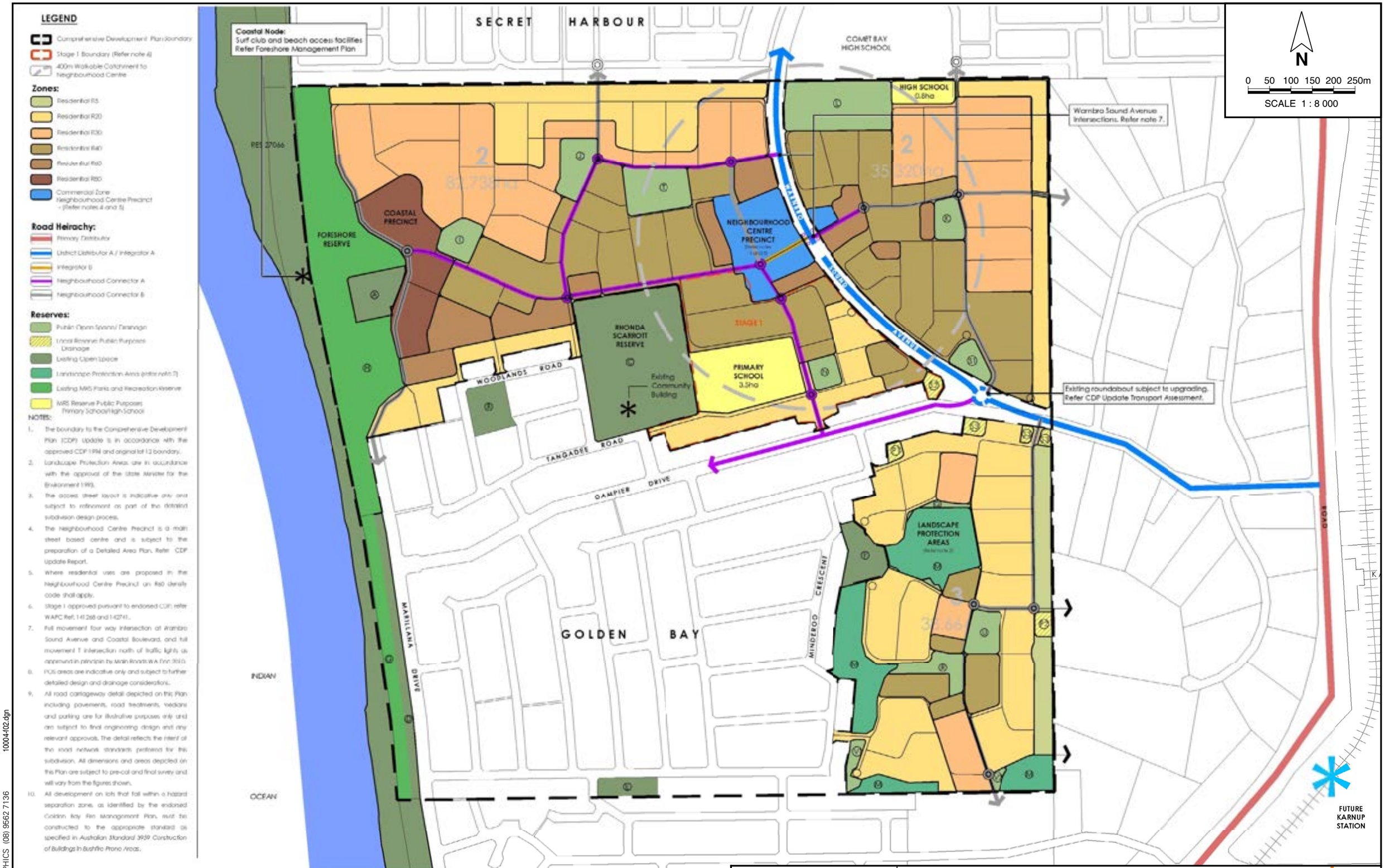
Department of Housing
COMPLIANCE ASSESSMENT REPORT
GOLDEN BAY

Drawn: B. Heath	Date: 10 Aug 2011
Job: 10004	Revision: A

REGIONAL LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 10004-f01.dgn



CHAPPELL LAMBERT EVERETT

SOURCE: Chappell Lambert Everett, Plan No. 2187-29U-01, 28-02-2011.

PINPOINT CARTOGRAPHICS (08) 9562 7136 10004f02.dgn

pgv ENVIRONMENTAL		Department of Housing FCOMPLIANCE ASSESSMENT REPORT GOLDEN BAY
Drawn: B. Heath	Date: 10 Aug 2011	**COMPREHENSIVE DEVELOPMENT PLAN**
Job: 10004	Revision: A	Figure 2

APPENDIX 1

MINISTERIAL STATEMENT 297

Ass # 604
Bull # 648
State # 297

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
12 JAN 1993

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

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

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

3RD HAY 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

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Locked Bag 10, East Perth WA 6892

www.epa.wa.gov.au

Reserve Enquiry Detail [5100L]

Screen Friendly Print Page

Reserve	34664	**Legal Area (ha)**	1.2757
Name		**Status**	Current
Type		**Current Purpose**	PUBLIC RECREATION
Notes			
File Number	3915/62		

Class	Responsible Agency	Date of Last Change
C	DEPARTMENT FOR PLANNING AND INFRASTRUCTURE	23/10/1995

Management Orders	Document	Land Use	Local Government Authority
THE CITY OF ROCKINGHAM		PUBLIC RECREATION	ROCKINGHAM, CITY OF

Add Item	CLT Number	Parcel Identifier	Street Address	Suburb	File Number	PIN	Area (sqm)	Map Viewer
☐	LR3067-211	Lot 2486 On Diagram 28721			3915/1962.	368857	12757.0	

Reserve Number 34664

Previous Certificates of Title		Historic Crown Allotments		
LR3053-222	Cancelled	COCKBURN SOUND	Location	2486

Gaz Page/Document	Date	Type	Text
4852	17/10/1995	Current Area	1.2757
4852	17/10/1995	Public Plan	BG33 (2) 7.13
2593	12/08/1977	Current Vesting	VEST SHIRE OF ROCKINGHAM
1841	17/06/1977	Formerly	FORMERLY PTN COCKBURN SOUND 16 LOT 246-D:28721
1841	17/06/1977	Original Gazettal and page	ORIGINAL GAZETTE
	17/06/1977	Class	C
	17/06/1977	Current Purpose	PUBLIC RECREATION
	17/06/1977	Correspondence File Number	3915/62
	17/06/1977	Historical Area	2.4306
	17/06/1977	Location	COCKBURN SOUND,2486


GEORGE HARBOUR
MARILLANA DR
YAMARNA RD
YERILLA RD
BONDARRA WAY
KINGSCLIFF DR
LYNDON RD
CALGOLI GR
GLENBURGH DR
ARGOONA AV
TAMBREY AV
CARLINDIE PWY
KYARRA LANE
TALGERING WAY
MOOTIBAR RD
MINARA ST
MEDORA LANE
GOLDEN BAY
AUREA BVD
CARDO LANE
NARCOO WAY
ETTRICK WAY
P40711
9015
R 32492
P8277
2264
WOODLANDS RD
PARDOO PL
COOLAWANYAH ST

APPENDIX 3

STATEMENT OF COMPLIANCE AND AUDIT 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 Department of Communities*
Proponent's Australian Company Number *(where relevant)*	94 600325 175 56 167 671 885

2. Statement of Compliance Details

Reporting Period	*1/01/20* to *31/12/20*

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

Audit Table for Statement addressed in this Statement of 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/or procedures of the Statement complied with within the reporting period? (please tick ✓ the appropriate box)			
No (please proceed to Section 3)		Yes (please proceed to Section 4)	✓

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

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 Date _____ ☐ Reported to DWER in writing 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: _____

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: 31 AUGUST 2021

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 6850
Phone:	(08) 6364 7000
Email:	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	C	Implementation of the proposal has been carried out in accordance with the requirements 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'.
Completed	CLD	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.
Not required at this stage	NR	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).

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 Conservation and Land Management (now known as Department of Parks and Wildlife); DPUD = Department of Planning and Urban Development (now Department of Planning)

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	As per attachment to the Minister's statement.	CAR	Overall	EPA DPaW		C	
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	C	No changes proposed
297: M2-2	The Proposal	Seek approval for modifications to the Proposal	Submit a written request to the Minister for Env. Detailing changes to designs, specifications, plans or other technical material.	Correspondence to OEPA	Overall	Minister for Env. EPA	Throughout life of the project	C	No changes proposed
297: M3-1	Foreshore Reserve	Provide a foreshore reserve for conservation and recreation which: 3. Protects the Peelhusrt Wetlands and the Southern Brown Bandicoot (Isoodon obesulus) population; and 4. 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 development	Minister for Env. EPA	Prior to lifting of 'Urban Deferred'	CLD	4 June 1993
297: M3–2	Foreshore Reserve	Transfer to public ownership the proposed foreshore reserve as required by M3-1.	Make a submission to the Minister for Env. On advice of the Department of Conservation and Land Management	Submission to the Minister for Env.	Pre development	Minister for Env. EPA	Prior to lifting of 'Urban Deferred'	CLD	4 June 1993
297: M4-1	Landscape Protection	Liaise with the Department of Planning and Urban Development 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 development	Minister for Env Minister for Planning DPUD CoR EPA.	Before or as a condition of subdivision	CLD	5 April 1994

Audit Code	Subject	Requirement	How	Evidence	Phase	To requirements of On advice from	Timeframe	Status	Comment
297: IM5-1:1	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 Department of Conservation and Land Management	Correspondence with Minister for Env.	Pre development	Minister for Env CALM	Prior to any clearing/construction activities commencing	CLD	6 February 1996
297: IM3-1:2	Southern Brown Bandicoot	Initiate management of the population of the Southern Brown Bandicoot (Isoodon obesulus)		Report on this in the first report required under IM8	Pre development	Minister for Env CALM	Prior to any clearing/construction activities commencing	CLD	CAR Submitted 20 May 2010
297: IM5-2:1	Southern Brown Bandicoot	Carry out the ongoing management of the population of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay as proposed in IM5-1.	Agreement with CALM	Report on this under IM8	Development	CALM	Ongoing	C	All stages of development have included a relocation program prior to any clearing activity.
297: IM5-2:2	Southern Brown Bandicoot	Carry out the ongoing management of the Southern Brown Bandicoot (Isoodon obesulus) at Golden Bay as proposed in IM5-1.	Agreement with CALM	Report on this under IM8	Post Development	CALM	Ongoing	C	Southern Brown Bandicoots are monitored in Autumn and Spring each year in the Foreshore Reserve in accordance with the FMP.
297: IM6-1	Project Ownership, management, control	Seek approval 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	C	DoC and Peet Golden Bay Pty Ltd were recognised by the OEPA as joint Proponents 1 August 2016.
297: IM7-1	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)	Letter application	Overall	Minister for Env. EPA	Before 12 January 1998 if project has not commenced substantially	CLD	
297: IM8	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	EPA	First report before clearing activities commence, second report one year after clearing has commenced, then as required by the OEPA.	C	OEPA has requested (Appendix 2) that from August 2016 compliance reports 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 M107, 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 M3-1		Predevelopment	EPA, DPUD CoR	At the rezoning stage	CLD	26 October 1995 Not Audited (duplicated by condition M3-1) – Audit Branch

Audit Code	Subject	Requirement	How	Evidence	Phase	To requirements of On advice from	Timeframe	Status	Comment
297: P2	Management Plan	Prepare a Management plan for the coastal reserve at Golden Bay.	In a submission to the local authority, Minster for Planning and EPA.	Management Plan for foreshore reserve to be submitted	Predevelopm ent	EPA, Minister for planning, local authority, DEP	before clearing/construct ion activities commence	CLD	Golden Bay Foreshore Management Plan approved by the OEPA on 30 March 2012 (on advice from DoP 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	Historic Site	Include the historic aboriginal camping site within the proposed Public Open Space for the development.	Present a submission to the local authority		Predevelopm ent	EPA Local Authority	before clearing/construct ion activities commence	CLD	13 December 1995
297: P4	Fire	Protect against Bushfire	By providing and maintaining a network of firebreaks and access tracks until the local authority takes on this responsibility	Report on this under M8	overall	EPA DEP	until the local authority takes on this responsibility	CLD	Fire Management Plan for the Golden Bay Structure Plan Area has been approved by the City of Rockingham in March 2012.
297: P5	Reticulated 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 Minister for planning and local authority	Report on this under M8	Development	EPA Minister for Planning Local Authority	During provision of services within the development	CLD	A Local Water Management Strategy (LWMS) has been prepared for the Structure Plan Area and approved by the Department of Water and the City of Rockingham. Urban Water Management Plans will be prepared in accordance with the LWMS 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			EPA CALM	Prior to any disturbance of the vegetation at Golden Bay	CLD	13 December 1995

APPENDIX 4

FORESHORE MANAGEMENT PLAN MANAGEMENT ACTION TABLE

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	C

	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	C
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	C
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	C
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	C
Regular inspections of adjacent roads will be undertaken for dust creating materials.	Developer	Stage 2-5	2	C

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	C
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	C
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 *Coastal Rehabilitation Policy* (CoR, 2002a)	Developer	Stage 2-5	2-3	C
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	C
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	C

		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 Survey
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	C
Ensure adequate provision of emergency vehicle access through the Foreshore Reserve.	Developer	Ongoing	2	C
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

2020 VEGETATION PHOTO POINT MONITORING REPORT

Prepared for:	Peet Golden Bay Pty Ltd and Department of Communities
Report Date:	30 August 2021
Version:	1
Report No.	2021-611

pgv ENVIRONMENTAL

CONTENTS

LIST OF ATTACHMENTS

Tables

Plates

Figures

Appendices

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 2020.

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 22 October 2020 at the eight 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.

Table 1: Photo Point Locations.

Site	Eastings	Northings
1	382545	6411987
2	382527	6412049
3	382544	6412057
4	382501	6412185
5	382469	6412279
6	382507	6412293
8	382458	6412346

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.

Table 2: Condition Indicators

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

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.

The vegetation has continued to recover to pre-fire cover levels.

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	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	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	2020							
	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	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	3	3	2	3	3	3	3
	2012	3	3	1	3	3	2	2
Fire History	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	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 2020 is provided in Appendix 2.

3.4.1 Site 1

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. There was approximately 10cm of standing water in the wetland, which is less than in previous years.

Plate 3: Year 2015

Plate 4: Year 2016

Plate 5: Year 2017

Plate 6: Year 2018

Plate 7: Year 2019

Plate 8: Year 2020

3.4.2 Site 2

Comparison of photos from 2015, 2016, 2017, 2018, 2019 and 2020 shows the site has recovered fully from the fire. The sedges in the wetland have regrown to approximately 50cm in height. The wetland was dryer than previous years with no standing water and there was significant flattening of the sedges from the Western Gray Kangaroos.

Plate 9: Year 2015

Plate 10: Year 2016

Plate 11: Year 2017

Plate 12: Year 2018

Plate 13: Year 2019

Plate 14: Year 2020

3.4.3 Site 3

Comparison of photos from 2015, 2016, 2017, 2018, 2019 and 2020 shows the sedges slowly regenerating on the track.

Plate 15: Year 2015

Plate 16: Year 2016

Plate 17: Year 2017

Plate 18: Year 2018

Plate 19: Year 2019

Plate 20: Year 2020

3.4.4 Site 4

Comparison of photos from 2015, 2016, 2017, 2018, 2019 and 2020 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 was dry at the surface on the day of the survey, previous years there has been approximately 10cm of surface water. There was evidence of increased of kangaroo activity passing through and sleeping in the wetland.

Plate 21: Year 2015

Plate 22: Year 2016

Plate 23: Year 2017

Plate 24: Year 2018

Plate 25: Year 2019

Plate 26: Year 2020

3.4.5 Site 5

Comparison of photos from 2015, 2016, 2017, 2019, and 2020 shows significant kangaroo activity from passing through and sleeping in the sedges. There was no surface water and the surface was completely dry in some places.

Plate 27: Year 2015

Plate 28: Year 2016

Plate 29: Year 2017

Plate 30: Year 2018

Plate 31: Year 2019

Plate 32: Year 2020

3.4.6 Site 6

Comparison of photos from 2015, 2016, 2017, 2018, 2019 and 2020 showed little kangaroo activity and the original track is completely covered. The surface was dry.

Plate 33: Year 2015

Plate 34: Year 2016

Plate 35: Year 2017

Plate 36: Year 2018

Plate 37: Year 2019

Plate 38: year 2020

3.4.7 Site 8

Comparison of photos from 2015, 2016, 2018, 2019 and 2020 shows kangaroo activity and there was no surface water.

Plate 39: Year 2015

Plate 40: Year 2016

Plate 41: Year 2017

Plate 42: Year 2018

Plate 43: Year 2019

Plate 44: Year 2020

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 drier than previous years which may be due to the survey being undertaken four weeks later than previous years. Only wetland 1 had surface water at the time of survey.

There is increased evidence of kangaroos resting and passing through wetlands 2, 4, 5, and 6. There is some evidence of grazing on the new sedges. 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.

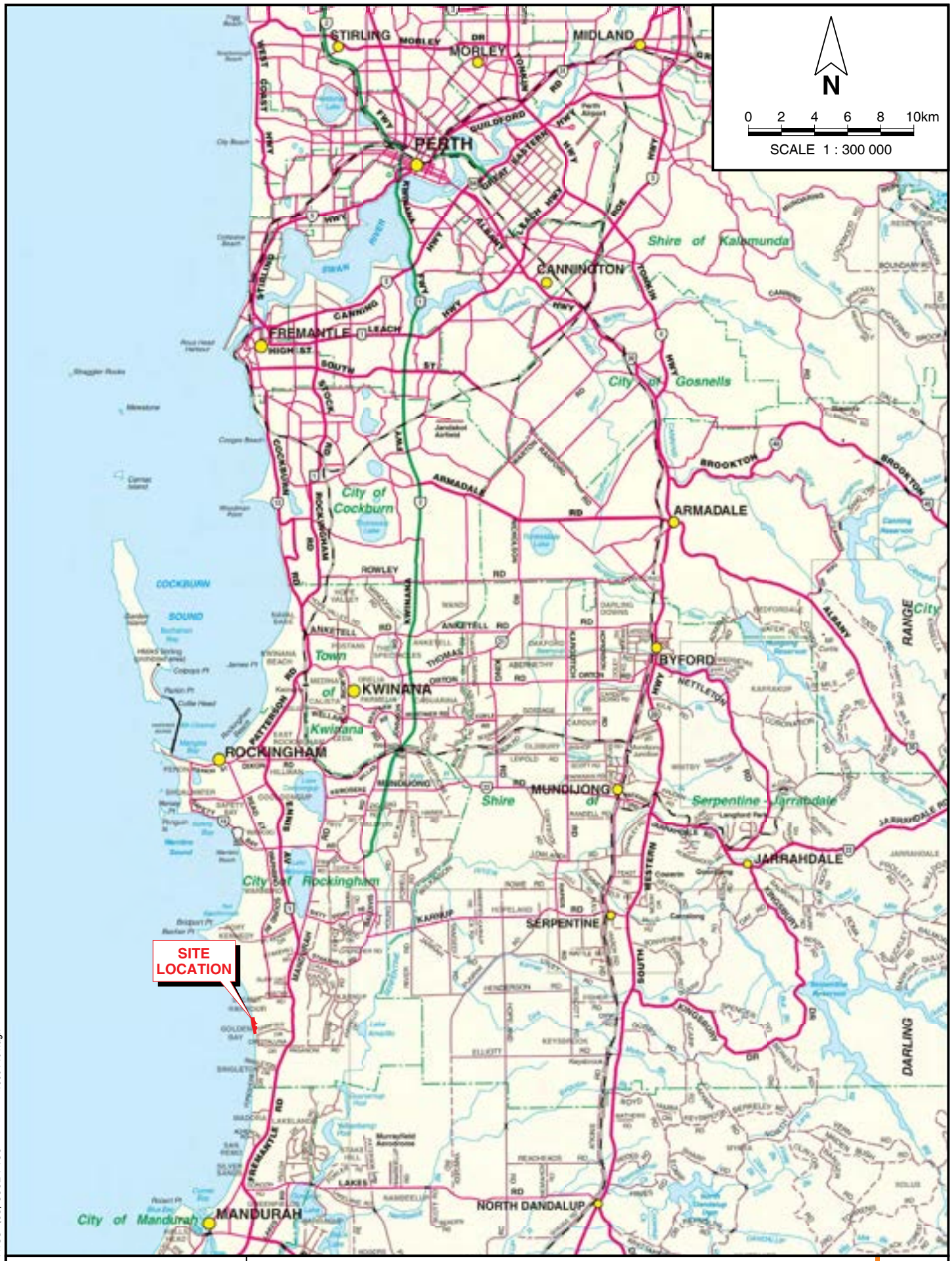
5 REFERENCES

JDA Consultant Hydrologists (2021). *Golden Bay – Wetland Groundwater Levels to end of 2020.*

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 (2020). *Quenda Monitoring Golden Bay – Spring 2020.* Report prepared for Peet Limited.

FIGURES



PINPOINT CARTOGRAPHICS (08) 9562 7136 10004-f01.dgn

pgv ENVIRONMENTAL

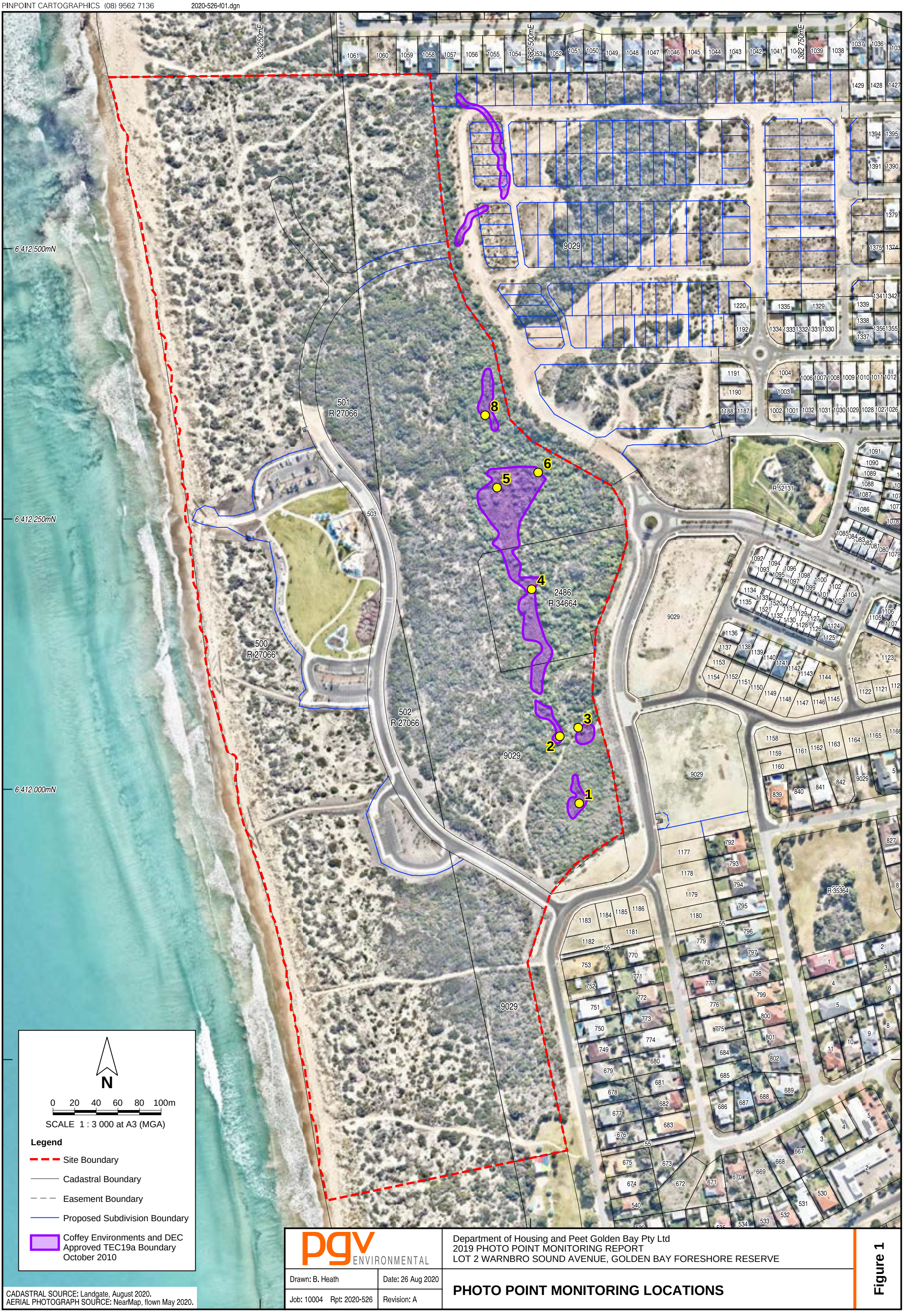
Department of Housing
VEGETATION PHOTO POINT MONITORING REPORT
GOLDEN BAY

Drawn: B. Heath	Date: 10 Aug 2011
Job: 10004	Revision: A

REGIONAL LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-526-f01.dgn



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.

pgv ENVIRONMENTAL

Department of Housing and Peet Golden Bay Pty Ltd
2019 PHOTO POINT MONITORING REPORT
LOT 2 WARNBRO SOUND AVENUE, GOLDEN BAY FORESHORE RESERVE

Drawn: B. Heath	Date: 26 Aug 2020
Job: 10004 Rpt: 2020-526	Revision: A

PHOTO POINT MONITORING LOCATIONS

Figure 1

APPENDIX 1

SITE ASSESSMENT PROFORMA

Site No.	Recorder (s)		Date	
GPS Point	Easting		Northing	
Fencing: fully/partial/not fenced	Current Land Use			
Monitoring Photos No. (taken from Stake)	East	South	West	North
Position of Marker in TEC				
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 = 1--30%				
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 2020 – 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 2

382527 m E **6412049 m N**

32 25 21.10 **115 45 1.90**

Plate 5: Looking East

Plate 6: Looking south

Plate 7 Looking west

Plate 8: Looking north

Site 3

382544 m E **6412057 m S**

32 25 20.61 **115 45 2.79**

Plate 9: Looking East

Plate 10: Looking south

Plate 11: Looking west

Plate 12: Looking north

Site 4

382501 m E **6412185 m S**

32 25 16.6 **115 45 1.03**

Plate 13: Looking East

Plate 14: Looking south

Plate 15 Looking west

Plate 16: Looking north

Site 5 and 7 combined

382469 m E **6412279 m S**

32 25 13.6 **115 44 59.78**

Plate 17: Looking East

Plate 18: Looking south

Plate 19: Looking west

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 22: Looking south

Plate 23 Looking west

Plate 24: Looking north

Site 8

382458.00 m E **6412346.00 m S**

Plate 29: Looking East

Plate 30: Looking south

Plate 31: Looking west

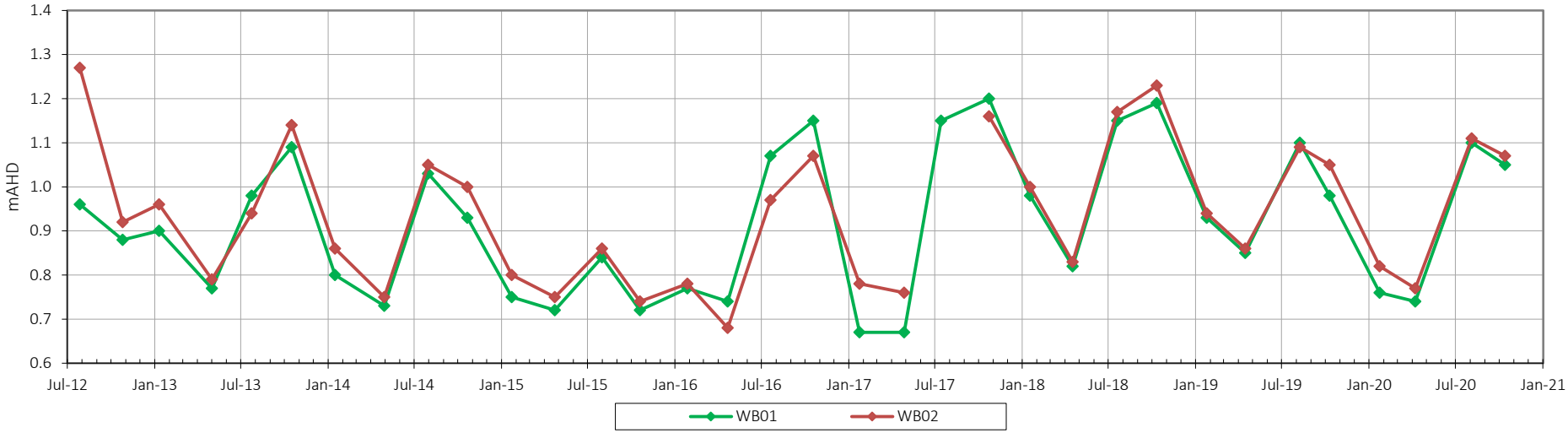
Plate 32: Looking north

APPENDIX 3

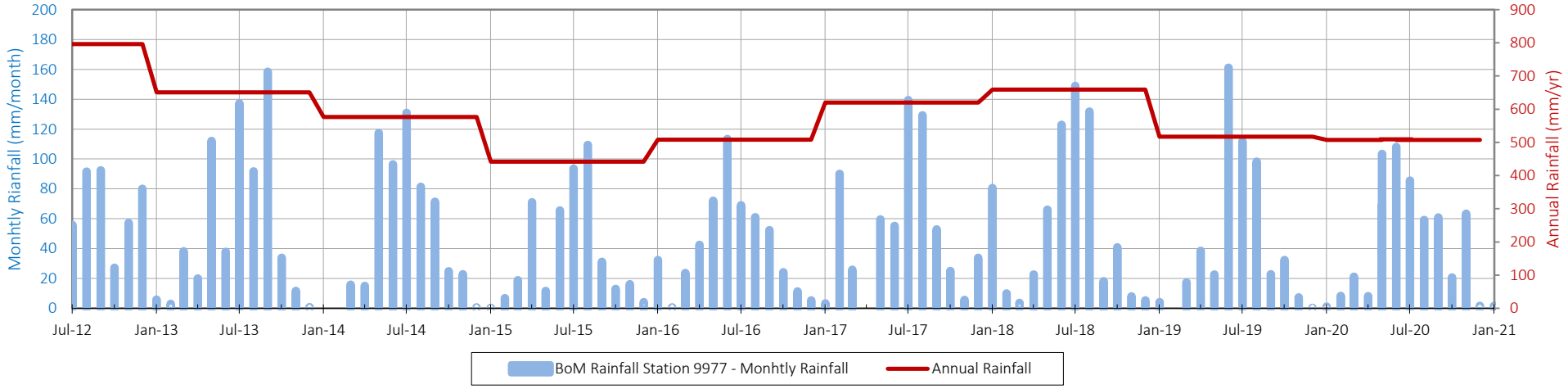
GROUNDWATER LEVELS IN WETLAND BORES

Wetland Bores - Groundwater Levels 2020

Groundwater Levels (mAHD)



Rainfall (mm)



JDA

Job No. J7073

Peet Golden Bay Pty Ltd and Housing Authority
Golden Bay Groundwater Monitoring

Figure 1: Groundwater Levels in Wetland Bores 2012 - 2020

APPENDIX 6

QUENDA MONITORING SURVEY REPORTS

Quenda Monitoring Golden Bay

Autumn 2020

Prepared for: Peet Limited

Version 2. June, 2020

RECORD OF DISTRIBUTION

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REPORT CONTENTS

LIST OF PLATES

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 spring 2012, autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018 and 2019 (Terrestrial Ecosystems 2012, 2013b, a, 2014a, b, 2015a, b, 2016a, b, 2017b, a, 2018a, b, 2019a, 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 formed track for bicycle riding, car parks at either end of the cleared area and two access tracks to the beach. As part of this construction program, some areas that we had previously trapped were cleared of vegetation.

Because of the regrowth in vegetation across the whole of the Foreshore Reserve and the clearing of vegetation to construct a playground, bicycle track and car parks, the location and number of traps was changed for this survey.

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 TEC 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 bandicoots residing in these lots. All Quenda caught prior to the last vegetation clearing program in July 2016 were relocated out of the 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 15 previous monitoring surveys are shown in Table 1. This report provides the outcomes of the sixteenth monitoring survey of Quenda in the Foreshore Reserve.

Table 1. Number of Quenda in previous monitoring programs

	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
# of indiv. captured	31	30	28	39	48	53	36	26	12	15	15	12	46	44	29
# of males	13	10	7	12	10	16	14	8	3	9	9	8	28	20	15
# of females	15	20	21	27	25	34	22	18	3	5	5	3	18	24	14
# of juveniles	3	-	-	1	12	3	6	-	6	1	1	1	1	-	-

The January 2016 fire corresponded with 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.

There was a significant decline in the population in the Spring 2019 survey, and multiple Quenda were in poor health. Five Quenda were taken to Native Arc. One died and the others were nursed back to health. Three of the Quenda were returned to Golden Bay Foreshore Reserve when the Native Arc veterinarians considered their health was in a state that they could survive after being released. One small Quenda was released at another site as it had been raised with another Quenda of a similar age. The vets determined that its long-term survival would be best accommodated if it was released with its companion Quenda.

Dr Meg Rodgers', veterinarian at Native Arc, assessment of the unwell Quenda indicated that the Quenda presented at their clinic, with the exception of the juvenile, were elderly compromised males. All had external and internal parasites (high coccidia and worm burdens) and one had an abscess and scarring on its back consistent with predation. We recorded multiple Quenda with fleas during the trapping program. Dr Rodgers consulted with Dr Tony Pusey (Terrestrial Ecosystems' veterinarian) and suggested worming and coccidia treatment.

Based on the information contained in (Vogelnest and Portas 2019), Dr Pusey recommended that Quenda in the Golden Bay Reserve be medicated with Baycox (i.e. Toltazuril) to assist in alleviating the coccidia and worm burdens and Cydectin (i.e. Moxidectin) to reduce the external parasites. Application was made to the Department of Biodiversity, Conservation and Attractions (DBCA) to amend our Regulation 28 licence to medicate the Quenda in accordance with our veterinarian's instructions.

Terrestrial Ecosystems received the following information from the DBCA:

> Your amendment has been assessed by DBCA and below is a summary of the assessment:
>
> There are no manufacturer's instructions for the use of baycox and moxidectin for native mammals. Their use in these species is off-label. There are dose rates available but these are anecdotal. While there is use of these drugs off-label with Australian wildlife (because the pharmacokinetic work to determine dose rates is logistically and economically prohibitive) in care or captive situations, it's important to continually remember that these drugs are not registered for use on the native wildlife.
>
> Coccidian parasitism is very common in bandicoots but rarely associated with significant pathology and therefore not usually treated. Treatment of clinical cases with toltrazuril (Baycox) has been unsuccessful in this species.

While reports of coccidial disease in free-ranging bandicoots are sparse, coccidial disease in macropods is common in juvenile, captive and hand-reared animals. Clinical disease (as opposed to positive faecal screening) is usually limited to young animals and poor husbandry conditions/overcrowding/environmental stressors.

Most endoparasites of bandicoots are non-pathogenic. The Department would require further information or pathology/parasitology reports to determine what parasites are suspected to see if moxidectin is likely to be a useful or indicated antiparasitical. Nematodes are very common in marsupials in general, with a huge number of species and genera which only rarely cause health problems. The efficacy/indication for routine parasitic treatment is difficult to make.

The Department notes that the letter identifies that the animals most affected are elderly and compromised and treatment of these individuals is unlikely to support population recovery.

The Department declines the amendment as these medications are unlikely to provide any relief to individuals or to the population and represent off-label use of the medication.

This advice was provided by Dr Simone Vitali the senior veterinarian at Perth Zoo. Subsequent discussions with Dr Vitali indicate there were no 'on-label' drugs approved for Quenda. As a consequence of the DBCA's directive, Quenda in the reserve were not medicated.

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-1) 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-1) 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 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 (Plate 2) were set in locations shown in Figure 1. Traps were located around the periphery of the Foreshore Reserve. This was a change in trapping locations compared with earlier monitoring surveys.

All cage traps were baited with a peanut butter sandwich and were set for 10 nights between 29 March and 8 April 2020.

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 area and in the north-eastern area of native vegetation.

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 hessian 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 mostly 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 trap-night. There were 100 cage traps targeting Quenda, so the trapping effort was therefore 1,000 trap-nights and 50 cat trap-nights. Quenda were caught in the small cage traps and the cat 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 Terrestrial Ecosystems and set up 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. Thirty one individual Quenda were caught with 18 females and 13 males (Plate 3). Two of these Quenda weighed less than 150g (i.e. juveniles). Six females had pouch young. The overall trapping success was 19.6% and for Quenda 15.1%. The Quenda trapping success is slightly higher than the last year but lower than the two earlier survey rates of 18.6%, 21.6% and 14.7% (spring 2018, autumn 2019 and spring 2019 respectively).

Table 2. Number of Quenda in autumn 2020

	Autumn 2020
# of individuals captured	31
# of males	12
# of females	17
# of male juveniles	1
# of female juveniles	1

There were 204 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, two cats (*Felis catus*), eight house mice (*Mus musculus*), two rats (*Rattus rattus*), two white-browed scrubwren (*Sericornis frontalis*), seven silvereyes (*Zosterops lateralis*), two splendid wrens (*Malurus splendens*) and 13 bobtails (*Tiliqua rugosa*) were caught. Both cats had no collar, identification tags, microchips or ear tattoos.

Fresh fox, cat and rabbit tracks were observed on multiple occasions (Plates 4 and 5). Cats and foxes would be predating on young Quenda and other small vertebrate fauna in the reserve. The vegetation clearing in the southern and central sections of the Foreshore Reserve will have increased predator access to Quenda in the bushland.

All caught Quenda appeared healthy. Of the thirty-one Quenda caught, nine were caught for the first time during this monitoring program and did not have a microchip, and five Quenda with microchips had been relocated from other trapping and relocation sites managed by Terrestrial Ecosystems. The remaining Quenda, except for one microchipped individual, had been caught during either the autumn or spring 2019 foreshore monitoring surveys.

The two juveniles that were caught were very small (i.e. the females was 100g and the male 80g) indicating that they had recently left their mother. There were four other Quenda, all females, that weighed less than 500g and six females had pouched young, indicating that breeding is occurring in the population.

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 through the reserve.

Western Grey Kangaroos were observed on most days during the survey, as well as their tracks and scats, indicating there continues to be 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 3. Quenda being released

Plate 4. Cat tracks

Plate 5. Rabbit diggings

4.1.1 Status of the population

The total number of Quenda caught during this monitoring program (31) is similar to the spring 2019 survey (29) but much lower than the previous two surveys (46 and 44, respectively). This decrease is concerning, particular as five of the Quenda caught had been relocated into the Foreshore Reserve. However, this is off-set by the obvious breeding activity and no evidence of adult Quenda showing signs of ill health as was the situation in the spring 2019 survey.

We did not find any evidence of Sarcoptic Mange in the Quenda population during the current survey, although a couple of adult males had scarring on the dorsal survey that may have been the result of fighting among males.

4.1.2 Western Grey Kangaroos

Western Grey Kangaroos in the Foreshore Reserve and surrounds are very wary and largely remain out of sight and 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.

4.1.3 Rabbits

Based on the rabbit scats and tracks, the population of rabbits in the Foreshore Reserve and the adjacent beach dunes has increased.

Concurrent with the Quenda monitoring program, RHDV1 K5 was deployed at multiple sites in sliced carrots. It is anticipated that this virus will have spread through the population and there would have been a reduction in the number of rabbits.

5. CONCLUSION

The regrowth in the vegetation since the January 2016 fire has provided good habitat for Quenda, particularly around the wetland areas (Plates 6 and 7). Although the regrowth has been appreciable in the non-wetland areas (Plates 8 and 9) few Quenda were caught in these areas. The Foreshore Reserve is probably able to support a population of ~50 Quenda, so there is considerable scope for a population increase.

Plate 6. Regrowth in the wetland area

Plate 7. Regrowth in the wetland area

Plate 8. Regrowth in the sand dunes

Plate 9. Regrowth in the sand dunes

The results of this and the spring 2019 trapping programs indicate a notable decrease in the population of Quenda since autumn 2019. It is likely that a combination of factors could have contributed to this, including predation by feral predators, illness, aging population, contaminated road run-off, habitat fragmentation and a reduction in overall habitat areas. Reducing suitable habitat for native fauna increases predation pressure due to improved access to the remaining animals for foxes and cats. The construction of the road through the reserve could have had a two-fold impact on the Quenda population by decreasing available habitat and improving access for predators (i.e. foxes and cats). The illness affecting this Quenda population that was evident during the spring 2019 survey was concerning, but there were no signs to suggest the current population was still suffering ill health.

Predation by foxes and cats is likely to be a major contributor to the recent population reduction. The removal of two cats that were caught during this monitoring program should reduce predation pressure on juveniles and young Quenda.

There was evidence of breeding in the Quenda population, and future surveys will indicate the number of these pouch young and juveniles that survive to join the adult population.

Based on scats and tracks, the abundance of rabbits has increased in the foreshore reserve and surrounds.

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 2021.

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Figure

Quenda Monitoring Golden Bay
Autumn 2020

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-0009-f01.dgn

N

0 20 40 60 80 100m

SCALE 1 : 3 000 at A3 (MGA)

LEGEND

- Foreshore Reserve Boundary
- Reserve Boundary
- Cadastral Boundary
- Trapping Site - Cat
- Trapping Site - Quenda

382 250mE

382 500mE

6 412 500mN

6 412 250mN

6 412 000mN

6 411 750mN

Cat 1

Cat 2

Cat 3

Cat 4

Cat 5

501 R 27066

502 R 27066

503

500 R 27066

9029

2486 R 34664

8009 R 52131

2533 R 35364

AUREA BOULEVARD

WOODLANDS ROAD

IVANHOE STREET

MARILLANA DRIVE

TANGADEE ROAD

CADASTRAL SOURCE: Landgate, April 2020.
AERIAL PHOTOGRPAH SOURCE: NearMap, flown February 2020.

TERRESTRIAL ECOSYSTEMS

Drawn: S. Thompson

Date: 22 Apr 2020

Peet Ltd and Department of Housing
QUENDA TRAPPING SITES
GOLDEN BAY - AUTUMN 2020

TRAPPING SITES

Figure 1

Job: 2020-0009

Appendix A.
Quenda trapping results

Quenda Monitoring Golden Bay
Autumn 2020

A.1 QUENDA TRAPPING RESULTS

						Trapping days and number of trapped individuals										
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	18/09/2019	19/09/2019	20/09/2019	21/09/2019	22/09/2019	23/09/2019	24/09/2019	25/09/2019	26/09/2019	27/09/2019	Total
Male	1100	84	33	57	6E2270D	1	1	1	1		1	1	1	1	1	9
Female	1060	79	32	57	6E23254				1				1		1	3
Male	1360	77	40	61	6E24A16			1								1
Male	740	74	29	56	783A1C3		1									1
Female	1100	52	33	56	783D198		1	1	1	1	1		1	1	1	8
Female	260	65	30	48	783D2F3			1			1	1		1		4
Male	1940	83	38	58	783D5BA	1	1									2
Female	820	75	33	55	783D913	1	1	1	1	1		1	1		1	8
Female	1300	70	36	56	783EB0A	1	1	1	1	1	1	1	1	1	1	10
Female	660	77	32	57	79D5522		1	1	1	1	1	1	1	1	1	9
Female	240	66	30	53	79D56EB					1						1
Female	100	52	20	40	79D5988								1			1
Female	530	64	27	52	79D5B0A									1		1
Male	1480	85	38	64	7ABA170								1	1	1	3
Female	540	63	33	54	7ABF6A6		1	1	1		1	1	1	1		7
Female	760	70	36	56	7ABFA06	1		1	1	1		1	1	1		7
Female	660	66	29	54	7AC009F			1								1
Male	1380	83	37	63	7AC06AD		1	1	1	1	1	1	1	1	1	9
Female	940	75	29	57	7AC1287				1	1	1	1	1		1	6
Female	900	74	34	54	7AC260C		1		1	1		1		1		5
Male	800	55	36	59	7AC3144	1	1	1	1	1	1	1	1	1	1	10
Male	1600	84	43	68	7AC3DC7		1				1				1	3
Female	520	71	28	54	7AC448E						1		1		1	3

						Trapping days and number of trapped individuals										
Sex	**Mass (g)**	**HL (mm)**	**HW (mm)**	**Pes (mm)**	**Chip No**	**18/09/2019**	**19/09/2019**	**20/09/2019**	**21/09/2019**	**22/09/2019**	**23/09/2019**	**24/09/2019**	**25/09/2019**	**26/09/2019**	**27/09/2019**	**Total**
Male	1660	89	34	56	7AC4C26		1	1	1		1		1	1	1	7
Female	660	79	31	54	7AC529F	1	1		1		1			1		5
Male	1440	88	44	62	7AC55E0	1	1	1		1		1	1	1	1	8
Female	820	69	33	55	7AC59A9	1		1			1	1		1	1	6
Female	1060	78	33	56	7AC75FB		1			1		1	1		1	5
Male	1180	79	34	59	7AC84DD			1	1	1	1	1	1	1	1	8
Male	80	43	20	33	7ACABA5							1			1	2
Male	780	71	29	55	7ACE1F1			1	1		1	1	1		1	6
					Total											204


DETECTION DOG

Quenda Monitoring Golden Bay

Spring 2020

Prepared for: Peet Limited

Version 1. November, 2020

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REPORT CONTENTS

LIST OF PLATES

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 spring 2012, autumn and spring of 2013, 2014, 2015, 2016, 2017, 2018, 2019 and autumn 2020 (Terrestrial Ecosystems 2012, 2013b, a, 2014a, b, 2015a, b, 2016a, b, 2017b, a, 2018a, b, 2019a, b, 2020). 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 formed track for bicycle riding, car parks at either end of the cleared area and two access tracks to the beach. As part of this construction program, some areas that we had previously trapped for Quenda were cleared of vegetation.

Because of the regrowth in vegetation across the whole of the Foreshore Reserve and the clearing of vegetation to construct a playground, bicycle track and car parks, the location and number of traps was changed for the monitoring survey in autumn 2020.

In July 2020, vegetation was cleared for the construction of a drain on the southern boundary adjacent to Solstice Grove. Earthworks have also begun along the eastern boundary adjacent to Marillana Drive.

Due to the construction works and the regrowth in vegetation across the whole of the Foreshore Reserve, the location and number of traps were changed for the autumn 2020 survey. For the spring 2020 survey, we used the same trap locations as autumn 2020.

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 16 previous monitoring surveys are shown in Table 1. This report provides the outcomes of the seventeenth monitoring survey of Quenda in the Foreshore Reserve.

Table 1. Number of Quenda in previous monitoring programs

	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
# of indiv. captured	31	30	28	39	48	53	36	26	12	15	15	12	46	44	29	31
# of males	13	10	7	12	10	16	14	8	3	9	9	8	28	20	15	12
# of females	15	20	21	27	25	34	22	18	3	5	5	3	18	24	14	17
# of juveniles	3	-	-	1	12	3	6	-	6	1	1	1	1	-	-	2

The January 2016 fire corresponded with 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 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 autumn 2020 monitoring survey. All cage traps were baited with a peanut butter sandwich and were set for 10 nights between 30 September and 10 October 2020.

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 area and in the north-eastern area of native vegetation (Figure 1).

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 mostly 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 trap-night. There were 100 cage traps targeting Quenda, so the trapping effort was therefore 1,000 trap-nights and 50 cat trap-nights. Quenda were caught in the small cage traps and the cat 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 Terrestrial Ecosystems set up signs 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. Forty-four individual Quenda were caught, (although three of these individuals may have been recaptures as the microchip reader malfunctioned), with 24 females and 19 males. Five Quenda weighed less than 150g (i.e. juveniles). Eleven females had pouch young, with one female having 'golden' coloured joeys. The overall trapping success was 30.05%, and 17.1% for Quenda. The Quenda trapping success was higher than the two previous survey rates of 14.7% and 15.1%, (spring 2019 and autumn 2020 respectively) but lower than earlier surveys (18.6% and 21.6% for spring 2018 and autumn 2019 respectively).

Table 2. Number of Quenda in spring 2020

	Spring 2020
# of individuals captured	44*
# of males	19
# of females	24
# of male juveniles	2
# of female juveniles	3

* 40 had microchips and 4 unknown due to scanner malfunction

There were 179 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, 77 bobtails (*Tiliqua rugosa*), 30 rats (*Rattus rattus*), 13 house mice (*Mus musculus*), seven dugites (*Pseudonaja affinis*), four silvereyes (*Zosterops lateralis*), one banjo frog (*Limnodynastes dorsalis*), one moaning frog (*Heleioporus eyrei*), one rabbit (*Oryctolagus cuniculus)* and one tiger snake (*Notechis scutatus*) were caught. The majority of the rats were euthanased.

Fresh cat tracks and rabbit scats and tracks (Plate 5) were observed on multiple occasions near the reserve boundaries and one rabbit was caught. Cats (and foxes) would be predating on young Quenda and other small vertebrate fauna. The vegetation clearing in the southern and central coastal sections of the Foreshore Reserve will have increased predator access to Quenda in the bushland.

Most caught Quenda appeared healthy. Of the 44 Quenda caught, 22 were caught for the first time during this monitoring program and did not have a microchip, and two Quenda with microchips had been relocated from other trapping and relocation sites managed by Terrestrial Ecosystems. The remaining Quenda had been caught during the autumn 2020 or autumn and spring 2019 monitoring surveys.

There were two sick quenda that appeared to have the same illness as the males in spring 2019. Dr Meg Rodgers' (Native Arc veterinarian) confirmed that they were elderly health-compromised males that had over-exerted themselves defending their mates and territories during the breeding season. During the trapping program, the Quenda don't have the opportunity to continually forage for food as they are caught in the traps, so they are easily fatigued {Terrestrial Ecosystems, 2019 #11048}. Terrestrial Ecosystems' zoologists took two large males to wildlife carers to rest and recover and they have both subsequently been returned to the Golden Bay Foreshore Reserve.

A juvenile female Quenda was found dead, but she had no obvious injuries. It is likely this Quenda was stressed by an off-lead domestic dog(s) which are common along the reserve boundary or could have been bitten by a

spider or snake. One male Quenda had what was thought to be Sarcoptic Mange (Plate 3), which is caused by the parasitic burrowing mite *Sarcoptes scabiei*. Due to the burrowing activity of the mite the host develops a range of symptoms, the most common of which are a thickening of the skin, irritation of the skin, dermatitis and patchy hair loss (Bornstein et al. 1995, Little et al. 1998, Davidson et al. 2008). This parasite is typically found on foxes but will infect other native mammals. When untreated an infected fox will usually die within two to four months (Borg 1987, Newman et al. 2002), so it is probably the same for Quenda. The high mortality rate can result in a severe population decline and previous outbreaks of Sarcoptic Mange in fox populations in Sweden and Bristol in the United Kingdom have resulted in >70% and >95% reduction in population density (Lindström et al. 1994, Soulsbury et al. 2007). Environmental stress (i.e. lack of food, predation pressure etc) can increase the chances of Quenda having Sarcoptic Mange.

The five juveniles that we caught weighed between 100g and 140g indicating that they had recently left their mothers. There were nine other Quenda that weighed less than 500g (four females and five males) and 11 females had pouched young, indicating that breeding is occurring in the population.

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 bushland areas of the reserve.

Western Grey Kangaroos were observed on most 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 3. Quenda with possibly mange

Plate 4. Quenda being released

Plate 5. Rabbit diggings

4.2 STATUS OF THE POPULATION

Despite the four Quenda that were in poor health or had possible mange, the population overall appears healthy. The total number of Quenda caught during this monitoring program (44) is higher than the autumn 2020 (31) and spring 2019 surveys (29) but similar to the autumn 2019 and spring 2018 surveys (44 and 46 respectively). The high level of recruitment in this survey has not been seen previously in this population and suggests that fox and cat control is having a positive effect on Quenda numbers. The increase in number since autumn is largely due to recent breeding and dispersal of young, and further monitoring will determine if the juveniles survive into adulthood.

4.3 WESTERN GREY KANGAROOS

Western Grey Kangaroos in the Foreshore Reserve and surrounds are very wary and largely remain out of sight and 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 has decreased in most areas, however, there were a few areas with higher numbers.

Concurrent with the Quenda monitoring program, RHDV1 K5 was deployed at multiple sites in sliced carrots. It is anticipated that this virus will have spread through the population and there would have been a reduction in the number of rabbits.

4.5 REPTILES

A Tiger Snake (Plate 6) was captured in the southern end of the reserve. This is the first Tiger Snake record since the January 2016 fire. There are likely to be more in the reserve and they are probably feeding on frogs

or rodents. Seven large dugites (Plate 7) were also captured or observed during the survey. There is evidence that they are increasing in numbers since the 2016 fire.

Seventy-seven Bobtails (*Tiliqua rugosa*) were caught but we didn't capture any Western Blue-Tongues (*Tiliqua occipitalis*). Western Blue-tongues are still present but in much lower densities. The population of Bobtails appears to be increasing.

Plate 6. Tiger Snake

Plate 7. Dugite

5. CONCLUSION

The regrowth in the vegetation since the January 2016 fire has provided good habitat for Quenda, particularly around the wetland areas (Plates 6 and 7). 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 8. Regrowth in the wetland area

Plate 9. Regrowth in the sand dunes

The results of this trapping program show an increase in recruitment in this population. The high number of juvenile Quenda indicates that predator control is having a positive effect, as predation by foxes and cats has previously been a major contributor to population decline in the reserve. The removal of two cats in autumn has reduced predation pressure on juveniles and young Quenda and should facilitate the juveniles surviving into adulthood. The next survey in autumn 2021 will determine if this is the case. There was evidence of breeding in the Quenda population, and future surveys will indicate the number of these pouch young and juveniles that survive to join the adult population.

The illness affecting the Quenda population that was evident during the spring 2019 and 2020 surveys is concerning, but there were no signs to suggest the overall population is suffering ill health. Elderly males will be monitored during future surveys and will be taken to carers to recover if needed. Spring 2018 was the first survey in which Sarcoptic Mange was recorded in Quenda and it was recorded again during the autumn 2019 and spring 2020 surveys. The combined effects of Sarcoptic Mange and predation by feral predators could reduce the number of Quenda in the Foreshore Reserve. There is little that can be done to address the prevalence of Sarcoptic Manage, other than to reduce the population of foxes and stop the spread of *Sarcoptes scabiei* mites.

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 2021.

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Figure

Quenda Monitoring Golden Bay
Spring 2020

PINPOINT CARTOGRAPHICS (08) 9562 7136 2020-0093-f01.dgn

N

0 20 40 60 80 100m

SCALE 1 : 3 000 at A3 (MGA)

LEGEND

- Foreshore Reserve Boundary
- Reserve Boundary
- Cadastral Boundary
- Trapping Site - Cat
- Trapping Site - Quenda

382 250mE
382 500mE
6 412 500mN
6 412 250mN
6 412 000mN
6 411 750mN

Cat 5
Cat 4
Cat 1
Cat 2
Cat 3

501 R 27066
9029
503
2486 R 34664
502 R 27066
8009 R 52131
2533 R 35364
500 R 27066

AUREA BOULEVARD
WOODLANDS ROAD
IVANHOE STREET
MARILLANA DRIVE
TANGADEE ROAD

CADASTRAL SOURCE: Landgate, April 2020.
AERIAL PHOTOGRPAH SOURCE: NearMap, flown September 2020.

TERRESTRIAL ECOSYSTEMS

Drawn: S. Thompson

Date: 21 Oct 2020

Peet Ltd and Department of Housing
QUENDA MONITORING
GOLDEN BAY - SPRING 2020

TRAPPING SITES

Figure 1

Job: 2020-0093

Appendix A.
Quenda trapping results

Quenda Monitoring Golden Bay
Spring 2020

A.1 QUENDA TRAPPING RESULTS

						Trapping days and number of trapped individuals										
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	18/09/2019	19/09/2019	20/09/2019	21/09/2019	22/09/2019	23/09/2019	24/09/2019	25/09/2019	26/09/2019	27/09/2019	Total
M	1180	84	35	63	6E2270D	1	1	1	1		1	1	1	1	1	9
F	1000	82	36	58	6E23254	1	1	1		1	1	1	1		1	8
F	100	37	22	37	7838D68			1								1
M	1100	84	36	62	7838DD4	1								1	1	3
F	920	79	38	63	783D198	1	1	1	1		1	1		1	1	8
F	580	71	33	52	783D2F3		1	1	1	1		1	1	1	1	8
F	840	73	32	56	783D913	1	1			1		1	1		1	6
F	120	48	21	32	783E2AA					1	1		1		1	4
M	1240	92	37	59	783EB0A		1	1			1	2	1	1	1	8
M	140	50	23	40	79D55D3				1							1
F	680	70	31	57	79D56EB	1	1	1		1		1	1	1	1	8
F	160	47	21	36	79D57A7									1		1
M	940	77	30	61	79D585A	1		1		1	1	1	1	1	1	8
F	200	56	26	42	79D5AFB							1				1
F	180	46	21	39	79D5BE7						1					1
F	640	72	28	53	79D5BOA					1			1			2
M	260	61	26	45	79D5C90				1		1	1		1		4
M	300	58	28	42	79D5CA4									1		1
M	320	49	25	42	7ABA208			1		1						2

						Trapping days and number of trapped individuals										
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	18/09/2019	19/09/2019	20/09/2019	21/09/2019	22/09/2019	23/09/2019	24/09/2019	25/09/2019	26/09/2019	27/09/2019	Total
F	480	70	33	50	7ABB6FE	1	1	1	1	1		1	1	1	1	9
F	460	70	27	50	7ABC9D5	1			1	1		1		1	1	6
F	1140	78	36	55	7ABF6A6	1	1	1	1	1	1	1			1	8
F	860	81	39	54	7ABFA06		1		1				1			3
F	260	54	31	42	7AC049C		1		1					1		3
M	1100	87	38	64	7AC06AD	1	1	1								3
M	140	54	25	41	7AC15A9									1		1
M	240	58	27	42	7AC17B2			1		1						2
M	660	76	32	59	7AC1B08		1		1		1	1		1	1	6
F	140	48	21	36	7AC1D47							1		1		2
M	180	47	26	46	7AC2115					1						1
F	820	79	34	56	7AC260C			1		1						2
M	1240	90	40	64	7AC3144	1	1	1	1	1		1	1	1	1	9
M	1620	99	39	68	7AC3DC7	1	1	1		1		1	1		1	7
F	740	76	32	54	7AC448E	1		1								2
F	820	74	32	54	7AC529F				1		1	1	1	1		5
F	760	78	24	56	7AC59A9		1	1		1	1		1	1		6
M	240	55	27	44	7AFE4EC				1	1	1		1		1	5
M	300	57	28	45	7AFEA6E									1		1
M	1040	84	42	59	7AFEBD8	1	1	2	1	1	1	1				8
F	180	56	25	40		1										1

						Trapping days and number of trapped individuals										
Sex	Mass (g)	HL (mm)	HW (mm)	Pes (mm)	Chip No	18/09/2019	19/09/2019	20/09/2019	21/09/2019	22/09/2019	23/09/2019	24/09/2019	25/09/2019	26/09/2019	27/09/2019	Total
F	540	79	36	59		1										1
M	720	77	35	58		1										1
F									1							1

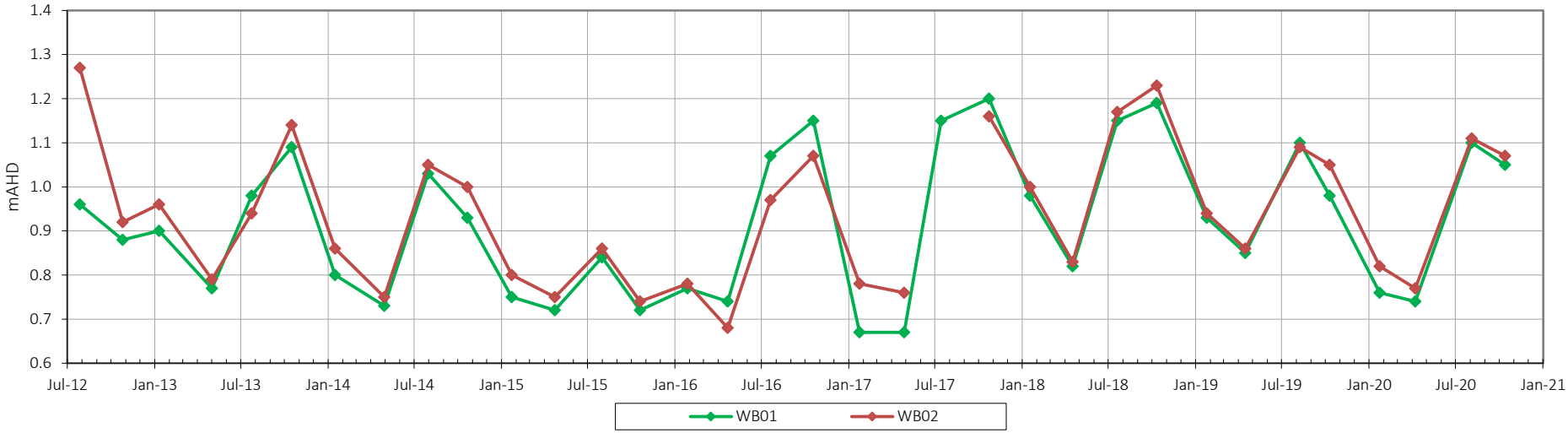

DETECTION DOG

APPENDIX 7

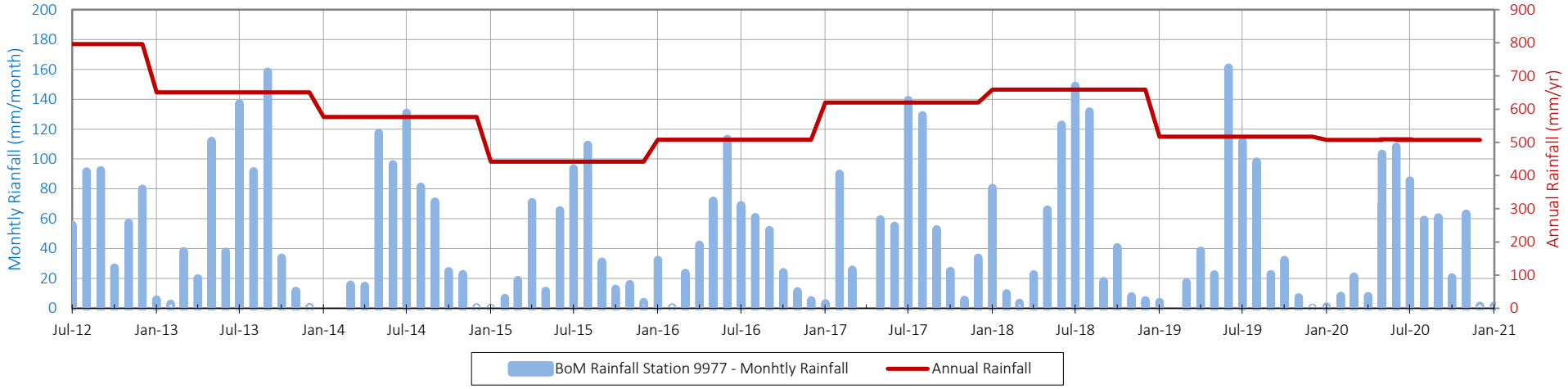
FORESHORE RESERVE GROUNDWATER LEVELS

Wetland Bores - Groundwater Levels 2020

Groundwater Levels (mAHD)



Rainfall (mm)



JDA

Job No. J7073

Peet Golden Bay Pty Ltd and Housing Authority
Golden Bay Groundwater Monitoring

Figure 1: Groundwater Levels in Wetland Bores 2012 - 2020

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 Department of Communities
Report Date:	27 April 2021
Version:	1
Report No.	2021-564

pgv ENVIRONMENTAL

CONTENTS

LIST OF ATTACHMENTS

Tables

Graphs

Figures

Appendices

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.

Table 1: Statement of Botanical Survey Conditions

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 the site (15.5ha), ease of access and low diversity of species and vegetation types.
Completeness (e.g. was relevant area fully surveyed)	No	
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

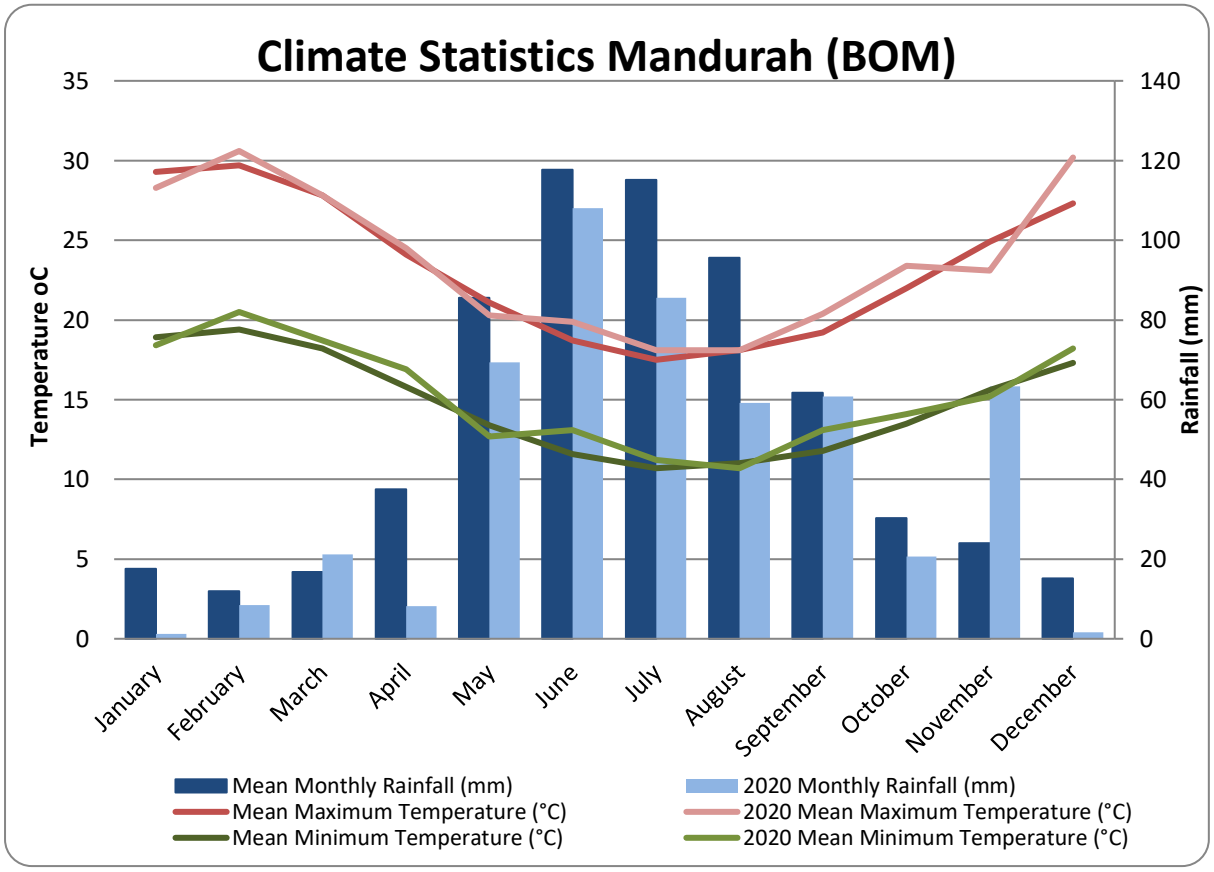
*Constraints have been rated as Significant, Moderate or No constraints

^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).

Table 2: Conservation Significant Flora Identified in Database Searches

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 Orchid	Schedule 3	Vulnerable	The 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		*Cardamine paucijuga* is found on moist flats in calcareous clay over limestone.	No – not moist calcareous habitat
Beyeria cinerea subsp. *cinerea*		Priority 3		*Beyeria cinerea* subsp. *cinerea* grows in sand over limestone on road verges, gullies	Unlikely – not known from m dune habitat
Calandrinia oraria		Priority 3		*Calandrinia oraria* is restricted to coastal habitats in low coastal heath or forbland on small white sand dunes immediately adjacent to the beach and up to 100–150 m inland in slightly larger dunes with grey or grey-brown sands (Obbens, 2014).	Highly Unlikely – too far from the coast
Dillwynia dillwynioides		Priority 3		*Dillwynia dillwynioides* 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		*Pimelea calcicola* 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 *et al.*, 2013).	Highly Unlikely – not woodland habitat
Conostylis pauciflora subsp. *pauciflora*		Priority 4		*Conostylis pauciflora* subsp. *pauciflora* 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

* 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.

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

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 (*Eucalyptus gomphocephala*) 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

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. *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.	

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).

Table 5: 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.

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).

Table 6: Quadrat percentage coverage in the Mandurah Hill Area

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

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 quadrats with each percentage coverage in the South West Interface

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).

Table 8: Proportion of quadrats with each percentage coverage in the Western Interface

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 percentage 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*).

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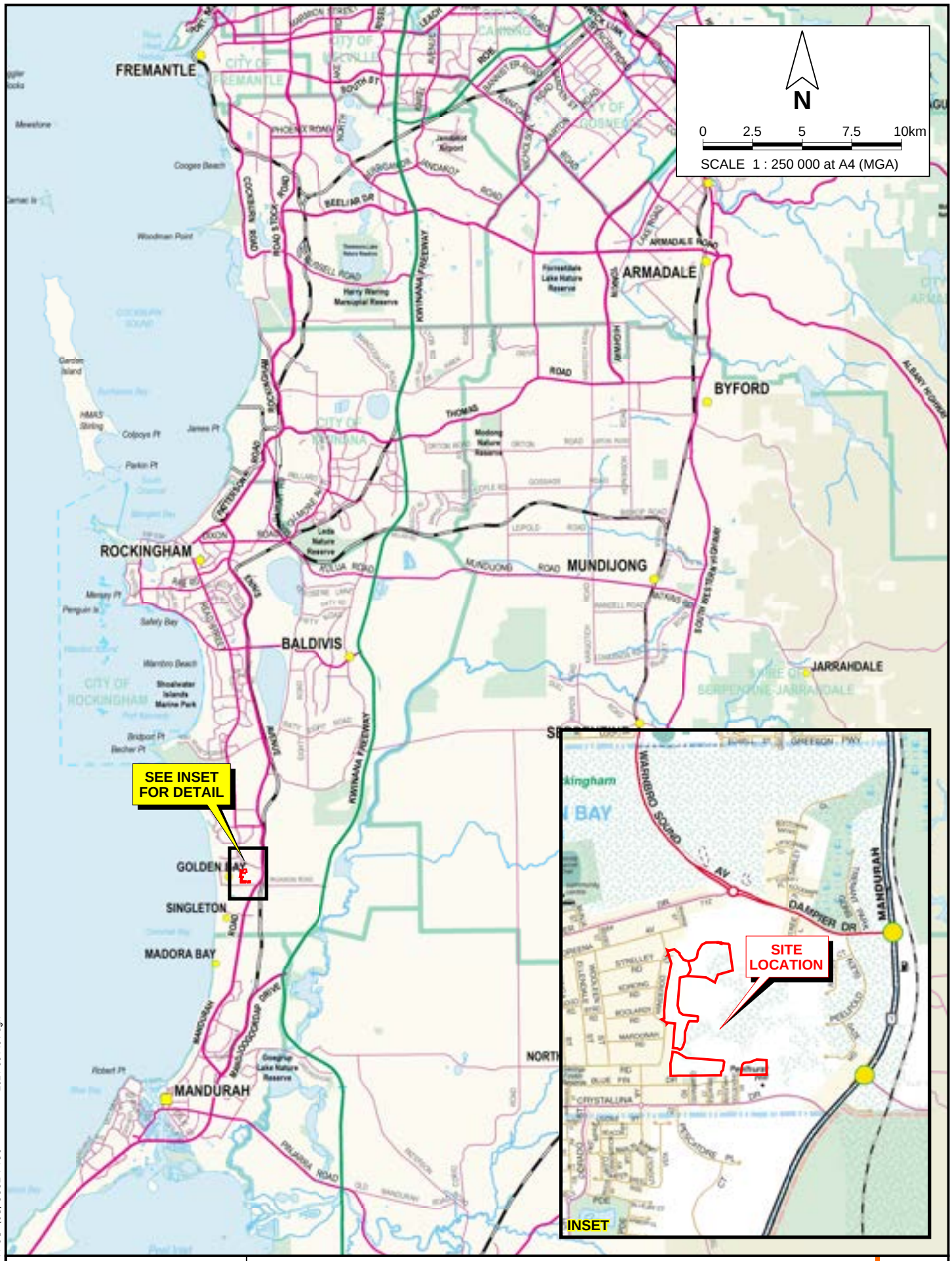
FIGURES



pgv ENVIRONMENTAL

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

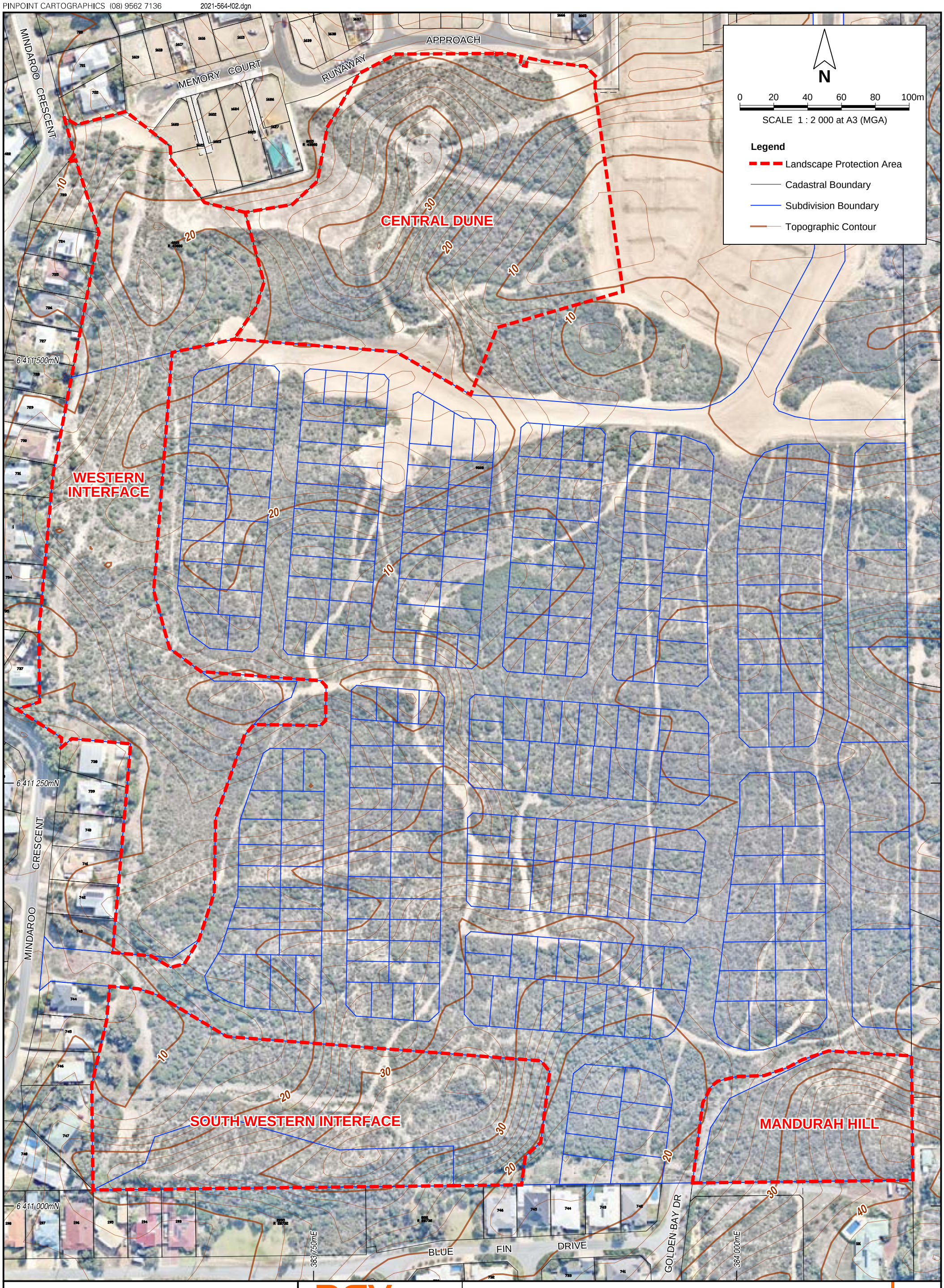
Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f01.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f02.dgn



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.

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Job: 10004 Rpt: 2021-564 | Revision: A

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

LANDSCAPE PROTECTION AREA BOUNDARIES

Figure 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f03.dgn

MINDAROO CRESCENT
MEMORY COURT
RUNAWAY
APPROACH
CENTRAL DUNE
WESTERN INTERFACE
SOUTH WESTERN INTERFACE
MANDURAH HILL
GB1
GB2
GB3
GB4
GB5
GB6
GB7
GB8
6 411 500mN
6 411 250mN
6 411 000mN
383 750mE
384 000mE
BLUE FIN DRIVE
GOLDEN BAY DR
MINDAROO CRESCENT

N

0 20 40 60 80 100m

SCALE 1 : 2 000 at A3 (MGA)

Legend

- Landscape Protection Area
- Cadastral Boundary
- Subdivision Boundary
- Quadrat Location
- Vegetation Type Boundary

Vegetation Types

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

ArSg
Acacia rostellifera/Spyridium globulosum Open to Closed Heath

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

Batter Slope Revegetation

Exotic Planting

Cleared Area

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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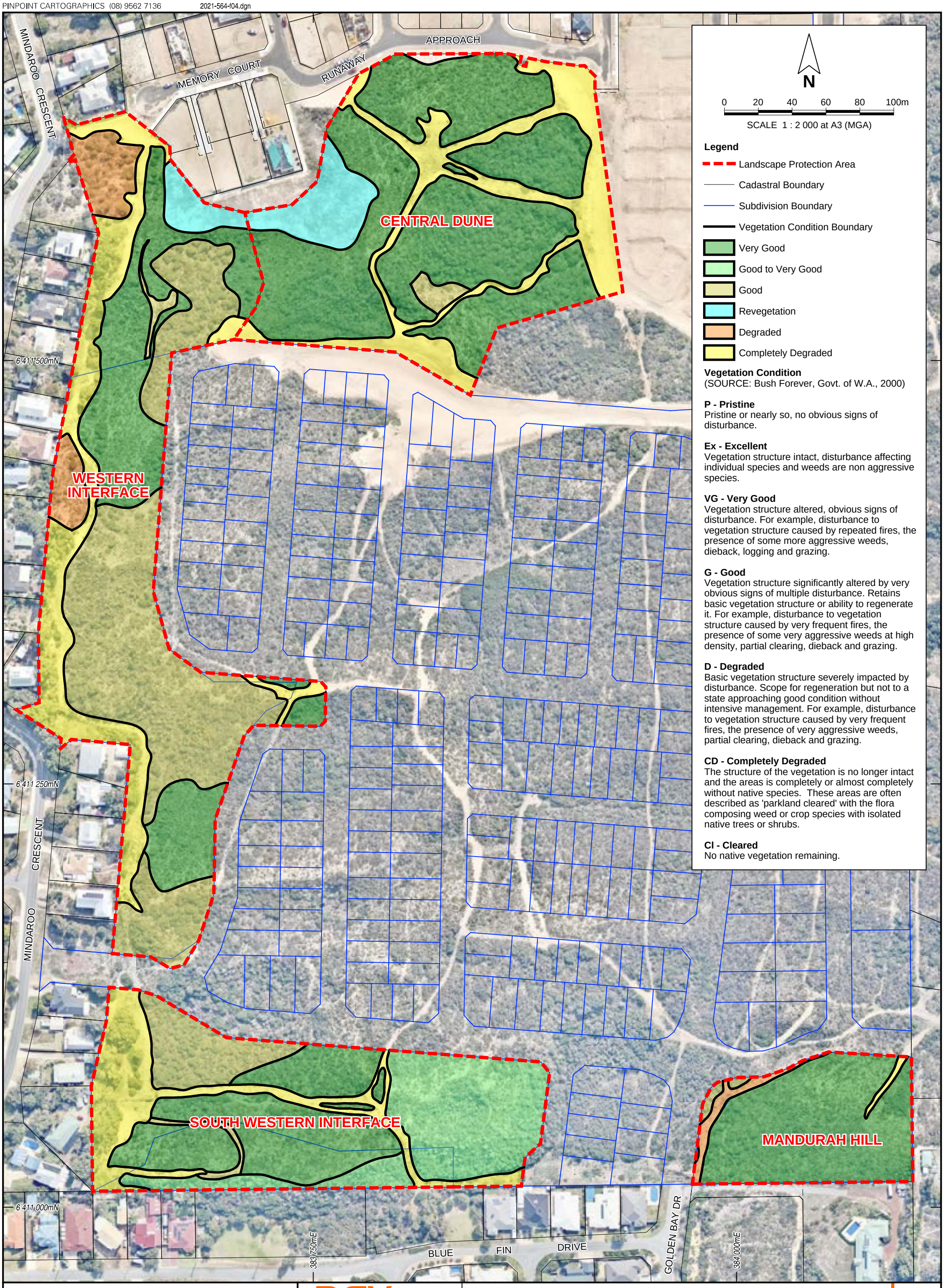
LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

VEGETATION TYPES

Figure 3

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f04.dgn



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

VEGETATION CONDITION

Figure 4

N

0 5 10 15 20m

SCALE 1 : 400 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 76-100% Coverage
- 6-75% Coverage
- 0-5% Coverage

384 000mE

384 050mE

384 100mE

6 411 100mN

6 411 050mN

9028

153

4039

R 42359

101

102

GOLDEN BAY DRIVE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-105.dgn

pgv ENVIRONMENTAL

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot | Date: 5 Apr 2021

Job: 10004 Rpt: 2021-564 | Revision: A

OVERALL WEED MAP FOR MANDURAH HILL AREA

Figure 5

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 76-100% Coverage
- 6-75% Coverage
- 0-5% Coverage

743
744
745
746
747
9028
2095
R 28732
8001
R 28732
196
195
194
193
6 411 100mN
6 411 000mN
383 700mE
383 800mE
383 900mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

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

Drawn: J. Cabot | Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564 | Revision: A

OVERALL WEED MAP FOR SOUTH WESTERN INTERFACE

Figure 6

2021-564-06.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f07.dgn

N

0 10 20 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 76-100% Coverage
- 6-75% Coverage
- 0-5% Coverage

CRESCENT

MINDAROO

6 411 600mN

6 411 400mN

6 411 200mN

383 600mE

383 800mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

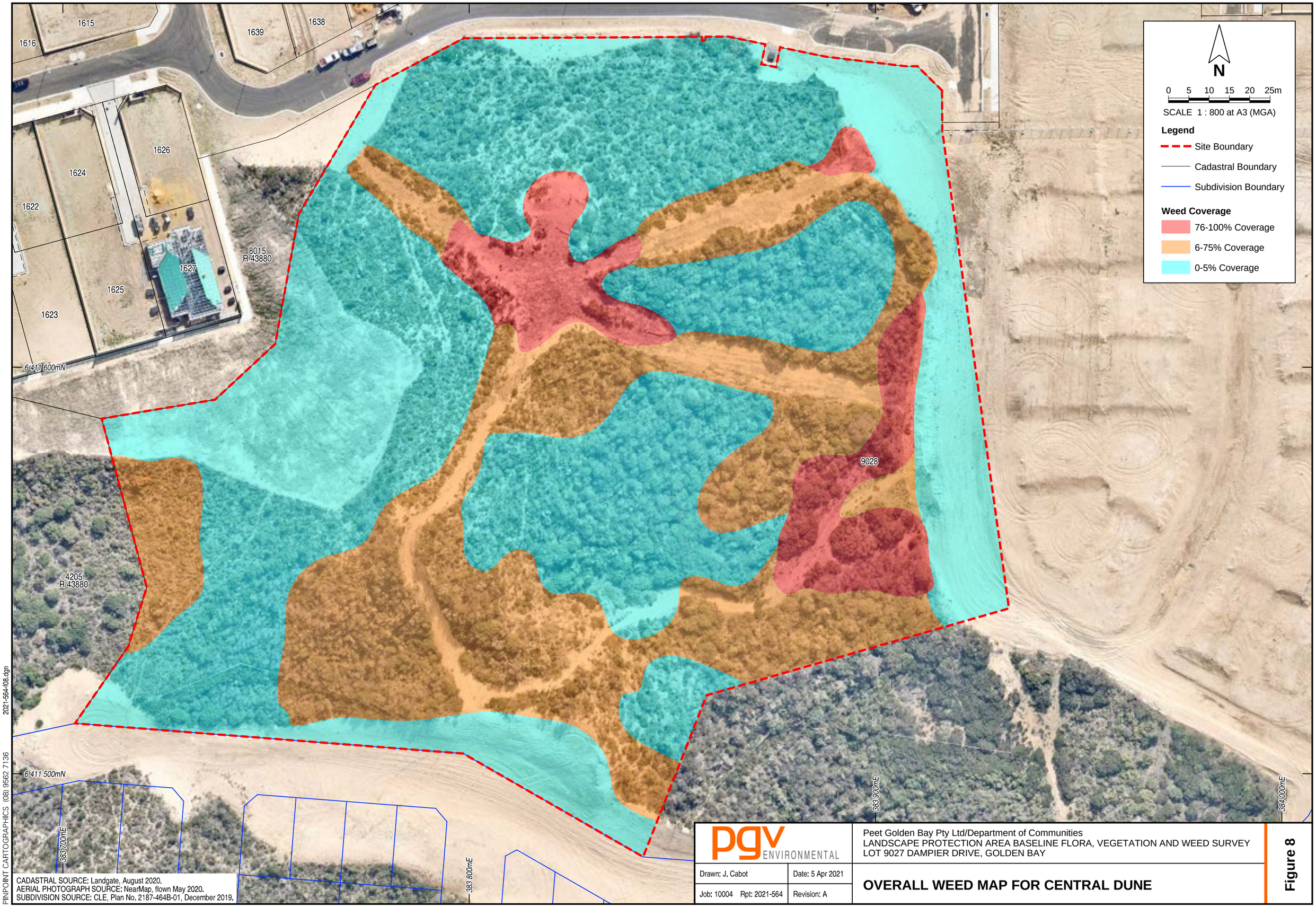
Peet Golden Bay Pty Ltd/Department of Communities
LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot | Date: 5 Apr 2021

Job: 10004 Rpt: 2021-564 | Revision: A

OVERALL WEED MAP FOR WESTERN INTERFACE

Figure 7



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136

2021-564-f08.dgn

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

OVERALL WEED MAP FOR CENTRAL DUNE

Figure 8

N

0 5 10 15 20m

SCALE 1 : 400 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

384 000mE

384 050mE

384 100mE

6 411 100mN

6 411 050mN

9028

153

4039

R 42359

GOLDEN BAY DRIVE

101

102

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-109.dgn

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

GERALDTON CARNATION WEED (*Euphorbia terracina*) IN MANDURAH HILL AREA

Figure 9

N

0 5 10 15 20m

SCALE 1 : 400 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

384 000mE

384 050mE

384 100mE

6 411 100mN

6 411 050mN

9028

153

4039

R 42359

GOLDEN BAY DRIVE

101

102

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-110.dgn

pgv ENVIRONMENTAL

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

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

ROSE PELARGONIUM (*Pelargonium capitatum*) IN MANDURAH HILL AREA

Figure 10

N

0 5 10 15 20m

SCALE 1 : 400 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 0-5% Coverage

384 000mE

384 050mE

384 100mE

6 411 100mN

6 411 050mN

9028

153

4039

R 42359

101

102

GOLDEN BAY DRIVE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f11.dgn

pgv ENVIRONMENTAL

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

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Job: 10004 Rpt: 2021-564	Revision: A

BRANCHED ONION WEED (*Trachyandra divaricata*) IN MANDURAH HILL AREA

Figure 11

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

743
744
745
746
747
9028
2095
R 28732
8001
R 28732
196
195
194
193
6 411 100mN
6 411 000mN
383 700mE
383 800mE
383 900mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot | Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564 | Revision: A

GERALDTON CARNATION WEED (*Euphorbia terracina*) IN SOUTH WESTERN INTERFACE

Figure 12

2021-564-f12.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

743
744
745
746
747
9028
2095
R 28732
8001
R 28732
196
195
194
193
6 411 100mN
6 411 000mN
383 700mE
383 800mE
383 900mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

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LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

ROSE PELARGONIUM (*Pelargonium capitatum*) IN SOUTH WESTERN INTERFACE

Figure 13

2021-564-f13.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

743
744
745
746
747
9028
2095 R 28732
8001 R 28732
196
195
194
193
6 411 000mN
6 411 100mN
383 700mE
383 800mE
383 900mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

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

Drawn: J. Cabot | Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564 | Revision: A

BRANCHED ONION WEED (*Trachyandra divaricata*) IN SOUTH WESTERN INTERFACE

Figure 14

2021-564-f14.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary

Weed Coverage

- 6-75% Coverage
- 0-5% Coverage

743
744
745
746
747
9028
6 411 100mN
6 411 000mN
383 700mE
383 800mE
383 900mE
8001
R 28732
2095
R 28732
196
195
194
193

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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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

BRAZILIAN PEPPER (*Schinus terebinthifolius*) IN SOUTH WESTERN INTERFACE

Figure 15

2021-564-f15.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

Site Boundary

Cadastral Boundary

Subdivision Boundary

Weed Coverage

0-5% Coverage

743

744

745

746

747

9028

6 411 100mN

6 411 000mN

196

195

194

193

2095
R 28732

8001
R 28732

383 700mE

383 800mE

383 900mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

2021-564-f16.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

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LOT 9027 DAMPIER DRIVE, GOLDEN BAY

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Job: 10004 Rpt: 2021-564 | Revision: A

CENTURY PLANT (*Agave americana*) & GERALDTON WAX (*Chamelaucium uncinatum*) IN SOUTH WESTERN INTERFACE

Figure 16

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f17.dgn

N

0 10 20 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

Site Boundary

Cadastral Boundary

Subdivision Boundary

Weed Coverage

6-75% Coverage

0-5% Coverage

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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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

Drawn: J. Cabot | Date: 5 Apr 2021

Job: 10004 Rpt: 2021-564 | Revision: A

GERALDTON CARNATION WEED (*Euphorbia terracina*) IN WESTERN INTERFACE

Figure 17

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f18.dgn

N

0 10 20 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

Site Boundary

Cadastral Boundary

Subdivision Boundary

Weed Coverage

6-75% Coverage

0-5% Coverage

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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LOT 9027 DAMPIER DRIVE, GOLDEN BAY

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Job: 10004 Rpt: 2021-564 | Revision: A

ROSE PELARGONIUM (*Pelargonium capitatum*) IN WESTERN INTERFACE

Figure 18

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f19.dgn

N

0 10 20 30 40 50m

SCALE 1 : 1 500 at A3 (MGA)

Legend

Site Boundary

Cadastral Boundary

Subdivision Boundary

Weed Coverage

6-75% Coverage

0-5% Coverage

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

Drawn: J. Cabot | Date: 5 Apr 2021

Job: 10004 Rpt: 2021-564 | Revision: A

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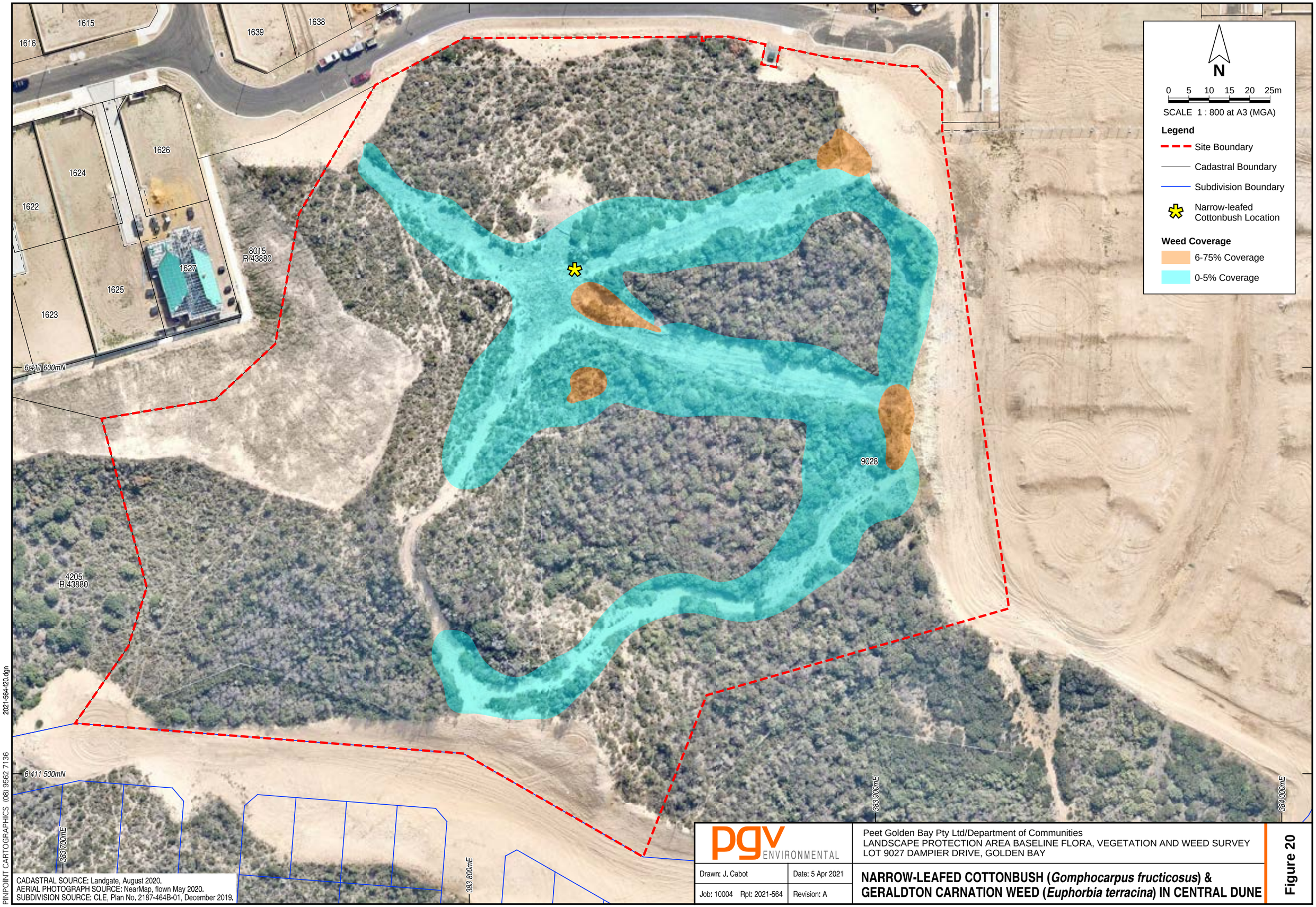
LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

BRANCHED ONION WEED (*Trachyandra divaricata*) IN WESTERN INTERFACE

Figure 19



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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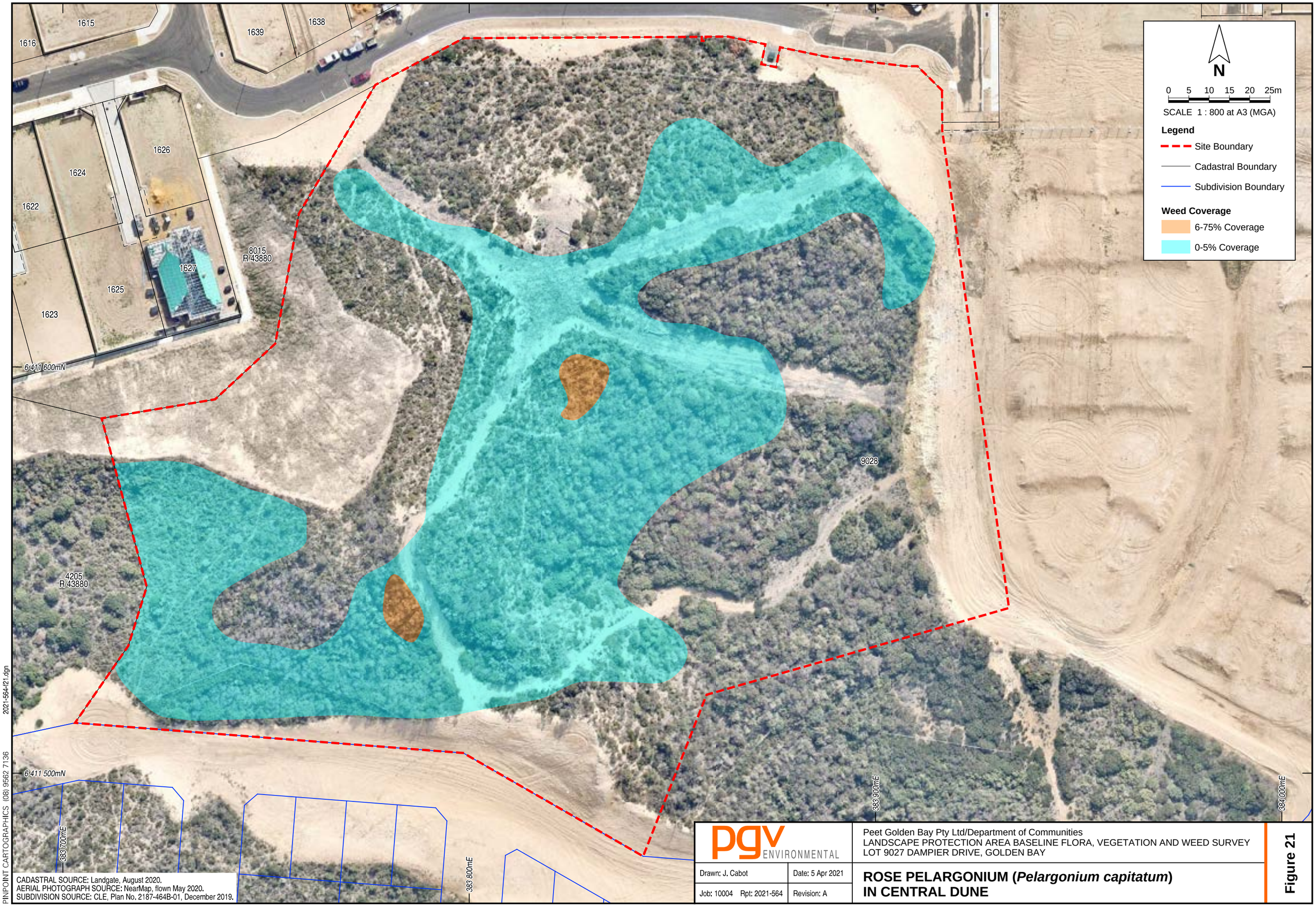
LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

NARROW-LEAFED COTTONBUSH (*Gomphocarpus fructicosus*) & GERALDTON CARNATION WEED (*Euphorbia terracina*) IN CENTRAL DUNE

Figure 20

2021-564-f20.dgn
PINPOINT CARTOGRAPHICS (08) 9562 7136



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

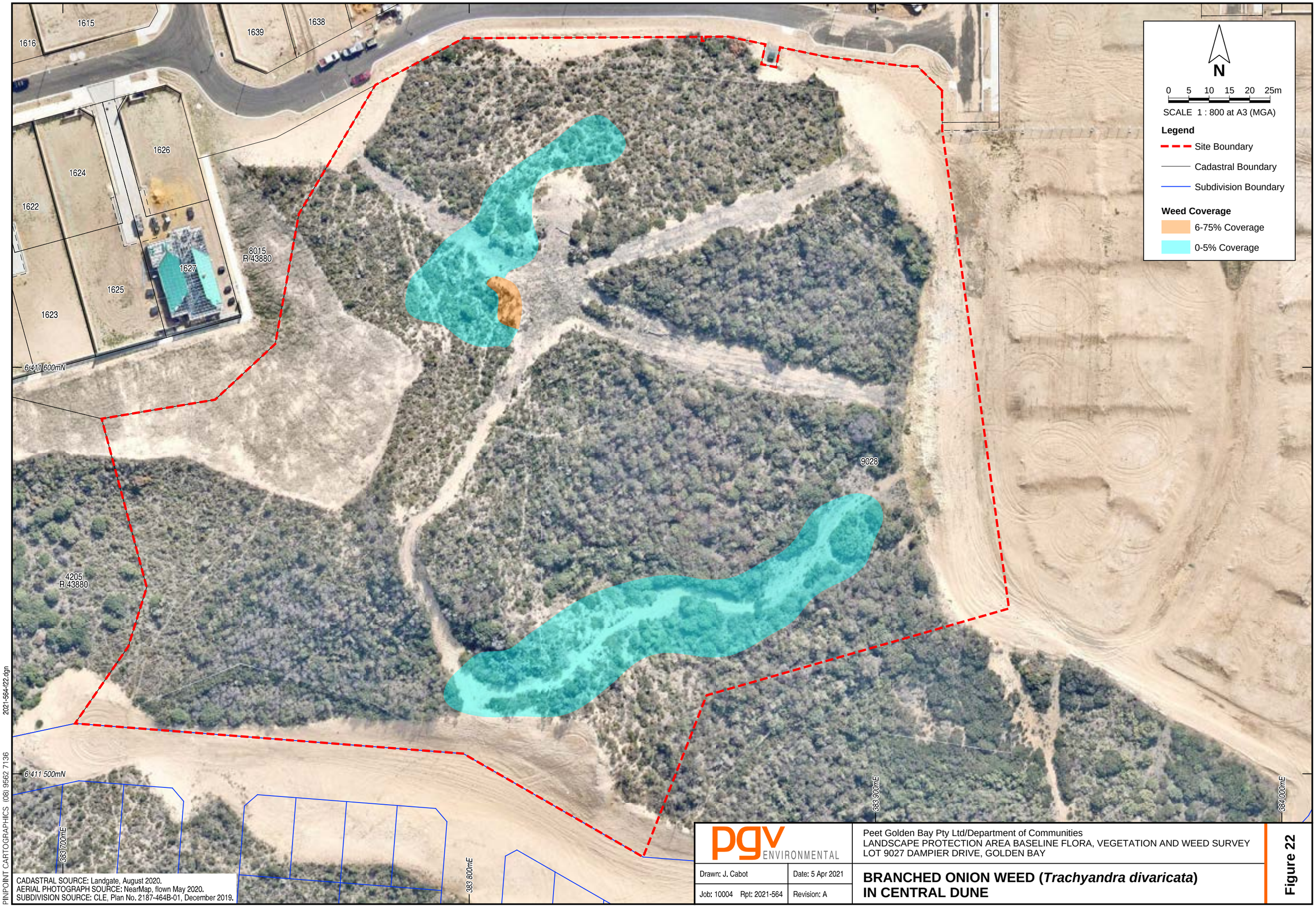
Peet Golden Bay Pty Ltd/Department of Communities
LANDSCAPE PROTECTION AREA BASELINE FLORA, VEGETATION AND WEED SURVEY
LOT 9027 DAMPIER DRIVE, GOLDEN BAY

Drawn: J. Cabot	Date: 5 Apr 2021
Job: 10004 Rpt: 2021-564	Revision: A

ROSE PELARGONIUM (*Pelargonium capitatum*) IN CENTRAL DUNE

Figure 21

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-564-f21.dgn



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

pgv ENVIRONMENTAL

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LOT 9027 DAMPIER DRIVE, GOLDEN BAY

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BRANCHED ONION WEED (*Trachyandra divaricata*) IN CENTRAL DUNE

Figure 22

2021-564-f22.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

APPENDIX 1

Weed Mapping Grids

N

0 5 10 15 20m

SCALE 1 : 400 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary
- Topographic Contour
- 20m Gridline
- Quadrat Location

384 000mE
384 050mE
384 100mE
6 411 100mN
6 411 050mN
6 411 000mN
9028
153
4039
R 42359
101
102

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPHY SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

10004-LPA-wkpln06.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

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Department of Housing
LANDSCAPE PROTECTION AREAS
GOLDEN BAY

Drawn: J. Cabot | Date: 18 Oct 2020
Job: 10004 Rpt: | Revision: A

LANDSCAPE PROTECTION AREA AND POS

Workplan 6

N

0 5 10 15 20 25m

SCALE 1 : 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary
- Topographic Contour
- 20m Gridline
- Quadrat Location

743 744 745 746 747 9028 2095 R 28732 8001 R 28732

6 411 100mN 6 411 000mN

383 700mE 383 800mE 383 900mE

196 195 194 193

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

PINPOINT CARTOGRAPHICS (08) 9562 7136 10004-LPA-wkpln07.dgn

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GOLDEN BAY

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LANDSCAPE PROTECTION AREA AND POS

Workplan 2

PINPOINT CARTOGRAPHICS (08) 9562 7136 10004-LPA-wkpln08.dgn

N

0 10 20 30 40 50m

SCALE 1 : 1 000 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Subdivision Boundary
- Topographic Contour
- 20m Gridline
- Quadrat Location

6 411 500mN
6 411 400mN
6 411 300mN
6 411 200mN
383 600mE
383 700mE
383 800mE

727 728 729 730 731 734 735 736 737 738 739 740 741 742 743 744 592 593 594 622 623 624 625 9028 1

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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GOLDEN BAY

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Job: 10004 Rpt: | Revision: A

LANDSCAPE PROTECTION AREA AND POS

Workplan 8

PINPOINT CARTOGRAPHICS (08) 9562 7136 10004-LPA-wkpln09.dgn

N

0 5 10 15 20m

SCALE 1 : 500 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Subdivision Boundary
- Topographic Contour
- 20m Gridline
- Quadrat location

721 722 723 724 725 726 727 728 729

1620 1621 1622 1623 1625

4205 R 43880

8015 R 43880

9028

6 411 650mN 6 411 600mN 6 411 550mN 6 411 500mN

383 600mE 383 650mE 383 700mE

CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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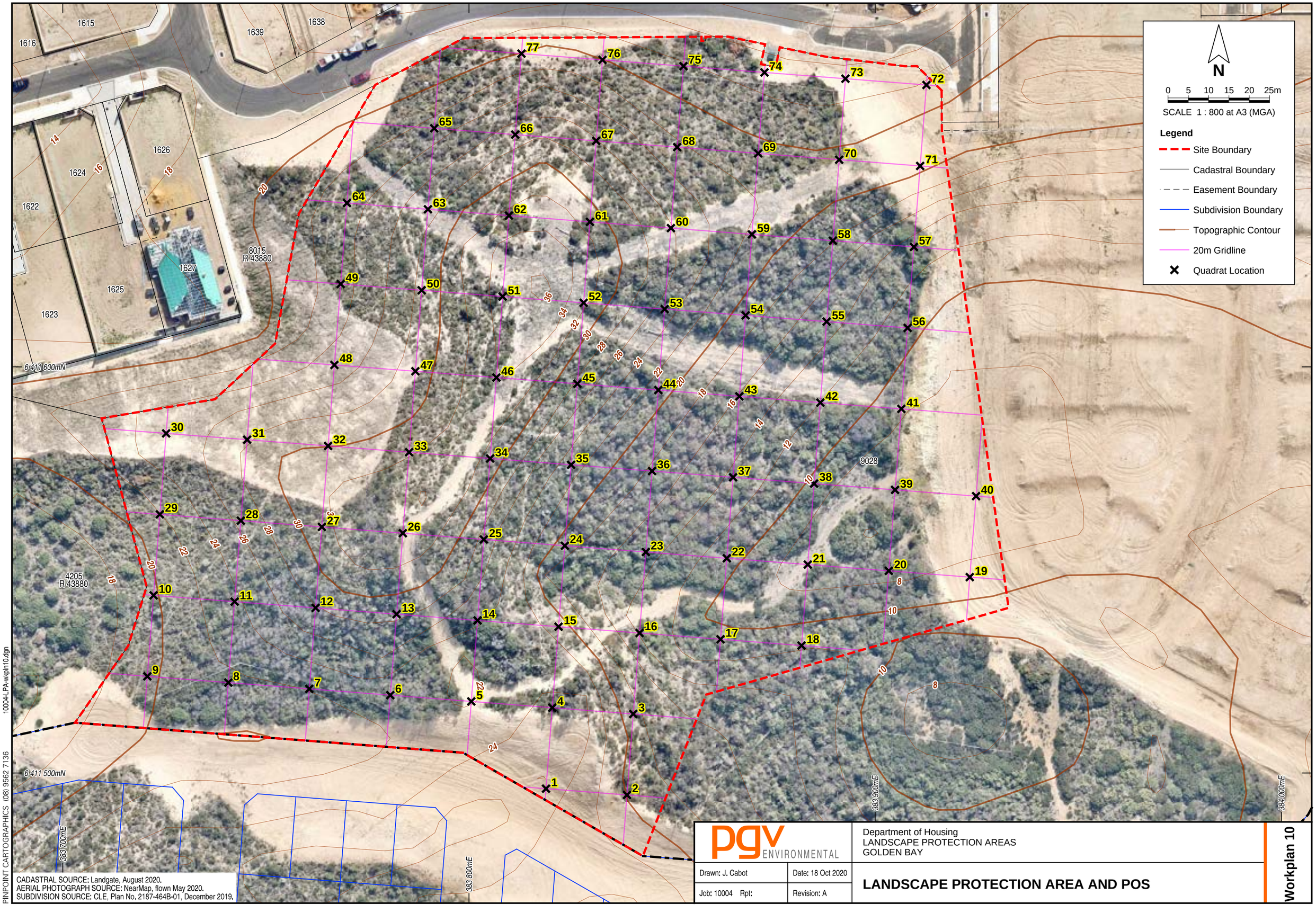
Department of Housing
LANDSCAPE PROTECTION AREAS
GOLDEN BAY

Drawn: J. Cabot | Date: 18 Oct 2020

Job: 10004 Rpt: | Revision: A

LANDSCAPE PROTECTION AREA AND POS

Workplan 9



CADASTRAL SOURCE: Landgate, August 2020.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown May 2020.
SUBDIVISION SOURCE: CLE, Plan No. 2187-464B-01, December 2019.

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LANDSCAPE PROTECTION AREA AND POS

Workplan 10

10004-LPA-wkpln10.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136

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	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
2.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
3.	24790	*Calidris tenuirostris (Great Knot)*		T	
4.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
5.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
6.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
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	
Protected under 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	
Other specially protected fauna					
34.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
35.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Priority 2					
36.	3237	*Acacia benthamii*		P2	
37.	3006	*Cardamine paucijuga*		P2	
Priority 3					
38.	34236	*Beyeria cinerea subsp. cinerea*		P3	
39.	44226	*Calandrinia oraria*		P3	
40.	3863	*Dillwynia dillwynioides*		P3	
41.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
42.	5038	*Lasiopetalum membranaceum*		P3	
43.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
44.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
45.	5237	*Pimelea calcicola*		P3	
46.	980	*Schoenus capillifolius*		P3	
47.	20348	*Sphaerolobium calcicola*		P3	
Priority 4					
48.	13862	*Caladenia speciosa*		P4	
49.	11657	*Conostylis pauciflora subsp. pauciflora*		P4	
50.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
51.	4027	*Jacksonia sericea (Waldjumi)*		P4	
52.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
53.	6573	*Parsonsia diaphanophleba*		P4	
54.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
55.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Non-conservation taxon					
56.	15466	*Acacia applanata*			
57.	3262	*Acacia cochlearis (Rigid Wattle)*			
58.	3282	*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.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
66.	30033	*Acacia saligna subsp. lindleyi*			
67.	30032	*Acacia saligna subsp. saligna*			
68.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
69.	3584	*Acacia truncata*			
70.	3602	*Acacia willdenowiana (Grass Wattle)*			
71.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
72.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
73.	24262	*Acanthiza inornata (Western Thornbill)*			
74.	1208	*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.	1790	*Adenanthos meisneri*			
82.	4582	*Adriana quadripartita (Bitter Bush)*			
83.		*Afurcagobius suppositus*			
84.	17202	*Agonis flexuosa var. flexuosa*			
85.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
86.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
87.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
88.	6565	*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.	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)*			
99.	1409	*Anigozanthos humilis (Catspaw)*			
100.	11434	*Anigozanthos humilis subsp. humilis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query 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.	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.	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.	38762	*Auriscalpium barbatum*			
139.	47713	*Austronomus australis (White-striped Free-tailed Bat)*			
140.	17234	*Austrostipa compressa*			
141.	17239	*Austrostipa exilis*			
142.	17240	*Austrostipa flavescens*			
143.	233	*Avena barbata (Bearded Oat)*	Y		
144.	24318	*Aythya australis (Hardhead)*			
145.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
146.	32580	*Banksia dallanneyi subsp. dallanneyi var. dallanneyi*			
147.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
148.	1830	*Banksia littoralis (Swamp Banksia, Pungura)*			
149.	1834	*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.	6341	*Brachyloma preissii (Globe Heath)*			
163.	8661	*Brachypodium distachyon (False Brome)*	Y		
164.	7878	*Brachyscome iberidifolia*			
165.	244	*Briza maxima (Blowfly Grass)*	Y		
166.	245	*Briza minor (Shivery Grass)*	Y		
167.	247	*Bromus arenarius (Sand Brome)*			
168.	249	*Bromus diandrus (Great Brome)*	Y		
169.	1383	*Burchardia bairdiae*			
170.	12770	*Burchardia congesta*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
171.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
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.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
177.	1276	*Caesia micrantha (Pale Grass Lily)*			
178.	3002	*Cakile maritima (Sea Rocket)*	Y		
179.	15330	*Caladenia arenicola*			
180.	1592	*Caladenia flava (Cowslip Orchid)*			
181.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
182.	15361	*Caladenia longicauda subsp. calcigena*			
183.	17589	*Caladenia occidentalis*			
184.	18019	*Caladenia vulgata*			
185.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			
186.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
187.	2854	*Calandrinia granulifera (Pygmy Purslane)*			
188.	2856	*Calandrinia liniflora (Parakeelya)*			
189.	40827	*Calandrinia tholiformis*			
190.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
191.		*Calyptorhynchus latirostris?*			Y
192.	5439	*Calytrix angulata (Yellow Starflower)*			
193.	5458	*Calytrix flavescens (Summer Starflower)*			
194.		*Candelariella sp.*			
195.	48920	*Canis familiaris (Dog, Dingo)*	Y		
196.	3005	*Cardamine hirsuta (Common Bittercress)*	Y		
197.	25625	*Carduelis carduelis (Goldfinch, European Goldfinch)*	Y		
198.	43241	*Carex thecata*			
199.	2798	*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.	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.	267	*Chloris gayana (Rhodes Grass)*	Y		
221.	763	*Chorizandra enodis (Black Bristlerush)*			
222.	24980	*Christinus marmoratus (Marbled Gecko)*			
223.		*Chroicocephalus novaehollandiae*			
224.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
225.	24288	*Circus approximans (Swamp Harrier)*			
226.	24289	*Circus assimilis (Spotted Harrier)*			
227.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
228.	10804	*Clematis linearifolia*			
229.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
230.	24399	*Columba livia (Domestic Pigeon)*	Y		
231.	4550	*Comesperma calymega (Blue-spike Milkwort)*			
232.	4552	*Comesperma confertum*			
233.	4555	*Comesperma integerrimum*			
234.	4564	*Comesperma virgatum (Milkwort)*			
235.	16853	*Conospermum capitatum subsp. glabratum*			
236.	1885	*Conospermum triplinervium (Tree Smokebush)*			
237.	6349	*Conostephium preissii*			
238.	1418	*Conostylis aculeata (Prickly Conostylis)*			
239.	11826	*Conostylis aculeata subsp. aculeata*			
240.	1427	*Conostylis candicans (Grey Cottonhead)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
241.	12027	*Conostylis candicans subsp. calcicola*			
242.	1436	*Conostylis juncea*			
243.	1443	*Conostylis pauciflora (Dawesville Conostylis)*			
244.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
245.	25592	*Corvus coronoides (Australian Raven)*			
246.	1285	*Corynotheca micrantha (Sand Lily)*			
247.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
248.	24671	*Coturnix pectoralis (Stubble Quail)*			
249.	25595	*Cracticus tibicen (Australian Magpie)*			
250.	25596	*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.	11709	*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.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
266.	11021	*Cuscuta planiflora*	Y		
267.	768	*Cyathochaeta avenacea*			
268.	40661	*Cycnogeton lineare*			
269.	24322	*Cygnus atratus (Black Swan)*			
270.	19625	*Cymbalaria muralis subsp. muralis*	Y		
271.	285	*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.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
276.	7454	*Dampiera linearis (Common Dampiera)*			
277.	7484	*Dampiera trigona (Angled-stem Dampiera)*			
278.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
279.	5518	*Darwinia neildiana (Fringed Bell)*			
280.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
281.	6218	*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.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
289.	17663	*Desmocladus asper*			
290.	17691	*Desmocladus fasciculatus*			
291.	16595	*Desmocladus flexuosus*			
292.	299	*Deyeuxia quadriseta (Reed Bentgrass)*			
293.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
294.	306	*Dichelachne crinita (Longhair Plumegrass)*			
295.	1287	*Dichopogon capillipes*			
296.	4454	*Diplolaena dampieri (Southern Diplolaena)*			
297.	18541	*Diplopeltis huegelii subsp. huegelii*			
298.	7054	*Dischisma arenarium*	Y		
299.	7055	*Dischisma capitatum (Woolly-headed Dischisma)*	Y		
300.	1635	*Diuris longifolia (Common Donkey Orchid)*			
301.	24470	*Dromaius novaehollandiae (Emu)*			
302.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
303.	3097	*Drosera gigantea (Giant Sundew)*			
304.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
305.	3109	*Drosera menziesii (Pink Rainbow)*			
306.	3113	*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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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.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
320.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
321.		*Eolophus roseicapillus*			
322.	6131	*Epilobium billardiereanum (Glabrous Willow Herb)*			
323.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
324.	14289	*Epilobium tetragonum subsp. tetragonum*	Y		
325.	24567	*Epthianura albifrons (White-fronted Chat)*			
326.	17175	*Eremophila glabra subsp. albicans*			
327.	15410	*Eriochilus dilatatus subsp. dilatatus*			
328.	15412	*Eriochilus dilatatus subsp. multiflorus*			
329.	4332	*Erodium botrys (Long Storksbill)*	Y		
330.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
331.	15446	*Eryngium pinnatifidum subsp. pinnatifidum*			
332.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
333.	5649	*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.	3880	*Eutaxia virgata*			
343.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
344.	25621	*Falco berigora (Brown Falcon)*			
345.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
346.	25623	*Falco longipennis (Australian Hobby)*			
347.	24041	*Felis catus (Cat)*	Y		
348.	20216	*Ficinia nodosa (Knotted Club Rush)*			
349.	25727	*Fulica atra (Eurasian Coot)*			
350.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
351.	907	*Gahnia trifida (Coast Saw-sedge)*			
352.	34028	*Galaxias occidentalis (Western Minnow)*			
353.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
354.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
355.	20473	*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.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
365.	7538	*Goodenia pulchella*			
366.	24443	*Grallina cyanoleuca (Magpie-lark)*			
367.	1982	*Grevillea crithmifolia*			
368.	15839	*Grevillea preissii subsp. preissii*			
369.	12824	*Grevillea vestita subsp. vestita*			
370.		*Gymnopilus allantopus*			
371.		*Gymnothorax prasinus*			
372.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
373.	1468	*Haemodorum laxum*			
374.	1472	*Haemodorum simplex*			
375.	2197	*Hakea prostrata (Harsh Hakea)*			
376.	2216	*Hakea varia (Variable-leaved Hakea)*			
377.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
378.	24295	*Haliastur sphenurus (Whistling Kite)*			
379.	24689	*Halobaena caerulea (Blue Petrel)*			
380.	3961	*Hardenbergia comptoniana (Native Wisteria)*			

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381.	25410	*Heleioporus eyrei (Moaning Frog)*			
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.	25119	*Hemiergis quadrilineata*			
388.	5117	*Hibbertia cuneiformis (Cutleaf Hibbertia)*			
389.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
390.	45534	*Hibbertia hypericoides subsp. hypericoides*			
391.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
392.	5172	*Hibbertia stellaris (Orange Stars)*			
393.	5176	*Hibbertia vaginata*			
394.	47965	*Hieraaetus morphnoides (Little Eagle)*			
395.	25734	*Himantopus himantopus (Black-winged Stilt)*			
396.	24491	*Hirundo neoxena (Welcome Swallow)*			
397.	13758	*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.	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.	1070	*Hypolaena exsulca*			
411.	17841	*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.	917	*Isolepis marginata (Coarse Club-rush)*			
418.	921	*Isolepis producta*			
419.		*Isopeda leishmanni*			
420.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
421.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
422.	8092	*Ixiolaena viscosa (Sticky Ixiolaena)*			
423.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
424.	20454	*Juncus acutus subsp. acutus*	Y		
425.	1178	*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.	5832	*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.	7572	*Lechenaultia expansa*			
438.	44490	*Leontodon rhagadioloides*	Y		
439.	925	*Lepidosperma angustatum*			
440.	42742	*Lepidosperma calcicola*			
441.	932	*Lepidosperma effusum (Spreading Sword-sedge)*			
442.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
443.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
444.	940	*Lepidosperma pubisquameum*			
445.		*Lepidosperma sp.*			
446.	945	*Lepidosperma squamatum*			
447.	1653	*Leporella fimbriata (Hare Orchid)*			
448.	1078	*Leptocarpus coangustatus*			
449.	46375	*Leptocarpus decipiens*			
450.	46382	*Leptocarpus roycei*			

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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.	6515	*Logania vaginalis (White Spray)*			
477.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
478.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
479.		*Lolium sp.*			
480.	11073	*Lolium x hybridum*	Y		
481.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
482.	1228	*Lomandra hermaphrodita*			
483.	1231	*Lomandra maritima*			
484.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
485.	14542	*Lomandra micrantha subsp. micrantha*			
486.	1239	*Lomandra preissii*			
487.	1243	*Lomandra sericea (Silky Mat Rush)*			
488.	1246	*Lomandra suaveolens*			
489.		*Lophoictinia isura*			
490.	8564	*Lotus subbiflorus*	Y		
491.	1198	*Luzula meridionalis (Field Woodrush)*			
492.	1097	*Lyginia barbata*			
493.	18049	*Lyginia imberbis*			
494.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
495.	2839	*Macarthuria australis*			
496.		*Macrolepiota clelandii*			
497.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
498.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
499.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
500.	25654	*Malurus splendens (Splendid Fairy-wren)*			
501.	24552	*Malurus splendens subsp. splendens (Splendid Fairy-wren)*			
502.	4961	*Malva parviflora (Marshmallow)*	Y		
503.	36522	*Malva pseudolavatera*	Y		
504.	4079	*Medicago polymorpha (Burr Medic)*	Y		
505.	4080	*Medicago sativa (Alfalfa)*	Y		
506.	25758	*Megalurus gramineus (Little Grassbird)*			
507.	34676	*Meionectes brownii (Swamp Raspwort)*			
508.	5921	*Melaleuca incana (Grey Honeymyrtle)*			
509.	13273	*Melaleuca incana subsp. incana*			
510.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
511.	5952	*Melaleuca preissiana (Moonah)*			
512.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
513.	18598	*Melaleuca systena*			
514.	5978	*Melaleuca teretifolia (Banbar)*			
515.	5980	*Melaleuca thymoides*			
516.	5987	*Melaleuca viminea (Mohan)*			
517.	13280	*Melaleuca viminea subsp. viminea*			
518.	4085	*Melilotus indicus*	Y		
519.	25184	*Menetia greyii*			
520.	6886	*Mentha x piperita*	Y		Y

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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.	485	*Microlaena stipoides (Weeping Grass)*			
527.	15419	*Microtis media subsp. media*			
528.	1660	*Microtis orbicularis (Dark Mignonette Orchid)*			
529.	8105	*Millotia myosotidifolia*			
530.	16693	*Minuartia mediterranea*	Y		
531.		*Missulena granulosa*			
532.		*Missulena hoggi*			
533.	37440	*Monopsis debilis var. depressa*	Y		
534.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
535.	25191	*Morethia lineoocellata*			
536.	48008	*Morus serrator (Australasian Gannet)*			
537.	2412	*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.		*Nannoperca vittata*			
543.	24738	*Neophema elegans (Elegant Parrot)*			
544.		*Nicodamus mainae*			
545.	25252	*Notechis scutatus (Tiger Snake)*			
546.	2401	*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.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
558.	30375	*Oxalis exilis*			
559.	4355	*Oxalis perennans*			
560.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
561.	24693	*Pachyptila desolata (Antarctic Prion)*			
562.	1667	*Paracaleana nigrita (Flying Duck Orchid)*			
563.	25253	*Parasuta gouldii*			
564.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
565.	25682	*Pardalotus striatus (Striated Pardalote)*			
566.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
567.	1763	*Parietaria judaica (Pellitory)*	Y		
568.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
569.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
570.	4346	*Pelargonium littorale*			
571.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
572.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
573.	16478	*Pericalymma ellipticum var. floridum*			
574.	48061	*Petrochelidon nigricans (Tree Martin)*			
575.	48066	*Petroica boodang (Scarlet Robin)*			
576.	20368	*Petrophile axillaris*			
577.	2299	*Petrophile linearis (Pixie Mops)*			
578.	19825	*Petrorhagia dubia*	Y		
579.	25697	*Phalacrocorax carbo (Great Cormorant)*			
580.	25698	*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.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
590.	16177	*Phyllangium paradoxum*			

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591.	4675	*Phyllanthus calycinus (False Boronia)*			
592.		*Phyllichthys punctatus*			
593.	4	*Phylloglossum drummondii (Pigmy Clubmoss)*			
594.		*Phytophthora cinnamomi*			
595.	14370	*Picris angustifolia subsp. angustifolia*			
596.	5252	*Pimelea lanata*			
597.	5261	*Pimelea rosea (Rose Banjine)*			
598.	18117	*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.	8175	*Podolepis gracilis (Slender Podolepis)*			
613.	8182	*Podotheca angustifolia (Sticky Longheads)*			
614.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
615.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
616.		*Podotheca sp.*			
617.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
618.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
619.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
620.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
621.	25722	*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.	25511	*Pseudonaja affinis (Dugite)*			
630.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
631.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
632.	24702	*Pterodroma brevirostris (Kerguelen Petrel)*			
633.	25710	*Pterodroma macroptera (Great-winged Petrel)*			
634.		*Pterostylis aff. nana*			
635.	48678	*Pterostylis angulata*			
636.	1686	*Pterostylis barbata (Bird Orchid)*			
637.	17267	*Pterostylis brevisepala*			
638.	48674	*Pterostylis orbiculata*			
639.	11118	*Pterostylis pyramidalis (Snail Orchid)*			
640.	12217	*Pterostylis sanguinea*			
641.		*Pterostylis sp.*			
642.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
643.	2751	*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.	24245	*Rattus rattus (Black Rat)*	Y		
655.		*Raveniella peckorum*			
656.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
657.	38832	*Resupinatus cinerascens*			
658.	19183	*Retama raetam*	Y		
659.	11341	*Rhagodia baccata subsp. baccata*			
660.	11930	*Rhagodia baccata subsp. dioica (Sea Berry Saltbush)*			

	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.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
684.	1004	*Schoenus nitens (Shiny Bog-rush)*			
685.	1006	*Schoenus odontocarpus*			
686.	1018	*Schoenus subfascicularis*			
687.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
688.	6	*Selaginella gracillima (Tiny Clubmoss)*			
689.	32433	*Sematophyllum homomallum*			
690.	25878	*Senecio condylus*			
691.	8203	*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.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
703.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
704.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
705.		*Sphyraena obtusata*			
706.	624	*Spinifex hirsutus (Hairy Spinifex)*			
707.	625	*Spinifex longifolius (Beach Spinifex)*			
708.	8710	*Sporobolus africanus (Parramatta Grass)*	Y		
709.	635	*Sporobolus virginicus (Marine Couch)*			
710.	4828	*Spyridium globulosum (Basket Bush)*			
711.		*Squatina australis*			
712.	9069	*Stackhousia huegelii*			
713.	4733	*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.	7696	*Stylidium calcaratum (Book Triggerplant)*			
726.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
727.	7713	*Stylidium dichotomum (Pins-and-needles)*			
728.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
729.	25829	*Stylidium neurophyllum (Coastal Plain Triggerplant)*			
730.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query 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.	19041	*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.	151	*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.	24852	*Tyto alba subsp. delicatula (Barn Owl)*			
785.		*Urolophus lobatus*			
786.	8255	*Ursinia anthemoides (Ursinia)*	Y		
787.	24386	*Vanellus tricolor (Banded Lapwing)*			
788.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
789.	25225	*Varanus rosenbergi (Heath Monitor)*			
790.	25526	*Varanus tristis (Racehorse Monitor)*			
791.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			
792.	7107	*Verbascum virgatum (Twiggy Mullein)*	Y		
793.	15725	*Verbesina encelioides*	Y		
794.	46275	*Verbesina encelioides var. encelioides (Crownbeard, Wild Sunflower, Goldweed, South African Daisy)*	Y		
795.	24206	*Vespadelus regulus (Southern Forest Bat)*			
796.	4325	*Viminaria juncea (Swishbush, Koweda)*			
797.	24040	*Vulpes vulpes (Red Fox)*	Y		
798.	722	*Vulpia bromoides (Squirrel Tail Fescue)*	Y		

	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 - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
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 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 medium-term 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 ≤5 occurrences or a total area of ≤ 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 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

QUADRAT GB 1

50 383848 E 6411647 N

Vegetation: *Acacia rostellifera/Melaleuca systena/Acacia lasiocarpa* 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

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

* introduced species

QUADRAT GB 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

SPECIES	HEIGHT (m)	COVER (%)
Hydrocotyle intertexta	0.1	1
Clematis linearifolia	Climber	2

* introduced species

QUADRAT GB 3

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

* introduced species

QUADRAT GB 4

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

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

* introduced species

QUADRAT GB 5

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

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 species

QUADRAT GB 6

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

* introduced species

QUADRAT GB 7

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

* introduced species

QUADRAT GB 8

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

QUADRAT (10 x 10m)

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

* introduced species