



ATTACHMENTS

Development and Infrastructure Services Committee Meeting

13 September 2017

6.00pm

City of Albany Council Chambers

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B		Development & Infrastructure Services Committee	
	DIS045	<ul style="list-style-type: none"> • Attachment A: Proposed Frenchman Bay Heritage Trail Feasibility Study – H+H Architects. • Attachment B: Frenchman Bay Heritage Trail – revised map. • Attachment C: Frenchman Bay Heritage Trail – trail & dam sketch. 	1
	DIS046	Extractive (Gravel) <ul style="list-style-type: none"> • Site Plan • Environmental Assessment Report & Operations Plan • Summary of Submissions 	71
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PROPOSED FRENCHMAN BAY HERITAGE TRAIL



FEASIBILITY STUDY

PREPARED BY H+H ARCHITECTS FOR THE FRENCHMAN BAY ASSOCIATION

FUNDED BY LOTTERYWEST

SEPTEMBER 2015



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EXECUTIVE SUMMARY

This feasibility study (made possible by a grant from Lotterywest) has been prepared for the Frenchman Bay Association (FBA) and outlines a proposal to create a Heritage Trail (the 'Trail') at Whalers Beach, Frenchman Bay, Albany. The Trail would run along the escarpment between the existing stairs at the western and eastern ends of the beach. The stairs lead from the escarpment to the beach, forming a circular route. The section of the Trail on the escarpment would be constructed with a stabilised limestone base and the beach itself would constitute the lower section of the Trail.

The project's overall objective is to commemorate, preserve and share with visitors the rich heritage of this historic section of Frenchman Bay. In addition to the construction of the path, the intention is to provide two sheltered areas to view the expanse of Whalers Beach, plus interpretive signage that would explain the cultural and historical significance of the location. The signage would describe:

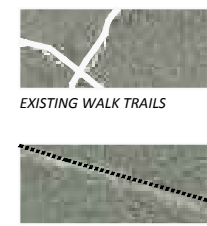
- stories of the Noongar people and their early contact with Europeans;
- the critical importance of the fresh water springs to Vancouver, Flinders, Baudin and the other navigators who followed;
- the Vancouver Dam, still in existence, that was so important to the development of Albany;
- the quarantine station on Mistaken Island;
- the Norwegian Whaling Station of which so little remains;
- the wrecks on the beach;
- the colourful history of the islands seen from the escarpment;
- the work of the early botanists, and the visit of Charles Darwin; and
- other events, places and persons of interest.

A world-class Heritage Trail at Frenchman Bay would add to the concentration of tourism attractions on Torndirrup Peninsula. Its appeal to tourists would lay not only in the panoramic scenery but also in the rich and largely unknown history of the location. Access would be free and open to visitors of all ages.

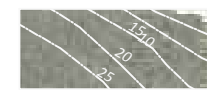
Important infrastructure is already in place in the project area - toilets, BBQ areas and a swimming beach. Discovery Bay, and its café, is close by.

The proposed Concept Plan for the Trail is shown on the following page.

LEGEND



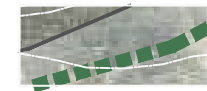
EXISTING WALK TRAILS
EXISTING POWER LINE



EXISTING CONTOUR LINES



PROPOSED FRENCHMAN BAY TRAIL ON PUBLIC LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED FRENCHMAN BAY TRAIL ON PRIVATE LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED PATH & STEPS TO VANCOUVER SPRING: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED STEPS ADJACENT TO EXISTING HERITAGE STEPS: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED FRENCHMAN BAY TRAIL: BEACH



PROPOSED LOCATION OF NEW TRAIL HEAD, TRAIL INFORMATION POINT OR INFORMATION NODE WITH INTERPRETIVE STRUCTURE



PROPOSED LOCATION FOR INFORMATION NODES WITH 'INTERPRETIVE SIGNAGE' (INDICATIVE LAYOUT)



PROPOSED LOCATION FOR 'DIRECTIVE SIGNAGE', 'DIRECTIVE SIGNAGE' IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM A DISTINGUISHED SECTION IN NEW LIME STONE WALK TRAIL (INDICATIVE LAYOUT)



FRENCHMAN BAY WHALING STATION (RUIN) HERITAGE REGISTER PLACE 16612

NEW INFORMATION NODE WITH INTERPRETATIVE STRUCTURE



NEW INFORMATION NODE WITH INTERPRETIVE STRUCTURE & SEATING - VIEWING POINT AND A PLACE TO REFLECT

VANCOUVER DAM - NEW VIEWING PLATT FORM



TIMBER DECKED VIEWING PLATFORM WITH TIMBER SEAT AND A TIMBER BOARD WALK FORMING THE TRANSITION TO NEW LIMESTONE PATHWAY

ITEM DIS045 REFERS

TRAIL HEAD - INTERPRETATION



TRAIL HEAD - INTERPRETATION STRUCTURE & SEATING

'DIRECTIVE SIGNAGE'



'DIRECTIVE SIGNAGE' IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM DISTINGUISHED SECTION IN NEW LIME STONE WALK TRAIL (INDICATIVE LAYOUT)

PATHWAYS



STABILISED LIME STONE WALK TRAILS

SEATING



CONCRETE OR QUARY-CUT GRANITE BLOCK SEATING TO NEW TRAIL HEAD & ALONG NEW PATH WAYS



Proposed Concept Plan - Draft

WITH INDICATIVE STRUCTURES, MATERIALS AND INTERPRETATION OPTIONS

SCALE 1:1500 @ A1

INDICATIVE INTERPRETATION OPTIONS



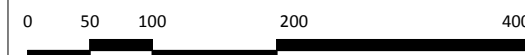
SCULPTURES

STRUCTURES

WALLS & SCREENS

FLOORS

PANELS



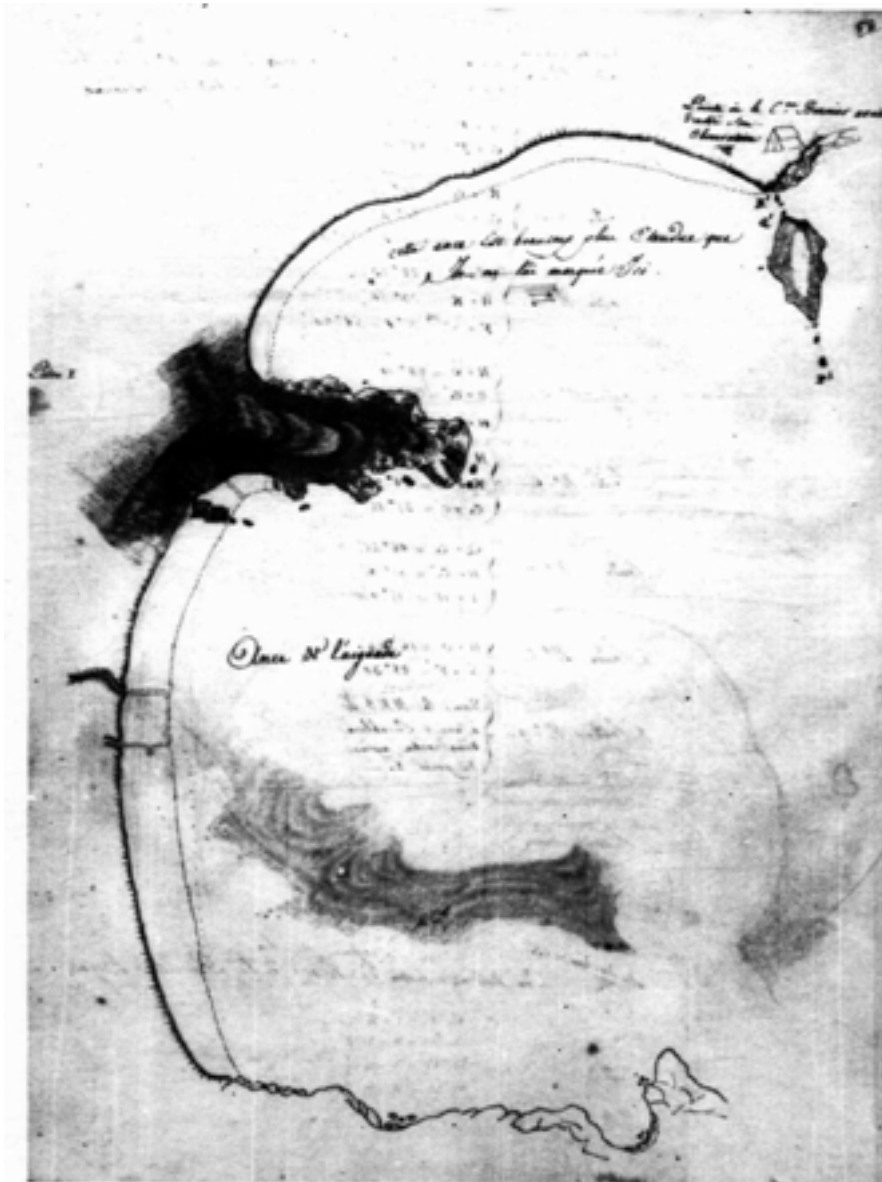
INTRODUCTION

The Purpose of the Heritage Trail Project

Visitors to Whalers Beach at Frenchman Bay are rewarded with beautiful scenery, a fine swimming beach and an attractive picnic area but they are told almost nothing of the extraordinary heritage of the location.

There are no signs to indicate the existence of the Vancouver Dam, the Norwegian Whaling Station, or wrecks that are visible from the shore. Nor is there any awareness that two centuries ago vessels from Britain, France, the United States, Norway and other European countries anchored here under the watchful eyes of Noongar men and women. What brought them to Whalers Beach were the fresh water springs that flowed even at the height of summer. For some years Albany residents themselves were dependent on these springs for a town water supply. There are many stories to be told about the fresh water springs and the people who were drawn to them.

Now is the time to commemorate these events, not only for Albany's residents but also for the growing numbers of tourists who visit Albany. It should be possible to stroll along the Trail, admiring the spectacular scenery and natural vegetation, while imagining the sailing ships anchored in the bay below. The interpretative Trail would enhance the tourism potential of the whole Torndirrup Peninsula.



Freycinet's 1803 map of Stream Bay (Whalers Beach) showing the two streams

The Purpose of the Feasibility Report

The purpose of this report is to:

- explain the rationale for the Trail;
- describe the heritage values of the site;
- map the proposed route;
- identify any environmental impacts in regard to site erosion, disturbance of flora, aesthetics and safety;
- suggest the location and content of the interpretative signage; and
- estimate the cost of construction of the various elements of the Trail

The report will be used to consult further with stakeholders and to approach: (i) various authorities for approvals; and (ii) funding bodies for support.

The Funding for the Feasibility Report

The funding for this feasibility study was provided by a grant from Lotterywest (Grant 421005719).



Picnic group posing on the jetty carrying a pipeline from the P&O Dam to a water lighter towed by the SS *Bruce* c.1904

OVERVIEW OF PROPOSED TRAIL SITE

Location and Ownership

The site for the proposed Heritage Trail is located on the City of Albany Reserve located between Vancouver Road and Frenchman Bay, along the northern boundary of privately owned Lots 1 and 2 Frenchman Bay Road and along Whalers Beach.

Heritage Significance of the Site

Frenchman Bay has considerable historical significance, some of which has been formally recognised by the Heritage Council of Western Australia through inclusion on the State Register of Heritage Places. A section of the bay incorporates the Frenchman Bay (Norwegian) Whaling Station (ruin), Whalers Beach, Vancouver Spring and Vancouver Dam. The Frenchman Bay Whaling Station (ruin) (1914) is a Permanent Entry (Place No. 16612) on the State Register of Heritage Places. The extent of the registered place is shown on the Heritage Council of Western Australia diagram (Attachment 2).

The statement of significance from the Register is included below.

'Frenchman Bay Whaling Station (ruin), has cultural heritage significance for the following reasons:

the place has considerable value as an archaeological site, being rare as a place where the original purpose is clearly apparent, thus having the ability to reveal characteristics of the early structures of the place;

the place was established in the 20th century and represented an attempt to re-establish the whaling industry in Western Australia;

the freshwater spring has historical significance with recorded use over more than 200 years, and usage also predating European settlement;

the set of concrete steps built in 1914 has aesthetic value as a rustic and aged element in the natural beach and bush setting; and,

the place is important for its association with the Norwegian and other Scandinavian whaling men who worked in a harsh, noxious and often dangerous industry in an isolated environment.



The P&O Dam above Whalers Beach c.1870



The Norwegian Whaling Station at Whalers Beach c.1915

The FBA has undertaken considerable research into the history of the Frenchman Bay area. This research has been informed by the Assessment Documentation compiled by the Heritage Council of Western Australia as part of the process of placing the Frenchman Bay Whaling Station on the State Register of Heritage Places.

The FBA has prepared a document entitled 'The Heritage of Frenchman Bay' to support the construction of the proposed Heritage Trail. A copy of this document and the Heritage Council of Western Australia Assessment documentation are included as Attachments 2 and 3.

There are few written stories of Noongar people that are particular to Frenchman Bay and during the next stage it is proposed to fund an archaeologist/anthropologist who could work with Noongar families to recover stories that could be incorporated in the interpretative signage. In addition, the early British and French navigators and their teams of natural scientists; American sealers; British whalers; the Vancouver Dam that supplied Albany with fresh water; and the Norwegian whaling station will all form part of the signage narrative along the proposed Trail.

This location should become a major tourist destination. There are few sites along the Australian coast that have so much history concentrated into such a small geographical area. However, the rich history of this area is not well publicised and is in danger of being lost. We believe that there is the potential for visitors from around Australia and overseas to make this place a major destination when they visit Albany.

Process of Development and Engagement

In preparing this report various stakeholder groups and individuals were consulted to ascertain their views on the type, location and impact of the proposed Trail. Several inspected the proposed Trail circuit accompanied by the FBA and H + H team members. Organisations, listed in alphabetical order, that were consulted include:

- Aurora Environmental
- Albany Historical Society
- Albany Museum
- Albany Public Library
- City of Albany
- Department of Water
- Department of Parks and Wildlife
- Discovery Bay
- Great Southern Development Corporation
- Kinjarling Trail Project Committee
- Noongar traditional Indigenous land owners
- South Coast Natural Resource Management



H+H Architects onsite with Aurora Environmental during the early stages of the Feasibility Study

PROPOSED TRAIL

Outline of Proposed Trail

The proposed Trail can be considered in four parts (Attachment 1):

Part 1 – is the lower portion of the Trail and encompasses Whalers Beach. It commences from a new Trail Head to be located in the upper car park across from the ablution block. The lower portion of the Trail then leads down the access road to the existing lower car park/picnic area at the eastern end of the beach and extends along the beach to the existing steps at the western end.

Part 2 - runs along the top of the escarpment through the City of Albany Reserve from the steps at the western end of Whalers Beach to the western edge of the privately owned Lots 1 and 2, Frenchman Bay Road ('Lots 1 and 2').

Part 3 - consists of a staircase leading from the Trail to a viewing platform situated above the Vancouver Dam.

Part 4 - runs along the escarpment within the privately owned Lots 1 and 2 to the Trail Head located across from the ablution block in the upper car park area above the eastern end of the beach.

There is also an alternative entrance to the Trail at the lookout on Vancouver Road, as mentioned below and shown in Attachment 1. Existing and additional signage will also direct walkers to the main Trail at this entrance.

Depending on the availability of funding, the Trail could be constructed on a part-by-part basis. It would be preferable, however, to build the Trail as a single development.

The proposed route is intended to wind along the top of the escarpment to maximise the view of King George Sound, but also to bring walkers in close proximity to the unique vegetation of the Great Southern District. It is anticipated that there will be different levels of use of the Trail:

- locals who would use the Trail regularly;
- visitors from Perth and other locations in WA who are exploring the south coast; and
- national and international tourists.

The primary Trail Head would be to the side of the existing car park at the end of Frenchman Bay Road. Toilets are conveniently located at the car park. It will have signage showing a map of the Trail and describing key features.

An important and largely unknown historical feature of Frenchman Bay is Vancouver Dam, which was the only source of water to Albany in the early 20th century. In order to avoid disturbance to the vegetation and soil, steps will lead down from the escarpment to a viewing platform situated above the dam. Signage will provide photos of the Dam in the early days and explain its significance.

One of the best vantage points is located midway along the escarpment. It will have a major display, seating and a shelter. This node can be accessed from the existing Vancouver Lookout and this location will provide a second car park and an alternative entry point to the Trail.

Shelters, aesthetically sculpted, will be provided at the Trail Head and mid-way along the escarpment to protect walkers from the rain.

The section of the Trail that runs along the top of the escarpment across the privately owned Lots 1 and 2 would be situated within the required coastal set back and in accordance with the City of Albany's zoning ordinances. The exact siting of the path would most likely follow the existing cleared section on the coastal perimeter of Lots 1 and 2 and would be undertaken in consultation with the owners or their representatives.

Environmental Considerations

Aurora Environmental consultant Melanie Price and Landscape Consultant Sally Malone viewed the proposed Trail location and provided advice about the siting of the Trail and its construction. The route of the proposed Trail takes account of their advice.

In summary, the four main threats are dieback (*Phytophthora cinnamomi*); erosion; disturbance to rare or endangered flora; and fire.

Dieback is present across the study area. This infestation has most likely been due to the earlier introduction of contaminated soil. The vegetation is dieback-susceptible and there is evidence of recent vegetation death. The soil is sandy, free draining and with appropriate trail construction and siting dieback on the site can be managed.

The topography is steep from the escarpment to the beach below. The Trail should be sited well back from the ridge, except where there are opportunities for viewpoints and interpretation facilities at specified locations along the proposed trail alignment. The topography and environmental considerations may constrain the width and therefore a limestone path is initially preferred to a dual use path.

The site contains unique vegetation types, including *xanthorrea* close to the beach and fairly intact banksia woodland. A sensitive approach in these areas is required. For this reason, the Trail pathway should wind around the banksia woodland and avoid, during construction, other unique vegetation types

Fire management will be necessary. The access track under the Western Power powerlines appears to also serve as a permanent strategic firebreak. If confirmed, this will need to be considered in the final fire management design.

Any clearing of new sections of the Trail will require permits from the Department of Parks and Wildlife.

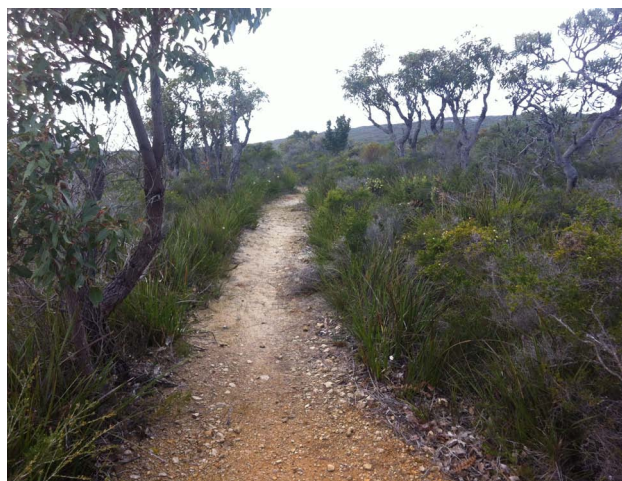
Construction of the Trail

After consideration of advice from the City of Albany Reserves Officers, Aurora Environmental consultants and landscaping consultants it has been determined that the most appropriate trail path is a 1500mm wide stabilised limestone path. This should minimise any risk of dieback and erosion. The path would be constructed in a manner that would enable it to be widened and sealed in a future stage if the need arose.

The key elements and 'signage nodes' along the Trail have been identified and costed. The nodes are identified on the attached plan (Attachment 1). The information shown is indicative only and will be designed when the final budget is known.



Views across the escarpment showing the steep topography



Example of the typical pathways already established onsite

Elements and Interpretive Nodes along the Trail

Eleven node points have been identified:

Node 1 - An 'information' node should anyone enter the Trail from Goode Beach. Orientation information will be provided on the directions and the length of the Trail.

Node 2 - A 'Context' node on the edge of the scarp that provides a broad context for Frenchman Bay and the Trail. There is also an opportunity to provide information on the flora and fauna within the area.

Node 3 - A 'Significant' node that will incorporate a covered 'iconic' lookout with seating. Information will be provided about Frenchman Bay and Mistaken, Seal and Michaelmas Islands

Node 4 - A 'Start' node for visitors approaching the Trail from the Vancouver Road car park. Orientation information will be provided on the directions and the length of the Trail. Information will also be provided on 'The Frenchman Bay Story'

Node 5 - A 'Directional' node to provide directions to Vancouver Dam

Node 6 - A 'Significant' node that will incorporate timber steps and a timber viewing deck. Information will be provided on the Vancouver Dam site. The exact location of the steps and deck will be determined in consultation with the traditional owners of the area to ensure that the course of the natural stream is not disturbed.

Node 7 - A 'Significant' node. Information will be provided on the former Hostel and Tea Rooms and on the concrete steps to the beach.

Node 8 - The 'Trail Head' node - for visitors approaching the Trail from the Frenchman Bay Road car park. Orientation information will be provided on the directions and the length of the Trail. Information will also be provided on Bald Head and 'The Frenchman Bay Story'. The 'Trail Head' node will also incorporate a covered area and seating.

Node 9 - A 'Significant' node. Information will be provided on the former Norwegian whaling station.

Node 10 - A 'Significant' node. Information will be provided on the discharge stream from Vancouver Spring.

Node 11 - A 'Significant' node. Information will be provided on various wrecks – *Elvie* and *Rip*.

Details of the information to be conveyed at the significant node points is outlined in the attached document (Attachment 5).

Indicative Costs

An Indicative Cost Estimate has been prepared by Chris O’Keefe -Quantity Surveyor and Construction Cost Consultant (Attachment 4).

The estimate of \$370,000.00 (Excl GST) includes an allowance for:

- the construction of the Trail;
- the various structures;
- the interpretive panels;
- professional fees; and
- design and contract contingencies
- archaeological survey of Noongar heritage

Potential Future Phases

The proposed Trail is considered a worthwhile stand-alone initiative that will add value to a location that deserves much more recognition and protection. However, it will be undertaken so that it can, if it became desirable, become a section of the much larger and more ambitious network of trails that were reflected in the Kinjarling Trail proposal dating back several years. There are logical extensions of this section of pathway, leading in one direction to Discovery Bay and the Bald Head Walking Trail, and in the other to Little Grove and eventually Albany city centre and beyond.

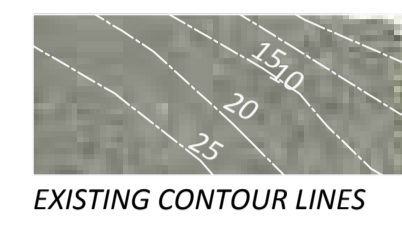
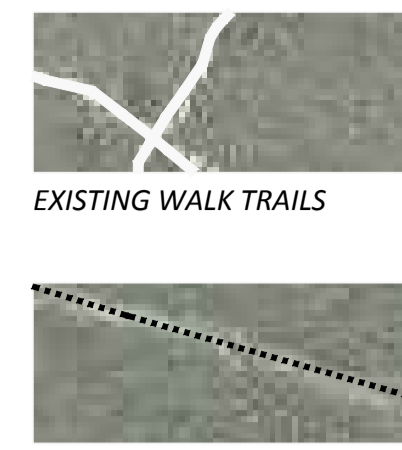
STAGING OF THE DEVELOPMENT

It is probable that the project will need to be completed in stages as funds become available. The stages in priority order are:

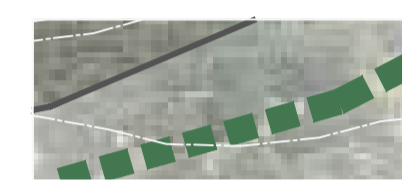
- a) Construction of the stabilised limestone path.
- b) The construction of the main Trail Head (Node 8) and interpretation information at the Vancouver Road car park (Node 4).
- c) Viewing shelter and associated interpretation (Node 3); the steps and viewing deck at the Vancouver Dam site (Node 5); and the interpretation signs associated with the dam and the spring (Nodes 5, 6 and 10).
- d) New steps to Whalers Beach (Node 7)
- e) Other Interpretation nodes (Nodes 1, 2, 9 and 11).

ATTACHMENT 1 - Plan of Proposed Trail

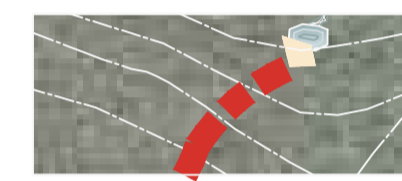
LEGEND



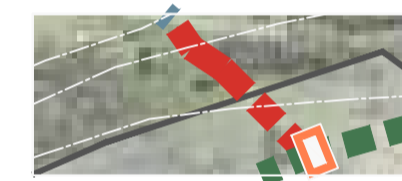
PROPOSED FRENCHMAN BAY TRAIL ON PUBLIC LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED FRENCHMAN BAY TRAIL ON PRIVATE LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED PATH & STEPS TO VANCOUVER SPRING: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED STEPS ADJACENT TO EXISTING HERITAGE STEPS: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



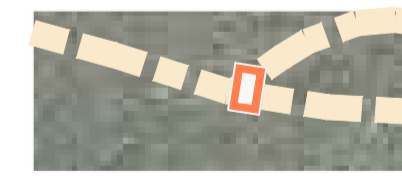
PROPOSED FRENCHMAN BAY TRAIL: BEACH



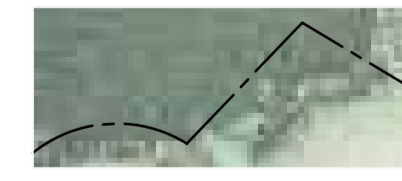
PROPOSED LOCATION OF NEW TRAIL HEAD, TRAIL INFORMATION POINT OR INFORMATION NODE WITH INTERPRETIVE STRUCTURE



PROPOSED LOCATION FOR INFORMATION NODES WITH 'INTERPRETIVE SIGNAGE' (INDICATIVE LAYOUT)



PROPOSED LOCATION FOR 'DIRECTIVE SIGNAGE'. 'DIRECTIVE SIGNAGE' IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM A DISTINGUISHED SECTION IN NEW LIME STONE WALK TRAIL (INDICATIVE LAYOUT)



FRENCHMAN BAY WHALING STATION (RUIN) HERITAGE REGISTER PLACE 16612

NEW INFORMATION NODE WITH INTERPRETATIVE STRUCTURE



NEW INFORMATION NODE WITH INTERPRETIVE STRUCTURE & SEATING - VIEWING POINT AND A PLACE TO REFLECT

VANCOUVER DAM - NEW VIEWING PLATT FORM



TIMBER DECKED VIEWING PLATFORM WITH TIMBER SEAT AND A TIMBER BOARD WALK FORMING THE TRANSITION TO NEW LIMESTONE PATHWAY

ITEM DIS045 REFERS



TRAIL HEAD - INTERPRETATION



TRAIL HEAD - INTERPRETATION STRUCTURE & SEATING

'DIRECTIVE SIGNAGE'



'DIRECTIVE SIGNAGE' IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM DISTINGUISHED SECTION IN NEW LIME STONE WALK TRAIL (INDICATIVE LAYOUT)

PATHWAYS



STABILISED LIME STONE WALK TRAILS

SEATING



CONCRETE OR QUARY-CUT GRANITE BLOCK SEATING TO NEW TRAIL HEAD & ALONG NEW PATH WAYS

Proposed Concept Plan

WITH INDICATIVE STRUCTURES, MATERIALS AND INTERPRETATION OPTIONS

SCALE 1:1500 @ A1

INDICATIVE INTERPRETATION OPTIONS



ATTACHMENT 2 - State Register of Heritage Places - Assessment Documentation



REGISTER OF HERITAGE PLACES

Permanent Entry

1. **DATA BASE No.** 16612
2. **NAME** *Frenchman Bay Whaling Station (ruin)* (1914)
OTHER NAME Norwegian Whaling Station
3. **LOCATION** Whalers Beach, Frenchman Bay Road, Albany
4. **DESCRIPTION OF PLACE INCLUDED IN THIS ENTRY**
Portion of Lot 300 on Deposited Plan 46683 being part of Reserve 21337 and part of the land contained in Crown Land Title Volume 3136 Folio 715 and Lot 301 on Deposited Plan 53420 being unallocated Crown land and the whole of the land contained in Crown Land Title Volume 3149 Folio 236 as shown on Heritage Council of Western Australia Survey Drawing 16612 (DP53432) prepared by Midland Survey Services.
5. **LOCAL GOVERNMENT AREA** Shire of Albany
6. **OWNER** State of Western Australia
(As to Reserve 21337. Management Order to the City of Albany)
7. **HERITAGE LISTINGS**

Register of Heritage Places:	Permanent Entry	02/09/2008
National Trust Classification:		-----
Town Planning Scheme:		-----
Municipal Inventory (Vancouver Spring):	Adopted	30/06/2001
Register of the National Estate:		-----
8. **CONSERVATION ORDER**

9. **HERITAGE AGREEMENT**

10. **STATEMENT OF SIGNIFICANCE**
Frenchman Bay Whaling Station (ruin), has cultural heritage significance for the following reasons:

the place has considerable value as an archaeological site, being rare as a place where the original purpose is clearly apparent, thus having the ability to reveal characteristics of the early structures of the place;

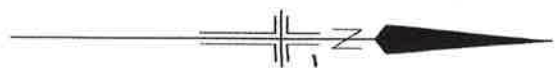
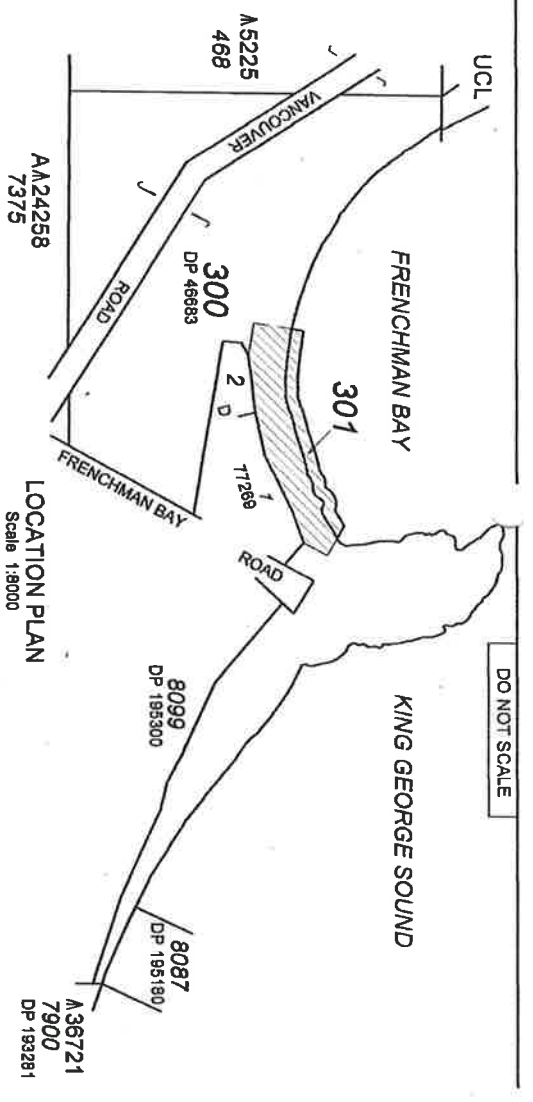
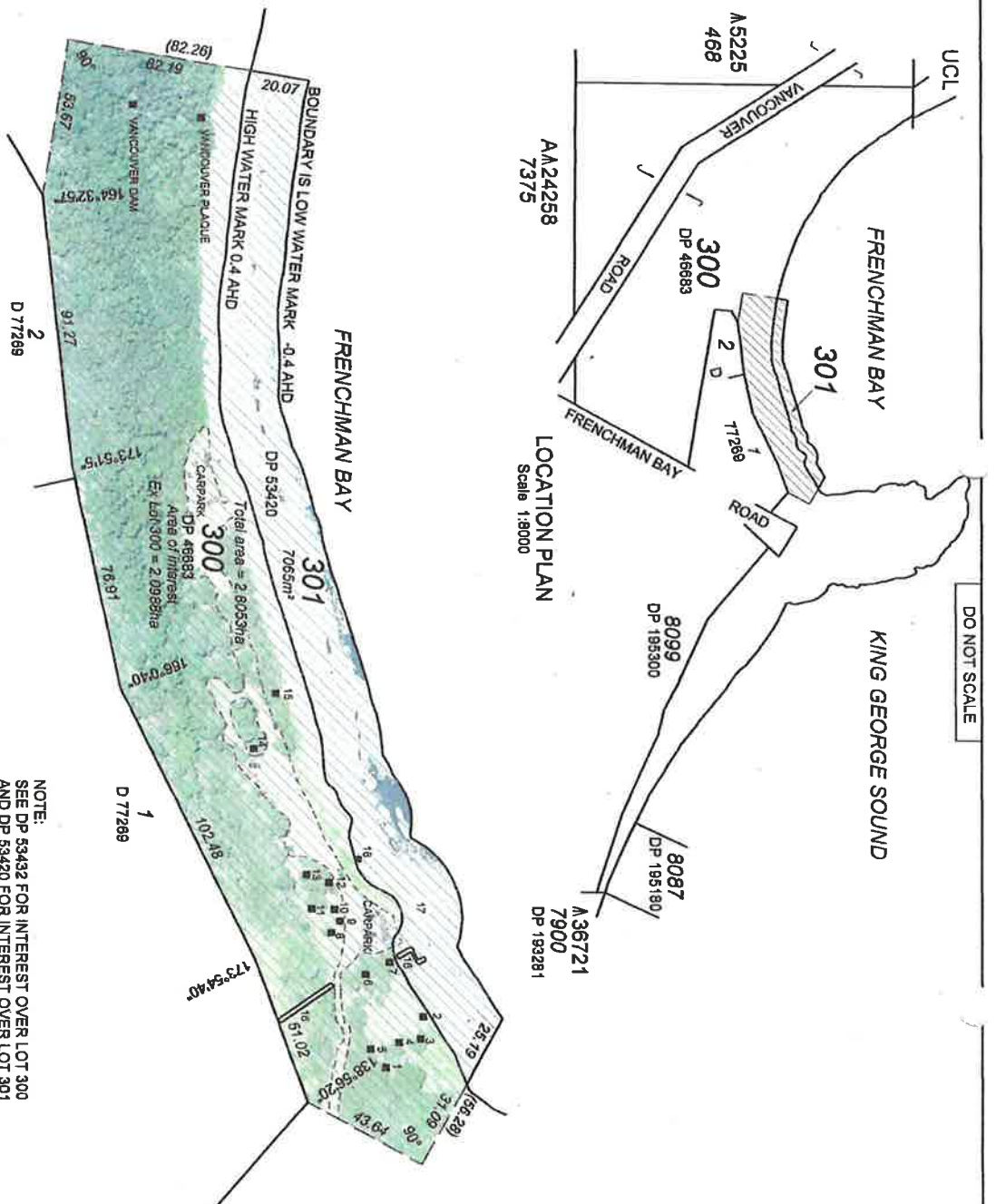
the place was established in the 20th century and represented an attempt to re-establish the whaling industry in Western Australia;

the freshwater spring has historical significance with recorded use over more than 200 years, and usage also predating European settlement;

the set of concrete steps built in 1914 has aesthetic value as a rustic and aged element in the natural beach and bush setting; and,

the place is important for its association with the Norwegian and other Scandinavian whaling men who worked in a harsh, noxious and often dangerous industry in an isolated environment.

The buildings associated with the former hostel and caravan park have some significance for their social and historical value but are outdated and substandard for the purpose for which they are intended and are not readily redeemable.



- LEGEND**
- 1 raised plinth
 - 2 artefact scatter
 - 3 metal and whalebone scatter
 - 4 metal whalebone, coal scatter
 - 5 metal, glass scatter
 - 6 coal, clinker and coke scatter
 - 7 brick flooring
 - 8 circular feature
 - 9 metal, coal, clinker and coke scatter
 - 10 raised plinth
 - 11 concrete
 - 12 raised pad, wall and scatter
 - 13 brick and mortar x5
 - 14 concrete steps
 - 15 brick and stone
 - 16 rectangular structures

NOTE:
SEE DP 53432 FOR INTEREST OVER LOT 300
AND DP 53420 FOR INTEREST OVER LOT 301

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SCALE 1:1500 METRES

DRAWN	M. ARIOTTI	01/03/2007
SURVEYOR	E. TURTON	10/04/2007

HERITAGE COUNCIL OF WA
 FRENCHMAN BAY WHALING STATION
 ALBANY

DATUM: MGA 94 (50)
 MSS No: 07307
 HCWA DRAWING NUMBER: 16612
 REV 0 SIZE A3

No.	Date	APPROVED AND ISSUED TO CLIENT	REVISION	MFA	Surveyor	Approved	ELT
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REGISTER OF HERITAGE PLACES - ASSESSMENT DOCUMENTATION

11. ASSESSMENT OF CULTURAL HERITAGE SIGNIFICANCE

The criteria adopted by the Heritage Council in November 1996 have been used to determine the cultural heritage significance of the place.

PRINCIPAL AUSTRALIAN HISTORIC THEME(S)

- 1.4 Appreciating the natural wonders of Australia
- 3.3.2. Fishing and whaling
- 3.23 Catering for tourists
- 5.1 Working in harsh conditions

HERITAGE COUNCIL OF WESTERN AUSTRALIA THEME(S)

- 106 Workers (incl. Aboriginal, convict)
- 305 Fishing & other maritime industry
- 311 Hospitality industry & tourism
- 503 Natural disasters

11.1 AESTHETIC VALUE*

Frenchman Bay Whaling Station (ruin), in association with the hostel and tearoom buildings on the bluff, contributes to the attractive seaside beach environment that is a popular picnic area. (Criterion 1.1)

Frenchman Bay Whaling Station (ruin) is important for its ability to reveal aesthetic characteristics of the early structures of the place. (Criterion 1.1)

The concrete steps of *Frenchman Bay Whaling Station (ruin)*, that lead from the beach to the bluff, have aesthetic value as a rustic and aged element in the natural beach and bush setting. (Criterion 1.3)

* For consistency, all references to architectural style are taken from Apperly, R., Irving, R., Reynolds, P. *A Pictorial Guide to Identifying Australian Architecture. Styles and Terms from 1788 to the Present*, Angus and Robertson, North Ryde, 1989.

For consistency, all references to garden and landscape types and styles are taken from Ramsay, J. *Parks, Gardens and Special Trees: A Classification and Assessment Method for the Register of the National Estate*, Australian Government Publishing Service, Canberra, 1991, with additional reference to Richards, O. *Theoretical Framework for Designed Landscapes in WA*, unpublished report, 1997.

11.2 HISTORIC VALUE

Frenchman Bay Whaling Station (ruin) was established by a Norwegian based whaling company as part of the expansion of their activities in the southern hemisphere, and operated from 1914 to 1916. The place therefore represents an association with Norway, one of very few countries to continue whaling to the present. (Criterion 2.1)

Frenchman Bay Whaling Station (ruin) was the first station established in WA in the 20th century and represented an attempt to re-establish the industry on the south coast of the State on a larger scale than had been previously practised. (Criteria 2.1 & 2.2)

The freshwater spring has historical significance with recorded use over more than 200 years, predating European settlement, and including the visits of Captain George Vancouver in 1791, Dumont D'Urville's *Astrolabe* in 1827, American whalers in the 19th century, as a water supply for ships calling into the port at Albany from 1900 to 1912, used by *Frenchman Bay Whaling Station (ruin)* from 1912-16 and the Frenchman Bay hostel and caravan park from the 1930s. (Criterion 2.1)

Frenchman Bay has been a popular seaside holiday resort from as early as the 1890s, enhanced by the construction of the hostel in 1936 and establishment of the caravan park in 1959. (Criterion 2.2)

Frenchman Bay Whaling Station (ruin) is important for its association with the Norwegian and other Scandinavian whaling men who worked in a harsh, noxious and often dangerous industry in an isolated environment far from their homes. (Criterion 2.3)

Frenchman Bay Whaling Station (ruin) marked a new era of whaling with technological advancements such as steam-powered ships and machinery and the use of explosive harpoons that increased industry effectiveness and safety. (Criterion 2.4)

11.3 SCIENTIFIC VALUE

Frenchman Bay Whaling Station (ruin) contributes to a wider understanding of the cultural history of the district and the State and has high importance as a possible teaching and research site. It contains within its boundaries 18 archaeological sites associated with the first Western Australian whaling station to use modern whale catching and processing techniques. In addition, there is high potential for subsurface, minimally disturbed archaeological remains. (Criterion 3.1)

Frenchman Bay Whaling Station (ruin) was the first permanent European occupation of this part of King George Sound. Its operation had a significant but short economic impact on Western Australia and the Albany area. The potential therefore to yield further information about the region's early European cultural history through the archaeological record is high. (Criterion 3.2)

11.4 SOCIAL VALUE

Frenchman Bay Whaling Station (ruin) has social significance for its historical associations as an early 20th century whaling station and as a popular site for seaside holidays. (Criteria 4.1 & 4.2)

12. DEGREE OF SIGNIFICANCE

12.1 RARITY

Frenchman Bay Whaling Station (ruin) is rare as a group of archaeological sites at a place where the original purpose is clearly apparent. The station was the first whaling station in Western Australia to use modern whaling catching and processing techniques, and therefore serves as a benchmark site for the later Australian whaling industry. (Criterion 5.1)

Frenchman Bay Whaling Station is rare as a place in Western Australian settled and operated exclusively by men of non-British decent. (Criterion 5.1)

The place is uncommon for its combination of a popular holiday destination directly adjacent to the whaling industry. (Criterion 5.1)

The archaeological remains of *Frenchman Bay Whaling Station* provide a physical reminder of a way of life and an industry no longer practiced. (Criterion 5.2)

12.2 REPRESENTATIVENESS

Frenchman Bay Whaling Station (ruin) is a ruin representative of the former whaling industry in Western Australia. (Criterion 6.1)

12.3 CONDITION

Frenchman Bay Whaling Station (ruin) archaeological sites are in a disturbed but sound condition. In addition, the sites are presently not under threat and their condition will not alter if land uses remain unchanged. However, the use of some of the remains for picnic seating is severely detrimental to the place, and this practice needs to be discouraged. The historical record shows use of the beach area as a garden, with the eastern section dug for manure, but there is high potential for undisturbed archaeological remains 20cm below the surface over the rest of the site.

12.4 INTEGRITY

Frenchman Bay Whaling Station (ruin) is in poor condition with all elements beyond restoration. The site presents interpretive opportunities, but it has a low degree of integrity. The set of concrete steps has high integrity and continues to function in its original intention.

12.5 AUTHENTICITY

There is some evidence of recent unsympathetic changes to the remaining fabric, but generally, *Frenchman Bay Whaling Station (ruin)* displays a high degree of authenticity.

13. SUPPORTING EVIDENCE

The documentation for this place is based on the heritage assessment completed by Irene Sauman, Historian and Shane Burke, Archaeologist, in October 2006, with amendments and/or additions by HCWA staff and the Register Committee.

13.1 DOCUMENTARY EVIDENCE

Frenchman Bay Whaling Station (ruin) comprises the site and remnants of a bay whaling station established in 1915 by the Norwegian owned Spermacet Whaling Company at Whalers Beach on Frenchman Bay, Albany. On the bluff above the beach are a 1936 former hostel/tearoom and 1960s caravan park, with associated outbuildings.

Frenchman Bay was chosen as the site of the Spermacet Company's operations because of an ample supply of fresh water and shelter from the prevailing weather. However, the limited nature of this shelter is shown by the number of wrecks in Frenchman Bay and the erosion of the beach during heavy storms.

The water supply at Frenchman Bay was first charted by Captain George Vancouver during his exploratory journey along the coast in September 1791. He watered his ships here at a freshwater spring, which is now marked by a memorial erected by the Albany Historical Society. American whalers who operated off the south coast in the 1800s also watered their ships at the spring, and in 1827 Louis de Sainson painted a meeting between local Aboriginal people and the sailors of the *Astrolabe* while the latter collected fresh water at Frenchman Bay. This painting, showing the saddle-backed rock at the tip of Waterbay Point, hangs in the Western Australian Art Gallery.

The site was marked as a watering place in the 1870s, although not officially gazetted as such until 1893, when it became Reserve 2295 as a watering place for travellers and stock.¹

In 1900, Captain Alex Armstrong and his partner, Waters, leased two acres of the Reserve at a cost of £1 per year for the purpose of providing water for the steamers that called at the Albany port. The water supply at the port at this time was not suitable for the boilers of the steamers, which required water uncontaminated with minerals. The Road Board considered it good sense to make the port more welcoming to all shipping, but it would only provide a lease for twelve months at a time with a six-month cancellation clause so as not to tie up the resource should it need it for its own proposed town water supply scheme.²

In 1902, Armstrong complained that the issue of twelve-monthly leases did not give him security of tenure to improve the site, which he needed to do in order to provide a sufficient supply, as some ships were leaving Albany without a full supply of water and this was giving the port a bad name. The terms of the lease do not appear to have been increased, but Armstrong undertook the improvement work anyway. A sketch map drawn by the Albany District Surveyor's Office in February 1912 shows that Armstrong had made an excavation and dammed the spring, and built a 200-foot jetty with pipes from the dam to the head of the jetty

¹ Department of Land Information (DLI), Reserves Index & Correspondence 29-3-1900, File for Reserve 2295, SROWA, ACC 541 Item 3172/1900.

² File for Reserve 2295, Item 3172/1900, op cit.

where lighters were loaded with water for transport to the Town Jetty. The improvements had cost between £500 and £600.³

The Road Board established its own town water supply in 1912, and Armstrong and Water's lease ended in December that year. The Road Board did not want competing supplies for the port as the provision of water and other facilities for shipping there was a major source of revenue.⁴

American whalers were operating in the Indian Ocean after 1789 and had visited King George Sound before the end of 1828.⁵ By 1837, two whaling companies were operating out of Western Australia: the Fremantle Whaling Company (established February 1837) based at Bather's Beach in Fremantle and the Perth Whaling Company on Carnac Island. The first whale was caught by their combined efforts on 10 June 1837:

This day will be memorable in the annals of the Colony for the killing of the first whale. At Perth, great firing was heard in the direction of Fremantle and it was supposed that a ship had arrived, but a messenger came in breathless haste to say that boats had struck a whale and were engaged with it. This was all that was known when I came away but everyone was running about elated with the news; I went to Fremantle on Thursday with the Governor and others, to examine a jetty and proposed tunnel which has been projected to be cut through a hill there giving an easy access from the beach to the main street. The plan is quite practicable and not very expensive for the distance is only eighty yards and the rock is soft limestone.⁶

The tunnel provided direct access to Fremantle for the sale of whale goods to the community. In that first year of operations, whaling generated revenue of £3,000 from 100 tons of oil and 5 tons of whalebone. By comparison, American whalers earned £30,000 that year from the same coastline.⁷ Large numbers of American whalers, as well as French, frequently operated close inshore, causing conflicts with local whalers. There were numerous incidents between the various companies. James Stirling was lobbied to ban the foreign vessels.⁸

Despite fluctuations in the price of whaling products, by 1844 they comprised 40% of the State's exports. In 1845 there were approximately 300 American, French, British and Australian whaling ships operating off the south coast with numerous shore stations.⁹ 1860 legislation prohibiting unlicensed whalers from operating in WA waters, although this appears to have had little impact. But after the discovery of petroleum oil in Pennsylvania in 1859, whale oil prices crashed. Subsequently, only a few vessels were still operating at the turn of the century.¹⁰

Around 1911, Norwegian whaling interests were looking to the southern hemisphere for possible whaling grounds due to heavy competition in the whaling

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- 3 Correspondence & sketch map, 17 February 1912, File for Reserve 2295, Item 3172/1900, op cit.
- 4 Correspondence 19 March & 2 July 1912, File for Reserve 2295, Item 3172/1900, op cit; DLI File 2268/1914 for Reserve 2295.
- 5 Nairn, John, *Western Australia's Tempestuous History* (Carlisle, Vic: Hesperion Press, 1986)
- 6 Moore, George Fletcher, *Diary of Ten Years Eventful Life of an Early Settler in Western Australia* (1884, facsimile edition 1978, UWA Press)
- 7 Battye, J.S., *Western Australia: A History from its Discovery to the Inauguration of the Commonwealth* (Oxford, 1924)
- 8 Nairn, *Tempestuous History*
- 9 www.whaleworld.org/About_Whale_World/Whaling_History/Whaling_in_Albury, consulted 22 Nov 2006
- 10 Nairn, *Tempestuous History*

grounds in the northern hemisphere.¹¹ Western Australia already had a history of whaling, particularly along the south coast, and the State Government saw economic benefit in the development of the whaling industry. On 1 January 1912 it issued seven-year licences to the Cape Leeuwin Whaling Company (renamed the Spermacet Whaling Company in November 1913), the Western Australian Whaling Company (located at Point Cloates in the northwest) and the Fremantle Whaling Company, all of which had been established by the Norwegian firm of Christian Nielsen & Associates. Nielsen was represented in Western Australia by the Norwegian Vice-Consul at Fremantle, August Stang, whose brother Christian was associated with the Nielsen company. To ensure the best benefits for the State, the licences required the construction of shore stations. Whalers operating from factory ships were unable to use the whole carcass and only processed the whale for the oil, whereas a shore station allowed the manufacture of guano (fertiliser), cattle fodder and bonemeal from what remained.¹²

The Cape Leeuwin Whaling Company was licensed to operate along the south coast from Cape Leeuwin to Esperance, where it planned to hunt sperm whales. Sperm whales did not migrate and travelled in a loose and widely spread manner rather than the schools favoured by the humpback whales, which followed a seasonal migratory path along the coast. In the 1912 migratory season (winter), the ships of the Spermacet Co, *Vasco Da Gama*, *Fynd* and *Klem*, assisted the Western Australian Whaling Company in the northwest to hunt humpbacks. On 29 October 1912, the ships arrived at Albany and began hunting sperm whales. The Company took 205 sperm whales during the 1912-13 summer, which were processed on a factory ship. A piece of ambergris was also discovered, worth around £4,000. Ambergris is a solid, opaque, ash-coloured inflammable substance secreted by whales and used in the manufacture of perfumes.¹³

On 22 February 1913, the Norwegian vessel *Prince George* is reported as arriving at Albany with machinery for the whaling company. The Cape Leeuwin Company's ships assisted in the northwest hunt again in the winter of 1913, and in September six vessels arrive in Albany from Point Cloates: the steamers *Fynd*, *Hawk*, *Vasco de Gama*, *Clem* and *Eagle*, and the sailing ship *Commonwealth*.¹⁴ In October, the Company leased an area at Frenchman Bay for its shore station. The area was created as Plantagenet Location 3961 and did not include the site of the dam and lighter jetty, although the Company purchased the jetty from Armstrong & Waters.¹⁵ In November 1913, the Company's name was officially changed to the Spermacet Whaling Company.¹⁶

The Company hunted sperm whales again during the 1913-14 summer but not as successfully as the previous summer. *Frenchman Bay Whaling Station (ruin)* was built early in 1914 on the leased land at Frenchman Bay, at a cost of £20,000 to

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- 11 For overview of the establishment and operation of the whaling industry in WA by Norwegian companies see HCWA documentation for P04321 Norwegian Whaling Station (ruin), Point Cloates.
- 12 Puls, Colin, *Frenchman Bay whaling companies and Western Australian Government, 1911-19*, BA honours thesis, UWA, 1970, pp. 22-29.
- 13 Puls, Colin, p. 36, 107.
- 14 List of Norwegian vessels calling at Albany during the year 1913, Norwegian Vice-Consulate Albany, Record Book, 1913-1916, Battye private archives, MN1069, ACC 3314A.
- 15 Correspondence 17 July 1914 from Norwegian Vice-Consul at Fremantle, August Stang, DLI file 2268/1914 for Reserve 2295.
- 16 Puls, Colin, op cit, p. 30.

£28,000.¹⁷ The buildings were constructed from imported timber and bricks, but there was some local building material used. A report in the *Albany Advertiser* in February 1914 on the revival of the timber industry stated that a consignment of karri flooring measuring 6" by 1.5" and 6" by 1" had been delivered to Albany from a mill at Denmark to 'the order of the Whaling Co who are using it in their buildings at Frenchman Bay'.¹⁸

The following gives some idea on the operation and layout of the site:

Frenchman Bay soon changed in appearance. A great wooden platform was built on the beach; it stood on piles and projected over the water as a wide and low pier or wharf. At the seaward extremity this platform sloped down to the water, and extended a little below the surface at low tide, forming a slipway up which whales could be easily hauled. One side at the shore end of this flensing platform, a high two-storey building of wood contained the boilers in which bones and meat could be digested under steam pressure. At the other side another shed contained open boilers for the blubber. There were unglazed windows to the top floor of the big boiler house and up to these openings wooden shores acted as rails on which great metal buckets filled with chunks of whale-meat were hoisted. The contents were tipped through the windows in a manner most convenient for filling the boilers. At the landward end of the flensing platform, and facing the sea, there stood a very well equipped engineer's 'shop'. All sorts of repairs had to be carried out there; but two regular jobs were the fitting of new heads to the explosive harpoons, and making new parts for the engine of a launch which as regularly consumed them. In front of the engineer's 'shop' were steam winches for hauling the heavy whale carcasses up the oily slipway from the sea. As for the rest, there were wooden houses on the bushy slopes above the boiler houses for the shore gangs and for the crews when not on board the 'chasers'. By 1915, £28,000 had been spent on machinery, and much more on coal and stores.¹⁹

Les Douglas, son of Captain Clem Douglas and from a family of Albany seafarers, described *Frenchman Bay Whaling Station (ruin)* as he remembered it as a lad:

There were a large number of big sheds stretching along the beach front, behind a very long brick retaining wall. A long flight of concrete steps led to the top of the hill. At the time of writing, [1991] the steps are still there. The steps were always there. They would have been built for access when the factory was first built. The path went straight up to the first building on the hill which was the kitchen and mess room for all the workers. It was only about 100 ft from the top of the steps. The men's quarters comprised of 5 huge houses including the kitchen and mess room. The four other buildings were spaced about 20 ft apart, to the right. These were the sleeping quarters and contained many rooms. I remember clearly, each room was painted a different colour. Being young I had never seen so many colours and to this day every time I think of Frenchman's Bay Station I see this rainbow of rooms. All, the buildings were built of Norwegian pine, resting on long spruce pine timbers, supported on brick pillars about 2' off the ground.²⁰

There was a small jetty about 200' long with a large 'T' Platform at the end which provided a good working area. There was also a derrick for loading. A light gauge

¹⁷ Puls, Colin, op cit, pp. 37-38, 92-93; *Albany Advertiser*, 5 May 1920, p. 3. Figures vary among sources.

¹⁸ *Albany Advertiser*, 25 February 1914, p. 3.

¹⁹ Dakin, William J., *Whalemen adventurers: the story of whaling in Australian waters and other southern seas related thereto, from the days of sails to modern times*, Sydney, Angus & Robertson, 1938, p. 186.

²⁰ Marshall, Gordon de L., *Maritime Albany Remembered: Les Douglas et al*, Kalamunda, Tangee Pty Ltd, c.2001, p. 14; photograph on p. 12, numbered 3715B in the Battye Library collection, is purported to be of the Norwegian whaling station but the landscape indicates it depicts the Cheynes Beach station.

railway line ran down to the jetty and connected to all parts of the station. Hand operated trolleys were used.²¹

The ramp on the seaward end of the flensing deck went out into about ten-feet of water. It appeared to have been held in position by eight to ten large wooden crates about eight-foot square filled with pieces of granite. The slats of the crates were spaced about six inches apart, apparently to allow the underwater surge to pass through.²²

When the station was in operation, the whale chasers towed the whales to *Frenchman Bay Whaling Station (ruin)* where they were treated, but the presence of the factory ship *Rakirua* at various times indicates that some processing was still done on board ship. The oil was stored in large wooden barrels and shipped back to Norway. Other Norwegian ships arrived at Albany occasionally with a load of empty barrels for the station.²³

On 5 June 1914, a day before the Spermacet fleet left for Point Cloates once again, 19-year-old deckhand Christian Flagstad was killed when a one ton piece of whale flesh fell on him while he was collecting oil from the deck of the factory ship *Rakiura* in Frenchman Bay. The accident occurred as a result of the failure of a spruce pine toggle from which the whale flesh was hanging.²⁴

The Public Works Department Water Supply section and August Stang had considerable correspondence over several years regarding the use of the water from Reserve 2295 and how much *Frenchman Bay Whaling Station (ruin)* should pay for it. Stang maintained in July 1914 that they had used very little water from the spring to that time and had water on their own lease close to the surface, which they could tap into. He steadfastly refused to pay any amount the Department claimed as the figure had been arrived at by guesswork and anyway the Company was already paying a licence fee, which should include water. In November 1915, however, he offered to pay £10 for water use for the coming year. An inspection of the site in March 1916 found two wells on the Company's lease supplying most of its water needs.²⁵

During the operation of *Frenchman Bay Whaling Station (ruin)*, the beach became 'most unpleasant, with a thick coating of oil and large pieces of whale lying around, and a noisome smell'. There were no roads connecting Frenchman Bay to Albany and all supplies had to come in by sea. It must have been a lonely life for the whalers, described for the most part as 'clean young men'.²⁶ Most of their wages would have gone back to Norway, but the operation of the station and its vessels was a bonus to the local economy, with a reported £80,000 spent on provisions, coal and general supplies in 1915.²⁷

Two more deaths occurred at *Frenchman Bay Whaling Station (ruin)*. Chief Engineer Hans P. Kittelsen died at age 40 on 24 November 1915, but no cause of

21 Marshall, Gordon de L., op cit, p. 14.

22 Marshall, Gordon de L., op cit, p. 14; Garratt, Dena, *Frenchman Bay Whaling Station (ruin), Frenchman Bay: maritime site inspection report*, Fremantle, WA Maritime Museum, 1994, p. 6.

23 List of Norwegian vessels, op cit; Marshall, Gordon de L., op cit, p. 15.

24 Article from *Albany Advertiser* in the Norwegian Vice-Consulate Albany, Record Book, 1913-16, op cit.

25 Correspondence 17 July 1914 to 14 March 1916, DLI file 2268/1914 for Reserve 2295.

26 Marshall, Gordon de L., op cit, p. 12.

27 Heritage Today, *City of Albany Municipal Inventory*, 2000.

death is recorded, and 44-year-old steward Karl Adoff Nielsen drowned two weeks later on 4 December while swimming at Frenchman Bay.²⁸

On 15 December 1915, Stang informed the Government of Spermacet's decision to close down, caused by both a poor whaling season and the impact of World War I. The closure was gazetted on 29 December, but it was 3 March 1919 before Stang signed an indenture legally surrendering the Company's licence. The size of the sperm whale catch had made the undertaking economically unfeasible and the War created suspicions that the whalers were sympathisers of Germany. The boilers and equipment were relocated to the new station established that year at Point Cloates, but the buildings were left behind. During its period of operation from 1912 to December 1916, the Spermacet Company took 1,125 whales, producing 28,675 casks of oil (1.2 million gallons) and 730 tons of fertiliser. The value of the oil would have been £119,475 and the fertiliser £5,840. This return was about 30% of that achieved by the Point Cloates station in the same period.²⁹

Two Norwegians remained as caretakers at *Frenchman Bay Whaling Station (ruin)*, brothers Hurbert and Lans Larsen. They built a boat and used it to sail into Albany for their stores. In 1920, there were reports that the Spermacet Company had applied to renew its licence to operate the place, but the application was refused.³⁰

In the early 1930s, Point Cloates again began servicing Norwegian whaling ships, but World War II brought rapid closure. Expanded use of factory ships and support chasers also lessened the need for shore-based services. In July 1949, the Nor'-West Whaling Company reopened the station. In September 1950, the Australian Government commenced whaling itself as the Australian Whaling Commission in a station at Babbage Island near Carnarvon. The operation ran until 1955, when the station was sold to Nor'-West Whaling Company, which closed down its Point Cloates station and relocated to the Carnarvon site.³¹ The Albany Whaling Company operated at Frenchman's Bay from 1947 until 1950. It took only six humpback whales.

The Cheynes Beach Whaling Station commenced operations at Frenchman's Bay in 1952 until closure in 1978, the last such station to close in Australia. The last whale was taken on 20 November 1978. The operation had struggled commercially for several years because of increased fuel costs and dwindling stocks. Environmental lobbying pressure finally brought an end to a WA industry that had operated for more than 140 years.

In 1921, a big south-easterly gale that lasted many days created havoc along the Albany coastline, tearing up trees, washing away beaches and sinking boats at their moorings. It wrecked a large portion of *Frenchman Bay Whaling Station (ruin)*. The jetty was swept away leaving only the end standing. The brick retaining wall collapsed, allowing seas to undermine the foundation of buildings

28 Norwegian Vice-Consulate Albany, Record Book, 1913-16, op cit.

29 Puls, Colin, op cit, p. 92-95.

30 Marshall, Gordon de L., op cit, p. 15; *Albany Advertiser*, 5 May 1920, p. 3.

31 <http://www.whales.org.au/published/whalemen/forward.html>, consulted 22 November 2006

close to the wall and many fell, including the brick building on the right of the flensing deck.³²

In May 1923, tenders were called for purchase of what remained.

Tenders for all the buildings as they now stand. Soft wood, hard woods, kitchen ranges, trolleys and light rails at the Frenchman's Bay Whaling Station. Tenders are invited for the lot as it now lies at the station... Walter Wheeldon, Auctioneer and Sworn Valuer.³³

Members of the Douglas family, namely Clem, his father William and brother Bert successfully tendered to dismantle and salvage *Frenchman Bay Whaling Station (ruin)*. They camped at the site for periods over the ensuing five years while they did the work. Bert Douglas was Captain of the State Steamship *Eucla*, which made several trips into the Bay where its surfboats were used to take off material.

There was a vast quantity of wood around... There were also hundreds of wooden barrels, for whale oil, some in good condition which they were able to sell... The station's jetty was in such a poor state of repair that the Douglasses had to construct a makeshift one of their own to bring the wood off.³⁴

A lot of coal and whale manure was salvaged, which was sold in Albany. The whale manure was discovered by accident as it had been covered by sand over the years. Some of the salvaged timbers were used to build a lighter, with a single spruce pole providing a 35-foot mast. In 1998, some of the wood and rails were still in storage at the old Douglas homestead, 'Maitland' on the Upper Kalgan River. The younger family members, including Les Douglas and his cousin Lenny Powell searched for 'lost treasure'; the ambergris that was reputed to have been buried somewhere at the site. It was not found.³⁵

Frenchman Bay had been a favoured holiday venue since at least 1896, when the steam launch *Jessie* made several trips, ferrying people for a public picnic. On New Year's Day 1902, Armstrong & Sons ran two launches on excursions to the Bay. The operation of the whaling station curtailed the enjoyment of the place until 1920, when Armstrong & Waters took the Steamship *Awhina* on two round trips on 26 January.³⁶ Access was only possible by sea, but in the early 1930s, as more people owned motor vehicles, there was considerable local agitation for a road to the Bay. Letters were published in the *Albany Advertiser* and the Tourist and Information Bureau offered funds to build the road on a route they had planned and which the Road Board inspected. The Frenchman Bay Road was completed by December 1934 when it was reported that:

The road terminates a few yards from the flight of steps leading down to the old whaling station and the beach. Water is obtainable a few chain from the steps along the beach.³⁷

Mrs D. van Raalte applied to the Road Board for a licence to operate a tea kiosk near the beach during the summer months. It was to be of rustic design, and the licence appears to have been issued because a newspaper report on 7 January states that on New Year's Day there were a considerable numbers of people

32 Marshall, Gordon de L., op cit, p. 16.

33 *Albany Advertiser*, 12 May 1923, p. 2.

34 Marshall, Gordon de L., p. 12.

35 Marshall, Gordon de L., p. 14-16.

36 *Albany Advertiser*, 15 October 1896 p. 2; 3 January 1902, p. 3 & 21 January 1920, p. 2.

37 *Albany Advertiser*, 6 December 1934.

swimming and fishing, with a number of families having a camping holiday, while 'the convenience of visitors had been further added to by the establishment of a tea kiosk near the beach'.³⁸

In February 1935, the *Albany Advertiser's* editorial extolled the virtues of the beauty spot that was Frenchman Bay and which was so popular among holiday makers, but called for the provision of sanitary conveniences as soon as possible, by working bee if necessary.³⁹ Also at this same time, Reserve 2295 was cancelled and was included with the site of the former *Frenchman Bay Whaling Station (ruin)* in a new reserve, 21337 for the purpose of camping, which was vested in the Albany Road Board.⁴⁰ In July 1935, the Board called tenders for the leasing of an area of the Reserve, the tenders to include specifications for improvements to cater to tourists. Included in the lease was the right to draw water from the dam at Vancouver's Spring and to erect a pump and pipes for the purpose.⁴¹ A few months later the purpose of Reserve 21337 was altered to 'Recreation, Health & Pleasure Resort... somewhat similar to Yancheep'.⁴²

The first lease was issued to Herbert (Bert) Harding and in November 1936 it was reported that 'an enterprising young man is even now erecting a hostel and tea rooms'. Harding's 'Frenchman's Bay Hostel' offered accommodation for a limited number of guests at moderate tariff, and supplied dainty afternoon teas, cool drinks, ices, lunches, fruit, confectionary and other necessities for the perfect picnic. Fresh running water from the spring and shade from the abundant number of willow-leaved Peppermint Myrtles (*Agonis flexuosa*) in the area added to the appeal of the Bay. By 1938 a tennis court had been laid and a golf course was under construction.⁴³

Mr. Bert Harding's Frenchman's Bay Hostel, overlooking the Bay, is a splendid place to stay for a Bay holiday, or to have a meal if you prefer comfort to picnic simplicity and sand in the sandwiches. There is a tennis court for those who can't work off all their energy in hikes, bathing and the other pursuits for which the area is noted.⁴⁴

Bert Harding and his wife ran the Hostel for several years, until 1 January 1941, when the lease was transferred to Edgar Stubbs.⁴⁵ During the war years, Edgar and Evelyn Stubbs' four young grandchildren lived at the Hostel while their father Ches Stubbs served in the armed forces. Edgar Stubbs had a vegetable garden near the foot of the steps that did very well, probably because the area was well fertilized with whale manure. The hostel had five bedrooms and a communal bathroom. The main clientele during the war years were honeymooners, while defence force personnel posted to the signal station on Stony Hill, a few miles to the west, spent their leave at Frenchman Bay.⁴⁶

38 *Albany Advertiser*, 7 January 1935, p. 3

39 *Albany Advertiser*, 21 February 1935.

40 DLI Reserves Index, Reserves 2295 & 21337.

41 DLI file, Reserve 21337, SROWA, WAS 211 CONS 1641, Item 2182-1934-01RO, 1934-1981.

42 Correspondence 25 July & 13 October 1935 & map of the reserves and leased area, DLI file, Reserve 21337, Item 2182-1934-01RO, op cit.

43 *Albany Advertiser*, 16 November 1936, holiday issue, p. 17.

44 *Albany Advertiser*, 28 November, 1938, holiday issue, p. 36.

45 DLI file, Reserve 21337, Item 2182-1934-01RO. op cit.

46 Abbott, Pat (nee Stubbs), 'Life at Frenchman Bay in the Forties (The hostel, the whaling station)', In *Southside of Princess Royal Harbour: history and personal reminiscences*, compiled by the South Coast Progress Association (Inc), Albany, South Coast Progress Association, 1988, pp. 109-113.

In 1948, the lease of the Frenchman Bay Hostel was acquired by William, Kenneth and Alick Proudlove of Proudlove's Bus & Taxi Service. They had taken the lease on behalf of a relative, Harold Gibson, who was in England at the time, and on 21 January 1948, the lease was transferred to Gibson who, with his wife, ran the place for the next eighteen years. In 1959, the Gibsons leased a further five acres and established a caravan park.⁴⁷ The timber and tile ablution block is likely to have been added at this time to service the caravan sites.

On 1 October 1963, in the presence of 150 people and after much research to establish the location where Captain George Vancouver had watered his ships, *Discovery* and *Chatham* in September 1791, the Albany Historical Society erected a Notch Weir Memorial at the site of the spring at Frenchman Bay. Emu Point was previously thought to be the site of this event when Vancouver had claimed the western half of Australia for Britain.⁴⁸

The Memorial subsequently had to be removed by the Town Council after storm damage. Modern GPS technology later threw doubt on the location of Vancouver's Spring and the Memorial was not replaced immediately. It was later argued that GPS technology should not be applied to the calculations as Vancouver would have been using eighteenth century navigation technology and that had to be used to correctly locate his watering place. The Notch Weir Memorial was replaced at Frenchman Bay in March 2004.⁴⁹

Later lessees of the hostel and caravan park were Mr and Mrs W. Broughall (4 years), Mr and Mrs E. Freeman (5 years) and Mr and Mrs C. Cooper, who took over in December 1972. In 1971, the guesthouse section ceased to operate. Apart from the fact that sufficient trade was generated by the shop and tearoom, the guest facilities were in need of costly modernising.⁵⁰

The lease of the hostel and caravan park site included a clause whereby the Road Board could not allow a competing facility to offer refreshments within one mile of the place. When the Jaycee Community Foundation leased the former Cheynes Beach whaling station they were not able to develop the facilities into a tourist attraction as they were within a mile radius of the Frenchman Bay hostel. To solve this problem it was decided to create a freehold site for the hostel and caravan park and thus release the Shire from the lease and its restrictions. Plantagenet Location 7584 was created with an area of 3.26ha covering the hostel buildings and the caravan park, and the lessees at that time, Peter and Anne Bott, purchased the site, which they then leased out.⁵¹ In the 1990s a prefabricated house was added to the site and the hostel building was no longer occupied as for a residential function.

In 1994, *Frenchman Bay Whaling Station* was included in the Albany Maritime Heritage Survey and in 1995 it was included in the Port-Related Structures

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- 47 DLI file, Reserve 21337, Item 2182-1934-01RO, op cit; *Albany Advertiser*, 15 December 1972, p. 11.
 48 *Albany Advertiser*, 1 October 1963, p. 1. A weir is a notch of regular form through which water flows, and the term is also applied to the structure containing such a notch.
 49 'Site of notch weir memorial, Vancouver Spring, Frenchman Bay Albany', Albany Historical Society, Inc, *Members' Magazine*, May 1999, pp. 2-10; Plaque attached to the Memorial.
 50 *Albany Advertiser*, 15 December 1972, p. 11.
 51 DLI file, Reserve 21337, SROWA, WAS 211 CONS 6461, Item 2182-1934-02RO, 1981-1989; Certificate of Title, Vol. 1746 Fol. 534, 28 March 1986.

Survey.⁵² Vancouver Spring is entered on the City of Albany Municipal Heritage Inventory as an historic site.⁵³

Physical evidence indicates that there have been numerous additions to the 1936 hostel building over the years. The timber and tile ablution building shows evidence of having been used for another purpose and relocated to the site. The bunkhouse appears to date from the same period as the hostel. The garage is a typical c.1950s construction. Physical and historical evidence show that none of these buildings are remnants of *Frenchman Bay Whaling Station (ruin)*. The tennis court associated with the hostel is now covered by the public car park while it is not known where the golf course was located. The last tenant of the hostel building was undertaking renovations and had replaced the timber floor in the tearoom before his tenancy was terminated.

The beach at Frenchman Bay, as elsewhere, is subject to change due to the action of storms and tides. In 2004, a storm washed away several metres of Whalers Beach, further undermining and moving the brick and concrete remains of *Frenchman Bay Whaling Station (ruin)*.⁵⁴ This is confirmed by surveys of the site undertaken in the early 1990s, which indicate that more of the remnants were visible at that time.⁵⁵

In 2005, title to the freehold land on the bluff was transferred to Frenchman's Bay Pty Ltd, and the site has been further subdivided into two lots.⁵⁶ A development proposal for the site, put forward in 2006, involves the construction of a five-star resort with beach houses, holiday apartments, convention/function centre, shopping and office facilities. The plan proposes to retain the existing concrete steps from *Frenchman Bay Whaling Station (ruin)* and construct two more in similar style.⁵⁷

In 2006, the caravan park and all buildings on the bluff are vacant and the site has been secured by a cyclone wire fence. The Notch Weir Memorial remains in place, and Vancouver's Spring and the dam remain largely intact in the undergrowth. The ruins of *Frenchman Bay Whaling Station (ruin)* remain along the beach and the concrete steps continue to provide access between the beach and the bluff.

13.2 PHYSICAL EVIDENCE

Frenchman Bay Whaling Station (ruin) comprises objects of brick, stone and unreinforced concrete at Whalers Beach in Frenchman Bay on the south side of Waterbay Point, located on reserve land. On the bluff above the beach is a former caravan park with associated outbuildings on freehold land. The site is situated on the northern edge of Torndirrup National Park, approximately 22 kilometres from Albany off Frenchman Bay Road, which ends in a bituminised car park adjacent to the entrance to the former caravan park site. A 1980s cement

⁵² Wolfe, Adam, *The Albany Maritime Heritage Survey, 1627-1994*, December 1994, pp. 144-45; Cumming, D.A., et al, *Port related structures on the coast of Western Australia*, Fremantle, WA Maritime Museum, 1995.

⁵³ Heritage Today, *City of Albany Municipal Inventory*, 2000; HCWA database.

⁵⁴ Information provided on site by Ian Wilson, president of the South Coast Progress Association.

⁵⁵ Garratt, Dena, op cit; Wolfe, Adam, op cit, pp. 144-145.

⁵⁶ Certificates of Title, Vol. 1883 Fols. 426 & 427 for Lots 1 & 2 on Diagram 77269.

⁵⁷ Dykstra Planning, *Development application: Proposed five star resort, Frenchman Bay, Albany*, May 2006.

toilet block is located at the north end of the car park, and a road runs from the west corner down to Whalers Beach, about 17 metres below, where there is a parking area and picnic facilities with rotundas, barbeques and seating, and the remnant fabric of *Frenchman Bay Whaling Station (ruin)*.

The buildings associated with the former caravan park consist of the 1936 weatherboard and iron hostel building that has had numerous additions; a rectangular weatherboard and tile ablution building, likely relocated to the site c.1959; a rectangular weatherboard and iron bunkhouse of similar age to the hostel; a c.1950s timber-framed asbestos clad double garage with timber lean-to; and a 1990s pre-fabricated timber and iron residence. The buildings are located in a group at the eastern end of the site near the entrance from the car park, with rough concrete slabs marking the caravan sites to the west along the top of the bluff. The site has been landscaped. There is a levelled and grassed outdoor area associated with the tearoom of the former hostel overlooking the Bay. It is enclosed with a brick and pipe fence on the north and east sides. Other landscaping includes low stone retaining walls, bitumen and gravel roadways and parking areas, native bush and some exotic plantings, the main feature of which is a mature date palm (*Phoenix canariensis*) adjacent to the hostel.

Further west along the beach is a stone memorial marking the location of Vancouver's Spring, which has been dammed.

Ablution building

The ablution building was considered a possible remnant of *Frenchman Bay Whaling Station (ruin)*. It functioned as an ablution block with toilet and shower facilities for patrons of the caravan park west of the hostel. The building abuts the west wall of the hostel. It is single-storey and rectangular measuring 14.1m by 3.3m, with the longest margin on 65° magnetic. The foundations are cement with laterite inclusions, while the walls are 165mm and 170 mm (6½" and 7") wide weatherboards attached with bullet head wire nails to a timber cross frame. Some of the weatherboards are hand cut, but most are machine sawn. All timber framing is machine sawn. Samples of timber from the weatherboard and frame were examined with a microscope that showed the timber's cellular structure to be of the *Eucalyptus* genus, most likely jarrah (*Eucalyptus marginata*).

The roof comprises unbranded cement Marseille style tiles attached to jarrah battens nailed to jarrah rafters. The roof timbers do not contain old nail holes suggestive of roof alteration, but blanked off windows in the north and east walls (the later against the west wall of the tearoom) suggest the structure had a different purpose in the past.

There is no archaeological evidence supporting the claim that the ablution building is contemporary with *Frenchman Bay Whaling Station (ruin)*. The materials used are local (jarrah), and these are cut to Imperial measurements used in Australia from first settlement to 1972. The historical record states that the station's accommodation and kitchen facilities were of Norwegian pine, with bearers supported by brick stumps, but the survey encountered none of these features and the building had a concrete foundation.

The concrete in the foundation contained a small amount of laterite aggregate. Many of the beach-based sites also contained concrete, but none had laterite as an aggregate inclusion indicating that the ablution building and beach sites are not contemporary. In addition, the roof frame of the ablution building carries

cement tiles that came into vogue shortly after World War II. The roof's rafters and battens show no evidence for alterations such as old nails, nail holes or timber stains suggesting that the building's present roof is original comprising materials forty year's older than the whaling station's period of use.

Blanked off windows suggest a different original function for the building.

Whalers Beach archaeological sites

The purpose of this section is to describe the material remains of *Frenchman Bay Whaling Station (ruin)* in detail to determine the past function of the place and evaluate preservation. Some of the archaeological remains – in the form of granite and brick piers – have been used to provide seating in an area near the western boundary of the site. This practice needs to be discouraged.

The archaeological record is spread over a 150 metre line parallel with the beach. The survey comprised visually analysing, measuring and photographing the components comprising the place.

Site 1 is a raised plinth of brick and mortar stucco. It measures 762mm by 647mm, with the longest measurement on 65° magnetic. Four heavy corroded studs protrude from the top. A recessed trapezoid shape on the top of the plinth suggests that a structure with this shape rested on it at some stage.

Site 2 is a high-density (25 to 50 artefacts per square metre) artefact scatter of coal, clinker and iron fragments eroding from a 2m by 2m cup-shaped depression facing the beach. One piece of clear glass was also present. The artefacts are eroding from a lighter coloured, sandy matrix that sits on a natural unit of black, peaty soil.

Site 3 comprises a low-density (0.5 to 10 artefacts per square metre) scatter of metal and small whalebone fragments in a 1.5m by 2m wide clearing. A Peppermint (*Agonis flexuosa*) in the middle of this clearing has grown over time and brought the artefacts to the surface.

Site 4 comprises a medium density (11 to 49 artefacts per square metre) scatter of metal, small whalebone and coal fragments in a 2m by 2.5m wide clearing. Similar to Site 3, a Peppermint tree's growth has brought the artefacts to the surface.

Site 5 comprises a low-density scatter of metal fragments and one piece of melted glass in a 2.5m by 3m wide clearing. Similar to Sites 3 and 4, a Peppermint tree has brought the artefacts to the surface.

Site 6 is a high-density 1.5m by 3m wide scatter with large (12.5mm to 25mm) pieces of coal, clinker and coke. The coal is similar to eastern Australian Newcastle coal and is not from Collie Western Australia. The artefact scatter's density is high around the trunk of a peppermint tree, the growth of which has brought the material to the surface.

Site 7 is a high-density 1m by 2m wide scatter with large (12.5mm to 25mm) pieces of coal and clinker, similar to that at Site 6. A peppermint tree has again brought the material to the surface.

Site 8 is a fragmented section of collapsed brick wall or brick flooring. It has 17 courses with lime-based mortar used for cement. The machine pressed, unbranded bricks average 224mm long, 62mm deep and 110mm wide. The

feature is angular but 1.3 by 2 metres at its widest points. Tree growth has raised the southern end. Also associated with the site are fragmented clinker and one piece of creamware ceramic.

Site 9 is a circular, ground level feature with a 4m diameter. It contains brick (averaging 224mm long, 62mm deep and 110mm wide), hewn metamorphosed granitic stone and un-reinforced mortar sections. The mortar sections suggest that a round object, like a tank, sat on the feature. In the centre is a 915mm by 915mm square cement boss. Four heavily corroded studs protrude from the top of the boss, and a 390mm by 390mm square recess in the boss suggests a support function for this component. The boss is set at 65° and 155° magnetic. (Refer photo Site 9 & 10)

Site 10 is similar to site 9 but has a 4.4 m diameter. The boss and square recess is 915mm by 915mm and 390mm by 390mm respectively. Nearby but associated with this site were large (12.5mm to 25.4mm) coal fragments. (Refer photo Site 9 & 10)

Site 11 is a high-density 1.5m by 3m wide scatter with large (12.5mm to 25mm) pieces of coal, clinker, coke and corroded ferrous metal fragments. The coal is similar to eastern Australian Newcastle coal and is not from Collie.


Site 12 comprises a rectangular raised 1110 mm by 640 mm concrete and brick plinth with a flat 580mm by 640mm concrete section 100mm to the south. Four recesses for studs are in the corners of the raised section.

Site 13 is a 2870mm by 690mm concrete feature. It comprises two raised sections measuring 2870mm by 300mm and 2870mm by 190mm respectively, separated by a lowered area measuring 2870mm by 200mm.

Site 14 is a raised pad with 19.6m by 8m dimensions. A 0.5m high retaining wall of hewn metamorphosed granitic stone brick forms the pad's north face and sections of the east face. A 4m by 3m area in the pad's north-east corner contains a heavy density scatter of coal and clinker fragments but, the whole pad area contains light and medium density artefact scatters of mostly coal and clinker fragments. The feature's long axis is at 64.5° magnetic.

Site 15 is complex of five ground level brick and mortar features in a 3.5m by 3m area. Two of the features contain heavily corroded studs suggesting a support function.

Site 16 is a flight of 62 concrete steps from the top of the bluff to bottom. The steps are 1m wide. The feature's alignment is 146° magnetic.

Site 17 is a 15m by 25m area comprising brick and stone. The brick component consists of high-fired machine pressed red brick (averaging 224mm long, 62mm deep and 110mm wide) used in pier construction between 1.5m and 1.9m in length. No piers are in situ, with all collapsed. Three pier shapes exist: 'L' shaped measuring 800mm on the long arm and 400mm on the short;  shaped, and square measuring 370mm by 370mm. (Refer photos Site 17[1] & Site 17[2])

The metamorphosed granitic stone component of Site 17 consists of large angular blocks. Some blocks have flat faces on which brick has been mortared, while others have been split to form 1.8m by 0.3m long blocks placed end-on-end on the seaward side of the site.

Site 18 comprises four rectangular structures. The construction of two of these structures is the same, measuring 2270mm by 1740mm by 640mm, and consisting of brick outside sections and a stone and mortar centre. The outside brick sections have three, 1-inch diameter steel studs with eight threads to an inch protruding from them. The west face of the west feature has unpointed mortar, suggesting that the bricks were laid against an already existing wall or other feature that inhibited the pointing of the mortar. Between these two features is a square structure of granite and brick rubble held together with mortar. Distinct formwork patterning of either timber or corrugated iron is visible in the four sides of the structure and eight highly corroded steel studs protrude from the top surface. These three structures are tilted seaward about 10 degrees.

The last feature of Site 18 is a brick and mortar structure at ground level. The partial covering with sand dunes inhibited the taking of accurate measurements or determining the extent of the structure.

This archaeological record reflects only a small percentage of the physical remains of *Frenchman Bay Whaling Station (ruin)* when operating in the 1910s. However, despite cultural and natural disturbance, function can be determined for much of the archaeological remains. Site 17 is the slipway and flensing deck. Descriptions of the structure when it was in use suggest that many of the brick pier components were buried in sand, much of which was washed away with the 1921 storm.⁵⁸ The brick piers were cemented to metamorphosed granitic stone that formed the foundations of the slipway and flensing deck. The 1921 storm also exposed these.

Despite damage inflicted by natural causes and the apparent disorder of the site, the slipway and flensing deck's artefacts retain structural integrity to approximate deck dimensions and possibly what the structure looked like when in use. The piers' stone foundations have moved little (with two possibly in situ), suggesting that the slipway and flensing deck was supported by four lines of piers running at right angles from the beach. Stone appears to have been used as a retaining wall or minor breakwater on the east face of the slipway and flensing deck. The centre piers supporting the slipway and flensing deck were square or rectangular, but the 'L' and ■ shaped piers are in an approximate line 13 metres from the edge of the present car park. This line of irregular shaped piers suggests the edge of some part of the slipway and flensing deck, whether the extent of the beach before the 1921 storm or the location of the brick retaining wall mentioned in historical documents.⁵⁹ The site's archaeological remains suggest eight metres for the deck's approximate width.

The condition of sites 2 and 18 also indicate disturbance by storm surge and wind. Evidence preserved on the four brick and stone features indicate they were originally enclosed in a structure, while their 10 degree angle seaward indicates foundation undercutting. There is evidence suggesting that the four features have resided and slumped forward by as much as one metre. The shape of three of the four brick and stone features and the steel stud fittings attached suggest their use to support machinery, most likely a steam engine. Douglas' sketch of the station's layout shows a double-storey brick building west of the slipway and

⁵⁸ Garrett, Dena, *Frenchman Bay Whaling Station (ruin), Frenchman Bay. Maritime Heritage Site Inspection Report*. Department of Maritime Archaeology, Western Australian Maritime Museum, number 82, 1994; Marshall, Gordon, *Maritime Albany Remembered Les Douglas et al.* 2001, p.16.

⁵⁹ Marshall, Gordon, op cit.

flensing deck, but it is unclear if this structure housed the components of Site 18.⁶⁰ There are no other brick remains near Site 18 indicative of a collapsed brick structure, and this supports Dakin's claim that the structure was of timber, rather than brick.⁶¹ The exposure of Site 2 is also due to natural disturbance.

Sites 9 and 10 are most likely foundations for digesters or cookers, and not tanks as previously suggested. These cylindrical steel objects that sometimes operated under steam pressure contained agitators that mixed the fluid containing whale meat and blubber allowing rapid processing. The concrete and steel bosses in the centre of the structures held the agitators' shafts.

Sites 2 to 7 and 11 are indicators for the nature of the subsurface archaeological remains. All are formed by natural processes: Site 2 by wind and wave action, and Site 3 to 7 and 11 by tree growth bringing material to the surface. These sites were not selected points where artefacts were deposited but instead suggest that the whole area has a subsurface layer of material from the whaling station period. Site 2 suggests that this layer is about 20 cm below the present ground level, with a high potential of containing small artefacts like coal, clinker, whalebone and iron fragments, but also larger structural objects.

Douglas' sketch suggests a barrel storage function for the west section of the site, and the retaining wall and level area of Site 14 suggests it was used for this function.⁶² Site 15 nearby probably has a related function, and may be associated with the narrow gauge tramway that took trolleys from the processing area to the barrel shortage site, and finally to the loading jetty. The function of sites 1, 12 and 13 is unclear, while the bricks used for various site features do not appear Western Australian made. Western Australian pressed bricks from this period were frogged and carried a brand name, but none of the bricks on the site have these characteristics. Their origin is unknown.

The steps (site 16) are most likely from the whaling station period, but their location does not positively correlate with the historical record. Douglas places them west of the flensing deck and the structure containing digesters, but the results of the archaeological survey suggest that the deck and digesters are west of the steps.⁶³ A survey of the slope leading to the former tearooms failed to find any evidence for a previous flight of steps.

Vancouver Spring, Dam and Memorial

Vancouver Spring Memorial is located west along the beach, past the picnic facilities. A stone structure about one metre high and wide, it straddles the stream issuing from the spring. The base section is partially covered with sand.

A plaque attached to the horizontal section reads;

This spring was charted by
Captain George Vancouver
in September 1791
It has been used ever since as a source of fresh water by
explorers and seafarers, local residents and visitors
16 March 2004 City of Albany

60 Marshall, Gordon, op cit.

61 Dakin, William, *Whalemen Adventures*, 1938, p.186.

62 Marshall, Gordon, op cit, p. 19

63 Marshall, Gordon, op cit.

The course of the stream over the sand to the sea is clearly discernible. An overflow stream can be seen a little further back to the east. A full inspection of the dam that is built around the spring was attempted through the thick undergrowth, but a swarm of bees had established a hive in the pump house and one sting was sufficient warning to leave promptly. The following is a description of the dam when last inspected by Les Douglas about 1991.

The dam cannot be more than five or so metres above the level of the beach, but the thick undergrowth goes up to the water's edge, in some places overhanging it, with the result that one comes upon the dam suddenly, noticing it only when the ground becomes wet underfoot. The best method of approach appears to be up the creek bed, then veering to the right.

There is a small corrugated iron pumphouse on the left shoreward side, housing an engine... giving the name on the inside wall of Bates & Co. The stream discharges just next to this and again further along the dam... The dam itself is long and narrow... but it is difficult to see its full length owing to the overgrowth.

The stream enters at the north end, and there are two or more wooden barriers across the dam, and a pipe running across it from the pumphouse. The water is clear and fresh looking, and it is possible to see into it for a distance of six or eight feet, except that it is full of freshwater grass. The sides are lined with wood ...[that] looks only forty or so years old, but may be older. The pipes have been replaced... It was not possible to go to the other side of the dam ... owing to the undergrowth.⁶⁴

Frenchman Bay Whaling Station (ruin) is in poor condition with all elements beyond restorative opportunities. However, the archaeological signature of the place suggests rich subsurface material strata. Presently the subsurface archaeological remains are in a stable environment and unthreatened, but consultation should occur before proposed ground breaking activities are undertaken. The site presents interpretive opportunities, but it has a low degree of integrity. There is some evidence of recent unsympathetic changes to the remaining fabric, but generally, *Frenchman Bay Whaling Station (ruin)* displays a high degree of authenticity.

There was no physical evidence found on the bluff of *Frenchman Bay Whaling Station (ruin)* buildings that had been located in that area.

13.3 COMPARATIVE INFORMATION

Western Australia's south coast was the home of many 19th century shore-based whaling stations.⁶⁵ Owned mostly by Australian or British companies, the stations had moderate success using aspects of the natural environment like granite shelves as slipways and flensing decks and hills for lookout positions. However, many of the shore-based operations could not compete against the American pelagic whaling. Stations existed at Torbay between 1844 and c.1864, Barker Bay 1849 to c.1873, Two Peoples Bay between 1842 and 1844 and c.1870s, Cheynes Beach 1846 to 1877, Cape Richie 1870 to c.1872, Doubtful Island Bay 1836 to 1838 and 1863 to 1870s, Barrier Anchorage c.1871 and Thomas' Fishery near Cape Arid c.1862.⁶⁶

64 Marshall, Gordon de L., op cit, p. 17; sketch plan of dam from 'Site of Notch Weir Memorial...', op cit, p. 7.

65 Gibbs, Martin, *The Historical Archaeology of Shore Based Whaling in Western Australia 1836-1879*. PhD thesis, Centre for Archaeology, University of Western Australia, 1995.

66 Gibbs, Martin, op cit; pp. 410-52.

After a lapse of about thirty years, *Frenchman Bay Whaling Station (ruin)* began a new era in Western Australian whaling. It was the first station established in the 20th century, and was dissimilar to the former 19th century stations because of technological advancements like steam-powered ships and station machinery and the use of explosive harpoons that increased industry effectiveness and safety. In addition, the station's operation by men from the efficient Norwegian whaling industry saw the introduction of whaling experience not seen previously.

Frenchman Bay Whaling Station (ruin) and *Norwegian Bay Whaling Station (ruin)* north of Point Cloates, Ningaloo, were the only two whaling stations operating in Western Australia before 1950. The Spermacet Whaling Company was associated with both stations and the layout of the stations was understandably similar. A photograph of Cheynes Beach station around 1952 shows that little had changed over forty years. Digesters are located at the flensing deck's end and the whale processing area and loading jetty linked by narrow gauge tramway. However, historical and archaeological evidence indicate that *Frenchman Bay Whaling Station (ruin)* was much smaller than the *Norwegian Bay Whaling Station (ruin)*, potentially containing two digesters compared with possibly 40 at Point Cloates.⁶⁷

13.4 KEY REFERENCES

Garratt, Dena, *Frenchman Bay Whaling Station (ruin), Frenchman Bay: maritime site inspection report*, Fremantle, WA Maritime Museum, 1994.

Puls, Colin, *Frenchman Bay whaling companies and Western Australian Government, 1911-1919*, BA honours thesis, UWA, 1970.

13.5 FURTHER RESEARCH

Frenchman Bay Whaling Station (ruin) was one of only two whaling stations operating in Western Australia in the early 20th century. Its foreign ownership and operation is unusual in Western Australian history. Information about the number of whales caught and the financial turnover is available, but little is known about the Norwegian men who lived at the station. Further research on these men's lives working as whalers, harpoon smiths, cooks, carpenters and other professions is needed to add humanness to presently innate physical remains. In addition, the archaeological survey recorded sites associated only with whale processing, with no personal artefacts like smoking pipes, ceramics or glass found. The place needs further archaeological and historical research on these topics to enable a more complete and rounded picture of operation and life at Frenchman Bay.

Further research is required into the Aboriginal history of the place, both before and after European occupation.

⁶⁷ HCWA assessment documentation, P04231 Norwegian Bay Whaling Station (ruin).

ATTACHMENT 3 - The Heritage of Frenchman Bay

The Heritage of Frenchman Bay

**This document has been written to support the proposal to construct a
history trail in Frenchman bay**

**Frenchman Bay Association
March 2014**

Introduction

Producing an account

The historical accounts of Albany and its hinterland are mainly about the settlement and development of the township; the events that unfolded at Frenchman Bay are incidental. The historical record contains few photographs taken at Frenchman Bay. Further, the sites where key events occurred and the remnants of early settlement on the southern shores of King George Sound have not been adequately preserved and commemorated.

This is all the more surprising given the colorful early history in which French, Americans and Norwegians, along with the British, played a prominent part. As for the Indigenous landowners who watched the visitations and colonisation unfold, there is almost no reference to their life at Frenchman Bay.

This documents summarises some of the stories that could feature on a history trail situated above Whalers Beach.

Narrative

The narrative of the early history Frenchman Bay can be woven around several themes:

1. The Mineng people who had lived around King George Sound for thousands of years;
2. The arrival of the British, initially Vancouver in 1791, and later Flinders in 1801, who searched for a safe anchorage, a supply of timber, and above all a year-round supply of potable water;
3. The scientific expeditions of Baudin, Freycinet and Peron in 1803, and d'Urville in 1826;
4. The development of the settlement of Albany and its dependence on fresh water from Frenchman Bay during the 19th and early 20th centuries;
5. The Norwegian and Cheynes Beach whaling stations at Frenchmen Bay; and
6. Frenchman Bay as a destination for picnickers and tourists during the late 19th and 20th centuries.

What's visible from the escarpment above Whalers Beach

The bay, defined by present day Whalers Beach, was considered by Vancouver and Flinders to be part of King George Sound and not specifically named. It constitutes a section of Frenchman Bay that stretches from Mistaken Island in the north to the Flinders Peninsula and Bald Head in the south.

The two permanent springs that flow into the ocean at Whalers Beach are of particular importance in the narrative of Frenchman Bay. In addition, the islands and other geographic features visible from above Whalers Beach are the sites of important events that contribute to the narrative.

Frenchman Bay: Then and Now

Vancouver's Spring

A number of springs feed into Frenchman Bay but by far the most significant is Vancouver's Spring. The stream fed by this spring empties onto present day Whalers Beach. The spring was of enormous significance to ships visiting the west coast of New Holland because it produced a strong, permanent flow of good quality water. A second spring within a hundred metres of Vancouver's Spring also produced a steady flow and is documented by early European visitors.

Francois Peron, who visited Frenchman Bay in 1803 as a naturalist later wrote:

Discovered in 1791 by Vancouver, its {King George Sound} importance is made all the greater by the fact that along a stretch of coast at least equal in magnitude to the distance between Paris and St Petersburg, it is the only well-known part of New Holland where it is possible to obtain fresh water at all times. (p. 105, Voyage of Discovery to the Southern Lands)

Peron records that the knowledge of the spring saved the lives of the crew of the *Casuarina* that arrived from the Cape of Good Hope at the site with only a few bottles of water remaining.



Vancouver's Spring, 2014

Later in the 19th century the P & O shipping Company dammed the spring in order to supply vessels anchored in the Sound (see below).

Today, the existing signage needs to be replaced. The sign identifying the site as Vancouver's Spring has rusted at its base and toppled. The gully leading up the hill towards the dam is gradually being eroded because of unauthorised pedestrian traffic. However, the notch weir, to which a plaque was attached in 2004, remains in good condition.

Stream Bay

The French, led by Nicolas Baudin, named the bay into which the springs flowed Stream Bay (*Anse de l'Aiguade*) in 1803. The expeditions cartographer, Louis Freycinet, drew a

map showing the promontory now known as Waterbay Point, Mistaken, Island and the two streams running across the sandy beach to the ocean.



Freycinet's map of Stream Bay

Baudin set up tents on the beach, one for sick crewmembers and the other for his scientific team. He used the opportunity to wash the ship's linen and hammocks in the fresh water available from the springs.



Louis de Sainson's painting of water collection from the springs at Stream Bay (Whalers Beach)

In an 1826 expedition, Durmont d'Urville's visited Frenchman Bay. The expedition's artist, Louis de Sainson produced a painting from that expedition depicting crewmembers loading fresh water from the springs by bucket on to a small boat. The Frenchmen are shown conversing with Mineng people, one of whom is carrying a bucket of water.

Mistaken Island

Mistaken Island was initially named by Matthew Flinders who visited King George Sound in 1801, a year ahead of the Baudin expedition. Because of his imprisonment in Mauritius when attempting his return to England, Flinders' journal and maps were not published until 1814.

During his visit in 1803 Baudin, remarked that it was 'a reasonably pleasant island'. He instructed his astronomer to set up a camp on the island to undertake scientific observations and named it 'Observatory Island'. The scientists had to subsequently move from the island to the mainland after they accidentally set fire to it.

Mistaken Island was used as a make-shift quarantine station in the 1830s. A map of 1831 names the whole of Frenchman Bay 'Quarantine Bay'. Passengers on ships with contagious diseases such as smallpox were required to stay on the island in tents for two weeks. The quarantining of the Colonial Secretary, F. P. Barlee, (second only to the Governor in importance) and his wife on the island triggered some prompt improvements. The indignant Barlee used his office to ensure the construction of the permanent quarantine station near Point Possession in 1874.

Later the island acquired the name 'Rabbit Island' following the attempt by early settler George Cheyne to breed rabbits. Other livestock were introduced to the island. These ventures failed and the island resumed its earlier name 'Mistaken Island'.

Seal Island

Seal Island was named by Vancouver after observing a large colony of seals basking on its rocky shore. After reading Vancouver's account of the seals in the Sound, Captain Isaac Pendleton from New York visited the Sound in 1803 in search of 20,000 seal skins which he planned take to Canton on the China coast. Instead, when he arrived in King George Sound there was not the bonanza he was hoping for. He did have the good fortune of meeting Baudin who told him over dinner on the *Geographe* about the rich takings in Bass Strait. Pendleton, supplied with maps and directions by Baudin, set off for the Tasmanian coast. A year later, Islanders in the Pacific murdered Pendleton and six of his crew when they went ashore.

When Vancouver sailed from the Sound he left a bottle containing a parchment on the island. A decade later Flinders visited the island to look for the bottle but couldn't find it leading him to surmise that there had been other European visitors who had taken it.

It was assumed by Flinders that a British whaler, the *Elligood*, captained by Christopher Dixon, was the culprit. He visited the Sound in 1800, though died of scurvy along with nine of his crew on his way back to Britain.

Flinders in turn left a bottle and parchment on Seal Island. However, when Captain Phillip King landed on Seal Island in 1818 to look for Flinders' bottle and parchment he found instead the skeleton of a goat's head and the remains of a bottle that were left by Lieutenant Forster, captain of the *Emu* which visited in 1815.

When Lockyer visited the Island in 1827 he found the remains of a hut, presumably erected by a sealer – but no bottles.

Local Historian, Robert Stephens sardonically referred to Seal Island as the 'Isle of Lost Bottles'. What happened to the bottles, and the parchments they contained, remains a mystery.

Michaelmas Island

In the early 19th century a large number of whalers and sealers plied the southern coast of New Holland. Most were American though some were from New South Wales. Among them were boats with gangs of sealers who could be likened to pirates. Often Indigenous people bore the brunt of their criminal behaviour.

When Major Lockyer first visited King George Sound in the *Amity* in 1826 he noticed a large plume of smoke rising from Michaelmas Island. He assumed it was set by persons in distress or else for some inexplicable purpose and resolved to send a boat to investigate.

An officer from his ship subsequently returned from Michaelmas Island with four Indigenous men who had had been marooned there. That same day, one of Lockyer's crewmembers was fatally speared while bathing in Oyster Harbour. It was thought that the rescued men were among the party that murdered the crewmember.

The next day on an island inside Oyster Harbour, Lockyer found the body of an Indigenous man who, as it became clear, had been murdered over two months earlier by sealers.

Several days later Lockyer encountered a gang of sealers who had approached the *Amity* for provisions. It emerged that the men marooned had been taken to Michaelmas Island shortly after their tribesman had been murdered. Further, a woman and child had been abducted and were being held on Eclipse Island by a Samuel Bailey. Bailey was apprehended and the woman released. The child's parents could not be identified and she was later sent to Sydney. Lockyer did his best to restore relations between the Mineng and the settlers.

He wrote in his journal:

From the lawless manner in which these Sealers are ranging about requires some immediate measures to control them as, from what we know as also from what I have learnt from themselves, they are a complete set of Pirates going from Island to Island along the southern coast...a great scene of villainy is going on, where to use their own words there are a great many graves, a number of desperate Characters, runaway prisoners from Sydney and Van Dieman's Land.

Bald Head

Bald Head, dominating the entrance to King George Sound, was named by Vancouver in 1791. It was visible to the early seafarers 'from 14 leagues out to sea'. Bald Head has retained its name and is often referred to by early visitors to the Sound in their journals.

Vancouver appears to have hiked to the end of the peninsula (later named Flinders Peninsula) as he observed in his diary the existence on the peak of Bald Head of 'coral'. 'Nowhere have I seen it so high up and so perfect' he wrote in his journal. This seemed to him evidence that the over many years the sea level must have fallen.

The so-called 'coral' became a matter of fascination among the scientists who followed in Vancouver's footsteps. Later visitors thought it might be petrified tree parts. Peron, a naturalist on Baudin's expedition, thought that the coral or petrified trees sections were in fact 'more or less hard sandstone, which preserves merely the shape of the plants that served them as moulds'. They were not genuine fossils.

Further, contrary to Vancouver, the French read the evidence to show that the sandstone peninsula leading to Bald Head had risen from the floor of the sea. It must have been a 'peaceful upheaval', according to Peron.

Captain King, who visited King George Sound in 1818 and obtained specimens of the material, was of the view that the material was 'merely sand agglutinated by calcereous matter', essentially agreeing with Peron.

De Sainson and M, Gaimard, officers on d'Urville's *Astrolabe* wrote that on their visit to the top of Bald Head in 1826 they 'did not find the faintest trace of any coral'. However, they did report that the top of Bald Head was 'pocked with meteors', a rather dubious claim.

To end matters, none other than Charles Darwin in 1836 made the trip to inspect the limestone material and provided a detailed explanation in his account *The Voyage of the Beagle*. It was largely consistent with that of Peron and King.

Interest in fossils, geomorphology, and variations in fauna and flora produced the intellectual ferment that eventually led to Darwin's groundbreaking *The Origin of the Species* published in 1859.

The Flora and Fauna

Early English and French Botanists quickly recognised that King George Sound was a botanic 'hot spot' with a huge number of previously unclassified plants. Menzies, Brown and Leschenault are some of the most prominent botanists who visited. Some of the species growing above Whalers Beach bear the names of these early botanists.

The ships had qualified gardeners on board who assisted the botanists collect specimens though their special function was to pot and nurture exotic specimens that were then returned to Kew gardens in England or to Paris. Sometimes the officers had to vacate their cabins to make room for the large number of specimens collected.

A major destination was the chateau of Empress Josephine, the wife of Napoleon Bonaparte. Animals were also collected and shipped back to France where some ended up in the estate of Josephine.

In addition to collections held by museums and displayed in government gardens there were also collections from New Holland in private hands. Botanists exchanged or bought specimens to build their collections.

The botanical work undertaken on these voyages was multifaceted. Botanists and gardeners collected specimens. Artists were employed to illustrate them. Botanists, not necessarily the collectors, scientifically named and classified the specimens. Gardeners propagated from seed or cuttings. There was an ambiguous grey area concerning the claims of those who collected and illustrated the plants to sell the items privately.

In later years, collectors in Europe employed locals to visit King George Sound and scour the countryside for new specimens and send the material back to them for classification.

The P & O Dam

Visiting whalers and sealers would have continued to use the water source during the 19th Century as it was available at any time of the day or night, all year round and free of charge. The early seafarers collected the fresh water from the stream as it entered the beach. It is thought that the first dam was constructed in the 1850s – amounting to little more than an excavation on the side of the escarpment immediately below the emergence of the spring.

Demand for fresh water was growing. The Peninsular & Orient Company (P & O) won the sea-mail contract across southern Australia with a scheduled stop in Albany. These vessels carried the mail for the whole of the Swan River Colony.



The P & O dam in the 1890s

In order to supply the water requirements of their fleet in Albany, P & O built a dam at Vancouver's Spring to form a reservoir with a reliable and sustainable supply from which lighters would fill up and take water to their steamers. The water from Vancouver's Spring was preferred because of its purity. They could not risk using water with mineral contaminants that would corrode the boilers.

From about 1890 to 1902, Albany's water supply was insufficient to meet shipping demands. As a result, in 1902 Armstrong and Sons acquired a lease for the section of Frenchman bay containing the old P & O Dam. They refurbished the dam and constructed a jetty at the beach. Water was pumped from the dam through a pipeline that ran to the end of the 200-foot jetty seen in the photo below. The water was stored on lighters (flat bottomed barges) that were towed to ships anchored in the Sound.

Armstrong was contracted to supply water from Vancouver Dam to the Town of Albany and various types of shipping (including Boer War transports) until about 1912. By 1914, Albany's water supply had improved and the Frenchman Bay supply was only occasionally required for shipping purposes.



The jetty and pipeline to water lighter circa 1902

From the 1920s to the 1980s, various tearooms, chalets and caravan parks were established above Whalers Beach and used the Vancouver Dam reservoir as a water supply - until a bore was drilled above the beach in the late 1980s. Even when the mains water supply from Albany reached the Goode Beach area in 1983, people still collected water from Vancouver Spring for various domestic purposes (including tea making), because of the good taste of the water compared to the scheme water!



The dam in 2014

Norwegian whaling station

In 1912, the Norwegian-owned Spermacet Whaling Company began hunting sperm whales on the southern coast. After taking over 200 whales in the first season they decided to set up a shore station. They began by purchasing the lighter jetty from Armstrong and Waters that contained the pipeline from the Vancouver Spring.

Today, little is left of the Norwegian Whaling Station. Further, there are few photographs and no contemporary accounts of life of the Norwegians who lived there. The workforce

was almost entirely Scandinavian and the station was not accessible by road. A rare photograph illustrates the substantial collection of buildings that were in use from 1914 to 1916 – a fact that is hard to imagine when visitors swim and barbeque at the site today. It is extraordinary that over such a short space of time the whole complex was obliterated. There are no plaques or signs explaining the significance of the site.

The station was constructed from imported timber and bricks as well as from some locally supplied karri planks. In the area above the beach that became the site of a hostel and later a caravan and camping site, there are no known archaeological remains of the whaling station of any significance. Yet this area contained the station's living quarters and consisted of five large houses, one of which served as a kitchen and mess. Four are visible in the photograph below.



The Norwegian Whaling Station circa 1915

The large two-storey building on the beachfront contained the boilers and was of timber construction. To the right is another two-storey building of brick that was used for engineering purposes.

The concrete stairs led from the processing buildings on the beachfront up the escarpment to the living quarters clearly seen in the photograph above. The stairs are the only intact remnant of the whaling station that survives today.



2014 photo showing the stairs leading from the work area to the living quarters

There are scattered remains of the brick embankment used to form a retaining wall on the lower level of the whaling station. This wall was intended to protect the buildings and equipment from high tides and erosion.

A massive storm in 1921 undermined the brick embankment causing a large brick building to topple. This storm, in effect, ended any plans for a renewal of the whaling station on that site. The site was subsequently sold for salvage,



The debris in the 1960s



The debris in 2014

Although the Norwegians dug two wells they also used Vancouver Dam for both a potable and process water supply – by installing a pipeline along the beach from the dam to various areas of the whaling station. Both the spring and the dam occur within the heritage-listed precinct of the Norwegian Whaling Station at Whalers Beach.

Wrecks

There are a number of wrecks in Frenchman Bay, usually hidden under sand. One that has a section visible on Whalers beach is the *Elvie*, a water lighter made locally from jarrah. The lighters were used to haul water or coal to ships anchored in the Bay.



Elvie wreck, Frenchman Bay 1922

The wrecks were usually plundered for usable pieces of timber and in most cases little is now visible. A section of the *Elvie* has been restored and is shown above Whalers Beach in the photo below. The rough-hewn ribs are clearly visible.



Restored section of *Elvie* showing jarrah planks and ribs

The Hostel and Tea Rooms

Frenchman Bay was a favoured picnic destination from the late nineteenth century. Access to Whalers Beach was possible only by boat and the enterprising Armstrong and Waters company ferried Albanians to the cove for one shilling per round trip. There were even moonlight cruises. Albany had a strong picnic culture and it was common for people to take large hampers and dress to the nines.

Tourism temporarily ceased at Frenchman Bay following the establishment of the Norwegian whaling station - the oil slick and pieces of whale carcasses that floated about made sure of that. The odors were described as 'noisome'. Following the demise of the whaling station tourism resumed. In 1934, a road was built that connected Albany to Whalers Beach and a tea kiosk was established.

Recognising its potential for tourism, the local authority established a new reserve for the purpose of camping and issued a lease that allowed water from the dam at Vancouver Spring to be pumped to the site for tourist purposes. In 1936 a hostel was built on the site of the Norwegian kitchen and mess at the summit of the stairs from Whalers Beach.



The tea rooms and hostel in the 1940s

Today there is nothing left of the hostel except the date palm that once graced its entrance.



The site of the tea rooms and hostel , 2014

Frenchman Bay Association: March 2014

ATTACHMENT 4 - Indicative Cost Estimate

INDICATIVE COST ESTIMATE

FRENCHMAN BAY TRAIL PROJECT

H + H ARCHITECTS

CHRIS O'KEEFE CONSTRUCTION COST CONSULTANT

Jun-15

FRENCHMAN BAY TRAIL PROJECT

Ref : A794

INDICATIVE COST ESTIMATE9/06/2015**PROJECT COST SUMMARY**

Total Cost from Summary	\$ 251,000
Design/Contract Contingency	\$ 38,000
Professional Fees	\$ 51,000
Subtotal	\$ 340,000
GST	\$ 34,000
TOTAL INDICATIVE COST ESTIMATE	\$ 374,000

Exclusions :

This estimate excludes the following costs :

Cost escalation to date of construction

Full Estimate Summary

Job Name : <u>A794 - FRENCHMAN</u>	Job Description
Client's Name:	FRENCHMAN BAY TRAIL PROJECT

Trd No.	Trade Description	Trade %	Cost/m2	Sub Total	Mark Up %	Trade Total
	Roads, Footpaths, Paved Areas	51.75		129,900		129,900
	Outbuildings and Covered Ways	37.85		95,000		95,000
	Landscaping and Improvements	10.40		26,100		26,100
		100.00		251,000		251,000
Final Total : \$						251,000

Trade Breakup

Job Name : A794 - FRENCHMANJob Description

Client's Name:

FRENCHMAN BAY TRAIL PROJECT

Item No.	Item Description	Quantity	Unit	Rate	Mark Up %	Amount
<i>Trade : 1 <u>Roads, Footpaths, Paved Areas</u></i>						
1	1.5m wide limestone trail	1,000.00	m	70.00		70,000.00
2	Timber decked viewing platform, access path & steps	64.00	m2	350.00		22,400.00
3	Timber stairs adjacent to existing tearooms	15.00	m	2,500.00		37,500.00
<u>Roads, Footpaths, Paved Areas</u>						Total : 129,900.00
<i>Trade : 2 <u>Outbuildings and Covered Ways</u></i>						
1	Trail head interpretation structure & seating		Item			45,000.00
2	Information node interpretative structure		Item			50,000.00
<u>Outbuildings and Covered Ways</u>						Total : 95,000.00
<i>Trade : 3 <u>Landscaping and Improvements</u></i>						
1	Vancouver spring barrier		Item			3,000.00
2	Relocate existing elements		Item			3,100.00
3	Interpretive panels		Item			20,000.00
<u>Landscaping and Improvements</u>						Total : 26,100.00

ATTACHMENT 5 - Interpretative Information

The Heritage of Frenchman Bay

Note: The text below will need to be abbreviated and simplified if we decide to use it. We will need to decide whether to employ someone to do this after we have agreed on the level of detail and style of presentation required. Max Angus

Nodes 4 and 8: The Frenchman Bay Story

Frenchman Bay, as this location is now named, has a surprisingly rich history.

The Noongar people have lived around King George Sound for many thousands of years. They observed the comings and goings of the first Europeans to visit King George Sound. *(Is there a Noongar word for the Sound?)* Though initial contacts with sailors from the British and French navies were friendly, their encounters with the sealers and whalers were sometimes bloody and abusive.

The arrival of the British, first Captain George Vancouver in 1791, and a decade later Commander Matthew Flinders in 1801 put King George Sound on the map. They found a safe anchorage, timber for repairs and fuel, and, above all, a year-round supply of potable water.

The French followed shortly after, launching a large scientific expedition, led by Commander Nicolas Baudin, assisted by his head-strong lieutenant Louis Freycinet and scientist Francois Peron in 1803. Captain Jules d'Urville followed in 1826. They were attracted by the certainty of fresh water provided by the spring that has flowed continuously to this day. In later years this section of King George Sound became known as Frenchman Bay and the beach onto which the stream flowed is now known as Whalers Beach.

Botanists and naturalists on board the British and French vessels were astounded by the diversity of the fauna and flora. Hundreds of specimens were collected and sent back to Europe.

The settlement of Albany developed during the 19th and early 20th centuries was also dependent on fresh water from the same spring that had supplied the early British and French sailors. The need for the spring water increased as sailing ships were replaced by steam ships. Their boilers required pure water. A dam was built in the 1860s. Pipes carried the water along a jetty to lighters that carted the water to waiting ships.

In 1914 a Norwegian company established a large whaling station at Frenchmen Bay at this very site. It closed after a few years and little now remains.

Frenchman Bay was a destination for picnickers and tourists during the late 19th and 20th century. There was no access by road until the 1930s. In the second half of the 20th century a hostel was built on this site.

You can find out more about the history of Frenchman Bay from the 11 plaques that are situated at intervals along this circular trail that runs along the top of the scarp and then returns along the beach.

It will take about 40 minutes to walk the trail.

Nodes 4 and 8: Map showing the various features of King George Sound and an outline of the trail.

Node 8: Bald Head

Bald Head, dominating the entrance to King George Sound, was named by Vancouver in 1791. It was visible to the early seafarers 'from 14 leagues out to sea'. Bald Head has retained its name and is often referred to by early visitors to the Sound in their journals.

Vancouver appears to have hiked to the end of the peninsula as he observed in his journal the existence of 'coral' on the peak of Bald Head. 'Nowhere have I seen it so high up and so perfect' he wrote in his journal. This seemed to him evidence that the over many years the sea level must have fallen.

The so-called 'coral' became a matter of fascination among the scientists who followed in Vancouver's footsteps. Later visitors thought it might be petrified tree parts. Peron, a naturalist on Baudin's expedition thought that the coral or petrified trees sections were in fact 'more or less hard sandstone, which preserves merely the shape of the plants that served them as moulds'. They were not genuine fossils.

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Interest in fossils, geomorphology, and variations in fauna and flora produced the intellectual ferment that eventually led to Darwin's groundbreaking *The Origin of the Species* published in 1859.

Node 7: The Hostel and Tea Rooms

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Recognising its potential for tourism, the local authority established a new reserve for the purpose of camping and issued a lease that allowed water from the dam at Vancouver Spring to be pumped to the site for tourist purposes. In 1936 a hostel was built on the site of the Norwegian kitchen and mess at the summit of the stairs from Whalers Beach.

Today there is nothing left of the hostel except the date palm that once graced its entrance.

Node 9: Norwegian whaling station

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Today, little is left of the Norwegian Whaling Station. Further, there are few photographs and no contemporary accounts of life of the Norwegians who lived there. The workforce was almost entirely Scandinavian and the station was not accessible by road. A rare photograph illustrates the substantial collection of buildings that were in use from 1914 to 1916 – a fact that is hard to imagine when visitors swim and barbeque at the site today. It is extraordinary that over such a short space of time the whole complex was obliterated. There are no plaques or signs explaining the significance of the site.

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A massive storm in 1921 undermined the brick embankment causing a large brick building to topple. This storm, in effect, ended any plans for a renewal of the whaling station on that site. The site was subsequently sold for salvage,

Node 10: The stream Vancouver's Spring

A number of springs feed into Frenchman Bay but by far the most significant is Vancouver's Spring. The stream fed by this spring empties onto present day Whalers Beach. The spring was of enormous significance to ships visiting to the west coast of New Holland because it produced a regular flow of good quality water all year round. A

second spring within a hundred metres of Vancouver's Spring also produced a steady flow and is documented by early European visitors.

Francois Peron, who visited Frenchman Bay in 1803 as a naturalist later wrote:

Discovered in 1791 by Vancouver, its {King George Sound} importance is made all the greater by the fact that along a stretch of coast at least equal in magnitude to the distance between Paris and St Petersburg, it is the only well-known part of New Holland where it is possible to obtain fresh water at all times. (p. 105, Voyage of Discovery to the Southern Lands)

Peron records that the knowledge of the spring saved the lives of the crew of the *Casuarina*. The boat had broken its rudder and the voyage had taken much longer than expected. The crew headed straight for King George Sound and reached the spring with only a few bottles of water remaining.

Hydrology and Hydrogeology of the Spring

The catchment area for the spring is predominantly to the west and northwest in the granite hills above the Whalers Beach. Rainfall and surface runoff infiltrate the soil and sand covering the granite hills and form groundwater flow, which moves along the top the low permeability granite into the sand forming the escarpment above Whalers Beach. Within the spring catchment, all groundwater flow reports to the spring area and discharges near the base of the escarpment above Whalers Beach.

The size of this catchment and the annual amount of rainfall-runoff infiltration determines the sustainable yield of Vancouver Spring. The rate of flow from the spring is seasonal and depends on the rainfall pattern. The smallest flows occur at the end of summer (April), when groundwater levels are declining due to the lack of rainfall over summer. The largest flows occur at the end of winter (October), when groundwater levels are higher due to infiltrating rainfall over winter. There is enough rainfall-runoff recharge over winter to increase groundwater storage in the catchment and this storage sustains groundwater flows to the spring during summer.

The spring has probably been flowing for thousands of years and therefore the balance of catchment size and rainfall-runoff infiltration volumes has resulted in a sustainable, continuous flow from the spring, which has served historical maritime expeditions and Albany well.

Stream Bay

The French named the bay into which the springs flowed Stream Bay (*Anse de l'Aiguade*) in 1803. The expedition's cartographer, Louis Freycinet, drew a map showing the promontory now known as Waterbay Point, Mistaken Island and the two streams running across the sandy beach to the ocean. He explains in an annotation that the long beach to the north, now known as Goode Beach, is not drawn to scale.

Baudin set up tents on the beach, one for sick crewmembers and the other for his scientific team. He used the opportunity to wash the ship's linen and hammocks in the fresh water available from the springs.

In an 1826 expedition, Durmont d'Urville's visited Frenchman Bay. The expedition's artist, Louis de Sainson produced a painting from that expedition depicting crewmembers loading fresh water from the springs by bucket on to a small boat. The

Frenchmen are shown conversing with Noongar people, one of whom is carrying a bucket of water.

Node 3 (Below lookout showing a panoramic view of the Sound)

Mistaken Island

Mistaken Island was initially named by Matthew Flinders who visited King George Sound in 1801, a year ahead of the Baudin expedition. Because of his imprisonment in Mauritius when attempting his return to England, Flinders' journal and maps were not published until 1814.

During his visit in 1803 Baudin, remarked that it was 'a reasonably pleasant island'. He instructed his astronomer to set up a camp on the island to undertake scientific observations and named it 'Observatory Island'. The scientists had to subsequently move from the island to the mainland after they accidentally set fire to it.

Mistaken Island was used as a make-shift quarantine station in the 1830s. A map of 1831 names the whole of Frenchman Bay 'Quarantine Bay'. Passengers on ships with contagious diseases such as smallpox were required to stay on the island in tents for two weeks. The quarantining of the Colonial Secretary, F. P. Barlee and his wife on the island triggered some prompt improvements. Barlee used his office to ensure the construction of the permanent quarantine station near Point Possession in 1874

Later the island acquired the name Rabbit Island following the attempt by early settler George Cheyne to breed rabbits. Other livestock were introduced to the island. These ventures failed and the island resumed its earlier name 'Mistaken Island'.

Seal Island

Seal Island was named by Vancouver after observing a large colony of seals basking on its rocky shore. After reading Vancouver's account of the seals in the Sound, Captain Isaac Pendleton from New York visited the Sound in 1803 in search of 20,000 seal skins which he planned take to Canton on the China coast. Instead, when he arrived in King George Sound there was not the bonanza he was hoping for. He did have the good fortune of meeting Baudin who told him over dinner on the *Geographe* about the rich takings in Bass Strait. Pendleton, supplied with maps and directions by Baudin, set off for the Tasmanian coast. A year later, Islanders in the Pacific murdered Pendleton and six of his crew when they went ashore.

When Vancouver sailed from the Sound he left a bottle containing a parchment on the island. A decade later Flinders visited the island to look for the bottle but couldn't find it leading him to surmise that there had been other European visitors who had taken it.

It was assumed by Flinders that a British whaler, the *Elligood*, captained by Christopher Dixon, was the culprit. He visited the Sound in 1800, though died of scurvy along with nine of his crew on his way back to Britain.

Flinders in turn left a bottle and parchment on Seal Island. However, when Captain Phillip King landed on Seal Island in 1818 to look for Flinders' bottle and parchment he found instead the skeleton of a goat's head and the remains of a bottle that were left by Lieutenant Forster, captain of the *Emu* which visited in 1815.

When Lockyer visited the Island in 1827 he found the remains of a hut, presumably erected by a sealer – but no bottles.

Local Historian, Robert Stephens sardonically referred to Seal Island as the 'Isle of Lost Bottles'. What happened to the bottles, and the parchments they contained, remains a mystery.

Michaelmas Island

In the early 19th century a large number of whalers and sealers plied the southern coast of New Holland. Most were American though some were from New South Wales. Among them were boats with gangs of sealers who could be likened to pirates. Often Indigenous people bore the brunt of their criminal behaviour.

When Major Lockyer first visited King George Sound in the *Amity* in 1826 he noticed a large plume of smoke billowing from Michaelmas Island. He assumed it was set by persons in distress or else for some inexplicable purpose and resolved to send a boat to investigate.

An officer from his ship subsequently returned from Michaelmas Island with four Noongar men who had had been marooned there. That same day, one of Lockyer's crewmembers was fatally speared while bathing in Oyster Harbour. It was thought that the rescued men were among the party that murdered the crewmember.

The next day on an island inside Oyster Harbour, Lockyer found the body of a Noongar man who, as it became clear, had been murdered over two months earlier by sealers.

Several days later Lockyer encountered a gang of sealers who had approached the *Amity* for provisions. It emerged that the marooned Noongar men had been taken to Michaelmas Island shortly after their tribesman had been murdered. Further, a woman and child had been abducted and were being held on Eclipse Island by a Samuel Bailey. Bailey was apprehended and the woman released. The child's parents could not be identified and she was later sent to Sydney. Lockyer did his best to restore relations between the Noongar and the settlers.

He wrote in his journal:

From the lawless manner in which these Sealers are ranging about requires some immediate measures to control them as, from what we know as also from what I have learnt from themselves, they are a complete set of Pirates going from Island to Island along the southern coast...a great scene of villainy is going on, where to use their own words there are a great many graves, a number of desperate Characters, runaway prisoners from Sydney and Van Dieman's Land.

Node 3

The Flora and Fauna

Early English and French Botanists quickly recognised that King George Sound was a botanic 'hot spot' with a huge number of previously unclassified plants. Menzies, Brown and Leschenault are some of the most prominent botanists who visited. Some of the species growing above Whalers Beach bear the names of these early botanists.

The ships had qualified gardeners on board who assisted the botanists collect specimens though their special function was to pot and nurture exotic specimens that were then returned to Kew gardens in England or to Paris. Often the officers had to vacate their cabins to make room for the large number of specimens collected.

A major destination was the chateau of Empress Josephine, the wife of Napoleon Bonaparte. Animals were also collected and shipped back to France where some ended up in the estate of Josephine.

In addition to collections held by museums and government gardens collections from New Holland were in private hands. There was a flourishing market for rare plants. Botanists exchanged or bought specimens to build their collections.

The botanical work undertaken on these voyages was multifaceted. Botanists and gardeners collected specimens. Artists were employed to illustrate them. Botanists, not necessarily the collectors, scientifically named and classified the specimens. Gardeners propagated from seed or cuttings. There was an ambiguous grey area concerning the claims of those who collected and illustrated the plants to sell the items privately.

In later years, collectors in Europe employed locals to visit King George Sound and scour the countryside for new specimens and send the material back to them for classification.

Node 6: Vancouver Dam Site

The P & O Dam

Visiting whalers and sealers would have continued to use the water source during the 19th Century as it was available at any time of the day or night, all year round and free of charge. The early seafarers collected the fresh water from the stream as it entered the beach. It is thought that the first dam was constructed in the 1850s – amounting to little more than an excavation on the side of the escarpment immediately below the emergence of the spring.

Demand for fresh water was growing. The Peninsular & Orient Company (P & O) won the sea-mail contract across southern Australia.

In order to supply the water requirements of their fleet, P & O built a dam at Vancouver Spring to form a reservoir with a reliable and sustainable supply from which lighters would fill up and take water to their steamers. The water from Vancouver's Spring was preferred because of its purity. They could not risk using water with mineral contaminants that would corrode the boilers.

From about 1890 to 1902, Albany's water supply was insufficient to meet shipping demands. As a result, in 1902 Armstrong and Sons acquired a lease for the section of Frenchman bay containing the old P & O Dam. They refurbished the dam and constructed a jetty at the beach. Water was pumped from the dam through a pipeline that ran to the end of the 200-foot jetty seen in the photo below.

Armstrong was contracted to supply water from Vancouver Dam to the Town of Albany and various types of shipping (including Boer War transports) until about 1912. By 1914, Albany's water supply had improved and the Frenchman Bay supply was only occasionally required for shipping purposes.

Although the Norwegians dug two wells they also used Vancouver Dam for both a potable and process water supply – by installing a pipeline along the beach from the dam to various areas of the whaling station.

From the 1920s to the 1980s, various tearooms; chalets; and caravan parks were established above Whalers Beach and used the Vancouver Dam reservoir as a water supply until a bore was drilled above the beach in the late 1980s. Even when the mains water supply from Albany reached the Goode Beach area in 1983, people still collected water from Vancouver Spring for

various domestic purposes (including tea making), because of the good taste of the water compared to the scheme water!

Node 11: Wrecks

There are a number of wrecks in Frenchman bay, usually hidden under sand. One that has a section visible on Whalers beach is the *Elvie*, a water-lighter made locally from jarrah. The lighters were used to haul water or coal to ships anchored in the Bay.

The wrecks were usually salvaged for usable pieces of timber and so in most cases little is now visible. A section of the *Elvie* has been restored and is shown above Whalers Beach in the photo below. The rough-hewn ribs are clearly visible.

Another wreck, the *Rip* rests in the waters below, mostly buried by sand. An outline of the *Rip* can sometimes be seen close to shore 100 metres south of the *Elvie*.

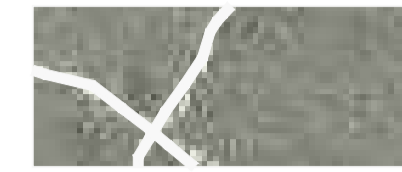


NEW INFORMATION NODE WITH INTERPRETIVE STRUCTURE & SEATING - VIEWING POINT AND A PLACE TO REFLECT

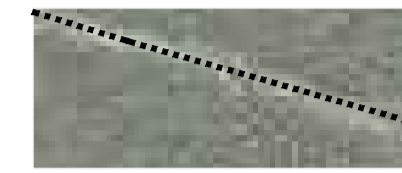


TIMBER DECKED VIEWING PLATFORM WITH TIMBER SEAT AND A TIMBER BOARD WALK FORMING THE TRANSITION TO NEW LIMESTONE PATHWAY

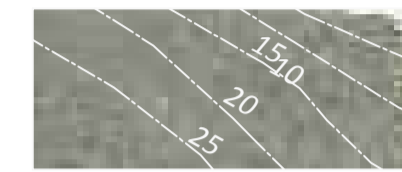
LEGEND



EXISTING WALK TRAILS



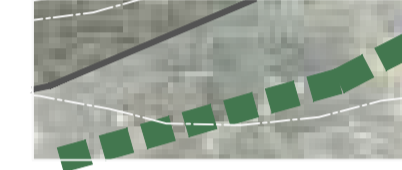
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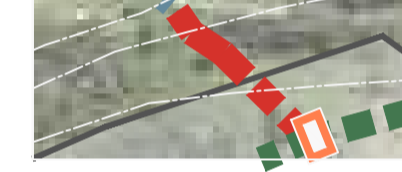
EXISTING CONTOUR LINES



PROPOSED FRENCHMAN BAY TRAIL ON PUBLIC LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED FRENCHMAN BAY TRAIL ON PRIVATE LAND: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED STEPS ADJACENT TO EXISTING HERITAGE STEPS: 1.5m WIDE PEDESTRIAN LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



PROPOSED FRENCHMAN BAY TRAIL: BEACH



PROPOSED LOCATION OF NEW TRAIL HEAD, TRAIL INFORMATION POINT OR INFORMATION NODE WITH INTERPRETIVE STRUCTURE



PROPOSED LOCATION FOR INFORMATION NODES WITH 'INTERPRETIVE SIGNAGE' (INDICATIVE LAYOUT)



PROPOSED LOCATION FOR 'DIRECTIVE SIGNAGE', DIRECTIVE SIGNAGE IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM A DISTINGUISHED SECTION IN NEW LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)



FRENCHMAN BAY WHALING STATION (RUIN) HERITAGE REGISTER PLACE 16612



Proposed Concept Plan - Draft
WITH INDICATIVE STRUCTURES, MATERIALS AND INTERPRETATION OPTIONS
SCALE 1:1500 @ A1

TRAIL HEAD - INTERPRETATION



TRAIL HEAD - INTERPRETATION STRUCTURE & SEATING

'DIRECTIVE SIGNAGE'



'DIRECTIVE SIGNAGE' IN NEW PATH WAY CAST IN LIME STONE COLOURED CONCRETE TO FORM DISTINGUISHED SECTION IN NEW LIMESTONE WALK TRAIL (INDICATIVE LAYOUT)

PATHWAYS



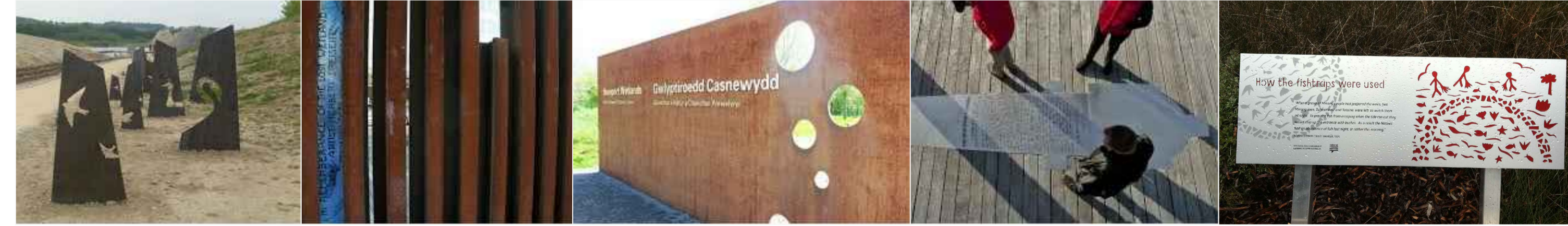
STABILISED LIME STONE WALK TRAILS

SEATING



CONCRETE OR QUARY-CUT GRANITE BLOCK SEATING TO NEW TRAIL HEAD & ALONG NEW PATH WAYS

INDICATIVE INTERPRETATION OPTIONS



SCULPTURES

STRUCTURES

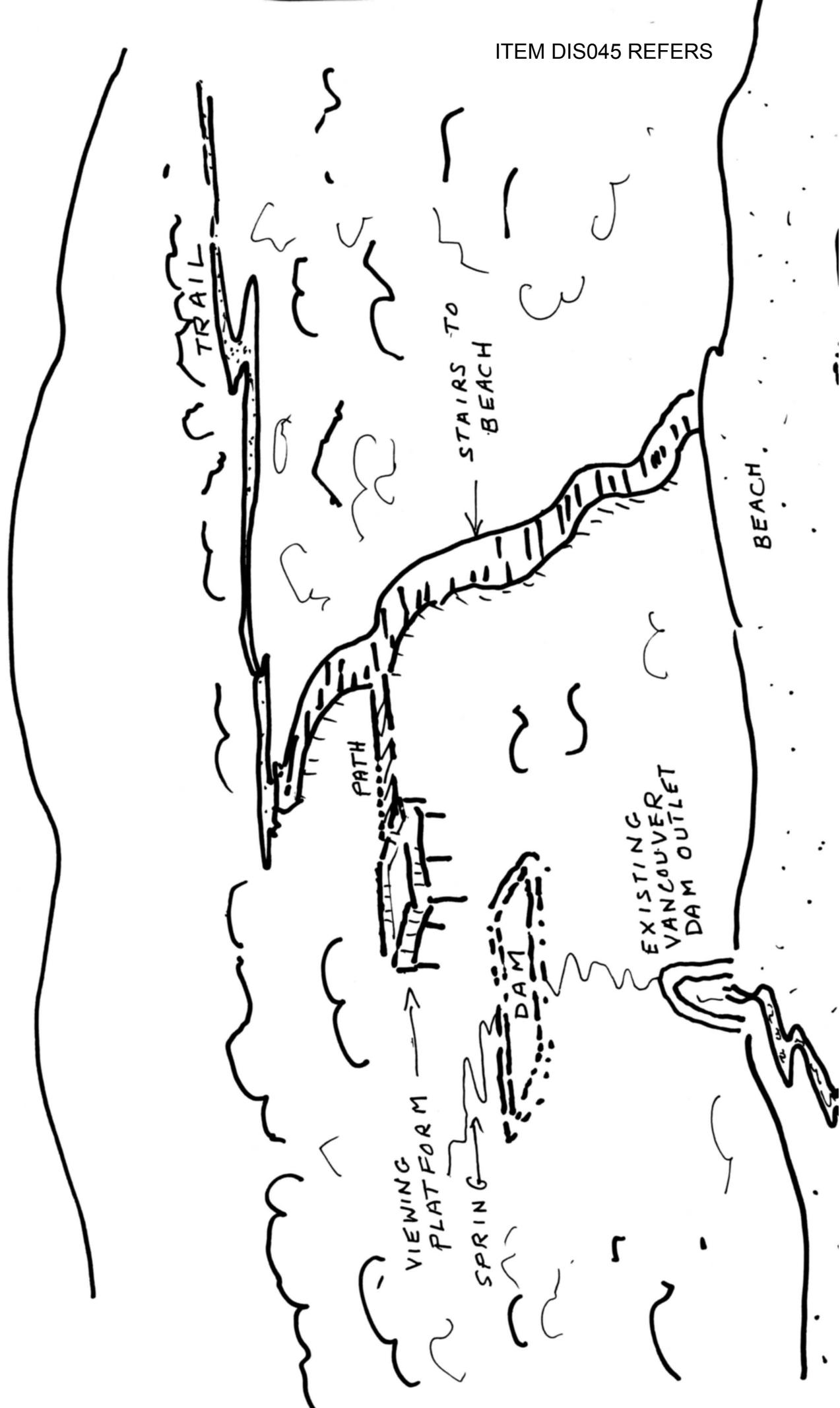
WALLS & SCREENS

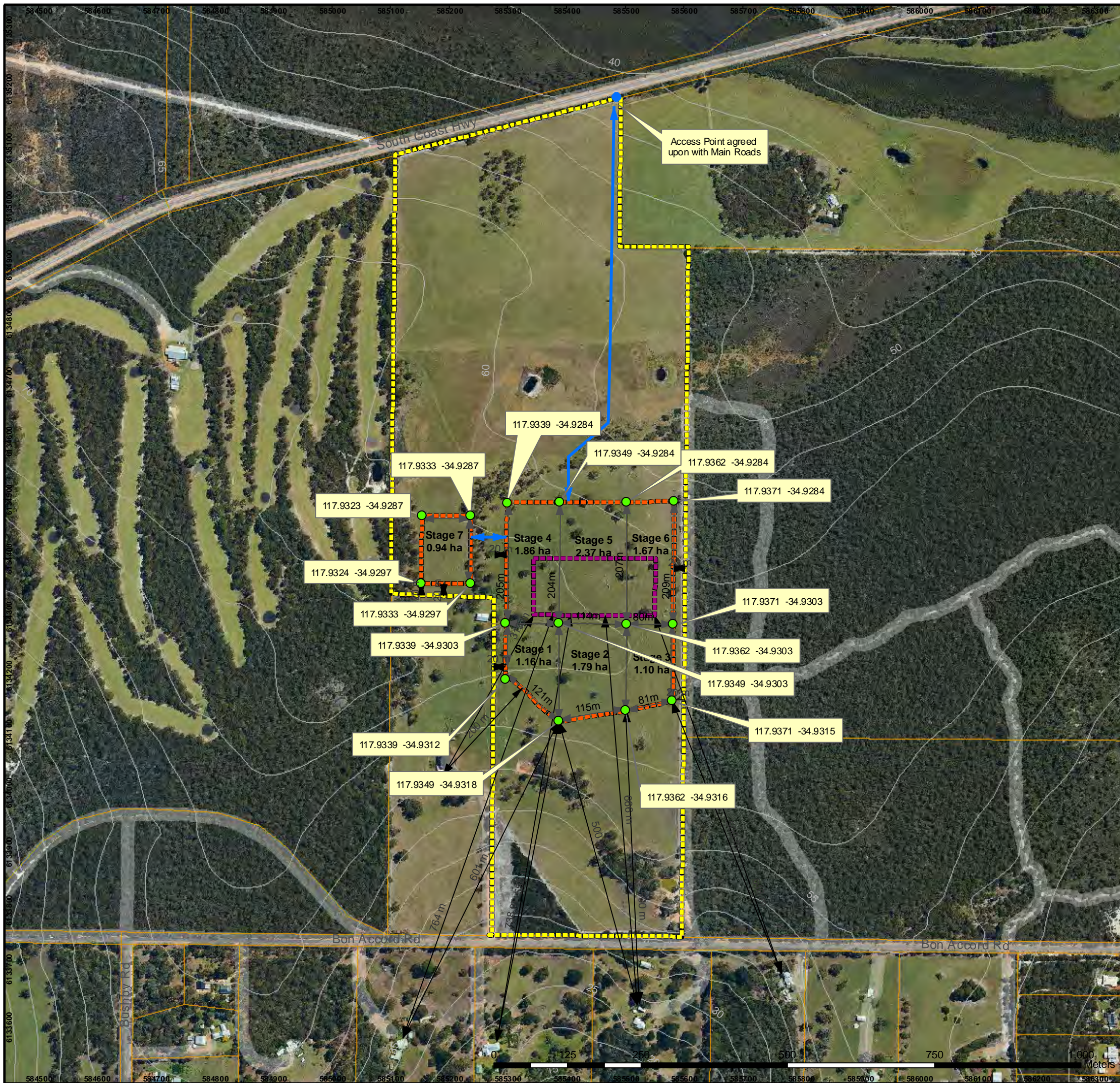
FLOORS

PANELS



FRENCHMAN BAY HERITAGE TRAIL
VANCOUVER SPRING & DAM SECTION





REPORT ITEM DIS046 REFERS



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Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents
- Cadastre
- 5m Contours
- Access
- Lot Dimensions
- Separation Distances

Stage Plan

- Stage



Scale
1:6,500 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT

Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

Site Plan

STATUS	FILE	DATE
FINAL	MSC0143	29/08/2017

**Lot 56 Bon Accord
Road, Lower King
WA 6330**

Environmental Assessment Report and Operations Plan



Bio Diverse Solutions

30th August 2017



DOCUMENT CONTROL

TITLE

Lot 56 Bon Accord Road, Lower King WA 6330, Environmental Assessment Report and Operations Plan

Author (s): Kathryn Kinnear and Bianca Theyer

Reviewer (s): Gary Howie

Job No.: MSC0143

Client: Gary Howie

REVISION RECORD

Revision	Summary	Revised By	Date
Draft ID 1	Internal QA Review	K. Kinnear	12/5/2017
Draft ID 2	Issued to Client	G. Howie	12/5/2017
Final ID	Issued to Client	K. Kinnear & B. Theyer	19/5/2017
Final ID 2	Minor changes to text as per client second review	B. Theyer	22/05/2017
Final ID 3	Minor Changes	B. Theyer	31/05/2017
Final ID 4	Updates as per CoA comments	B. Theyer	15/08/2017
Final ID 4	Issued to Client		30/08/2017



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APPENDICES

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APPENDIX D – ACID SULPHATE SOIL MAPPING
APPENDIX E – IBRA AND PRE-EUROPEAN VEGETATION MAPPING
APPENDIX F – DATABASE SEARCHES
APPENDIX G – BUSHFIRE MAPPING

1. Introduction

Bio Diverse Solutions (Environmental Consultants) was commissioned by **Gary Howie (“The Client”)** as **Environmental Consultants** to prepare an Environmental Assessment Report and Operations Plan for a proposed Gravel extraction project at Lot 56 Bon Accord Road, Lower King within the City of Albany.

The purpose of this document is to assess the environmental values for the site, assess the proposed facility and provide supporting documentation for a Development Application with the City of Albany. The document provides and outlines details of emissions associated with the project and associated mitigation measures.

2. Background

2.1. Site Details

The **“property” is defined as Lot 56** and is located 15km north of the Albany CBD along Bon Accord Road in the municipality of the City of Albany. The property is 56.56 hectares in total and is situated in a rural residential/rural interface. The property is zoned as **“General Agriculture”** under the **City of Albany Local Planning Scheme No. 1**. The **“subject site” is defined as the 10.93 ha area in which extraction will occur** and **“crushing and screening extents” are defined as the area in which crushing and screening operations will occur** within the property.

Please refer to Figure 1 below and Appendix A - Location Mapping.



Figure 1 – Property Locality

2.2. Existing Land Uses

The existing land use within the subject site is **“General Agriculture”**. There will be no further impacts to the Subject Site. The adjacent properties to the east and west are also zoned general agriculture, with the adjacent property to the south west currently running a small herd of sheep. After extraction activities are complete (anticipated 5 years) the Subject Site will return to agricultural grazing pursuits.

2.3. Alignment to Legislation, Policy and Guidelines

In assessing the proposed gravel extraction facility, Bio Diverse Solutions has prepared this report aligned to the following legislation:

- *Biosecurity and Agriculture Management Act 2007 (BAM Act);*
- *Environmental Protection Act 1986;*
- *Environmental and Protection and Biodiversity Conservation Act 1999 (EPBC Act);*

- Environmental Protection Authority (EPA) (2015) *Draft Environmental Assessment Guideline for Separation Distances between Industrial and Sensitive Land Uses*;
- Environmental Weeds Strategy for Western Australia 1999;
- *Wildlife Conservation Act 1950*;
- *Conservation and Land Management Act 1980 (CALM Act)*;
- Environmental Code of Practise – Extractive Industries (1990) – DEP (now EPA);
- Water Quality Protection Guidelines No.6 (2000) – WRC (now DoW); and
- City of Albany Policy Extractive Industries and Mining

2.4. Scope of Works

2.2.1. Desktop Survey

Desktop assessment was undertaken of government databases and associated literature. A desktop review of the Subject Site within and adjacent to the site was undertaken. This assessment was conducted to various levels, ranging from state-wide to area specific information.

The following desktop searches were undertaken as part of this report:

- Interim Biogeographic Regionalisation of Australia (IBRA) – identifies, at a regional level, the vegetation communities and land systems present within Australia;
- Land Systems – Further detailed information on the vegetation communities and land systems;
- Department of Indigenous Affairs - Aboriginal Heritage Database
- Department of Water – 250K Hydrogeological Mapping and Public Drinking Water Source Areas datasets, 2001;
- Department of Agriculture and Food WA (DAFWA) – Declared weeds database;
- Pre-European vegetation mapping dataset (DEC 2005) based on the project AJM Hopkins, GR Beeston, JM Harvey (2000);
- Beard's Vegetation Classification dataset, 1:3,000,000 digital representation of Beard's vegetation map of the state of Western Australia;
- Department of Water (DoW) Water Information Reporting tool;
- Department of Parks and Wildlife threatened flora and fauna dataset publicly available online;
- NatureMap (DPaW) – Provides Species Reports for a chosen area; and
- EPBC Act Protected Matters Search Tool – Provides guidance on matter of national environmental significance.

2.3.1. Site Assessment

Assessment of the property was previously undertaken in 2011 as part of a Land Capability Assessment conducted by Bio Diverse Solutions. A follow up secondary site survey was again conducted by Bio Diverse Solutions in April 2017 to ensure that no major changes had occurred within or surrounding the subject site. The original site assessment undertaken for a proposed subdivision involved an assessment of remnant vegetation, site soils analysis and laboratory testing of soils by Structerre and CSBP Soil Laboratory. Soil testing was undertaken in late winter conditions in August 2011. A summary of results of these assessments are included in the following sections.

3. Existing Environment

3.1. Existing Land Use

The property was cleared of native vegetation in 1949 (E. Register 2010) for agricultural use. Historically the land has been used for cattle grazing, a dairy and for general stock grazing. The property and the Subject Site currently has no residential dwelling, or other infrastructure on the property. Subdivision of the property in 2015 resulted in the original house being separated and two lots created. Refer to photographs 1-6 below.



Photograph 1: View to the South of the property of cattle pasture areas internal to the subject site. Photo taken in 2017.



Photograph 2: View to the east of the property of cattle pasture areas internal to the subject site. Photo taken in 2017.



Photograph 3: Cattle waiting to go into the cattle yards. Photo taken in 2017.



Photograph 4: View of shed infrastructure located on the adjacent property to the south east. Photo taken in 2017.



Photograph 5: View from the east to west of the creek / seepage area through the paddock. Photo taken by K. Kinnear in 2011.



Photograph 6: View of seepage dam in the western area of the property adjacent to the Golf Course. Photo taken by K. Kinnear in 2011.

3.2. Adjacent Land uses and Tenure

The subject site is located within a Rural Residential/Rural interface, with rural residential properties to the south and south east along Bon Accord Road. There is also a residential property located directly to the west – this dwelling formed the original property and was part of Lot 56 but has since been subdivided. City of Albany Reserves are adjacent to the west (Golf Course Reserve 28686 and Bon Accord Road Nature Reserve 30469), and east (Reserve 18779 and 34934). North of the property is the South Coast Highway and Bakers Junction Nature Reserve Vested with the DEC (Reserve 30463). Refer to Photographs 7-12 below.



Photograph 7: View of the neighbouring existing dwelling.



Photograph 8: View of bushland to the west of the property within the Golf Course Reserve 28686.



Photograph 9: View of remnant bushland within reserve 18779 along the eastern boundary of the property.



Photograph 10: View of remnant bushland within Reserve 18779 along the eastern boundary of the property.



Photograph 11: Roadside vegetation present along Bon Accord Road, view looking towards the Bon Accord Road Nature Reserve (R30469).



Photograph 12: Remnant vegetation within Reserve 34934 located to the east of property.

3.3. Climate

The nearest Bureau of Meteorology (BoM) operational station is Albany (Site No. 009500). The average maximum temperature is 19.5°C whilst the average minimum temperature is 11.7°C. The average annual rainfall for the station is 929.2mm, with the majority of rainfall occurring between May and September (BoM, 2017).

3.4. Topography

The property is located in an undulating landscape in the King River Catchment area. The average slope for the area is (rise/run) calculated to be 3-6°. The site slopes from a central ridge (highest point 65m AHD) to the north east and to the south (35m AHD) towards Bon Accord Road. There is a creek line (Johnson Creek) entering the property from the west exiting to the east with the areas within the creek line relatively flat (<2°).

3.5. Geology and Soils

3.5.1. Desktop Assessment

Regolith Mapping (Department of Mines and Petroleum - Geological Survey Division 2001) indicates soils across the Subject Site are classified as Sandplain, mainly eolian; includes some residual deposits. In addition, Australian Geoscience Mapping indicates the site is from the Cainozoic/Quaternary Period Qzs (refer to Figure 2 below) – Sand – white, grey or brown, commonly contains iron pisoliths and overlies laterite; and Qa – Clay Silt, sand and gravel in watercourses; and Cainozoic/Tertiary Period Tp - Plantagenet Group: mostly Pallinup Siltstone; spongolite with minor siltstone and sandstone, includes Nanarup Limestone Member of the Werrilup Formation (1984 Geological Survey WA). Refer to Figure 2.

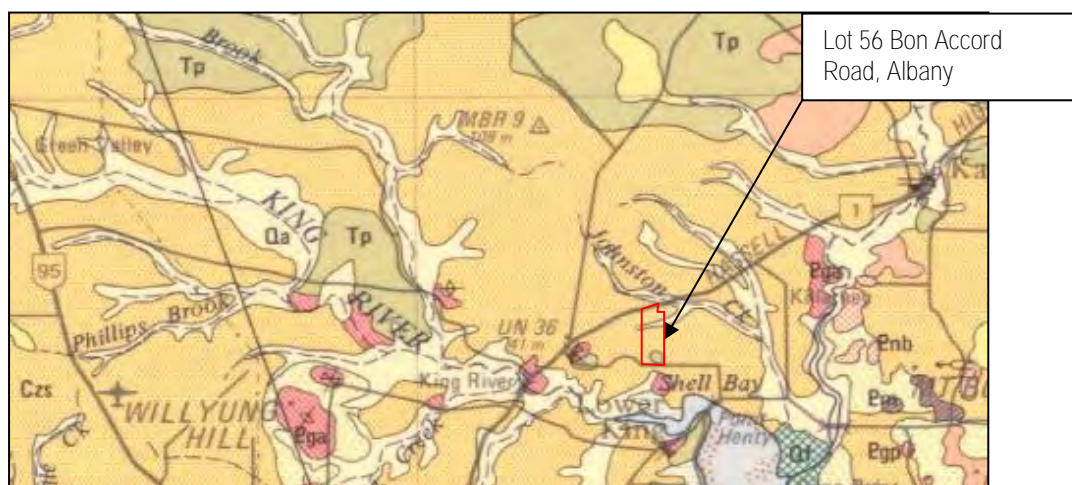


Figure 2: Australian Geoscience Mapping

3.5.2. Site Soil Testing (August 2011)

Site soil testing was undertaken by Bio Diverse Solutions in April 2011. The soil types encountered were:

- Sands over Sandy Gravel; and
- Sand over Sandy Gravel/Laterite Rock.

Sands over Sandy Gravel

This soil type was encountered in approximately 30% of the property in southern areas below the 50m AHD contour (north of Bon Accord Road) at Boreholes 1 and 10, and in the creek area at Borehole 6. Soils were commonly dark grey/black silty sandy topsoil, over dark grey sand over white/grey sand and sandy gravels. Refer to Appendix G – Previous Reports for more detail.

Laboratory testing was undertaken for rates of permeability by Structerre in the cream sands (A and B Soil Horizon) of Borehole 1 and 10 with a result of 0.3 m/day and 0.2 m/day respectively this indicates the soils are moderately draining (Bio Diverse Solutions, 2011). Refer to Appendix G – Previous Reports for more detail.

Phosphorous Retention Index Testing (PRI) was undertaken by CSBP Laboratories of the same soil with a result of 0.2 for the sands and 675 in the sandy gravels. This indicates the sands have a poor ability to fix nutrients, however the underlying sandy gravels have a high ability of fixing nitrogen and phosphorous (Bio Diverse Solutions, 2011). Refer to Appendix G – Previous Reports for more detail.

Sand over Sandy Gravel/Laterite Rock

This soil type was encountered over approximately 70% of the site at Boreholes 2, 3, 4, 5, 7, 8 and 9. Soils were commonly **dark grey sandy topsoil, with light brown/grey sandy gravel over laterite rock. Soils were moist from previous day's heavy rains.** Refer to Appendix G – Previous Reports for more detail.

Shallow rock was noted within this soil type, often exposed at the surface. The machine managed to penetrate through the laterite rock in Borehole 9 and mottled red/pink/white clay was reached. It would be assumed that this would be common across the site as the material underlying laterite rock. Drilling through the rock was able to be undertaken by **penetrating through the "floater" laterite rocks. Noted on site were excavated "floater" laterite rocks from previous disturbances from farming activities.**

Laboratory testing was undertaken for rates of permeability by Structerre in the Sandy Gravels/Laterite rock at Borehole 2 and 9 (A and B Soil Horizon) with a rate of 0.1m/day for both. These results indicate the sandy gravels/laterite rock soils are moderately draining. Refer to Appendix G – Previous Reports for more detail.

PRI tests were undertaken by CSBP Laboratories of the sandy gravels and gravel/laterite at Borehole 2 and 9 had a result of 303.4 and 697.9 indicating the sandy gravels and gravel soils have an extremely high capability of fixing nitrogen and phosphorous.

3.6. Hydrogeology and Groundwater

Australian Geoscience Mapping and Department of Water 250K Hydrogeological mapping places the property and the **Subject Site from the "Tertiary – Cainozoic-Phanerozoic (TP): Plantagenet Group - siltstone, spongolite; minor sandstone, peat, and conglomerate". The aquifer is a "sedimentary aquifer with intergranular porosity – extensive aquifers, major groundwater resources"**. Refer to Appendix B - 250K Hydrogeological Mapping.

The subject site is situated within the Albany Coast Basin and the Oyster Harbour Kalgan King Catchment. Department of Water Database searches show there are no groundwater resources on the Site, however groundwater was encountered at 1.2m in Borehole 6 during the August 2011 soil testing. Borehole 6 was located in the central portion of the property. Groundwater was not encountered at any of the other 9 boreholes during the August (late winter) 2011 soil investigations (Boreholes were constructed to a maximum depth of 2.5m). There are two small existing dams within the lower lying area through the centre of the Subject Site and one dam within the adjacent golf course in the same low-lying area which appear to be groundwater fed, it is likely a groundwater stream is present through this low-lying section which discharges in a north easterly direction to Johnston Creek.

The subject site is not in a Public Drinking Water Source Area (PDWSA).

3.7. Surface Water and Wetlands

The Subject Site is gently sloping with little to no surface runoff occurring most of the year. Subjected to heavier rainfalls the northern portion of the site drains in a north easterly direction towards Johnston Creek, located outside of the Subject Site. The central portion of the site also drains towards Johnston creek via a floodplain running through the centre of the property which is likely underlain with a groundwater stream. Johnston Creek ultimately discharges to Oyster Harbour. The southern portion of the site drains in a southerly direction, likely discharging to the King River via the Bon Accord Road Reserve. Refer to Surface Water Mapping Appendix B.

Database searches show that the northern and central portions of the site are located in the Johnston Creek Conservation Class Wetland area. Refer to Appendix C – Significant Wetlands and Environmentally Sensitive Areas. The vegetation at the Subject Site is classified as completely degraded (as described below in Section 3.9.4) due to its long history of agricultural use, there is very little habitat for fauna (Section 3.10.2) and there are no significant waterways across the Site as such it is recommended that the Subject Site be reclassified to Priority Agriculture and not include any significant wetlands.

3.8. Acid Sulphate Soils

Database searches indicate the subject is not situated on any known Acid Sulphate Soils. There is however a section of moderate to low risk of ASS occurring within 3m of natural soil surface but high to moderate risk of ASS beyond 3m of natural soil surface just outside of the North-East corner of the property. Refer to Appendix D – Acid Sulphate Soil Mapping.

3.9. Flora

3.9.1. Threatened Flora Database Searches

Desktop inventory of potential threatened flora species likely to occur within 10 km of the survey area was undertaken using the following databases:

- DPaW's Nature Map Database Search (combined data from DPaW and Western Australian Museum) (DPaW 2007-); and
- Protected matters search tool (DoE 2017).

The property is adjacent to a population of a Declared Rare Flora (DRF) under the Western Australian Wildlife Act 1950. *Chordifex abortivus* was declared as Rare Flora in May 1991 and is currently ranked Vulnerable (VU) under World Conservation Union (IUCN 2001) Red List criterion D2 due to its restricted area of occupancy and its small number of locations. Three populations approximately 40 kilometres apart are currently known and together total around 2,000,000 plants over an area of 194 hectares. The species is listed as Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

A search was undertaken in 2011 by Bio Diverse Solutions with no individuals of *C. abortivus* located on the property.

3.9.2. Remnant Vegetation

Database searches show there are 23 patches of remnant vegetation within the 1km assessment area. One of these identified patches is situated along the southern boundary and to the east of the lot boundary along Albany Highway. Refer to Appendix E – IBRA and Pre-European Vegetation Mapping.

3.9.3. Vegetation Types

The vegetation has been mapped on a broad scale by J.S. Beard (Shepherd *et al* 2002) in the 1970's, where a system was devised for state-wide mapping and vegetation classification based on geographic, geological, soil, climate structure, life form and vegetation characteristics (Sandiford and Barrett 2010). A GIS search of J.S. Beards (DEC, 2005) vegetation classification for the general area places the site within 1 Vegetation Association:

- System Association Name: Albany
- Vegetation Association Number: 978
- Vegetation Description: Low forest; jarrah, *Eucalyptus staeri* & *Allocasuarina fraseriana* (Source DEC Pre-European Vegetation GIS dataset, 2005)

The area is classified as Jarrah Forest under the Interim Biogeographic Regionalisation for Australia:

- IBRA6.1 and 7 Name: Jarrah Forest
- Region Code: JAF
- IBRA6.1 Region Number: 61

3.9.4. Vegetation Assessment and Condition

Jarrah/Marri/Blackbutt Woodland

Site Assessment by Bio Diverse Solutions in 2011 classified the vegetation on site as containing areas of remnant Jarrah/Marri/Blackbutt Woodland scattered throughout. This vegetation type consisted of an overstorey containing *Eucalyptus marginata*, *E.patens*, *E.staeri*, *Allocasuarina fraseriana* and *Banksia grandis*. Midstorey species included *Taxandria fragrans* in wet areas, *Hakea florida* and *Dasypogon bromeliifolius*. This vegetation type is still present along the south-western boundary adjoining the Golf course and the residential lot to the south west. Vegetation condition was assessed using the vegetation condition scale as per Keighery (1994). Please refer to Table 1 for details on the Condition Rating Scale. Remnant vegetation within the northern area of the property were generally devoid of understorey vegetation due to grazing from cattle. Therefore, this is considered to be **“Completely Degraded: The structure of the vegetation is no longer intact and the area is completely or almost completely without native species”** (Keighery, 1994). Please refer to Photographs 13 – 16 below.



Photograph 13: View of Jarrah/Marri Woodland in the western portion of site, adjacent to the golf course, taken by Kathryn Kinnear in 2011.



Photograph 14: View of Jarrah/Blackbutt vegetation through central area of property, taken by Kathryn Kinnear in 2011.



Photograph 15: View of the Jarrah/Marri Woodland in the western portion of the site adjacent to the golf course, taken in 2017.



Photograph 16: View of the Jarrah/Blackbutt vegetation through the central area of the subject site, taken in 2017.



Photograph 17: View of the Jarrah/Marri Woodland along the eastern boundary adjacent to Reserve 18779.



Photograph 18: View of Jarrah Woodland central to the subject site.

The pocket of Jarrah/Marri Woodland adjacent to Reserve 18779 (See Photograph 17 and 18 above) contain some mid and understorey species, but is still **heavily altered due to grazing activities**. This small pocket is classified as “Degraded” (See Table 1 below). Although classified as degraded if fenced off and rehabilitated this small pocket could provide significant habitat for fauna species as it is connected to the adjacent reserve. It is likely the mature tree currently holds habitat value for Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and Carnaby’s Black Cockatoo (*Calyptorhynchus latirostris*) (Bio Diverse Solutions, 2011).

The small area of vegetation previously described by Bio Diverse Solutions as being heavily weed infested with Sydney Golden Wattle and Coastal Tea Tree adjacent to the existing driveway has been extensively managed for weeds. Current owners have removed all mature weedy individuals and are continuing to manage weed regrowth. See photographs 19 and 20 below



Photograph 19: View of vegetation within the southern extent of the subject site, showing extensive weed management activities.



Photograph 20: View of remnant vegetation within the southern extent of the subject site, showing the results of an extensive weed management strategy.

Managed Grassland

This vegetation type occurs across the entire subject site as the land is used for grazing/agricultural purposes. All native vegetation has been cleared (except for a few small stands and individual mature trees) and now consists of introduced pasture species such as Kikuyu (*Cenchrus clandestinus*) and Clover (*Trifolium sp.*). Please refer to photographs 21 – 24 over the page.



Photograph 21: View of the grasslands central to the subject site.



Photograph 22: view of the grasslands at the rear of the property.



Photograph 23: View of grasslands surrounding the farm shed in the adjacent property.



Photograph 24: View of grasslands surrounding the cattle yard, with a small stand of mature trees in the background.

Table 1 – Condition Rating Scale

Vegetation Condition Rating	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.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate to it.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
Completely Degraded	Vegetation structure not intact; the area completely or almost completely without native species.

(Keighery, 1994)

3.10. Fauna

3.10.1 Database Searches

Desktop inventory of potential threatened fauna species likely to occur within 10 km of the survey area was undertaken using the following databases:

- DPaW's Nature Map Database Search (combined data from DPaW, Western Australian Museum and Birds Australia) (DPaW 2007-); and
- Protected matters search tool (DoE 2017).

The list compiled from this data (Appendix F) is based on observations from a broader area than the survey area and is likely to include species that are vagrants or would not occur in the actual survey area due to a lack of suitable habitat or poor ecological connectivity. The databases also often included very old records and in some cases the species in question may have become locally or regionally extinct.

3.10.2. Fauna Habitat

The subject site itself has very little habitat value to native fauna as the area has been cleared land used for agricultural purposes. The temporary use of the area for extractive industries will have no detrimental effect on fauna persisting in the broader area.

3.11. Heritage

A search of the Department of Aboriginal Heritage Aboriginal Heritage Inquiry System (AHIS) database revealed that there are no Aboriginal Heritage sites located within the Subject Site.

A search of the Heritage Council State Heritage Office shows there are no other registered heritage sites on the Subject Site or within a 1km radius of the property boundary.

Although no heritage values were identified, on-site consultation with local Indigenous spokespersons was undertaken by the client in August 2017.

4. Proposed Development

4.1. Extraction process, staging and haulage routes

The location and extent of the proposed gravel extraction area is shown in Appendix A – Location and Site Mapping covering an area of 10.93 hectares in total of cleared agricultural land. It is assumed that the average amount of 10,000 tonnes per year over the life of the extraction pit. In times of high demand, it is expected a maximum of 15,000 tonnes per year would be extracted (*Pers. comms. M. Palmer, 2017*). Ultimately the amount of extracted materials will be reliant upon industry demand. It is proposed that the entire life of the project will be approximately 5 years (each pit open for maximum of 12 months) with extraction planned to commence as soon as possible after all required approvals are obtained. Refer to Implementation Plan Section 8. The extraction facility will be gated and locked, with no unauthorised persons able to enter.

The extraction of gravel including crushing and screening will take place on site by Palmer Civil Construction Pty Ltd. All extraction, crushing and screening operations will be conducted throughout the months of July-October as this is when the gravel is moist / damp, resulting in better crushing and screening efficiency and aiding in the mitigation of noise and dust. Extracted products will then be transported to various construction sites within the City of Albany and adjoining areas. Various machinery will be used during the extraction process such as bulldozers, front end loaders, excavator, crusher, screener and a stacker. No blasting will be required, whilst portable crushing and screening equipment will be utilised. The **crushing of large gravel “boulders” will only occur when required and it is therefore expected that most of the extracted resource will not require crushing.** Crushing and screening is to occur within a defined area within the pits and is restricted as shown on the Site Buffers Mapping in Appendix A.

It is proposed that extraction will be staged, where only one of the 7 pits of approximately 1-2.5ha will be exposed/operated at any given time. In stages / pits that exceed the 2 ha in area a maximum of 2 ha will be extracted. This area will then be rehabilitated / closed up (covered with topsoil) and the remaining area of the stage will be opened. Gravel will be stockpiled within the stage / pit area adjacent to the next stage, for use as demand requires. It is estimated that the maximum amount of time gravel will be stockpiled is 6-12months. Stockpiles will be no higher than 2.5 meters.

Trucks will access the property via a to be installed crossover along South Coast Highway, in the north-east corner of Lot 56. It is understood a Memorandum of Understanding (MOU) will be signed between Main Roads and the client (landowner) in regards to the proposed access point / crossover. This proposed access route will allow for trucks to head either east or west along South Coast Highway. This access will be utilised solely for trucks engaged in gravel extraction operations.

4.2. Vegetation and Topsoil Removal

This proposal requires no clearing of native vegetation as the subject site consists of approximately 10.93ha of agricultural land. Topsoil will be removed to a depth of 100-150mm, with the maximum depth of excavations to 600-700mm below ground level. Topsoil will be replaced over extracted pits prior to the commencement of excavation works within each stage (estimated 70% of pit area will be rehabilitated within 2-3 weeks). Topsoil will be stockpiled in piles no higher than 2.5m which will then be respread over the pit area once excavation activities have ceased. This will be done as the client wishes to continue agricultural practices once the extractive proposal has ceased.

4.3. Operation Times

Operation times will be restricted to the hours between 7:00am and 6:00pm Mondays to Fridays only, not including Public Holidays. Actual operation times will vary as a result of product demand, if demand is low due to no construction projects being carried out then the facility will not be operational. Truck movements during operation times an average will equate to 1.97 truck movements per day. This has been calculated based on the premise there will be 230 work days (5-day weeks for 46 weeks of the year) with an average of 10,000 tonnes to be moved per year (*Pers. Comms. M. Palmer, 2017*). During peak operation times, this may reach a maximum of 30 truck movements per day for a period no longer than 2 weeks (*Pers. comms. M. Palmer, 2017*). Truck signs are to be installed prior to operations commencing on the day prior to the access point along South Coast Highway, warning of truck movements.

4.4. Vehicles and Machinery

No hydrocarbons, chemicals, fuels, coolants etc. will be stored onsite. These will be transported onsite as required by a contained mobile service vehicle which will be appropriately equipped with spill kits in the unlikely event there is a spillage. Furthermore, no trucks will be stored on site outside of operation hours (Mon-Fri 7am to 6pm), only screening and crushing equipment will be stored on site. If major servicing of these machines is required they will be removed from site. In the

unlikely event of a major breakdown on site all necessary precautions to ensure no hydrocarbons or other liquids enter the environment, and any contaminated soil will be removed and disposed of at an appropriate location.

5. Environmental Considerations

5.1. Noise

The Client and the site manager will ensure all extraction operations and vehicular movements are to be carried out only between 7:00am and 6:00pm Mondays to Fridays. The properties located off Bon Accord road to the south of **the subject site are zoned as "Rural Residential"**. The current land owners of Lot 56 have spoken to the landowners directly adjoining the subject site and they have indicated they have no opposition to the temporary extraction proposed (*Pers. Comms. G. Howie, 2017*).

Noise will be the largest consideration to the project from crushing and screening operations. Crushing and screening operations will be only undertaken in the designated crushing and screen extents within the pits to create further buffers to residents and sensitive receptors. The closest dwelling is located to the south east (200m) from the closest pit (Stage 1) and 313m from the crushing and screening extent. Dwellings to the south of Bon Accord Road (measured to the closest Stage) are all over 500m away, whilst separation distances from the crushing and screening range between 648-764m (See Site Buffers Mapping in Appendix A).

To create noise buffers, topsoil stockpiles will be placed around the perimeter of the pit (e.g. stage 1). Vegetation to the east and south of the subject site will act as buffers to residential dwellings located along Bon Accord and Bushby Road. Traffic routine internal to the site will be planned out in such a way as to minimise vehicle reversing requirements and thus minimise reversing alarm noise (particularly for the nearest residence). Replacing standard **"beeping" reversing alarms with a mixed frequency alarm (which does not carry as far)** should also be considered to further reduce noise issues to nearby residences.

In conjunction with these activities regular maintenance of onsite plant and machinery will help to reduce unnecessary noise pollution. Any equipment identified as noisy will either be removed from site or its use terminated until repairs are made.

All employees and contractors will be educated through site inductions raising awareness and outlining company practices to be employed to help mitigate noise pollution whilst on site and when entering and exiting the property. It **will be the site manager's** responsibility to ensure all personnel adhere to noise reduction measures.

Finally, a noise complaint system should be implemented. A notice should be placed at the front gate providing the contact details of the site manager. Any noise related complaints will be recorded by the site manager and acted on immediately. Any complaints made should be kept in a register. Refer to Section 6.5 for Noise Management to be implemented during all operations.

5.2. Dust

Dust emissions are anticipated during topsoil removal, resource excavation, crushing and screening, loading, haulage and wind erosion of exposed surfaces in adverse weather conditions. However, dust management can be implemented in order to mitigate dust emissions, ensuring dust levels cannot reach levels that adversely impact health, welfare, surrounding amenities and the environment.

All topsoil stockpiles and stockpiled gravel will be no greater than 2.5 meters in height. Long-term stockpiling should be avoided where possible and will be dependent on demand, it is expected stockpiling will range between 6-12months (*Pers. Comms. D. Palmer, 2017*). Stockpiles will not be located in areas subject to adverse environmental conditions (e.g. prevailing winds) such as prominent ridges, and will be located within the stage or extraction pit currently in operation.

Pits adjacent to the vegetated reserve (west and east) are to be excavated in damp/wet conditions only (approximately May-November) to ensure dust is not prevalent on the adjacent vegetation. The crushing and screening operations are located 50m from the CoA Reserve to the east, together with damp soil operations this will reduce the impact on dust to native vegetation areas.

5.3. Light

Extraction activities will not be conducted outside of daylight hours, therefore there will be no light emissions.

5.4. Discharges to water

There will be no discharge to surface or ground water.

5.5. Discharges to land

There will be no discharges to land.

5.6. Wetlands

The subject site and crushing and screening extent lie within the Johnston Creek catchment area (Refer to Appendix C). However, all works within the subject site and the crushing and screening extent will be 176m and 276m away from the Johnston Creek line respectively.

5.7. Flora and Vegetation

There are no significant areas of native remnant vegetation within the subject site. There will be no discharges to land or water and this further reduces any risk to surrounding flora and vegetation. Weed management will be undertaken to ensure no invasive weeds identified will spread into the surrounding remnant vegetation. Furthermore, the Clients have stated that they are willing to implement the proposed Weed Management Plan in Section 6.1.

5.8. Fauna

As the subject site is located in an area that has already been cleared and highly modified for agricultural practices, there will be no further impacts to fauna than are already present.

5.9. Heritage

Not applicable as no heritage sites were detected within or surrounding the subject site or the property.

6. Management Plans

6.1. Weed Management

Weed management is to be used in conjunction with dieback hygiene management (See Section 6.2). The following Weed Management Plan is to apply to all aspects of site operations. All operations shall conform to this Weed Management Plan, and monitoring to occur post construction for any infestations. Weed management will primarily be undertaken through avoiding introducing new weeds to the site, whilst also controlling weeds already present.

6.1.1. Aims of Weed Management Plan

The aims of the weed management program at will be:

- Eradicate Declared plants (BAM Act) from the property;
- Maintain a weed free environment;
- Ensure all vehicles are clean on entry prior to any soil or vegetation movement;
- Site is to be secured to prevent trespassers illegally accessing, dumping rubbish and green waste;
- All weeds on site removed promptly on discovery;
- Remove weeds from least affected areas to the most affected areas (Bradley Method);
- Do not use weed affected soils for rehabilitation, but remove infected soils to waste disposal; and
- Regularly monitor the site for invasive species.

If weeds are discovered on site, they will be treated using the following methodology:

- Large woody weeds will be burned, poisoned or removed from site and disposed to approved green waste;
- Small weeds will be sprayed by a licensed contractor or landholder; and
- Initial follow up spraying will be undertaken at 6 months and 18 months and repeated as necessary.

6.1.2 Program for weed control

The following program for weed management will be implemented prior to commencement of extractive activities, during extractive activities, and post extraction monitoring activities. Table 2 (over the page) is a guide for aggressive common species (adapted from Department of Agriculture and Food and Department of Parks and Wildlife (FloraBase) recommended technique) and should be used as a guide to treat any infestations promptly. Further information for any species and recommended treatment not listed in Table 2 should be gained from the Department of Agriculture and Food.

Table 2 – Weed Management Program

Species	Treatment
Grasses	
Kikuyu <i>Cenchrus clandestinus</i>	Control with herbicides whilst growing.
African Love Grass <i>Eragrostis curvula</i>	Removal of small plants/infestations Annual Spray during winter, small infestations all year round as required.
Flat weed <i>Hypochaeris sp.</i>	Annual Spray during winter, small infestations all year round as required.
Hare's-tail Grass <i>Lagurus ovatus</i>	Prevent seed set for 2-3 years by the removal of the topsoil through civil works. Hand removal of small infestations. Annual spray during winter
Perennial Grasses <i>Phalaris sp.</i>	Selective control can be achieved with 800mL/ha Verdict®520 plus 1% spray oil. Or use 10mL Verdict®520 plus 100mL of spray oil per 10L water for hand sprays.
Woody Weeds	
Golden wattle <i>Acacia longifolia</i>	Hand pull seedlings. Fell mature plants, apply herbicides and diesel to trunk, or cut and paste or inject with Glyphosate
Tayloriana <i>Psoralea pinnata</i>	Treat seedlings early summer with Glyphosate, juveniles can be hand pulled. Fire not recommended. Slash or doze large trees.
Blackberry <i>Rubus ulmifolius</i>	Mechanical control difficult. Annual summer applications of Grazon, 3 applications required, use Glyphosate in sensitive areas (i.e. creek lines).
Ink weed <i>Phytolacca octandra</i>	Uproot heavy infestations and cut remaining plants 5cm below ground. Spraying is effective.
Kangaroo Apple <i>Solanum laciniatum</i>	Herbicide treatment of 150mL Access® in 10L diesel to the lower 50cm of the trunk of the plant. Young growing seedlings can be sprayed with 1L/ha Starane® or hand pulled. Control spread for a radius of 5km. Plant perennial species to provide a good mulch on the soil.
Herbs	
Spear thistle <i>Cirsium vulgare</i>	Spray control effective for seedlings and adults. Manual control by eliminating seed production by close mowing/cutting twice per season
## Arum Lily <i>Zantedeschia aethiopica</i> P1 and P4	Mechanical control only effective if all root fragments removed. Multiple rotary hoeing over a few years provides control. Herbicides are most effective use 1g chlorsulfuron(750g/kg) plus 10mL 2,4-D amine(500g/L) plus 25mL Pulse® per 10L of water. Or use 1g metsulfuron(600g/L) plus 25mL Pulse® per 10L of water.
Curled Dock <i>Rumex crispus</i>	Remove isolated plants by cutting their roots at least 20cm below ground level. Small infestations 0.5g chlorsulfuron(600g/kg) plus 100mL Tordon®75-D in 10L of water in winter will control existing plants and seedlings for about a year.
Cape Weed <i>Arctotheca calendula</i>	Manual removal before flowering effective. For large infestations apply Lontrel® 6 ml/10 L (300 ml/ha) in early growth stages. Glyphosate at 0.2% will provide some selective control if the plants are young or at the budding stage, otherwise spot spraying glyphosate at 10 ml/L. Introduction of native species which provide shade.
## Paterson's Curse <i>Echium plantagineum</i> P1 and P4	Isolated plants can be manually removed and burnt if flowering or seeding. Graze heavily with wethers (castrated ram) over spring to reduce seed production. Spray graze pasture with 500mL/ha Tigrex® in early winter before the weed has reached the 6-leaf stage and repeat if necessary.
**Penny Royal <i>Mentha pulegium</i>	Improve drainage, spray with 40 g/ha metsulfuron before flowering, establish a vigorous perennial pasture such as kikuyu then spray graze annually in early winter with 750 mL/ha 2,4-D amine.
Smooth Cats-ear <i>Hypochaeris glabra</i>	Mowing and grazing ineffective. Hand remove small infestations and/or isolated plants, ensuring the taproot is removed. For dense infestations, apply Lontrel® and wetting agent. Introduction of native species which provide shade.

Western Australian Herbarium (1998-); Wheeler (2002), **HerbiGuide (2014).

Denotes Declared weeds

6.2. Dieback and General Hygiene Management

The aims of the dieback and hygiene management are to:

- To ensure there is zero spread of Phytophthora and other diseases into and out of the area;
- Implement measures for successful completion of the project in terms of education to personnel, decontaminating equipment, and defining access measures.

The following will apply to all aspects of operations and will form part of the hygiene management briefing to all site workers:

- Earth moving vehicles and equipment are to be cleaned prior to entering site;
- Visual inspections on vehicles, plant, equipment and footwear are clean when entering the site;
- Access to the site during excavation will be controlled (fenced and gated and locked when unattended);
- Completed areas will be rehabilitated as soon as practicable;
- The rehabilitated surface will be free draining and not contain wet or waterlogged soils;
- Materials used in rehabilitation will be from on-site stockpiled material; and
- Road and transport vehicles are to be restricted to defined road reserve, loading and turn around areas.

Clean down specification:

A visual inspection is necessary of in-coming and out-going vehicles to determine whether or not vehicles, machinery or equipment is free of a build-up of:

- Clods of soil and plant material and / or slurry consisting of a mixture of soil, plant and water;
- Dust and grime adhering to the sides of vehicles need not be removed before entering the site; and
- Records of inspections and clean downs are to be maintained.

6.3. Bushfire Risks and Management

Vegetation Classification to AS3959-2009 was undertaken by Kathryn Kinnear (level 2 BPAD Practitioner, BPAD 30794). Refer to the Vegetation Classes Map in Appendix G. As per the requirement of State Planning Policy (SPP) 3.7 (WAPC, 2015) a Bushfire Hazard Level (BHL) map was produced as per the defined methodology of the Guideline for Planning in Bushfire Prone Areas Version 1.1 (WAPC, 2017). Refer to Bushfire Hazard Level mapping in Appendix G.

Areas of moderate BHL's occur on and adjacent to the site, generated off Woodland Type B05 and Scrub Type D14 (AS3959). Where moderate BHL's occur Grassland Type G (Low BHL) will adopt a moderate BHL for 100m (WAPC, 2017).

Bushfire Management Statement

Planning in Bushfire Prone Areas Version 1.1 (WAPC, 2017) requires assessment to the bushfire protection criteria – a process where land is assessed for compliance to the criteria. The bushfire protection criteria (Appendix 4, WAPC, 2017) are a performance based criteria in assessing bushfire risk management.

The bushfire protection criteria (Appendix 4, WAPC, 2017) outline four elements, being:

- Element A1: Location;
- Element A2: Siting and Design of Development;
- **Element A3: Vehicle Access; and**
- Element A4: Water.

(WAPC, 2017)

The Subject site is located in a Bushfire Prone Area (OBRM, 2016), refer to Figure 3 over the page.

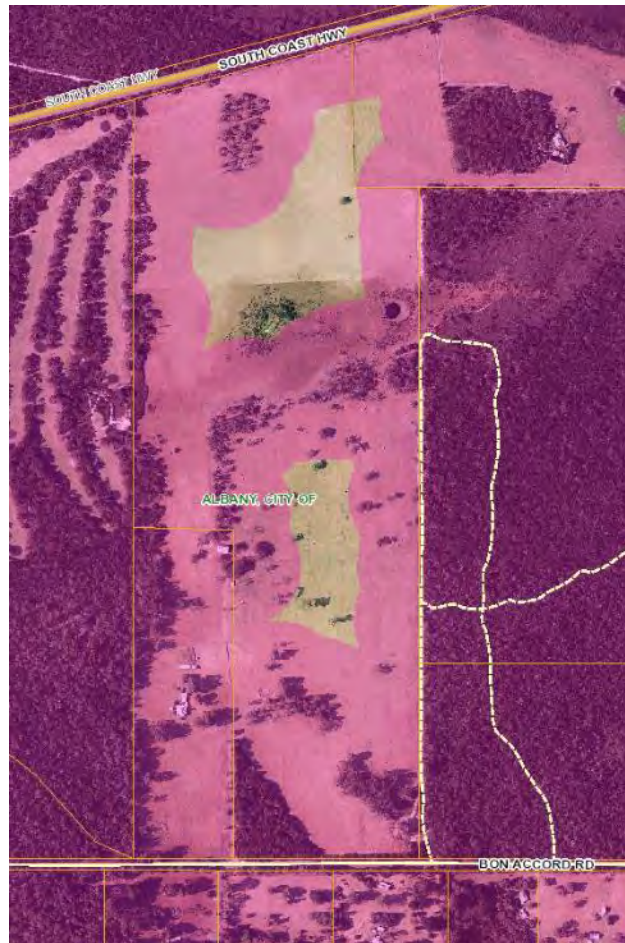


Figure 3 – State Bushfire Prone Mapping (SLIP, 2016). <https://maps.slip.wa.gov.au/landgate/bushfireprone2016/>

Element 1: Location

Intent: To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.

Acceptable Solution applied A1.1: the strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low Bushfire hazard level or BAL-29 or below

Acceptable Solutions Applied:

As per SPP.3.7 and the Guidelines for Planning in Bushfire Prone Areas, the development will not be subject to a higher BHL than moderate. There are no proposed habitable buildings for this development (site office or dwellings) on the extraction site.

Development deemed to meet Acceptable Solution A.1.1

Element 2: Siting and design of development

Intent: To ensure that the siting and design of development minimises the level of bushfire impact.

Assessment to the Acceptable Solutions – every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements:

- *Width: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29) in all circumstances.*
- *Location: the APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes).*
- *Management: the APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones'.*

(WAPC, 2017)

WAPC Guidelines Standard for an APZ (WAPC, 2017)

Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.

Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.

Fine Fuel load: combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.

Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. See Figure 4 (WAPC Figure 16, Appendix 4) below

Figure 16: Tree canopy cover – ranging from 15 to 70 per cent at maturity

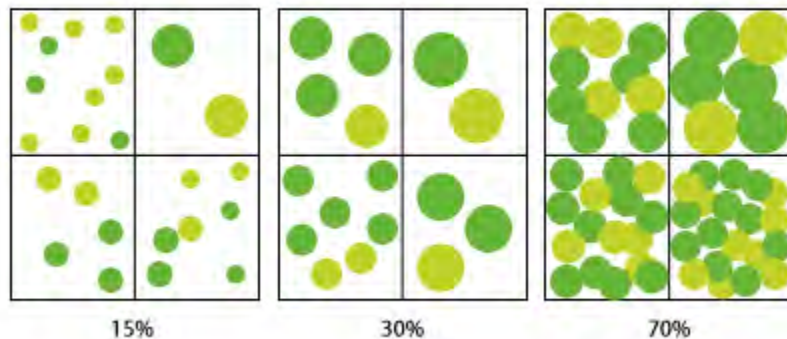


Figure 4: Tree Canopy Cover (WAPC, 2017)

Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m² in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

Ground covers (<0.5 metres in height): can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.

Grass: should be managed to maintain a height of 100 millimetres or less.

(WAPC, 2017)

Acceptable Solutions Applied:

The Crushing and screening equipment will be in low fuel areas as defined by a AS3959 whereby bare areas will exist. No habitable buildings are proposed for this development.

Development deemed to meet Acceptable Solution 2.1.

Element 3: Vehicular Access

Intent: To ensure that the vehicular access serving a subdivision/development is available during a bushfire event.

Acceptable Solutions Applied:

A3.1 Two Access Routes – Site personnel will have access in alternative directions north to South Coast Highway and south to Bon Accord Road (both fully formed public roads), which enables unimpeded emergency access-egress to both the east or west meeting Acceptable Solution A3.1.

A3.2 Public Road – not assessed, no public roads proposed.

A3.3 Cul-de-sacs – not assessed, no cul-de-sacs proposed.

A3.4 Battle Axes – not assessed, no battle axes proposed.

A3.5 Private Driveways – The access road from South Coast Highway will be along a private driveway between 700-950m (to both the crushing and screening area and stage 7). Access from Bon Accord Road measures between 440 - 700m (furthest extents of pits). The standards for private driveways is required to meet the following:

- 4m minimum trafficable surface (m);
- 6m horizontal clearance (m);
- 4.5m vertical clearance (m);
- Maximum grade 1:10
- Minimum weight capacity 15 (t);
- Maximum crossfall (1 in 33; and
- Curves inner radius (8.5 (m).

Where a driveway exceeds 50m from a public road, the following design standards are to apply:

- Turnaround areas at 500m intervals from the public road;
- Passing lanes every 200m.

Refer to standards below in figure 5 for design requirements for private driveways >50m

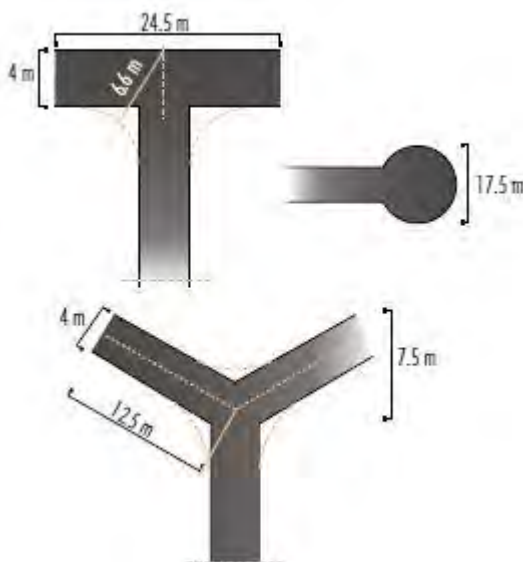


Figure 5: Private driveway design requirements (WAPC, 2017)

The access road from South Coast Highway will have a minimum 6m horizontal clearance and 4m stabilised all weather surface. The private driveway (accessed from Bon Accord Road) is to meet the same minimum technical requirements. This will enable fire service appliances to access the site in the event of a bushfire emergency. Open pit areas will have adequate turn around areas as per the minimum requirements as per Figure 5 above.

A3.6 Emergency Access Ways – not assessed, no emergency access ways proposed.

A3.7 Fire Service Access – not assessed, no fire service access ways proposed.

A3.8 Firebreaks – Fire breaks are currently in existence around the property and to the standards required in the CoA Annual Fire Management Notice. The farm will continue to operate as agriculture and all firebreaks are to continue to be to the CoA standards.

The proposal will meet Acceptable Solutions A3 (1-8).

Element 4: Water

Intent: To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

Water will be required for bushfire safety and dust control. A 10,000 L water tank dedicated for bushfire control will be located within Lot 56 to the west of the extraction area, near the neighbours existing shed. Reticulated water will not be available. Water sources are from onsite dams and pumps to the storage tank.

The proposal will meet Acceptable Solutions A4.3.

Other bushfire mitigation measures

There is a potential bushfire risk from **operations on days rated > “Extreme” “Fire Danger Index” (FDI) rated days**. The predominant bushfire risk associated with the site is the adjacent reserves (east and west) where heavily vegetated areas (Extreme Risks) under hot conditions can give rise to hot and intense fires. The following fire control methods should be enforced at all times during summer periods.

Summary of bushfire control methods to apply to this development:

- Driveway construction standards as outlined in this document (responsibility of the developer);
- Abide by CoA imposed Vehicle Movement and/or Harvest ban due to dangerous fire weather conditions or if there are bush fires already burning during the Restricted and Prohibited Burning Times (i.e. High-Very High Fire Danger days) (responsibility of the contractor); and
- Maintain at all times minimum 10,000L of water in separate firefighting tank for firefighting purposes (responsibility of the developer and contractor); and
- A mobile firefighting appliance dedicated to firefighting operations is located on the property at all times during bushfire season operations (November - April) (responsibility of the contractor).

6.4. Dust management

The aims of the dust management plan are to:

- Ensure dust is not prevailing over adjacent residences and properties;
- Maintain a dust free working environment for all employees on site;
- Ensure all employees and contractors are educated to minimise dust from all operations; and
- Ensure dust is controlled and minimised at all times.

The following is to be implemented by the contractor during excavation operations:

- **All crushing and screening to occur within the designated boundary of the “Crushing/screening” area as defined in Appendix A.**
- Topsoil mounds to be no greater than 2.5 metres in height.
- Stock piles to be located in pit areas and along the southern edge of pits to assist in noise reduction to the southern properties and should not exceed 2.5m.
- Stockpile to be configured to accommodate easy access for watering/dust minimisation.
- The access road, immediate extraction area and fixed plant (screen) to be watered as required to minimise dust emissions.
- Education to employees and contractors to raise awareness of dust management issues.
- Minimise area impacted on and the time between extraction and rehabilitation, a recommended maximum of 2 ha of pit open at any one time.
- Managing operations to minimise work in windy conditions to minimise dust emissions. Works only to occur in low velocity winds (i.e. less than 20km/hr).
- Truck to be fully covered by tarpaulins when fully loaded.

- Dust complaint register in place to record any issues from neighbours. A contractor sign at the front gate to be erected clearly showing the contractors contact details.

6.5. Noise Management

The aims of the Noise Management Plan are to:

- Ensure noise does not prevail over adjacent residences and properties;
- Ensure all employees and contractors are educated to minimise noise from all operations; and
- Ensure noise is controlled and minimised at all times.

The following is to be implemented by the contractor during excavation operations:

- **All crushing and screening to occur within the designated boundary of the “Crushing/screening’ area as defined in Appendix A.**
- All extraction operations and vehicular movements are to be carried out only between 0700 and 1800 hours Monday to Friday.
- Mounding of topsoil along the southern edge of pits to act as noise bunds to assist in noise reduction to properties to the south.
- Regular inspections of all plant and machines on site to ensure working and functioning correctly without excess noise.
- Education to employees and contractors to raise awareness of noise management issues.
- Strongly recommended that excavation crushing and screening operations are only carried out on southerly and south westerly winds to ensure that noise to adjacent neighbours is restricted.
- Noise complaint register in place to record any issues from neighbours. A contractor sign at the front gate to be erected clearly showing the contractors contact details.

6.6. Rehabilitation Management

Rehabilitation will be to constructed soils and a return to pasture paddocks. The following aims will apply to all rehabilitation works:

- To re-instate pastures for ongoing agricultural pursuits;
- To establish pasture vegetation through seeding and compaction through use of preserved topsoil; and
- To reduce weed invasions and competition of weeds with native species.

Rehabilitation methods

- The method of revegetation is to use the seed from existing topsoil and seeding pasture paddocks;
- Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide, or grubbed out, depending on the species involved. Refer to Weed Management Plan Section 6.1; and
- Rehabilitation will be carried out promptly after soil disturbance (within two weeks of extraction).

Seed stock

Species shall be sourced from stockpiled topsoil from clearing operations. If regeneration is slow then pasture seed shall be collected at the first spring period and spread at the first Autumn rains (usually after three continuous rain days is recommended). It is anticipated that most species will regenerate from site topsoil. Paddock trees will be planted where appropriate to assist in wind buffers for the long term agricultural pursuits.

Methodology

The rehabilitation methodology is proposed to be undertaken using the following steps:

1. Remove topsoil and place on regeneration area or store adjacent to the site (no more than 10m from removal area).
2. Store topsoil in piles no higher than 2.0m.
3. Spread topsoil over batters and regeneration areas of the pits.
4. Ensure batters do not exceed 1:5m slopes.
5. Seeding of paddocks / closed stage pits and compaction of soil.
6. Inspect site after first large rainfall event, ensure erosion has not occurred over any slopes.
7. Inspect site after 6 months to determine success rate of seeding and any weed establishment. Remove weeds either through selective spraying or hand removal.

8. Inspect site after 6, 12 and 18 months to determine success rate of native plant establishment and any weed establishment. Remove weeds either through selective spraying or hand removal.
9. Instigate any seeding to assist regenerating areas.

Topsoil Management

Where topsoil removal is required, topsoil and overburden will be directly transferred from an area being cleared to an area to be rehabilitated. Where this is not possible the topsoil and overburden will be stored in low dumps (overburden and 2.0m for topsoil) for future use in rehabilitation. No topsoil soil rehabilitation/movement is to occur during high to avoid erosion and slumping.

Bank stability works/erosion control

The predominant soil type is deep sands and gravels over laterite. Loose sands during revegetation works can be subject to prevailing winds and water erosion. Mounding of the rehabilitation areas will assist with any runoff and brushing will reduce the effects of wind erosion. The mounding and contouring of soil will also assist in trapping water for seedling germination and growth and will be employed where applicable. Mounding should occur along contours or in flat areas perpendicular to surface flow direction.

Stabilisation techniques may need to be applied during and post construction activities (i.e. use of sediment traps). Mulching of pit faces or use of geo-fabrics should be used wherever possible to ensure there is minimal erosion to the site. The creek area should not receive untreated storm water from surface water run-off, buffers of operations of 50m to any creeks or dams on site will ensure there is minimal sedimentation to these areas.

It is recommended as the site is predominantly sandy (topsoil) in nature, best practise is carried out when site is developed and sediment traps are installed during development activities with any bare ground areas stabilised (i.e. mulching).

6.7. Acid Sulfate Soil Management

As the site operation does not involve excavation or disturbance of soils to wetlands or creek areas, there is no requirement to treat Acid Sulfate Soils.

6.8. Surface water and drainage management plan

The proposed extraction will be designed, constructed and operated to avoid disruption to surface water flows, minimise erosion and ensure that potential contaminants are not released into the environment. The surface water drainage management plan aims to achieve the following:

- Manage run off from disturbed areas to minimise erosion and exportation of sediments;
- Contouring of pit edges to contain surface water;
- Encourage point source infiltration across the existing rural areas (future stages) and in rehabilitated areas; and
- Ensure all surface water is contained and treated on site.

Soils in the development area recorded sandy gravels over rock over clay. Sandy gravels are moderately draining soils where pits are not excavated rainfall and surface water runoff will continue to occur as per agricultural management practises. Excavated pits will be to clay layers so pooling of water is expected to occur in open pit areas. Where excavation is taking place, contour banks will be constructed downstream of works to prevent the transportation of sediment to neighbouring properties and significant waterways. Contour banks will be constructed to retain and infiltrate at source rainfall events up to the 100yr ARI critical rainfall event.

Once excavation is complete the ground surface will be flattened and contour banks maintained until groundcover has been established. The contour banks should be flattened once groundcover has been established to maintain the existing surface hydrology. Furthermore, the process of seeding and compaction during rehabilitation will reduce surface erosion post rehabilitation stages.

6.9. Control of Environmental Incidents

An important aspect in the environmental program is management of non-conformance or incidents. An environmental incident is an event which could result in pollution to the local environment. The planning of site works and methodology as outlined within this management plan limits the risk and harm of construction works impacting on-site or off-site.

If an incident or event occurs during operations and excavation, it should be emphasised to all personnel working on site that all incidents are documented. Investigations should be conducted and action plans established in order to ensure the

event does not happen again. The Site Operations Manager will be responsible for maintaining records of environmental incidents and reporting.

Examples of an “incident” for this project may include:

- Hygiene protocols not adhered to;
- Topsoil has not been appropriately placed;
- Unplanned vegetation clearing has occurred;
- Mechanical breakdown occurring along a waterway and hydraulic oil spill occurs;
- Refuelling occurs within the creek area;
- **Complaints from “stakeholders” or neighbours; and**
- Any event which causes non-compliance with the Operations Management Plan.

Should an incident occur which leads to a non-conformance, the Site Manager shall inform the owner of the property of any non-compliance or potential non-compliance within seven days of that non-compliance being known, and if further action is required then the CoA will be informed.

6.10. Corrective and Preventative actions

An environmental investigation should include the following basic elements:

- Identify the cause of the incident;
- Identifying and implementing the necessary corrective action;
- Identifying the personnel responsible for carrying out corrective action;
- Implementing or modifying controls necessary to avoid repetition;
- Recording changes in written procedures required; and
- Reporting to the appropriate government agencies if required.

6.11. Contingency Procedures

Contingency measures are included within this management plan. These protocols are designed to reduce adverse environmental impacts and provide an early detection of non-conformance and subsequent corrective action. Any modifications to the outlined strategies and methodologies to meet unexpected conditions shall be agreed to by the Site Manager. Monitoring shall be used to confirm the effectiveness of any changes.

Should it be identified by any personnel involved in the project there is a non-conformance to the acceptable methodology or there is reason to cause environmental harm, in consultation with the Site Manager and owner of the property, activities should cease during resolution of the required change in methodology.

The Site Manager should be notified of any environmental non-conformances and undertake site investigation. It will be the responsibility of the Site Manager to report any environmental incidents to the appropriate government agencies (e.g. Department of Water and Environmental Regulation – contamination, spills etc., Parks and Wildlife Service (PAWS) - impacts to flora or fauna).

6.12. Spill Management Procedures

The following information is from the PAWS Spill Management Brochure (DEC 2011). This should be the methodology employed should a spill from fuel or chemical occur.

Dealing with minor spills

A small spill is considered to be a spill of 5 litres or less providing the product is not concentrated. For concentrated products of any quantity the spill must be treated as a large spill.

1. Assess safety. Make sure that people are kept clear, and that you have the right training and equipment to deal with the spill.
2. Stop the source. Providing it is safe to do so, stop the spill at its source. This may involve righting an overturned container or sealing holes or cracks in containers.
3. Contain and clean up the spill. The spill should be mopped up immediately.

4. Record the spill. Record when, what, how and where the spill occurred, clean up measures undertaken and the names of any witnesses. Also, make note of what changes can be made when handling, transporting or storing chemicals to ensure a similar incident does not happen again.

Dealing with large spills

A large spill is considered to be anything over 5 litres or concentrated chemicals of any volume.

1. Assess safety. Make sure that people are kept clear, and that you have the right training and equipment to deal with the spill.
2. Consult the Material Safety Data Sheet (MSDS). The MSDS will have instructions on how to deal with specific chemical spills.
3. Put on protective clothing. If necessary, put on gloves and goggles, a mask and an apron.
4. Stop the source. Providing it is safe to do so, stop the spill at its source. This may involve righting an overturned container or sealing holes or cracks in containers.
5. Contain and control the flow. The spill should be prevented from filtrating into the ground or entering the stormwater system. The outer edge of the spill should be dammed with rags, blankets, sand, sands bags, mops and/or absorbent booms.
6. Clean up the spill. Promptly cover the spill using absorbent materials such as the correct absorbent granules for the product (Note that some strong acids will react with some types of granules and sawdust), sand and rags, being mindful not to splash the spill. Using a dustpan or spade, the absorbent granules or sand must then be scooped up and placed into a container. This waste material is not to be buried or thrown into the environment. The method of disposing this waste will depend on the amount and the type of chemical that was spilt. The Department of Environment Controlled Waste Section will advise on the appropriate disposal of hazardous substances. There are several contractors that will dispose of contaminated substances and soils. All contact phone numbers can be found below
7. Notify the appropriate authority. If the spill does enter a stormwater drain or open ground, the Department of Environment and your local council must be notified. Please refer to the phone numbers listed below. If there is a hazard to health or property, call Fire and Rescue on 000 immediately.
8. Record the incident. Record what, how and where the spill occurred and the names of any witnesses. Also, make note of what changes can be made when handling, transporting or storing chemicals to ensure a similar incident does not happen again.

Who to call in an emergency

All hours' phone numbers

Life / property emergencies: Ambulance, Fire or Police	000
Pollution emergencies - Department of Water and Environment Regulation	1300 784 782
Poisons Information Centre	13 11 26
Water Corporation – Emergencies and water service difficulties	13 13 75

6.13. Monitoring and contingency planning

Environmental controls during construction will be checked at frequent intervals as outlined in Table 3 below. This will be the responsibility of the Site Supervisor and the Environmental Officer to ensure all the below activities are carried out.

Table 3: Environmental Monitoring Activities During Construction

<i>Frequency & Compliance Number</i>	<i>Activity</i>
Daily	Check all sediment controls
	Check waste materials collected from site are correctly sorted and stored (i.e. green waste, refuelling in designated areas only).
	Check personal safety equipment before each use.
	Check dust filters on equipment.
	Visually check vehicles and equipment for leaks or potential oil spills.
	Check signage, gates and demarcation tapes (trees and dieback) in place
	Check noise suppression devices on equipment prior to working.
	Check no disturbance to Soils in wetlands/creek areas for disturbance of ASS.
	Check vehicle/hygiene requirements have been met.
	Check topsoil has been appropriately placed.
	Check no unplanned vegetation clearing has occurred.
	Incident reports have been completed if required.
	Check containers of hazardous materials are properly stored and not damaged (away from site)
Twice weekly	Ensure dust suppression controls in place
	Visually check vehicles and equipment for leaks or potential oil spills
Weekly	Inspect all sediment control structures
After rain (i.e. >10mm)	Check all drains are free from debris or chemicals (i.e. hydrocarbons)
	Stormwater structures are checked and/or are cleaned out
	Check for erosion after wet periods and winter months
	Ensure drainage structures are working as required
Monthly	Ensure sediment controls are working appropriately
	Ensure rehabilitation areas are healthy and free of weeds
	Apply stabilisation on any bare regenerating areas
	Remove weeds as per Weed Management Plan
	Ensure public access is restricted and signage in place

7. Consultation process

To ensure that all aspects of the project encompass current best practise, legislative requirements and guidelines, the following consultation plan shall be implemented.

Consultation shall occur with government agencies:

- At approval of the CoA Planning Approval and prior to implementation, for CoA feedback and comment regarding the document;
- A site meeting/walk over with government agency representatives (if requested) prior to commencement of any site works to confirm refuelling area, demarcation, turnarounds, areas of concern etc.; and
- Post construction periods.

Recommended government agencies to consult are:

- Department of Water and Environmental Regulation – regarding all storm water and water quality issues;
- Department Biodiversity, Conservation and Attraction (Parks and Wildlife Service) – vegetation and flora, fauna, wetlands weeds, disease, flora and fauna issues;
- City of Albany – regarding site construction activities, areas of environmental concern, pit and track design, control measures implemented and ongoing management.

Personnel whom contact and consultation has already been initiated regarding the proposal include:

- Adjacent neighbour; and
- City of Albany – Alex Bott and Jan Van der Mescht.

Regular consultation can occur during operations with other stakeholders as required and may include but not be limited to:

- Neighbours;
- Community groups;
- City of Albany representatives;
- Department of Parks and Wildlife; and
- Interest groups as identified.

The client and site supervisor shall have overall responsibility of conveying information to relevant government agencies regarding any environmental or operational issue or concern.

8. Implementation Process

The first operational pit (Stage 1) is proposed during 2017. A generalised implementation for each phase of the construction of the track is shown below in Table 6. All extraction, crushing and screening operations will occur in May – November (weather depending) with screening lasting approximately 2 to 3 weeks. Carting of gravel products will occur during times of high demand such as through the construction period of November to May. Each stage / pit is to be rehabilitated prior to the next stage being opened, which should take no more than 1 week to complete.

Table 6 –Implementation Program

Year	2017	2018	2019	2020	2021	2022
Stage						
Stage 1 extraction						
Rehabilitation						
Stage 2 extraction						
Rehabilitation						
Stage 3 extraction						
Rehabilitation						
Stage 4 extraction						
Rehabilitation						
Stage 5 extraction						
Rehabilitation						
Stage 6 extraction						
Rehabilitation						
Stage 7 extraction						
Rehabilitation						

It is recommended that this management plan is reviewed post initial excavation stages to ensure site management is occurring to the plan and any modifications are undertaken to the document consistent with operational duties and environmental requirements. Any factors which need to be considered for long term management should be documented into an updated post completion report or long-term maintenance schedule. At each stage/activity the management goals/objectives should be met prior to commencement of the next stage of works.

9. References

- AS 3959-2009 Australian Standard, Construction of buildings in bushfire-prone areas, Building Code of Australia, Primary Referenced Standard, Australian Building Codes Board and Standards Australia.
- Beard's Vegetation Classification dataset, 1:3,000,000 digital representation of Beard's vegetation map of the state of Western Australia.
- Bureau of Meteorology (BoM) (2017) www.bom.gov.au accessed May 2017
- City of Albany Fire Management Notice 2016/2017, accessed 31/3/2016 from: www.albany.wa.gov.au
- Department of Environment and Conservation (2005) *Pre-European Vegetation Spatial Dataset* GDA 94, based on the project AJM Hopkins, GR Beeston, JM Harvey (2000). A database on the vegetation of Western Australia. Stage 1. Unpublished.
- Department of Fire and Emergency Services Website accessed July 2016:
www.dfes.wa.gov.au
- Department of Water 1:250 000 Hydrogeology Map Series (2001) Mapping dataset, Government of Western Australia
- Department of Water Public Drinking Water Supply Act (2001) Mapping dataset, Government of Western Australia.
- Department of Environment (2017). EPBC Act Protected Matters Search Tool. URL: <http://www.environment.gov.au/webgis-framework/apps/pmsi/pmst.jsf#>
- DPaW (2007 –) *NatureMap: Mapping Western Australia's Biodiversity*. Department of Parks and Wildlife. URL: <https://naturemap.dpaw.wa.gov.au/>
- Environmental Protection Authority Western Australia (2015) *Draft Environmental Assessment Guideline for Separation Distances between Industrial and Sensitive Land Uses*. Government of western Australia.
- Geological Survey of Western Australia (1984) Mt Barker – Albany SI 50-11,15. Geological Survey Division, WA.
- Keighery, B. (1994) *Bushland Plant Survey, A Guide to Community Survey for the Community*, Wildflower Society of WA.
- Master, R, and South Coast Agricultural RCA Team. (2008), *Oyster harbour catchment appraisal 2007*. Department of Agriculture and Food, Western Australia, Perth. Report 320.
- Moore, J, and Wheeler, J. *Southern Weeds and Their Control*, Department of Agriculture.
- Personal Communication from Michael Palmer to Kathryn Kinnear, 20th April 2017.
- Personal Communication from Gary Howie to Kathryn Kinnear during site assessment, 11th April 2017.
- Personal Communication from Dave Palmer to Kathryn Kinnear during the review process, 17th May 2017.
- Rogister E. (2011) unpublished literature prepared for the City of Albany
- Sandiford, E.M. and Barrett, S. (2010) *Albany Regional Vegetation Survey, Extent Type and Status, A project funded by the Western Australian Planning Commission (EnviroPlanning "Integrating NRM into Land Use Planning" and State NRM Program), South Coast Natural Resource Management Inc. and City of Albany for the Department of Environment and Conservation*. Unpublished report. Department of Environment and Conservation, Western Australia.
- State Land Information Portal (SLIP) (2016) Map of Bushfire Prone Areas. Office of Bushfire Risk management (OBRM) data retrieved from: <https://maps.slip.wa.gov.au/landgate/bushfireprone2016/>
- Shepherd, D.P. (2003) *Implementation of the National Vegetation Information System model in Western Australia. Milestone 6 Report*. Final report on the implementation of the National Vegetation System model in Western Australia. Unpublished Report to the Bureau of Rural Sciences, Canberra. October 2003.
- Western Australian Planning Commission (WAPC) (2017) Guidelines for Planning in Bushfire Prone Areas. Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.
- Western Australian Planning Commission (WAPC) (2015) State Planning Policy 3.2 Planning in Bushfire Prone Areas. Department of Planning WA and Western Australian Planning Commission.

APPENDICES

Appendix A – Location and Site Facility Mapping

Appendix B – 250k Hydrogeological Mapping

Appendix C – Significant Wetlands and Environmentally Sensitive Areas.

Appendix D – Acid Sulphate Soil Mapping

Appendix E – Vegetation Mapping

Appendix F – Database Searches

Appendix G – Bushfire Mapping

Appendix A

Location and Site Facility Mapping



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Cadastre



Scale
1:20,000@ A3
GDA MGA 94 Zone 50

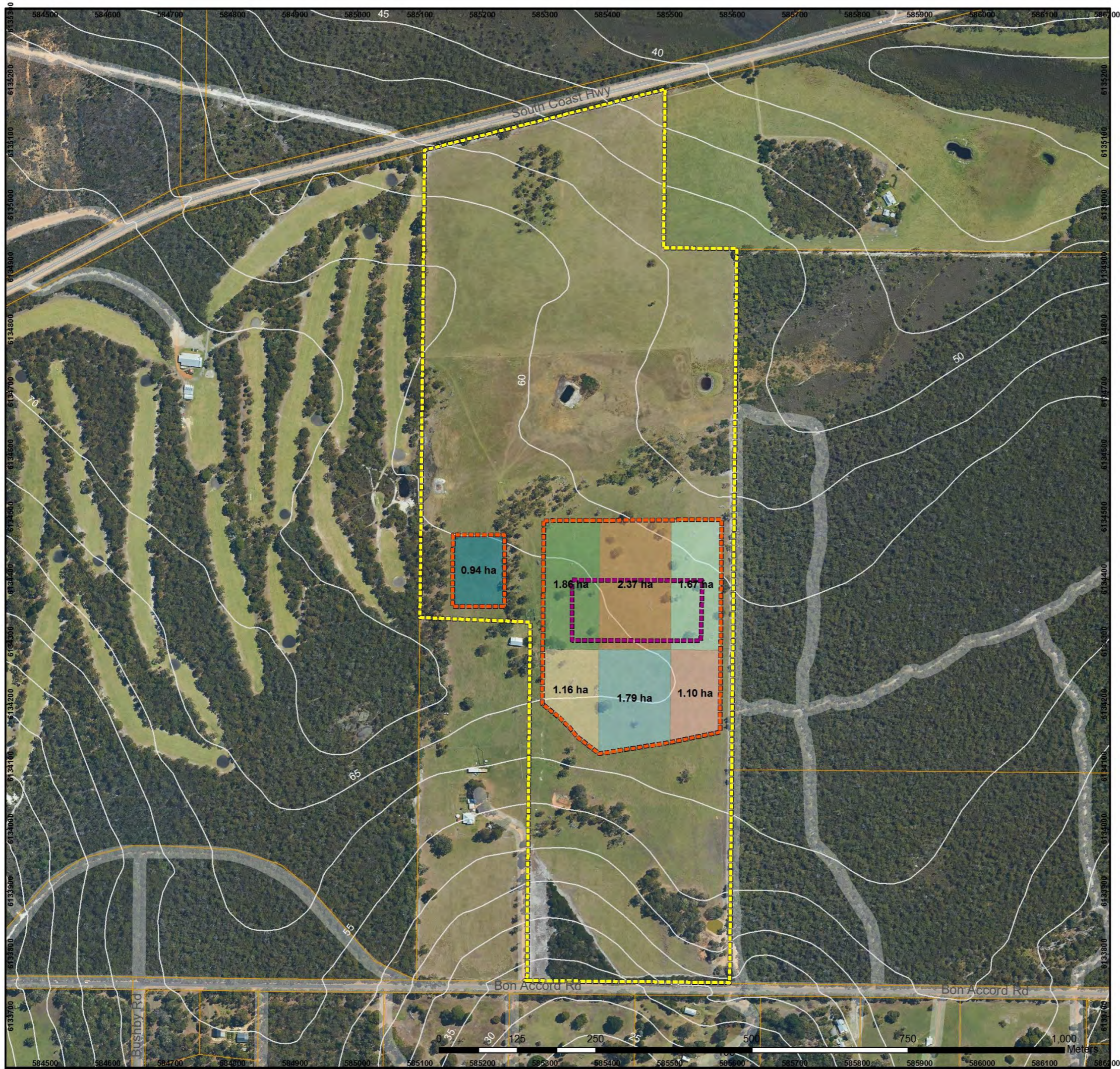
Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT

Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

Location Mapping

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents
- Cadastre
- 5m Contours

Stage Plan

- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Stage 6
- Stage 7
- Stage 8



Scale
1:6,000 @ A3
GDA MGA 94 Zone 50

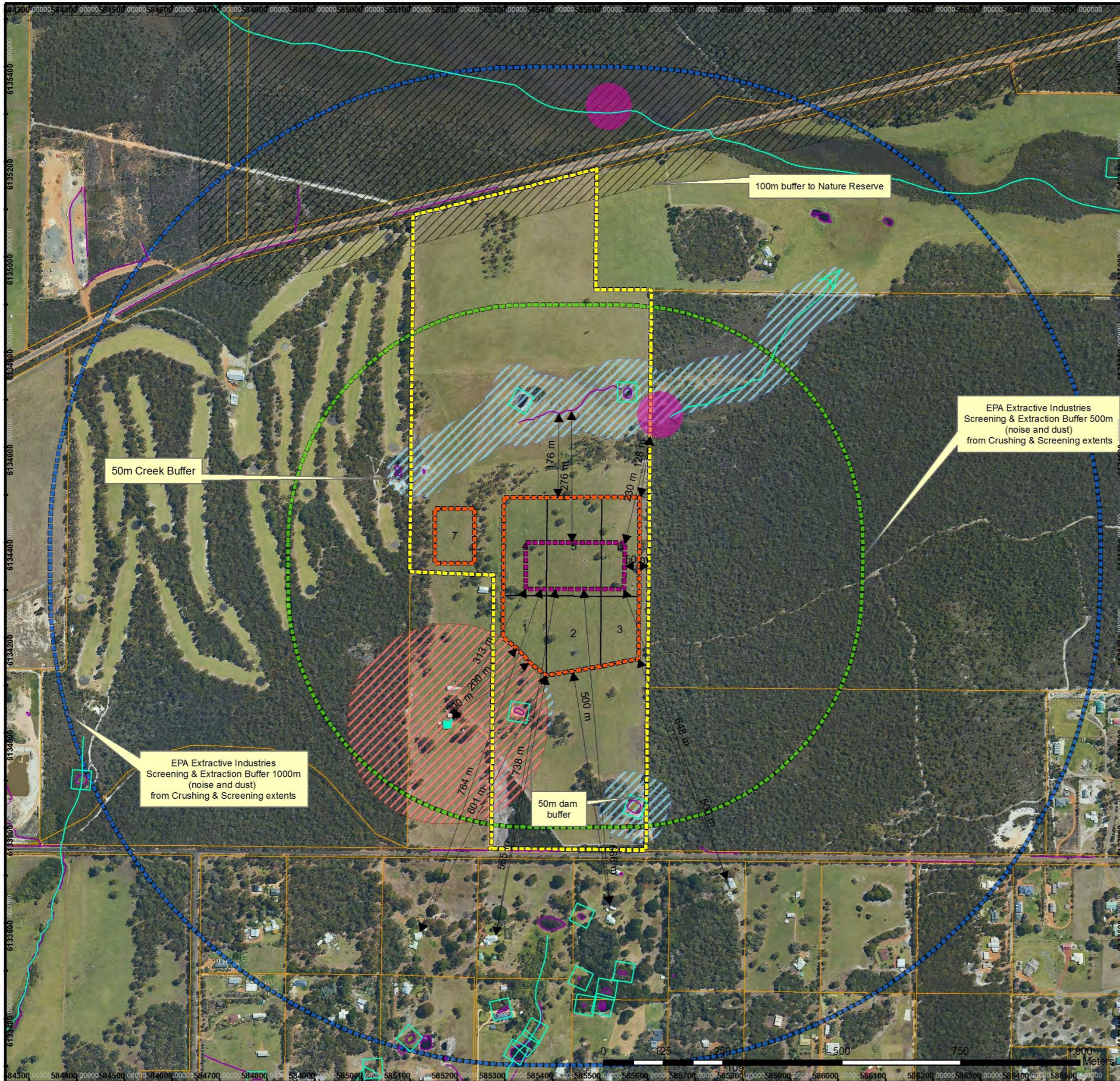
Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT

Gary Howie
Lot 5241 Bon Accord Road
Lower King, WA 6330

Staging Plan

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
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Overview Map Scale 1:100,000

Legend

- Lot 5241
 - Subject Site
 - Existing Dwelling
 - Crushing & Screening Extents
 - Stage Plan
- Buffers**
- 50m Dam/Creek Buffer (CoA)
 - 100m Nature Reserve Buffer (DPaW)
 - 200m Adjacent residences (CoA)
 - 300m Sand Extraction Buffer (EPA)
 - 500m Noise and Dust Buffer (EPA)
 - 1000m Noise and Dust Buffer (EPA)
- Separation Distances
- Cadastre
 - Creekline
 - waterfeatures_25000
 - waterfeatures_2000



Scale
1:8,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

Site Buffers Mapping

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017

Appendix B

250k Hydrogeological Mapping
& Surface Water Flows



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents

Buffers

- 1000m
- 500m
- Cadastre
- 5m Contours

250K Hydrogeology Map Series

- TP: Tertiary-Cainozoic-Phanerozoic
- P_go: Proterozoic
- P_n: Proterozoic



Scale
1:8,000 @ A3
GDA MGA 94 Zone 50

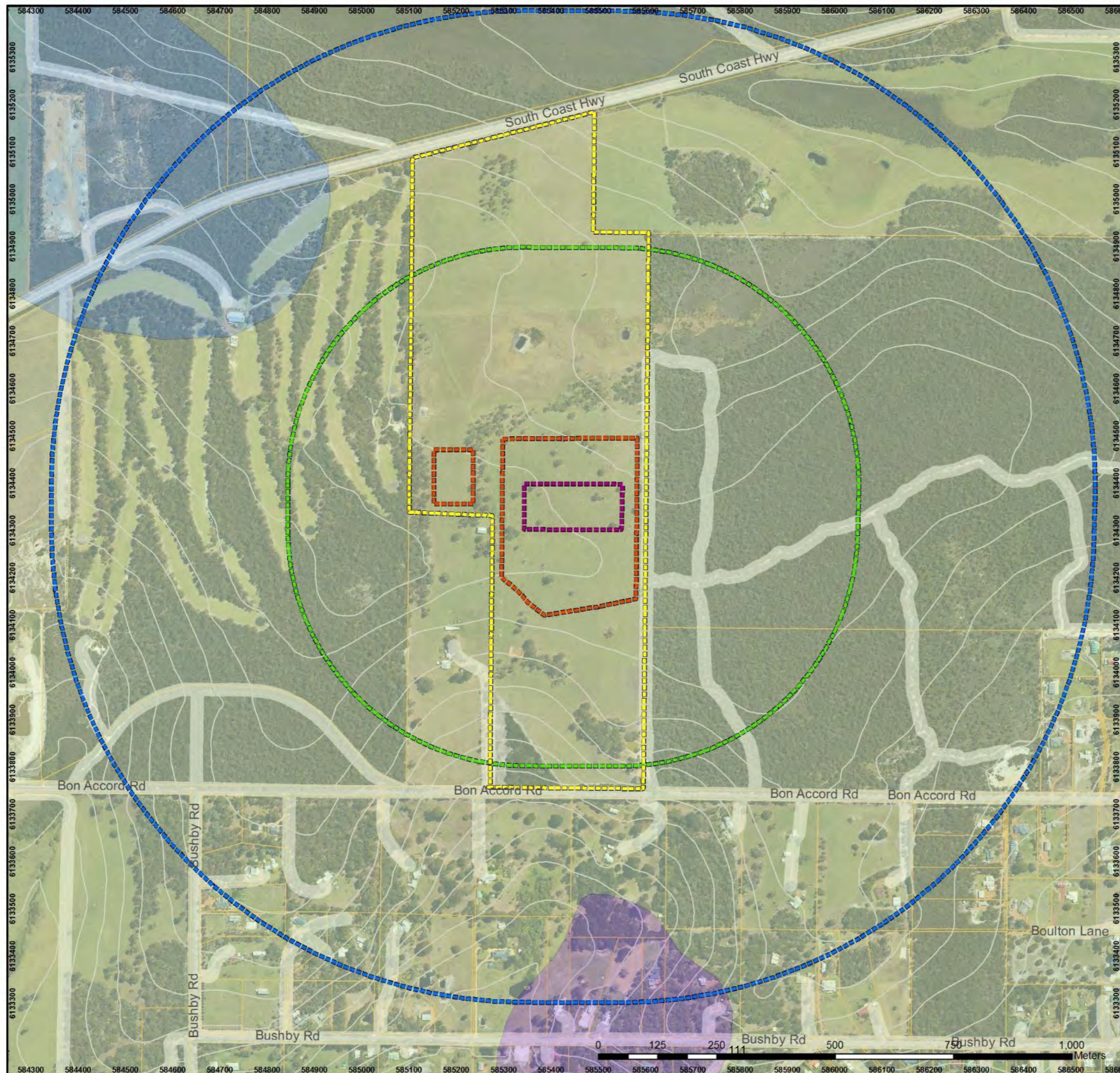
Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

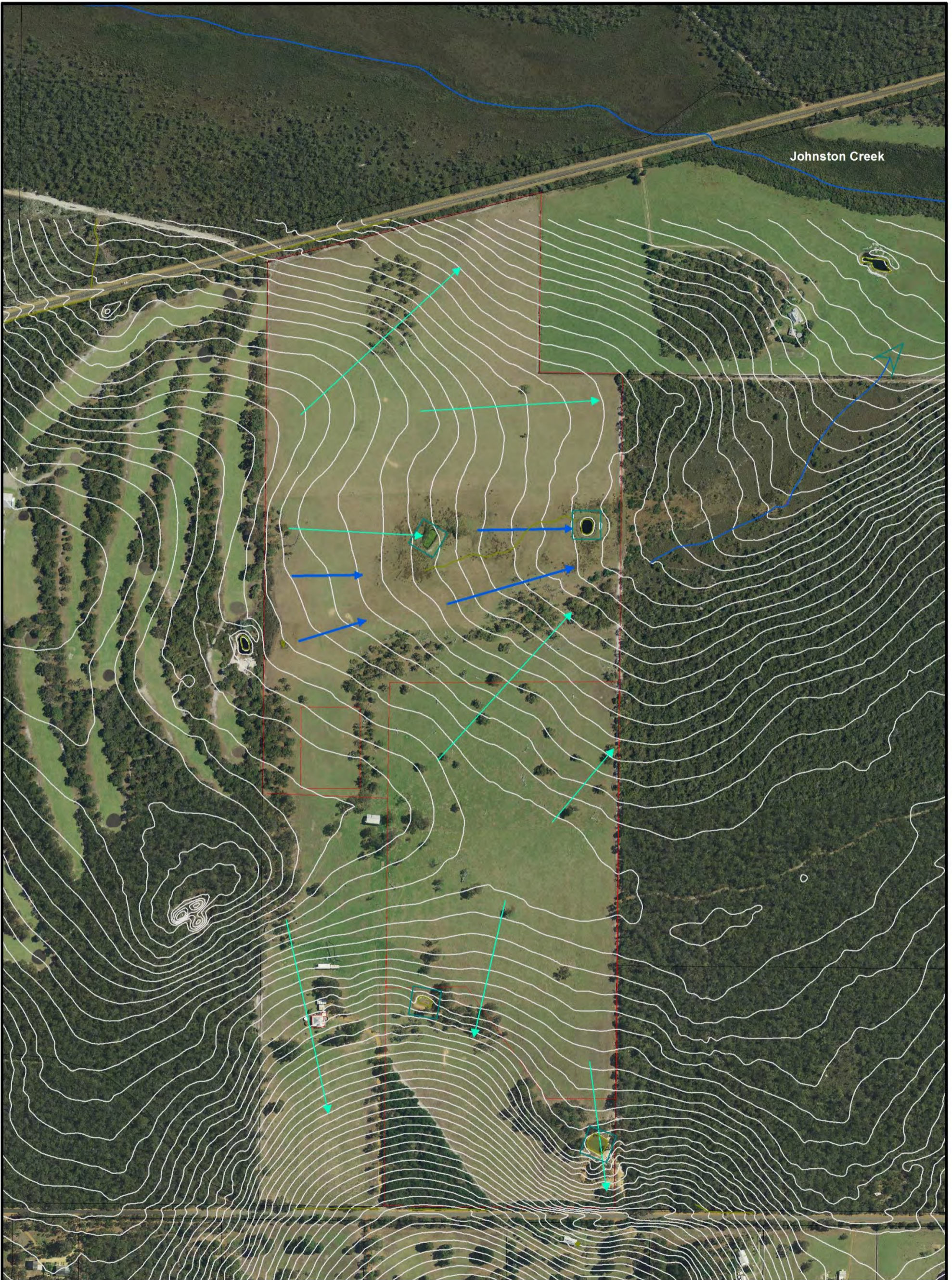
CLIENT

Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

250K Hydrogeological Mapping

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017

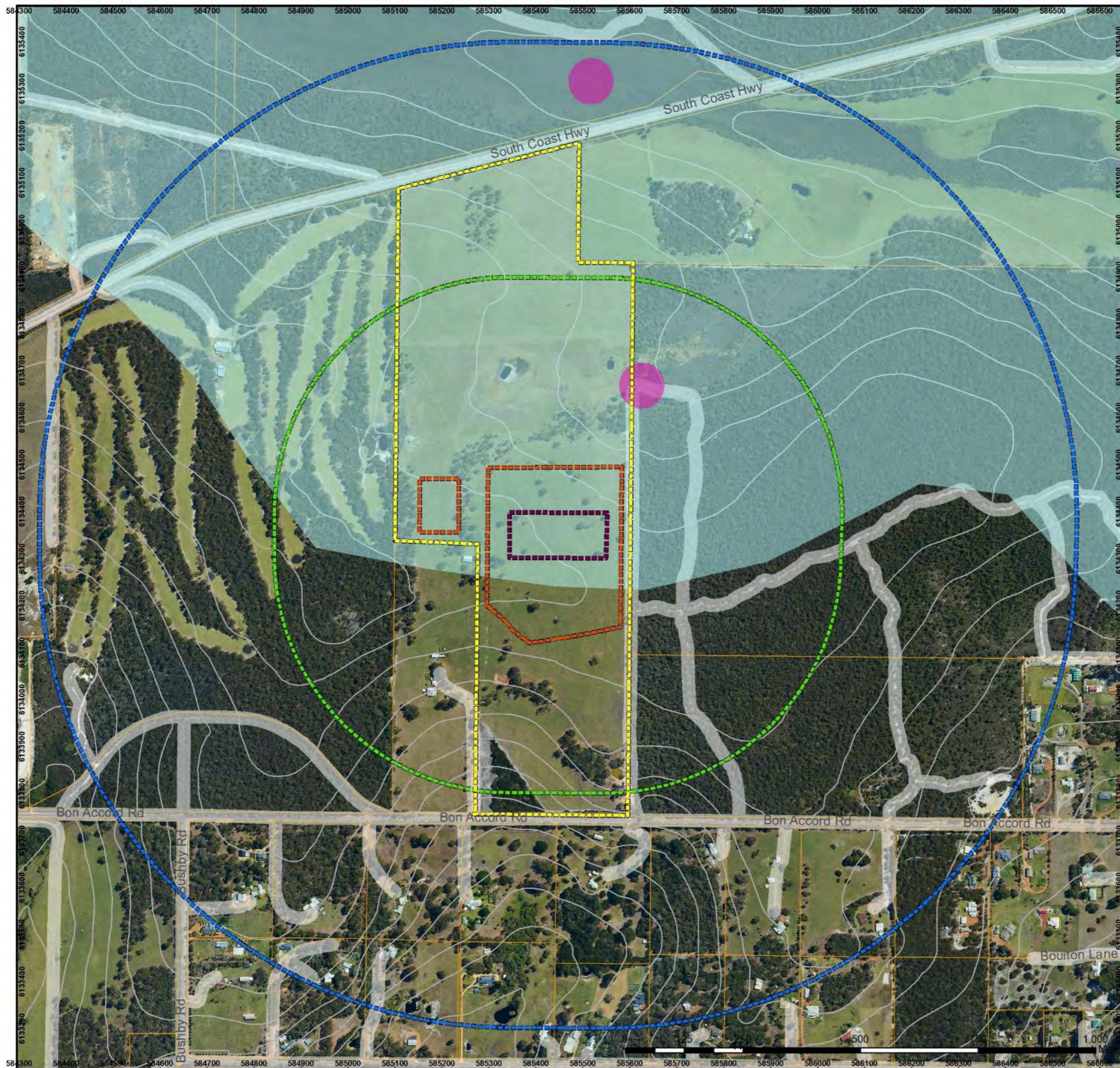




Legend waterways Groundwater movement Surface water Subject Site	Scale: 1:5000@ A3 0 2550 100 150 200 Meters	 BIO DIVERSE SOLUTIONS	CLIENT Gary Howie Lot 56 Bon Accord Road Lower King, WA 6330		
	Surface Water & Groundwater			STATUS FINAL	FILE HSH0011

Appendix C

Significant Wetlands and Environmentally Sensitive Areas



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crusting & Screening Extents
- 100m Buffer
- 500m Buffer
- Cadastre
- 5m Contours
- Environmentally Sensitive Area



Scale
1:8,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

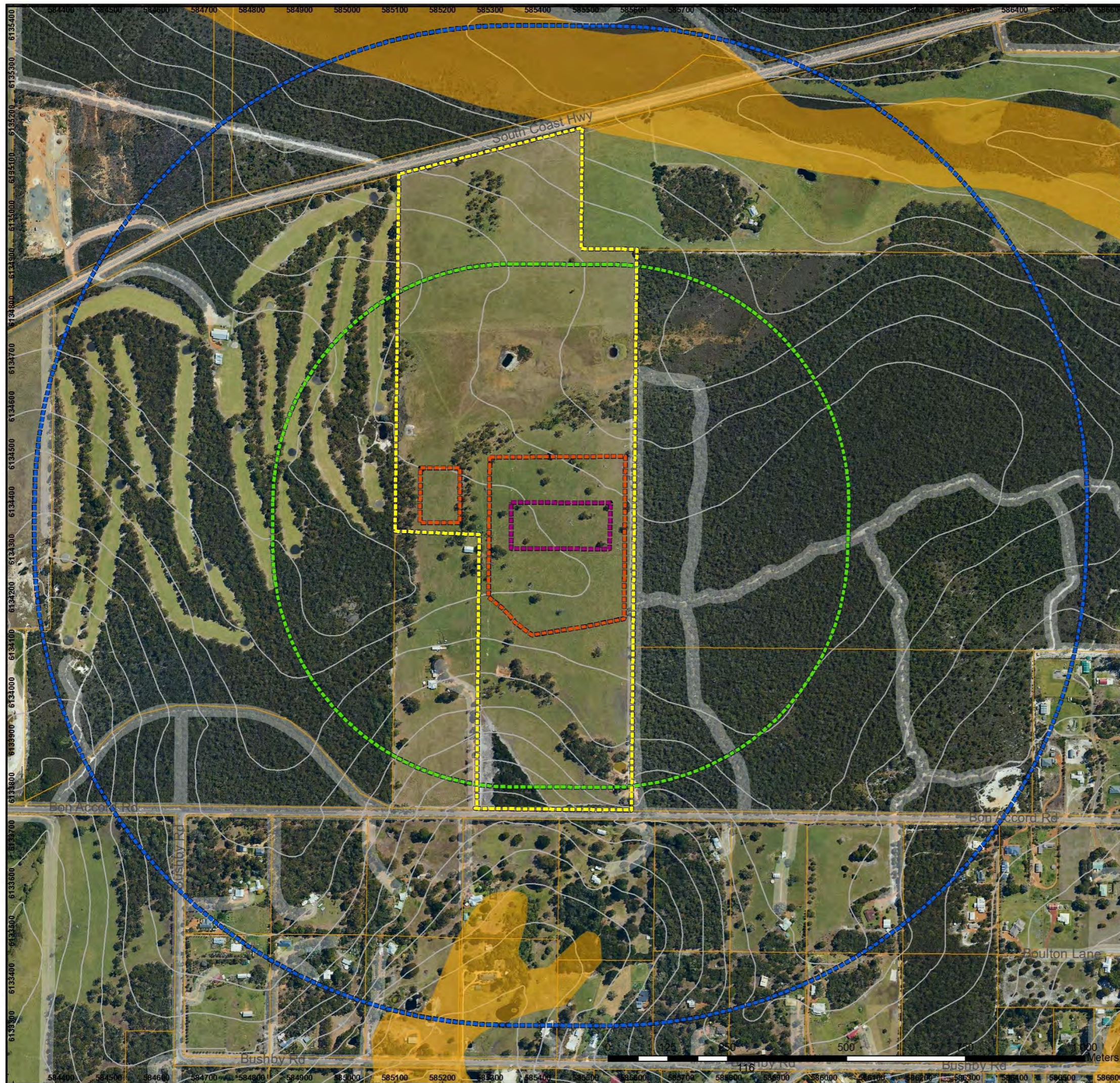
CLIENT
Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

Significant Wetlands and Environmentally Sensitive Areas

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017

Appendix D

Acid Sulphate Soil Mapping



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents

Buffers

- 1000m
- 500m
- Cadastre
- 5m Contours

Acid Sulphate Soil Risk Map - Albany-Torbay

- High to moderate risk
- Moderate to low risk



Scale
1:8,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

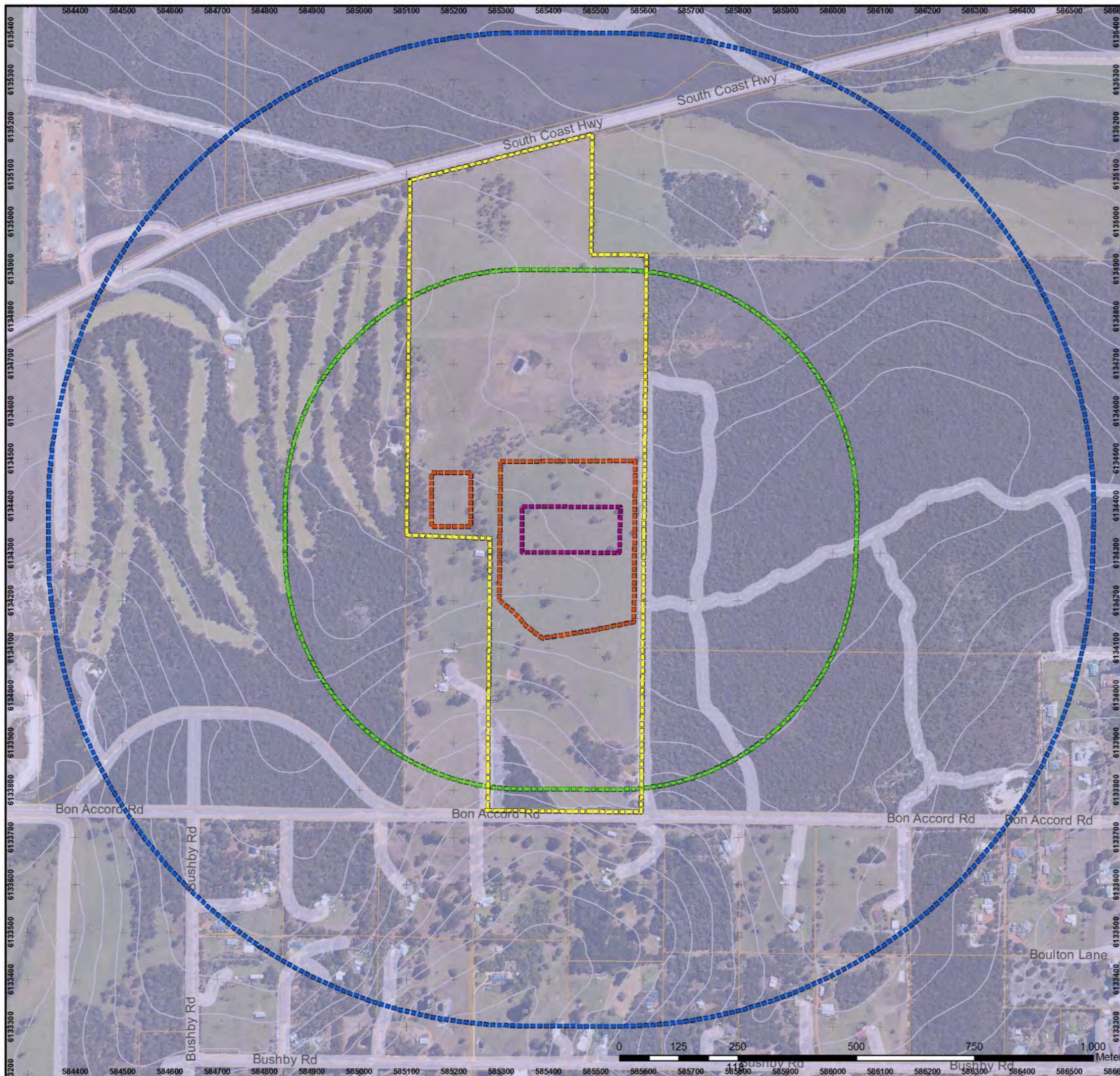
CLIENT
Gary Howie
Lot 5241 Bon Accord Road
Lower King, WA 6330

Acid Sulphate Soils Mapping

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017

Appendix E

IBRA and Pre-European Vegetation Mapping



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents
- Buffers**
- 1000m
- 500m
- Cadastre
- 5m Contours
- IBRA 6.1**
- Jarrah Forest, JF, 61



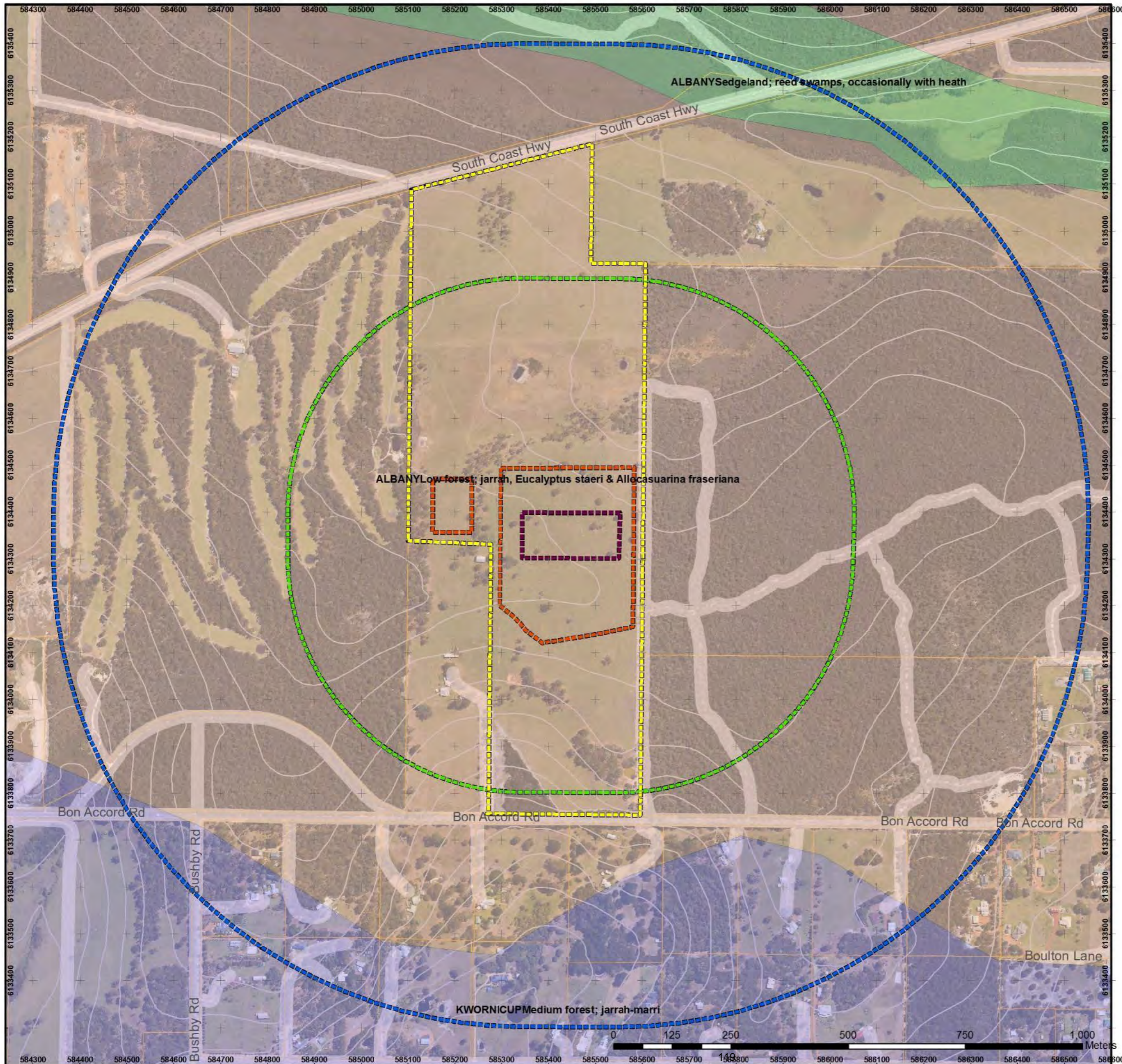
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GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastral and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

IBRA 6.1 Vegetation Mapping

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017



REPORT ITEM DIS046 REFERS



29 Hercules Crescent
Albany, WA 6330
Australia
Tel: 08 9842 1575
Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Lot 5241
- Subject Site
- Crushing & Screening Extents

Buffers

- 1000m
- 500m
- Cadastre
- 5m Contours

South Coast Pre European Vegetation

- 3, KWORNICUP_3
- 51, ALBANY_51
- 978, ALBANY_978



Scale
1:8,000 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2016
Cadastre and Contours: Landgate 2016
Overview Map: World Topographic map service, ESRI 2012

CLIENT

Gary Howie
Lot 56 Bon Accord Road
Lower King, WA 6330

Pre-European Vegetation

STATUS	FILE	DATE
FINAL	MSC0143	15/08/2017

Appendix F

Database Searches



Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 08/05/17 11:26:04

[Summary](#)

[Details](#)

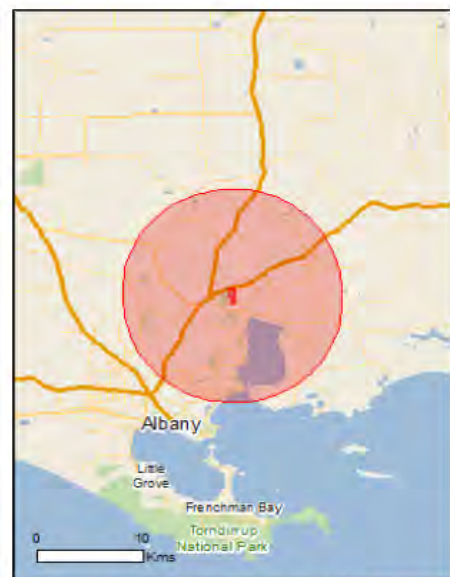
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

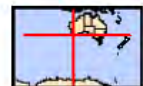
[Acknowledgements](#)



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

[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	61
Listed Migratory Species:	52

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	85
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	9
Regional Forest Agreements:	None
Invasive Species:	26
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community may occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Dasyornis longirostris Western Bristlebird [515]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Psophodes nigrogularis nigrogularis Western Heath Western Whipbird [64449]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed	Vulnerable	Species or species

Name	Status	Type of Presence
Albatross [64459]		habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Fish		
Galaxias truttaceus hesperius Spotted Galaxias (western subspecies), Western Spotted Galaxias, Western Trout Galaxias [81282]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroi Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat known to occur within area
Plants		
Banksia brownii Brown's Banksia, Feather-leaved Banksia [8277]	Endangered	Species or species habitat known to occur within area
Banksia goodii Good's Banksia [16727]	Vulnerable	Species or species habitat likely to occur within area
Banksia verticillata Granite Banksia, Albany Banksia, River Banksia [8333]	Vulnerable	Species or species habitat likely to occur within area
Caladenia harringtoniae Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat likely to occur within area
Caladenia winfieldii Majestic Spider-orchid [64504]	Endangered	Species or species habitat may occur within area
Chordifex abortivus Manypeaks Rush [64868]	Endangered	Species or species habitat known to occur within area
Conostylis misera Grass Conostylis [21320]	Endangered	Species or species habitat likely to occur within area
Darwinia collina Yellow Mountain Bell [17296]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Darwinia oxylepis Gillam's Bell [13188]	Endangered	Species or species habitat may occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Isopogon uncinatus Albany Cone Bush, Hook-leaf Isopogon [20871]	Endangered	Species or species habitat known to occur within area
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Microtis globula South-Coast Mignonette Orchid [6780]	Vulnerable	Species or species habitat likely to occur within area
Sphenotoma drummondii Mountain Paper-heath [21160]	Endangered	Species or species habitat likely to occur within area
Verticordia fimbriolepis subsp. australis Southern Shy Featherflower [24630]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur

Name	Threatened	Type of Presence within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur

Name	Threatened	Type of Presence within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area

Name	Threatened	Type of Presence
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

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

Extra Information

State and Territory Reserves		[Resource Information]
Name	State	
Bakers Junction	WA	
Bon Accord Road	WA	
Green Island	WA	
Gull Rock	WA	
Mill Brook	WA	
Mount Mason	WA	
Unnamed WA23923	WA	
Unnamed WA30791	WA	
West Mount Mason	WA	

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur

Name	Status	Type of Presence
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		within area Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large- leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area
Nationally Important Wetlands		[Resource Information]
Name		State
Oyster Harbour		WA

Caveat

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

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

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

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

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-34.923031 117.932119,-34.922222 117.935982,-34.924509 117.935982,-34.924509 117.937226,-34.935134 117.937269,-34.935064 117.933707,-34.929892 117.933664,-34.929892 117.931819,-34.923137 117.931819,-34.923031 117.932162,-34.923031 117.932119

Acknowledgements

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

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

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

Please feel free to provide feedback via the [Contact Us](#) page.

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NatureMap Species Report

Created By Guest user on 08/05/2017

Kingdom Animalia
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method By Line
Vertices 34° 55' 22" S, 117° 55' 55" E 34° 55' 18" S, 117° 56' 10" E 34° 50' 07" S, 117° 56' 10" E 34° 50' 07" S, 117° 56' 00" E 34° 55' 52" S, 117° 56' 01" E 34° 55' 52" S, 117° 55' 55" E 34° 55' 22" S, 117° 55' 55" E
Group By Family

Family	Species	Records
Accipitridae	1	2
Anatidae	1	131
Apodidae	1	1
Ardeidae	3	04
Atrichornithidae	1	3
Balaenopteridae	1	1
Charadriidae	4	105
Cheloniidae	1	4
Cinelocomatidae	1	1
Dasyornithidae	1	1
Dasyuridae	1	2
Dermochelyidae	1	1
Diomedelidae	2	2
Elapidae	1	1
Falconidae	2	5
Geotridae	1	4
Lamnidae	1	1
Laridae	1	2
Macropodidae	2	4
Megapodiidae	1	1
Meropidae	1	7
Muridae	1	0
Odontaspidae	1	1
Otaridae	2	5
Peramelidae	2	40
Phaethonidae	1	1
Phycetidae	1	3
Procellariidae	3	7
Pseudocheiridae	1	00
Psittacidae	3	308
Scolopacidae	17	337
Thylacomyidae	1	1
Tytonidae	1	1
TOTAL	63	1131

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Accipitridae				
1.	24200 <i>Falco haliaeetus subsp. cristatus</i> (Osprey)		IA	
Anatidae				
2.	24328 <i>Oxyura australis</i> (Blue-billed Duck)		P4	
Apodidae				
3.	25554 <i>Apus pacificus</i> (Fork-tailed Swift, Pacific Swift)		IA	
Ardeidae				
4.	25558 <i>Ardea ibis</i> (Cattle Egret)		IA	
5.	41324 <i>Ardea modesta</i> (Eastern Great Egret)		IA	
6.	24345 <i>Botaurus poiciloptilus</i> (Australasian Bittern)		T	
Atrichornithidae				
7.	24358 <i>Atrichornis clamosus</i> (Noisy Scrub-bird)		T	
Balaenopteridae				
8.	24048 <i>Balaenoptera musculus subsp. brevicauda</i> (Pygmy Blue Whale)		T	
Charadriidae				
9.	25575 <i>Charadrius leschenaultii</i> (Greater Sand Plover)		IA	
10.	25570 <i>Charadrius mongolus</i> (Lesser Sand Plover)		T	

NatureMap is a collaborative project of the Department of Parks and Wildlife and the Western Australian Museum.



Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
11.	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)		IA	
12.	24383 <i>Pluvialis squatarola</i> (Grey Plover)		IA	
Cheloniidae				
13.	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
Cinclosomatidae				
14.	24388 <i>Psophodes nigrogularis</i> subsp. <i>nigrogularis</i> (Western Whipbird (western heath))		T	
Dasyornithidae				
15.	24440 <i>Dasyornis longirostris</i> (Western Bristlebird)		T	
Dasyuridae				
16.	24002 <i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T	
Dermochelyidae				
17.	25340 <i>Dermochelys coriacea</i> (Leatherback Turtle)		T	
Diomedeidae				
18.	30830 <i>Diomedea exulans</i> subsp. <i>exulans</i> (Snowy Albatross)		T	
19.	44007 <i>Thalassarche melanophris</i> (Black-browed Albatross)		T	
Elapidae				
20.	25200 <i>Elapognathus minor</i> (Short-nosed Snake)		P2	
Falconidae				
21.	25024 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
22.	24475 <i>Falco peregrinus</i> subsp. <i>macropus</i> (Australian Peregrine Falcon)		S	
Geotriidae				
23.	34030 <i>Geotria australis</i> (Fouched Lamprey)		P1	
Lamnidae				
24.	34031 <i>Carcharodon carcharias</i> (Great White Shark)		T	
Laridae				
25.	24523 <i>Sterna caspia</i> (Caspian Tern)		IA	
Macropodidae				
26.	24133 <i>Macropus irma</i> (Western Brush Wallaby)		P4	
27.	24145 <i>Setonix brachyurus</i> (Quokka)		T	
Megapodiidae				
28.	24557 <i>Leipoa ocellata</i> (Malleefowl)		T	
Meropidae				
29.	24508 <i>Merops ornatus</i> (Rainbow Bee-eater)		IA	
Muridae				
30.	24215 <i>Hydromys chrysogaster</i> (Water-rat, Rakali)		P4	
Odontaspidae				
31.	34034 <i>Carcharias taurus</i> (Grey Nurse Shark)		T	
Otariidae				
32.	24208 <i>Arctocephalus forsteri</i> (New Zealand fur-seal, long-nosed fur-seal)		S	
33.	24210 <i>Neophoca cinerea</i> (Australian Sea-lion)		T	
Peramelidae				
34.	25478 <i>Isodon obesulus</i> (Southern Brown Bandicoot)		P4	
35.	24153 <i>Isodon obesulus</i> subsp. <i>fusciventer</i> (Quenda, Southern Brown Bandicoot)		P4	
Phaethontidae				
36.	24003 <i>Phaethon rubricauda</i> (Red-tailed Tropicbird)		P4	
Physeteridae				
37.	24073 <i>Physeter macrocephalus</i> (Sperm Whale)		T	
Procellariidae				
38.	24000 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
39.	24712 <i>Puffinus carneipes</i> (flesh-footed shearwater, fleshy-footed shearwater)		T	
40.	24715 <i>Puffinus huttoni</i> (Hutton's Shearwater)		T	
Pseudocheiridae				
41.	24100 <i>Pseudocheirus occidentalis</i> (Western Ringtail Possum)		T	
Psittacidae				
42.	24731 <i>Calyptorhynchus banksii</i> subsp. <i>naso</i> (Forest Red-tailed Black-Cockatoo)		T	
43.	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)		T	
44.	24734 <i>Calyptorhynchus latirostris</i> (Garnaby's Cockatoo (short-billed black-cockatoo), Garnaby's Cockatoo)		T	

NatureMap is a collaborative project of the Department of Parks and Wildlife and the Western Australian Museum.



Department of Parks and Wildlife





Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Scolopacidae				
45.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
46.	25730 <i>Arenaria interpres</i> (Ruddy Turnstone)		IA	
47.	24770 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
48.	24780 <i>Calidris alba</i> (Sanderling)		IA	
49.	25738 <i>Calidris canutus</i> (Red Knot)		IA	
50.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
51.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
52.	24780 <i>Calidris subminuta</i> (Long-toed Stint)		IA	
53.	24700 <i>Calidris tenuirostris</i> (Great Knot)		T	
54.	30032 <i>Limosa lapponica</i> (Bar-tailed Godwit)		IA	
55.	24708 <i>Numenius madagascariensis</i> (Eastern Curlew)		T	
56.	25742 <i>Numenius phaeopus</i> (Whimbrel)		IA	
57.	24802 <i>Philiomachus pugnax</i> (Ruff)		IA	
58.	24803 <i>Tringa brevipes</i> (Grey-tailed Tattler)		P4	
59.	24800 <i>Tringa glareola</i> (Wood Sandpiper)		IA	
60.	24808 <i>Tringa nebularia</i> (Common Greenshank)		IA	
61.	24800 <i>Tringa stagnatilis</i> (Marsh Sandpiper)		IA	
Thylacomyidae				
62.	24108 <i>Macrotis lagotis</i> (Bilby, Dalgyle)		T	
Tytonidae				
63.	24855 <i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i> (Masked Owl (southern subsp.))		P3	

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 wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap Species Report

Created By Guest user on 08/05/2017

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	By Line
Vertices	34° 55' 23" S, 117° 55' 55" E 34° 55' 23" S, 117° 55' 54" E 34° 55' 18" S, 117° 50' 10" E 34° 50' 00" S, 117° 50' 15" E 34° 50' 07" S, 117° 50' 00" E 34° 55' 52" S, 117° 50' 01" E 34° 55' 52" S, 117° 55' 55" E 34° 55' 23" S, 117° 55' 54" E
Group By	Family

Family	Species	Records
Asparagaceae	3	37
Droseraceae	1	0
Ericaceae	8	22
Fabaceae	3	3
Goodeniaceae	1	2
Haloragaceae	2	2
Juncaceae	1	1
Malvaceae	1	2
Myrtaceae	5	7
Orchidaceae	5	22
Pleurophacaceae	1	0
Poaceae	2	5
Proteaceae	11	44
Recifonaceae	1	0
Rhamnaceae	2	3
Rutaceae	1	8
Stylidiaceae	1	2
TOTAL	49	178

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Asparagaceae				
1.	1302 <i>Laxmannia jamesii</i> (James' Paperbilly)		P4	
2.	1332 <i>Thysanotus gageoides</i>		P3	
3.	1330 <i>Thysanotus isantherus</i>		P4	
Droseraceae				
4.	3000 <i>Drosera fimbriata</i> (Manypeaks Sundew)		P4	
Ericaceae				
5.	0301 <i>Andersonia auriculata</i>		P3	
6.	0310 <i>Andersonia grandiflora</i> (Red Andersonia)		P4	
7.	0310 <i>Andersonia setifolia</i>		P3	
8.	41737 <i>Andersonia</i> sp. <i>Jamesii</i> (J. Liddelow 84)		P4	
9.	0355 <i>Leucopogon alternifolius</i>		P3	
10.	33370 <i>Leucopogon altissimus</i>		P3	
11.	0384 <i>Leucopogon cymbiformis</i>		P2	
12.	0400 <i>Lysinema lasianthum</i>		P4	
Fabaceae				
13.	3407 <i>Acacia prismifolia</i>		X	
14.	3700 <i>Bossiaea divaricata</i>		P4	
15.	13113 <i>Chorizema carinatum</i>		P3	
Goodeniaceae				
16.	10050 <i>Goodenia</i> sp. <i>South Coast</i> (A.R. Annelis ARA1840)		P3	
Haloragaceae				
17.	0102 <i>Gonocarpus pusillus</i>		P4	
18.	0100 <i>Gonocarpus simplex</i>		P4	
Juncaceae				
19.	14031 <i>Juncus meianthus</i>		P2	
Malvaceae				

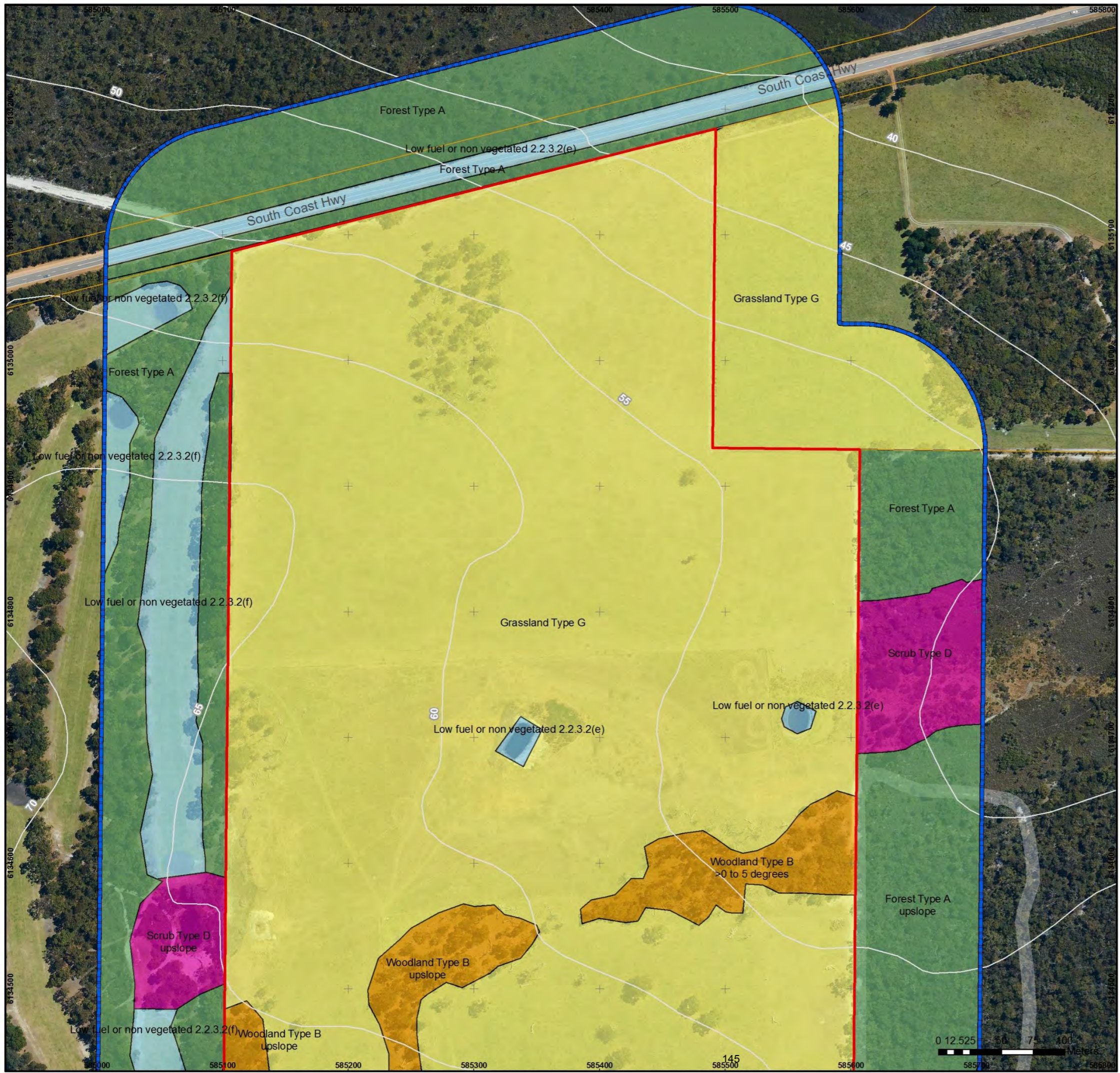
	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
	20.	5100	<i>Thomasia solanacea</i>		P4
Myrtaceae					
	21.	42620	<i>Actartea transversa</i>		P2
	22.	5710	<i>Eucalyptus newbeyi</i> (Beaufort Inlet Mallee)		P3
	23.	12424	<i>Verticordia fimbriolepis</i> subsp. <i>australis</i>		T
	24.	0085	<i>Verticordia harveyi</i> (Autumn Featherflower)		P4
	25.	12431	<i>Verticordia huegellii</i> var. <i>tridens</i>		P3
Orchidaceae					
	26.	12035	<i>Corybas abditus</i>		P3
	27.	12040	<i>Corybas limpidus</i>		P4
	28.	13035	<i>Drakaea micrantha</i>		T
	29.	1050	<i>Microtis globula</i> (South-coast Mignonette Orchid)		T
	30.	1717	<i>Thelymitra variegata</i> (Queen of Sheba)		P2
Pleurophascaceae					
	31.	10002	<i>Pleurophascum occidentale</i>		P4
Poaceae					
	32.	25863	<i>Lachnagrostis billardierei</i> subsp. <i>billardierei</i>		P3
	33.	35300	<i>Foa billardierei</i>		P3
Proteaceae					
	34.	10670	<i>Adenanthos x cunninghamii</i>		P4
	35.	32170	<i>Banksia acuminata</i>		P4
	36.	1800	<i>Banksia brownii</i> (Feather-leaved Banksia)		T
	37.	1818	<i>Banksia goodii</i> (Good's Banksia)		T
	38.	32085	<i>Banksia seneciifolia</i>		P4
	39.	32084	<i>Banksia serra</i> (Gerrate-leaved Dryandra)		P4
	40.	12220	<i>Hakea lasiocarpa</i>		P3
	41.	2100	<i>Hakea oldfieldii</i>		P3
	42.	12008	<i>Isopogon buxifolius</i> var. <i>buxifolius</i>		P2
	43.	2242	<i>Isopogon uncinatus</i>		T
	44.	2327	<i>Synaphea preissii</i>		P3
Restionaceae					
	45.	17705	<i>Chordifex abortivus</i>		T
Rhamnaceae					
	46.	4833	<i>Spyridium spadicum</i>		P4
	47.	10704	<i>Stenanthemum cubilneare</i>		P2
Rutaceae					
	48.	4412	<i>Boronia craspedes</i>		P3
Stylidiaceae					
	49.	7080	<i>Stylidium articulatum</i> (Stout Triggerplant)		P2

Conservation Codes
 T - Rare or likely to become extinct
 X - Presumed extinct
 I1 - 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 wholly 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 G

Bushfire Mapping



REPORT ITEM DIS046 REFERS

This BAL Plan was prepared by:
 Kathryn Kinnear, Bio Diverse Solutions
 Accreditation No: BPAD30794
 Jurisdiction: Level 2 - WA



29 Hercules Crescent
 Albany, WA 6330
 Australia
 Tel: 08 9842 1575
 Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Subject Site
 - 100m Assessment Boundary
 - Crushing & Screening Extents
 - Cadastre
 - 5m Contours
- Vegetation
- Forest Type A
 - Woodland Type B
 - Shrubland Type C
 - Scrub Type D
 - Grassland Type G
 - Low fuel or non vegetated 2.2.3.2

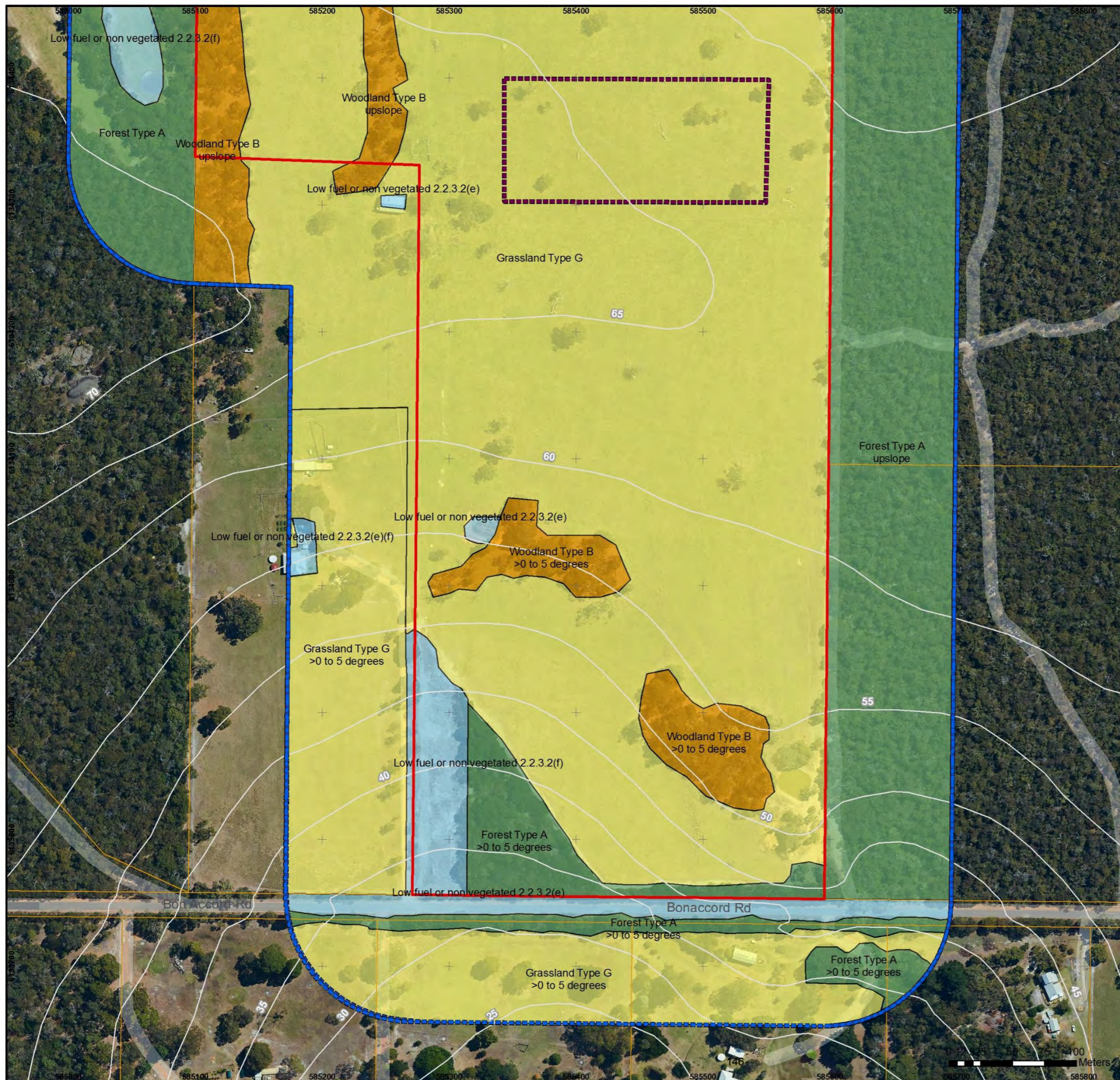


Scale
 1:3,000 @ A3
 GDA MGA 94 Zone 50

Data Sources
 Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT
 Gary Howie
 Lot 56 Bon Accord Road
 Lower King, WA 6330

Vegetation Classes - North		
BAL Assessor KK	QA Check KK	Drawn by BT
STATUS FINAL	FILE MSC0143	DATE 15/08/2017



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Overview Map Scale 1:100,000

Legend

- Subject Site
 - 100m Assessment Boundary
 - Crushing & Screening Extents
 - Cadastre
 - 5m Contours
- Vegetation
- Forest Type A
 - Woodland Type B
 - Shrubland Type C
 - Scrub Type D
 - Grassland Type G
 - Low fuel or non vegetated 2.2.3.2



Scale
 1:3,000 @ A3
 GDA MGA 94 Zone 50

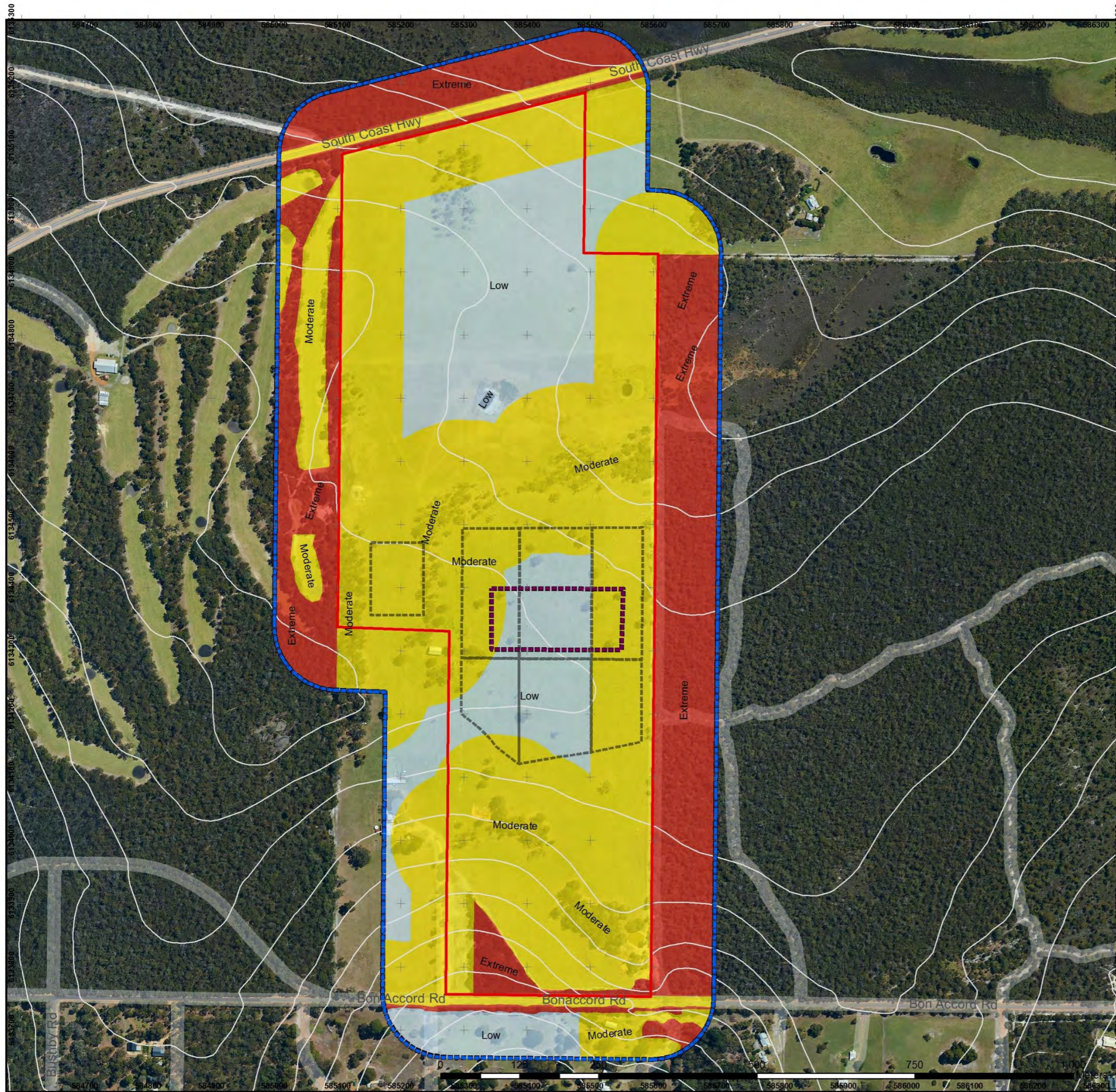
Data Sources
 Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT

Gary Howie
 Lot 56 Bon Accord Road
 Lower King, WA 6330

Vegetation Classes - South

BAL Assessor KK	QA Check KK	Drawn by BT
STATUS FINAL	FILE MSC0143	DATE 15/08/2017



REPORT ITEM DIS046 REFERS

This BAL Plan was prepared by:
 Kathryn Kinnear, Bio Diverse Solutions
 Accreditation No: BPAD30794
 Jurisdiction: Level 2 - WA



29 Hercules Crescent
 Albany, WA 6330
 Australia
 Tel: 08 9842 1575
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Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- Crushing & Screening Extents
- Development Area
- 5m Contours

- BHL**
- Extreme
 - Moderate
 - Low



Scale
 1:6,000 @ A3
 GDA MGA 94 Zone 50

Data Sources
 Aerial Imagery: SLIP Virtual Mosaic WMS Service, Landgate 2017
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT
 Gary Howie
 Lot 56 Bon Accord Road
 Lower King, WA 6330

BHL Mapping

BAL Assessor KK	QA Check KK	Drawn by BT
STATUS FINAL	FILE MSC0143	DATE 15/08/2017

CITY OF ALBANY LOCAL PLANNING SCHEME No. 1

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
1.	<p>Supports the proposal</p>	<p>No objections on the basis that those opposing it will be the first to complain when gravel is needed to fix roads.</p> <p>The rehabilitation on the present pit is absolutely great. Has made good useless rocky ground into serviceable land for agriculture.</p>
2.	<p>Adjoining landowner has no objections to the proposal being approximately 90 metres from their dwelling, which is on the adjacent site.</p>	<p>The City of Albany’s Extractive Industry Policy requires that there is a 200 metre setback from dwellings not on the subject site. Although the adjoining owner has no objections to the decreased buffer, staff recommend that the setback is increased to 200 metres and the applicant has since agreed.</p>
3	<p>Safety of road users due to the increase in vehicle movements combined with the existing road conditions of Bon Accord / Prideaux Roads as detailed below:</p> <p>a) <u>Current conditions of Bon Accord and Prideaux Road</u></p> <ul style="list-style-type: none"> • Too narrow to accommodate additional heavy traffic • Two trucks/cars cannot pass at the same time • Trucks will take up the whole road width to turn into the subject lot • Proximity of proposed access to residential access points • Blind crest at the intersection of Bushby Road and Bon Accord Road. 	<p>Bon Accord Road was initially proposed as the haulage route due to a restrictive covenant preventing vehicular access directly onto South Coast Highway. The City has met with Main Roads WA who have since revised their initial advice and have now agreed to grant temporary access directly onto South Coast Highway subject to the following conditions.</p> <ul style="list-style-type: none"> • A Memorandum of Understanding is signed between the landowner and Main Roads with

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
	<ul style="list-style-type: none"> • Vehicular access onto Lower King Road is already busy • Blind bend to the west of Bon Accord Road – poor visibility • Location of proposed access is dangerous • Bon Accord constructed to residential standards not industrial • The applicant should have to widen and maintain the road at their cost. • Access should be via South Coast Highway <p>b) <u>Safety concerns due increased traffic</u></p> <ul style="list-style-type: none"> • Concerns with the increased number of heavy vehicle movements in addition to the existing current mix of trucks, tourist vehicles, private vehicles and school bus. • Safety of non-vehicular traffic (i.e. children walking to bus stop, bike riders, horse riders etc) • Spillage from trucks causing slippage • Truck numbers are not monitored or enforced. • Trucks speeding • Wear and tear of road. <p>c) <u>School bus route / children walking to and from bus stop / route used as part of commute to Grammar School.</u></p> <ul style="list-style-type: none"> • Requests that the City of Albany place a curfew on truck movements while the school bus is running 	<p>respect to length of time of use and, the volume and type of trucking entering and leaving the site.</p> <ul style="list-style-type: none"> • A suitable bond is posted by the land owner to cover the future cost of the removal of the driveway and the reinstatement of the road reserve. • A maintenance agreement to prevent transport of clay, gravel or sand onto the road surface of South Coast Highway is signed by the land owner • The design and location of the access crossover, including gate set back and gate type is approved by Main Roads • All other vehicular access to Lot 56, excluding trucks employed in extraction of gravel, shall utilise the existing access on Bon Accord Road. <p>It is considered that direct access onto South Coast Highway mitigates all concerns raised in relation to Bon Accord Road being the primary access. Therefore, officers recommend that a condition be applied to any approval which restricts vehicles associated with the extractive operation having direct access from the site onto Bon Accord Road.</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
4	<p>General amenity of the area and lifestyle of residents being impacted by noise, dust, vibrations and other emissions from trucks and on-site operations. Proximity to residential area and visual amenity.</p> <p>a) Noise, dust and vibrations (on-site and truck movements) and proximity to a residential area</p> <ul style="list-style-type: none"> • Peace and quiet will be destroyed • Location of screening/crushing area on top of the hill will amplify the noise • Location of access and the incline will result in further noise • Use not compatible with the adjacent Special Rural zone. • Residential not industrial area • Residential use is a sensitive land use • Not meeting the EPA buffers • Proposed buffers not adequate <p>b) Visual amenity – will be visually obtrusive</p> <ul style="list-style-type: none"> • Existing pit has scarred the landscape • Reflects badly on the City of Albany • Can be viewed from Whale World 	<p>a) The subject site is zoned General Agriculture and under the Local Planning Scheme No. 1, an extractive industry is a use that can be considered within this zone. An extractive industry is a common use on Priority and General Agriculture zoned land.</p> <p>The <i>Extractive Industry and Mining Policy</i> requires that buffer distances are to be in accordance with the setbacks outlined within the Environmental Protection Authority requirements. The Environmental Protection Authority’s Separation Distances between Industrial and Sensitive Land Uses guidelines do not set out a specific buffer for this type of extraction, however the policy states 200 metres should be achieved between dwellings not on the subject property.</p> <p>In response to the concerns raised, the proponent has since agreed to increase the setbacks. A revised plan has been received.</p> <p>In relation to the nominated extraction areas, the closest dwelling to the west is 200 metres and the closest dwelling to the south is 500 metres.</p> <p>In relation to the nominated screening and crushing area, the closest dwelling to the west is 313 metres and closest dwelling to the south is 648 metres. It should be noted The Department of Environment Regulation is the responsible</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>body for the assessment of the emissions and buffers for screening and crushing plants. The applicant is responsible for ensuring that they have the required licences from DER prior to undertaking this activity onsite.</p> <p>It is considered that the Dust and Noise Management Plan, in conjunction with the increased setbacks from dwellings and revised access onto South Coast Highway mitigate any potential amenity issues raised during the submission period.</p> <p>b) The subject site is suitably screened with vegetation. In addition to this, earth bunds will be erected to act as a screen on the edges of each stage.</p>
5	<p>Health and safety concerns due to dust, ongoing noise, vibrations and other emissions, drinking water being contaminated and mental health.</p> <p>a) Ongoing dust, noise, fumes, gaseous, odour, vibrations will impact health of residents, including mental health and pre-existing respiratory conditions.</p> <p>b) Drinking water being contaminated</p>	<p>a) The proposed operation times would be 7.00am to 6.00pm (Monday to Friday), which is less than the permitted operation times for Extractive Industries.</p> <p>A dust and noise management plan have been submitted.</p> <p>A water truck is available when dust suppression is required.</p> <p>As a further dust mitigation measure, the applicant proposes to extract during the months of July to October when the ground is moist/damp.</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>The pit area is screened by a significant amount of vegetation. In addition to this, topsoil will create earth bunds screening the pit from Bon Accord Road.</p> <p>The <i>Extractive Industry and Mining Policy</i> requires that buffer distances are to be in accordance with the setbacks outlined within the Environmental Protection Authority requirements. The Environmental Protection Authority's Separation Distances between Industrial and Sensitive Land Uses guidelines do not set out a specific buffer for this type of extraction, however the policy states 200 metres should be achieved between dwellings not on the subject property.</p> <p>In response to the concerns raised, the proponent has since agreed to increase the setbacks. A revised plan has been received.</p> <p>In relation to the nominated extraction areas, the closest dwelling to the west is 200 metres and the closest dwelling to the south is 500 metres.</p> <p>In relation to the nominated screening and crushing area, the closest dwelling to the west is 313 metres and closest dwelling to the south is 648 metres. It should be noted The Department of Environment Regulation is the responsible body for the assessment of the emissions and</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>buffers for screening and crushing plants. The applicant is responsible for ensuring that they have the required licences from DER prior to undertaking this activity onsite.</p> <p>It is considered that the measures with the Dust and Noise Management Plan, in conjunction with the increased setbacks from dwellings and revised access onto South Coast Highway mitigate any potential amenity issues raised during the submission period.</p> <p>b) The Department of Health state that unless adequately treated, rainwater is not reliably safe to drink, it is almost impossible to completely protect rainwater from contamination. However, our advice is that installing screens, filters and first flush devices will reduce contamination if people are using rainwater for this purpose.</p>
6	<p>Environmental concerns in relation to proximity and impact on adjoining reserves (dieback, weeds, threatened flora and fauna), water run-off and impact on water ways (acid sulphate soils) clearing of vegetation and mosquito spread.</p> <p>a) Proximity to adjoining reserve</p> <ul style="list-style-type: none"> • Impact on flora and fauna – threatened species (Green Pitcher Orchid, Red Tail cockatoos) • Spread of dieback • Spread of weeds – Sydney Golden Wattle 	<p>a) The proponents have submitted a Dieback, Weed, Surface Water and Drainage Management Plans.</p> <p>The proposal and specific concerns raised were referred to the relevant departments.</p> <p>Advice from the City of Albany's Reserve team was that the spread of dieback and impact on the flora and fauna was minimal. They have</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
	<p>b) Water contamination</p> <ul style="list-style-type: none"> • Contamination of drinking water – residents rely on rainwater • Contamination of waterways • Surface water will impact adjoining neighbours • Acid Sulphate soils are present and will impact the waterways <p>c) Mosquito breeding</p> <p>d) Clearing of vegetation</p>	<p>recommended the following condition be applied to the approval, should it be granted:</p> <p><i>Control (spray) or remove all weed infestations from around the extraction pit and ensure vehicles are brushed/washed down prior to entering the pit if they have been at a site affected by weeds, to avoid introducing weeds to the pit area.</i></p> <p>The proposal was referred to the Department of Biodiversity, Conservation and Attractions (formerly DPAW) who have stated that they have no objections to the proposal as it presents no direct impact on biodiversity conservation values as the area under the application is pasture and no native vegetation will be impacted. They recommend that as the gravel cannot be considered as dieback free that the following advice be applied:</p> <p><i>The basic raw material source from this pit may contain Phytophthora dieback disease and should be used with due caution in areas where susceptible plant species and vegetation occur, in particular, locations where threatened flora are known to occur and roads that area promoted as “flora roads”.</i></p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>b) The setback from the waterway is approximately 176 metres, which meets the required 50 metres under the Extractive Industry and Mining Local Planning Policy.</p> <p>The proposal was referred to the Department of Water who is the responsible body for assessing the risk to the waterways. They have no objections to the proposal and were satisfied that the surface water management issues were satisfactorily addressed within the Environmental Assessment Report and that there are no ground water issues on the site.</p> <p>Should the proposal be supported, it is recommended that it is conditioned that cut-off drains are constructed surrounding the pit to ensure all run-off is contained on-site.</p> <p>The Department of Health state that unless adequately treated, rainwater is not reliably safe to drink, it is almost impossible to completely protect rainwater from contamination. However, our advice is that installing screens, filters and first flush devices will reduce contamination if people are using rainwater for this purpose.</p> <p>c) The proposal was referred to the City of Albany's Environmental Health Department who have provided the following advice:</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p><i>The subject land is in a region that experiences significant problems with nuisance and disease carrying mosquitoes. The design, construction and maintenance of this development are to be completed so as to ensure that no additional mosquito breeding sites are produced.</i></p> <p>d) The subject site is currently under pasture. No vegetation is proposed to be cleared as part of the proposal.</p> <p>It is considered that the Dust, Dieback, Weed and Surface Water Management Plans, in conjunction with cut-off drains will mitigate any concerns in relation to environmental concerns.</p>
7	<p>Impact on surrounding land uses – Golf club, Reserve, Art Gallery, Holiday Accommodation, families and peoples enjoyment of the reserve. Does not meet the intent of the zone</p>	<p>The proposal was referred to the City of Albany’s Reserves team who have advised that it is unlikely that the proposal will have any impact on the reserve.</p> <p>The closest nominated extraction area is approximately 510 metres from the golf club house and approximately 80 metres to the nearest fairway. It is believed that there is sufficient vegetation screening the site from the adjoining use.</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>The closest registered holiday accommodation is located in excess of 1000 metres to the south east.</p> <p>Given the change in access and setbacks, the operation is unlikely to have a detrimental impact on any current or future art galleries or other tourism related uses within the vicinity of the proposal.</p> <p>Overall officers believe the proposed setbacks in conjunction with the existing vegetation sufficiently mitigate any concerns raised in relation to the proximity to the golf club.</p> <p>The subject site is zoned 'General Agriculture' and the objectives of the zone are as follows:</p> <ul style="list-style-type: none"> • <i>Provide for the sustainable use of land for agricultural and rural activities;</i> • <i>Support complementary land uses where those land uses do not detract from adjoining agricultural and rural activities and are compatible with the character and amenity of the area;</i> • <i>Prevent land uses and development within the zone that may adversely impact on the continued use of the zone for agricultural and rural purposes;</i>

CITY OF ALBANY LOCAL PLANNING SCHEME No. 1 REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<ul style="list-style-type: none"> • <i>Provide for value-adding opportunities to agricultural and rural products on-site; and</i> • <i>Provide for tourism experiences where those developments do not impact upon adjoining agricultural and rural land uses.</i> <p>The subject site is zoned General Agriculture and under the Local Planning Scheme No. 1, an extractive industry is a use that can be considered within this zone. An extractive industry is a common use on Priority and General Agriculture zoned land.</p>
8	Future agricultural uses will be impacted with the removal of subsoil	<p>The applicant is removing the gravel layer so that the land can be better used for pasture and planting.</p>
9	Impact on property value	<p>Property value is not a valid planning concern.</p>
10	Compliance – concerns that the existing pits are non-compliant and conditions of approval are not enforced by the City of Albany.	<p>All extractive industries are subject to an annual inspection, prior to their renewal of the license. This ensures that the operation is being undertaken in accordance with the planning</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

SCHEDULE OF SUBMISSIONS AND MODIFICATIONS

Note: This is a broad summary of the submissions only. A copy of the submissions in full have been provided to the Councillors as a separate document.

No.	Summary of submission.	Officer Comment
		<p>approval and license. If the operator is not operating in accordance with their license, it is</p> <p>withheld until such a time that they do. It is an offence to operate without a current license.</p> <p>The City of Albany also requires a bond to be paid per hectare, to ensure that rehabilitation is undertaken to satisfaction of the City of Albany.</p> <p>It should be noted that the lack of compliance, if any, is not a relevant planning matter for consideration, each application must be considered on its own merit in good faith.</p>
11	Aboriginal / European Heritage	<p>This site is currently not listed with the Department of Aboriginal Affairs as a place of Aboriginal heritage significance. The proposal was however referred to the department of Aboriginal Affairs who have provided the following advice:</p> <p><i>No objections however the DAA recommends that developers within the area of the proposal take into consideration the DAA's Aboriginal Heritage Due Diligence Guidelines when</i></p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

Industry – Extractive (Gravel) – Lot 56 Bon Accord Road, Kalgan

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No.	Summary of submission.	Officer Comment
		<p><i>planning specific developments associated with the proposal.</i></p> <p>Due to a number of specific concerns raised during the submission period in relation to Aboriginal heritage, the proposal was re-referred to the Department of Aboriginal Affairs. The Department of Aboriginal Affairs stated that although it is recommended that the proponent <i>takes into consideration the DAA's Aboriginal Heritage Due Diligence Guidelines when planning specific developments associated with the proposal</i> provides, requested that the proponent sought local knowledge in regards to the specific concerns raised.</p> <p>Staff met with local Noongar representatives on-site to discuss the specific issues raised during the submission period. A consensus was made on-site that there were no Aboriginal Heritage matters and therefore the proposed development was considered acceptable. The applicant did request that the representatives had an input in relation to the location of the access leg due to the wetlands.</p> <p>A concern was raised that the application made no mention of the adjacent farmhouse which is nearly 100 years old. There are no heritage listed properties within the immediate vicinity.</p>

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No.	Summary of submission.	Officer Comment
12	<p>Life of pit and extent of resource is being underestimated resulting in extra truck movements</p> <ul style="list-style-type: none"> • Lifespan will exceed the proposed 5 years due to the amount of resource onsite. • Estimated volume of resource is inaccurate, which therefore increases the truck movements • Depth of extraction will exceed the 700mm 	<p>The proposal is for a period of 5 years, and should the proposal be supported then the temporary approval would reflect this time. Should the resource not be exhausted within this time, the applicant would be required to reapply. The proposal would be readvertised and would be required to meet the relevant legislation at that time.</p> <p>The in ground volume (Bank Cubic Metres) is the bulk volume of the material which is naturally compacted in the ground. Once aerated the material expands and the volume is essentially increased (referred to as LCM - Loose Cubic Metres).</p> <p>The proposed volume of resource to be extracted per year is anticipated to be 10,000 (BCM) tonnes, however this could increase to 15,000 (BCM) tonnes in times of high demand. It should be noted that these are estimates only.</p> <p>Based on the revised area (10.94ha), the following calculation has been used to work out to the estimated truck movements:</p> <ul style="list-style-type: none"> • 110,000m² (area) x 500mm depth (average) = 77,000 LCM

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		<ul style="list-style-type: none"> • 77,000 LCM / 12.5m3 (m3 that a Semi Tipper carries) • Total number of trips via a semi tipper over the 5 year period = 6,160 trips • 6,160 / 15 (loads per day) = 411 days @ 15 loads per day to remove entire LCM estimated resource. • 411 days / 5 years = 82 days per year where 15 truckloads will be removed off-site. <p>Based on the calculation above, it is considered that the estimated 15 loads (30 movements per day) is accurate.</p> <p>The depth of the resource the proponent intends to extract within the nominated extraction areas varies from 0mm to 700mm. The estimated proposed maximum depth of extraction is 700mm. Class two extractive industries can be considered with a depth of extraction of up to 3 metres, therefore the proposed depth is considered acceptable.</p>
13	<p>Inaccurate information within application and fact sheet supplied was misleading</p> <ul style="list-style-type: none"> • Communication with residents was not adequate – a 30 x 30cm sign is not sufficient • Fact sheet misleading 	<p>The full application lodged contained two key parts. The proposal (which is what we seek public comment on) and then also a full Environmental Assessment Report with associated maps (soils,</p>

CITY OF ALBANY LOCAL PLANNING SCHEME No. REPORT ITEM DIS046 REFERS

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No.	Summary of submission.	Officer Comment
	<ul style="list-style-type: none"> • Full application was not readily made available • Property address is wrong • Environmental report bias and highly flawed – number of overlays incorrect • Impact on further subdivision • Common Law of Nuisance and Negligence can be applied both to the persons causing such nuisance and possible to the persons approving the application having knowledge of such nuisance and therefore acting with negligence. The COA owes residents a Duty of Care and breached that duty of care resulting in lost capital and right to use and quiet enjoyment of their land. 	<p>bushfire, hydrology, wetlands, vegetation, database searches etc).</p> <p>In accordance with Schedule 2, clause 64 (3) of the <i>Planning and Development (Local Planning Schemes) Regulations 2015</i>, the City of Albany advertised the proposal for 21 days. Advertising involved referral to approximately 130 nearby lots and agencies, a sign on-site and a notice on the City of Albany website.</p> <p>The fact sheet was an additional attachment to the proposal prepared by the City and was accompanied by a dated cover letter. The intent of the fact sheet was to summarise the proposal briefly and answer frequently asked questions only. Fact sheets have been found to be an effective tool in informing residents on proposals of this nature.</p> <p>All stakeholders that were consulted (approximately 130 lots) received a covering letter, fact sheet, a copy of the proposed development/site plan and all the associated management plans. The stakeholders who were believed to be impacted the most received the full 77 page proposal with Environmental Report. Although the Environmental Report was not sent to all stakeholders, it was made clear that it was available on the City of Albany’s website or also at the City of Albany offices.</p>

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No.	Summary of submission.	Officer Comment
		<p>The City and relevant departments are satisfied with the accuracy of the information. It should be noted that a details such as volume and truck movements are estimated only.</p>
14	<p><u>Non-compliant with the City of Albany’s Community Strategic Plan and Albany’s Transport Network Strategy (2003)</u></p> <ul style="list-style-type: none"> • Specifically the objectives in relation to: • Protect and enhance our natural environment • To advocate for and support “green initiatives” within our region • We will listen our community and deliver outcomes that reflect their needs and expectations • Engage effectively with our community 	<p>In the case of a land use proposal, the City of Albany <i>Local Planning Scheme No 1</i> is the relevant statutory document to determine the appropriateness of a proposal.</p> <p>The subject site is zoned General Agriculture and under the <i>Local Planning Scheme No. 1</i>, an extractive industry is a use that can be considered within this zone. An extractive industry is a common use on Priority and General Agriculture zoned land.</p> <p>The proposal was advertised for public comment for a period of 21 days, in accordance with clause 9.4 – <i>Advertising of Applications of Local Planning Scheme No. 1</i>.</p>
15	<p><u>Common Law – nuisance and negligence</u></p>	<p>In conjunction with the access being off South Coast Highway, staff are satisfied that the concerns raised within the submissions can be mitigated through appropriate planning conditions or through the appropriate buffers.</p>

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No.	Summary of submission.	Officer Comment
16	<p>Department of Water – No objections</p> <p><i>The gravel extraction area is situated over a ridgeline on the property, which is a catchment divide. Surface water from stages 1-3 will shed overland to the south of the property in the King River catchment, where there is no defined waterway. Stages 4-7 are located in the Johnson Creek catchment. Surface water will drain to the north, to a minor swale, which forms a minor tributary in the reserve to the east of the property. Surface water management issues are satisfactorily addressed in the Environmental Assessment Report. There are no ground water issues on the site.</i></p> <p><i>The DOW is satisfied that the water resources will be managed appropriately during the gravel extraction process and thus has no objections to the proposal.</i></p> <p>Note: A number of concerns were raised in relation to environmental impacts. These concerns were re-referred to the Department of Water. The Department had no further comment in relation to these concerns and were satisfied with their previous advice.</p>	<p>This advice will form a planning condition should the proposal be supported.</p>
17	<p>Main Roads WA: Revised advice in relation to access being off South Coast Highway</p> <p><i>No objections subject to the following conditions:</i></p> <ul style="list-style-type: none"> • <i>A Memorandum of Understanding is signed between the landowner and Main Roads with respect to length of time of use and, the volume and type of trucking entering and leaving the site.</i> • <i>A suitable bond is posted by the land owner to cover the future cost of the removal of the driveway and the reinstatement of the road reserve.</i> 	<p>This advice will form a planning condition should the proposal be supported.</p>

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	<ul style="list-style-type: none"> • <i>A maintenance agreement to prevent transport of clay, gravel or sand onto the road surface of South Coast Highway is signed by the land owner</i> • <i>The design and location of the access crossover, including gate set back and gate type is approved by Main Roads</i> • <i>All other vehicular access to Lot 56, excluding trucks employed in extraction of gravel, shall utilise the existing access on Bon Accord Road.</i> 	
18	<p>Department of Agriculture and Food:</p> <p><i>Advises that the land on and surrounding Lot 56 is identified under the Lower Great Southern Strategy as Priority Agricultural Land (PAL). Land Capability mapping, available for view on NR-Info (http://maps.agric.wa.gov.au/nrm-info/) also identifies the land area, at a regional scale assessment, as having a moderate to high capability for Annual and Perennial Horticulture.</i></p> <p><i>In considering the application to extract gravel from Lot 56 Bon Accord Road, DPIRD has no objection, on the basis that:</i></p> <ul style="list-style-type: none"> • <i>The staged extraction plan presented will be followed.</i> • <i>Dust and noise control measures included in the plan will be adhered to.</i> • <i>Control measures for water use / movement are included to prevent erosion on or off-site.</i> • <i>Site rehabilitation proposed after extraction activity will be completed and monitoring of rehabilitation is maintained to ensure success and prevention of erosion hazard.</i> • <i>The Weed Management Plan satisfies DPIRD guidelines.</i> 	Noted
19	<p>Department of Parks and Wildlife</p> <p><i>No objections –</i></p> <ul style="list-style-type: none"> • <i>Presents no direct impact on biodiversity conservation values as the area under the application is pasture and no native vegetation will be impacted. It must be noted</i> 	This advice will form a planning condition should the proposal be supported.

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	<p><i>however that the gravel extracted from the pit cannot be considered dieback free as there are no indicator species present to be able to assess the dieback status of the gravel.</i></p> <ul style="list-style-type: none"> <i>It is recommended that a condition or notification be placed on the licence that clearly states that basic raw material source from this pit may contain Phytophthora dieback disease and should be used with due caution in areas where susceptible plant species and vegetation occur, in particular, locations where threatened flora are known to occur and roads that area promoted as “flora roads”.</i> 	
20	<p>Department of Mines and Petroleum:</p> <p>No objections -</p> <ul style="list-style-type: none"> A continuing supply of low-cost basic raw materials is an important part of maintaining the lifestyle and infrastructure that all Western Australians enjoy. 	Noted
21	<p>Department of Environment Regulation:</p> <p><i>No objections however provides the following advice:</i></p> <ul style="list-style-type: none"> <i>A works approval is to be obtained before constructing the prescribed premises</i> <i>The purpose of the works approval is to allow DWER to assess the environmental acceptability of a proposal’s potential to cause emissions and discharges against standards and policies. Any works approval or licence issued under Part V of the EP Act will only regulate emissions associated with the crushing and screening operation (such as dust, noise and contaminated stormwater). It does not extend to the environmental impacts of extracting the material from the ground or transport off-site.</i> 	
22	<p>Department of Aboriginal Affairs –</p>	<p>Staff met with local Noongar representatives on-site to discuss the specific issues raised during the submission period. A consensus was made on-site</p>

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No.	Summary of submission.	Officer Comment
	<p><i>No objections however the DAA recommends that developers within the area of the proposal take into consideration the DAA's Aboriginal Heritage Due Diligence Guidelines when planning specific developments associated with the proposal. These guidelines have been developed to assist proponents to identify any risks to Aboriginal Heritage and to mitigate risk where heritage sites may be present. These guidelines are available at: https://www.daa.wa.gov.au/heritage/land-use/</i></p> <p>The proposal was re-referred after specific concerns were raised in relation to Aboriginal heritage. The DAA provided the following advice:</p> <p>There are currently no reported Aboriginal heritage places identified within the proposal area of Lot 56 Bon Accord Road, Kalgan. Based on the information held by the AHD currently, no approvals under the <i>Aboriginal Heritage Act 1972</i> (AHA) are required.</p> <p>The AHD is aware of two Aboriginal heritage surveys which intersect portions of this area.</p> <p>Goode, B. 2005. Kinjarling, the Place of the Rain: The City of Albany and Department of Indigenous Affairs Aboriginal heritage Survey. Ferguson, W. 1985. A Mid-Holocene Depopulation of the Australian Southwest. Vol. 1 (PhD Thesis).</p> <p>No specific Aboriginal heritage places were identified within the area of the proposal as a result of these surveys. However, it should be noted that both these surveys were for areas larger than the area of the proposal and are not specifically focussing on the proposal area.</p> <p>The Aboriginal Heritage Directorate (AHD) of the Department of Planning Lands and Heritage advises developers to undertake due diligence using the Aboriginal Heritage Due Diligence Guidelines to assess the risk of the proposal in regards to Aboriginal heritage.</p>	<p>that there were no Aboriginal Heritage matters and therefore the proposed development was considered acceptable. The applicant did request that the representatives had an input in relation to the location of the access leg due to the wetlands.</p> <p>Staff recommend the following conditions be applied should the proposal be supported:</p> <ul style="list-style-type: none"> • The Aboriginal Heritage Directorate (AHD) of the Department of Planning Lands and Heritage advises developers to undertake due diligence using the Aboriginal Heritage Due Diligence Guidelines to assess the risk of the proposal in regards to Aboriginal heritage. • The proponent shall liaise with Main Roads and the Noongar community in regards to the exact details of internal access.

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	The proponent is recommend providing the South West Aboriginal Land and Sea Council notification of the proposal and to seek their comment.	
23	Public Transport Authority – No objections – Any truck movements in this area will have minimal impact on our services.	Noted
24	<p>City of Albany Reserves –</p> <p>Surface water contours fall away from stage 5 and 6 towards the adjacent City reserve R18779 to the east. The reserve is dieback free/protectable. It is reasonable to assume that dieback may be present in the soil on the subject lot and therefore, all attempts should be made to ensure that all surface water and soil is contained on the subject lot and not have the potential to infect adjacent healthy bushland.</p> <p>It is also worth noting that there are three patches of the protected <i>Banksia coccinea</i> populations in the reserve R18779 to the east. There are also two historical recordings of threatened flora <i>Chordifex abortivus</i>. It is unlikely that any negative impacts will occur to these populations as a direct result of the extractive industry, as long as any potential cross boundary dieback spread is controlled.</p> <p>Recommends the following condition be applied: Control (spray) or remove all weed infestations (including Gorse) from around the extraction pit and ensure vehicles are brushed/washed down prior to entering the pit if they have been at a site affected by weeds, to avoid introducing weeds to the pit area.</p>	<p><i>Noted. The following conditions will be applied:</i></p> <ul style="list-style-type: none"> • <i>Surface water to remain on-site</i> • <i>Minimum setback of 20 metres from reserve</i> • <i>Control (spray) or remove all weed infestations (including Gorse) from around the extraction pit and ensure vehicles are brushed/washed down prior to entering the pit if they have been at a site affected by weeds, to avoid introducing weeds to the pit area.</i>

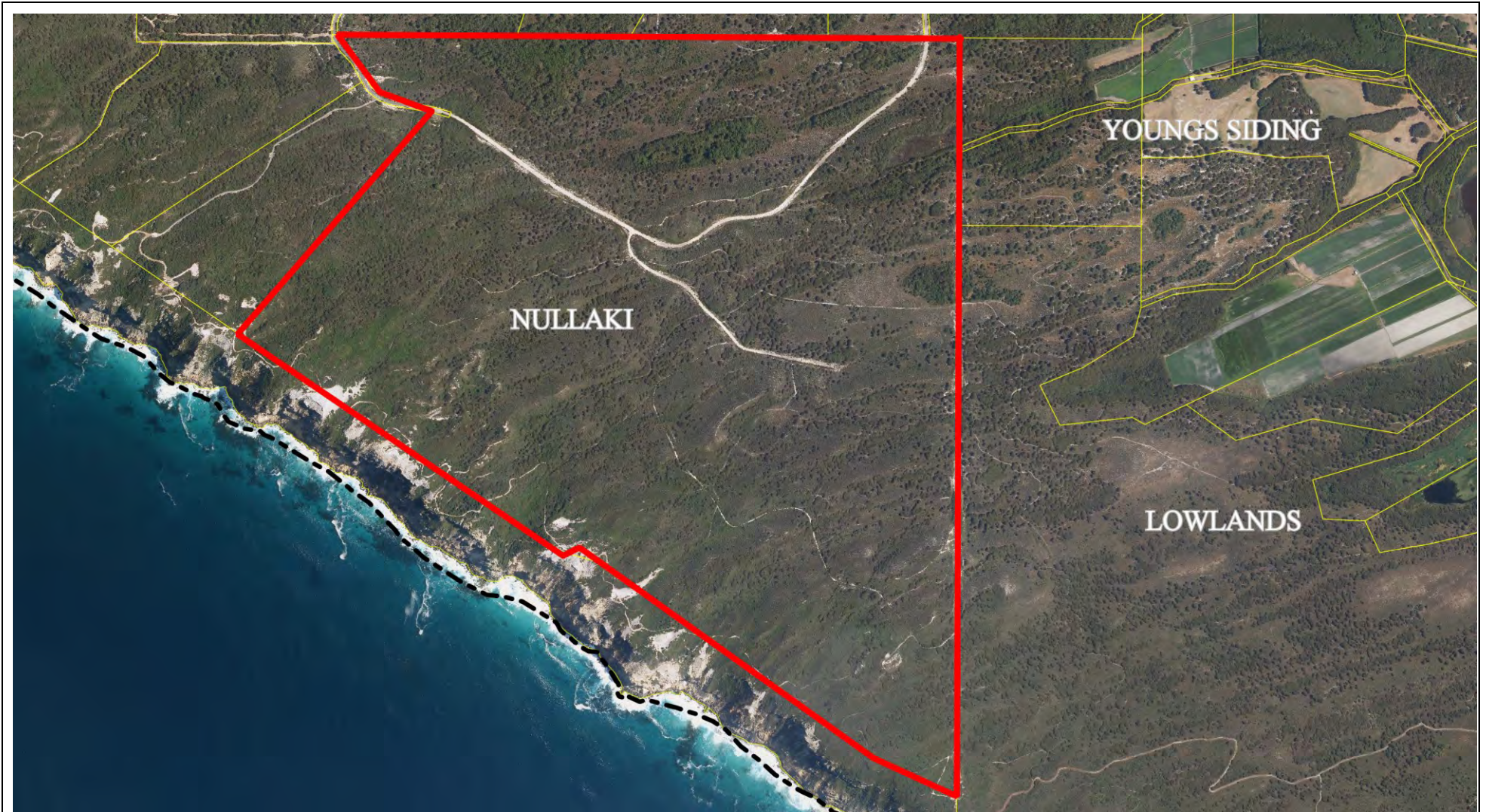


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Area Plan

1:40000





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Site Plan

1:20000



Development Application for an Extractive Industries Licence (Lime Pit)



Lot 9005 Rock Cliff Circle, Nullaki

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1 Preliminary

1.1 Introduction

This report has been prepared by Sam Williams on behalf of Mr Graeme Robertson the proponent of the proposed development on a portion of Lot 9005 Rock Cliff Circle, Nullaki Peninsula, Albany (the site). Sam Williams has prepared this following report in support of an Application for Approval to Commence Development for an Industry Extractive Use (Extractive Industry- Lime Pit) and Extractive Industry Licence on the site for the extraction of limestone. The limestone will be crushed on site and carted for the application of crushed lime for agricultural purposes.

This report will discuss various elements pertinent to the proposal, including:

- Site Details.
- Proposed Development.
- Statutory Planning Framework.
- Strategic Framework.
- Relevant Supporting Documentation.

1.2 Background

A significantly small portion of the site contains a rehabilitated lime pit, which was previously used by the proponent for limestone extraction during the development of the Nullaki Peninsula for road construction purposes.

The site comprises the balance parent title of the original Nullaki Peninsula development, which represents a land area of 432ha, of which the proposed lime pit comprises 7.5ha or 1.7% of the site.

1.2.1 Nullaki Wilderness Association

In developing the Nullaki Peninsula the proponent/developer created the Nullaki Wilderness Association. This was established as a pseudo body corporate, in which the owners of lots on the Nullaki provided funds that provided for the environmental upkeep of the Nullaki. This included the maintenance of a vermin proof fence and gates on the Nullaki Peninsula, trapping and baiting programmes for feral animals and general maintenance of tracks and fire access ways.

Whilst successful in generating the environmental objectives of the Nullaki Conservation zoning, the provision of funds to the Nullaki Wilderness Association has diminished, as

3

landowners on the developed and sold lots are no longer willing to make funds available for the required environmental works on the Nullaki Peninsula. The required environmental works to maintain the environmental attributes of the Nullaki Peninsula are being undertaken completely at the cost and good will of the proponent of this Development Application, who also developed the Nullaki Peninsula. Currently, whilst the developer/proponent is willing to provide the required funds there is no guarantee this will be continued in perpetuity.

1.2.2 Subdivision Application

The site is currently subject to a proposed subdivision application, which seeks to create 11 additional conservation lots. A copy of the proposed *Plan of Subdivision* is included as **Appendix 1**.

All proposed lots, with the exception of proposed Lots 4 and 6, are subject to strict environmental controls by way of a conservation covenant recently applied to the parent title Lot 9005. Lots 4 and 6 will comprise circa 90ha and are located at the eastern end of the proposed subdivision area. All lots will also be subject to the existing conservation provisions of the LPS1, which provide specific future development requirements within the conservation zone.

The subdivision application is currently with the Western Australian Planning Commission (WAPC) for assessment and determination, noting this proposed Development Application for Extractive Industry has been prepared on the basis the subdivision application will be supported. Irrespective, the area identified for the lime pit constitutes a small portion of area within proposed Lots 4 and 6 and can be developed independently if required in the unlikely event the subdivision proposal is delayed or refused.

2 Site details

2.1 Legal description

Table 1 provides a description of the land subject to the proposed development.

Table 1: Existing title particulars:

Lot Description	Volume	Folio	Area
Lot 9005 on Plan52008	2653	12	432ha

Refer **Appendix 2** for a copy of the Certificate of Title.

2.2 Regional Context

The site is located within the municipality of the City of Albany (The City), on the Nullaki Peninsula. It is approximately 10 km south east from Denmark town site on the Nullaki Peninsula. Refer to **Figure 1**- Regional Context Plan.

2.3 Local Context

The proposed lime pit is situated in the south eastern corner of Lot 9005. To the south of the lime pit are sheer cliffs adjacent to the Southern Ocean. To the east, separated by the vermin proof fence is Reserve 17464 vested in the City of Albany and associated with the Nullaki campsite and Lake Sadie.

A portion of the Bibbulmun Track traverses Reserve 17464 to the east of the proposed lime pit. Given the significant undulation of the land, the small scale of the proposed lime pit operation, the remnant vegetation and the distance of the lime pit from the Bibbulmun Track there is no possibility of the lime pit being visible from the Bibbulmun track (refer **Figure 2**- surrounding land use)

To the north and west are vegetated blocks that form part of the Rock Cliff Circle subdivision. These lots address Eden Road and Rock Cliff Circle.

Currently the closest dwelling to the proposed Lime Pit is 2.3km, with the next closest being 2.8km. In placing this in context, the recently closed lime pit at the Shire of Denmark is 1km away from tourist accommodation and residential dwellings in a density far exceeding the development of the Nullaki Peninsula.

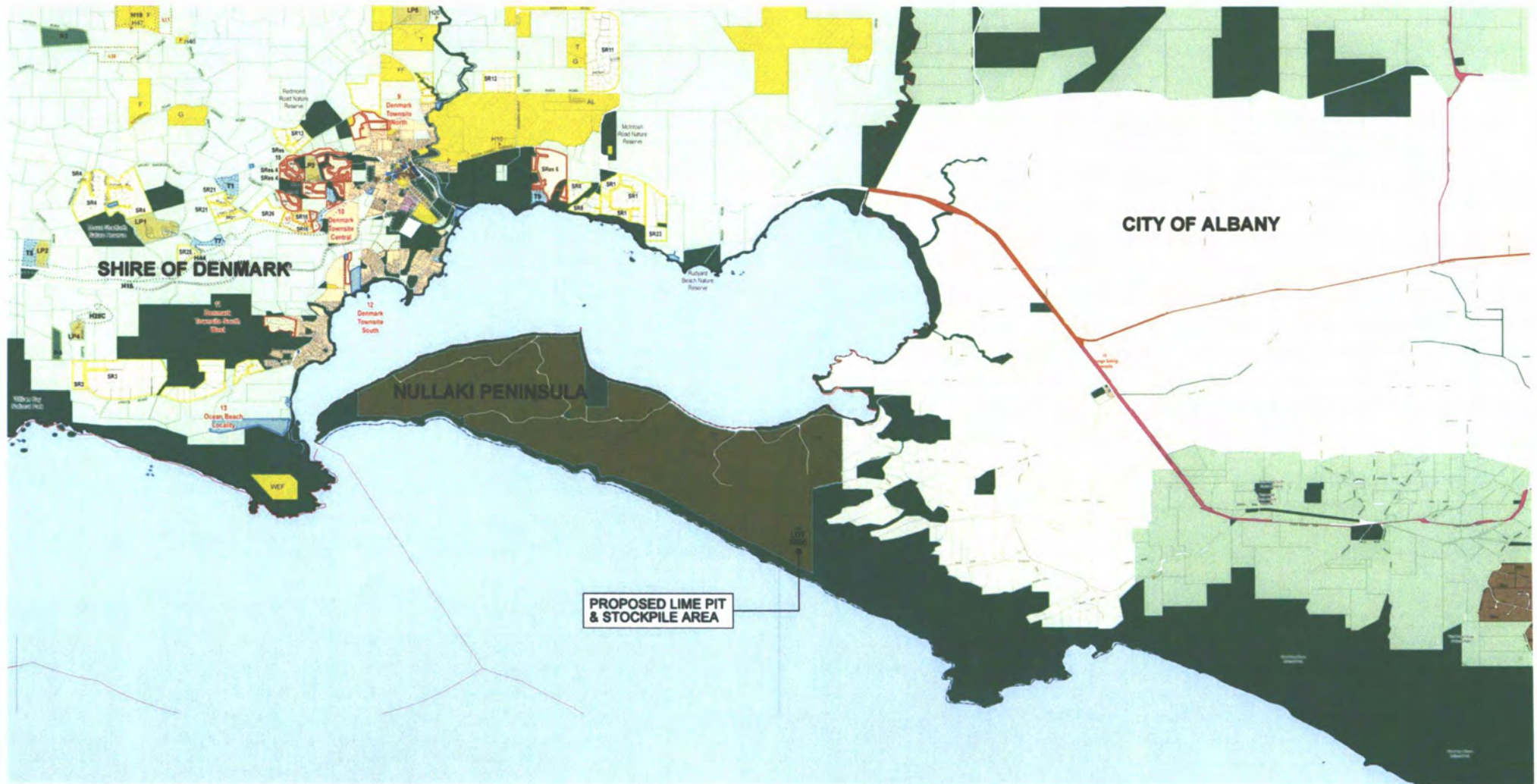


FIGURE 1 - REGIONAL CONTEXT PLAN
LOT 9005 NULLAKI PENINSULA, NULLAKI ALBANY



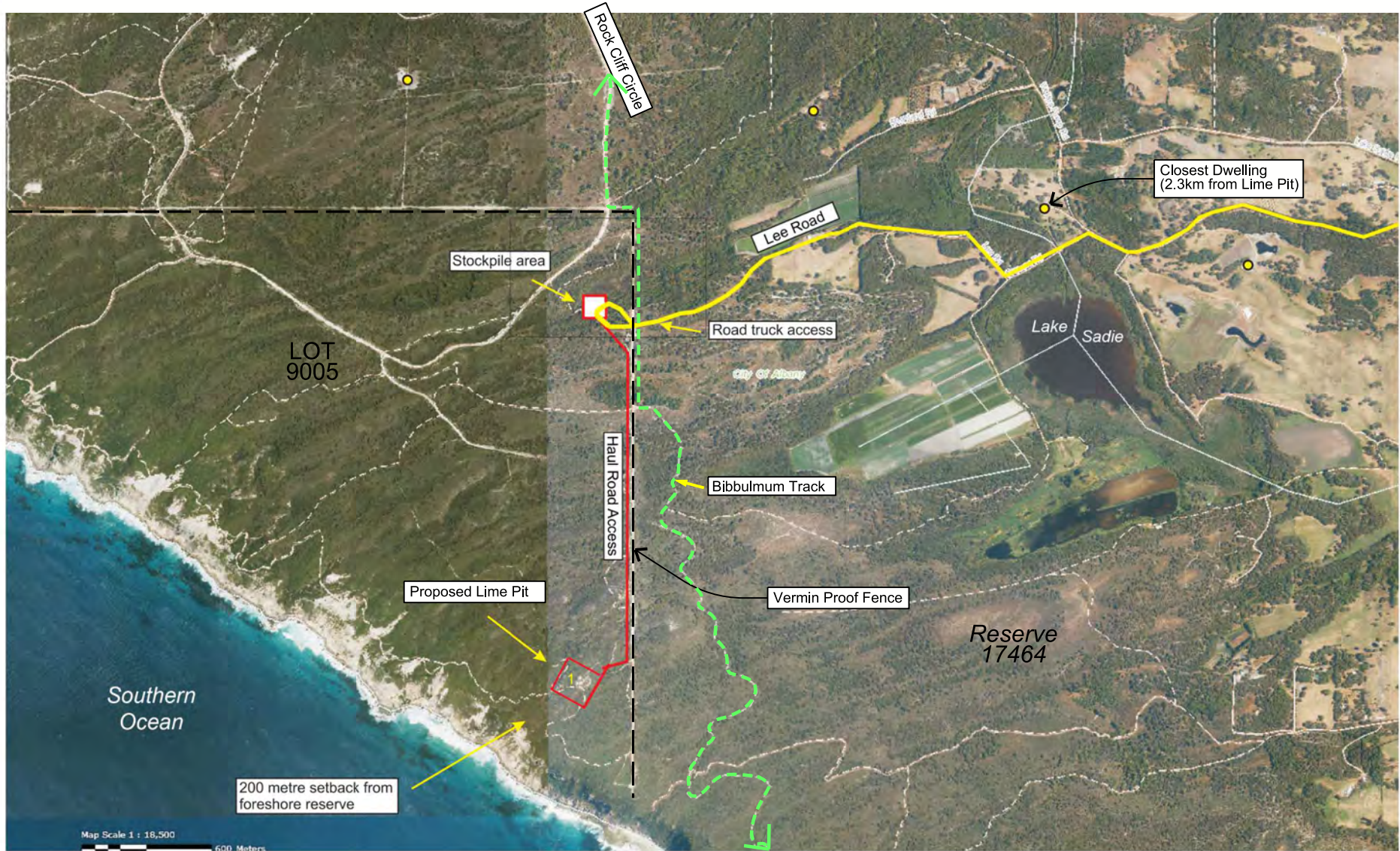


FIGURE 2 - SURROUNDING LANDUSE
LOT 9005 NULLAKI PENINSULA, NULLAKI ALBANY



2.4 Land use and topography

The site is currently vacant and comprises remnant vegetation.

The site is undulating with the lime pit located on a high point, not visible from the surrounding locality. Pictures 1 and 2 below illustrate the immediate location of the lime pit. Furthermore, as the lime pit will be extracted any visibility will be significantly lessened. Picture 3 illustrates the gradient separation from the eastern boundary of the site (the limestone track) to the adjoining Reserve 17464.



Picture 1- Location of proposed lime pit looking towards the North East. Note the ridge line, which will provide a visual barrier to the lime pit.



Picture 2- Location of the proposed lime pit looking towards the South East to the Southern Ocean.



Picture 3- The Eastern boundary of Lot 9005 as defined by the Vermin Proof Fence looking towards the north at Wilson Inlet. Note the high point of the site in relation to the Reserve 17464 to the east.

*Development Application for Extractive Industries Licence -Lime Pit
Lot 9005 Rock Cliff Circle, Nullaki*

3.0 Proposed Development

The lime pit will enable high quality lime for agricultural use to be extracted from a small 7.5ha portion of the site on proposed Lot 6 and subsequently stockpiled within a designated 2ha storage area on proposed Lot 4 (refer **Figure 3- Development Layout Plan**). The extracted material will be carted from the extraction site to the stockpile via a limestone base constructed road located on the eastern boundary of Lot 9005 (refer **Picture 2**). Extraction is anticipated to commence at around 20,000 tonnes per year rising to 50,000 tonnes per year. Refer **Appendix 3 Excavation and Rehabilitation Management Plan**, prepared by Landform Research, which details the excavation process of the proposed lime pit.

Extracted crushed lime will be carted from the site via Lee Road. Whilst the Gazetted Lee Road Reserve currently extends to the eastern boundary of the site, it is only constructed to a gravel finish approximately 1.25km east of the site. As part of the development of the lime pit the proponent, at his cost, will construct Lee Road to a finished gravel standard. Furthermore, subject to the continual operation of the lime pit, the proponent will undertake to upgrade Lee Road at a rate of 500m a year.

To date minor exploration work has been completed for the proposed lime pit including the preparation of access tracks and drill platforms. In time, and following completion of all extraction, the site will be rehabilitated in accordance with the direction afforded under the *Excavation and Rehabilitation Management Plan (Appendix 3)* which details within Part 5.9 the rehabilitation measures proposed.

It is expected the lime pit will have a 20-year lifetime, ceasing operation in approximately 2037. The lime pit will also be required to operate in accordance with the conditions of any Extractive Industry Licence issued by the City under the City's *Extractive Industries Local Law 2009*.

The proposal has been supported, in principal, by the Department of Agriculture & Food, acknowledging the short supply of quality lime sources within the region (refer **Appendix 4**). The limestone on Lot 9005 is highly suitable for agriculture use as it neutralises the acidity of soils, and in addition it can also be used in the construction of road base.

Operations are intended to be undertaken in accordance with the recommendations of the supporting technical reports, included as Appendices within this application

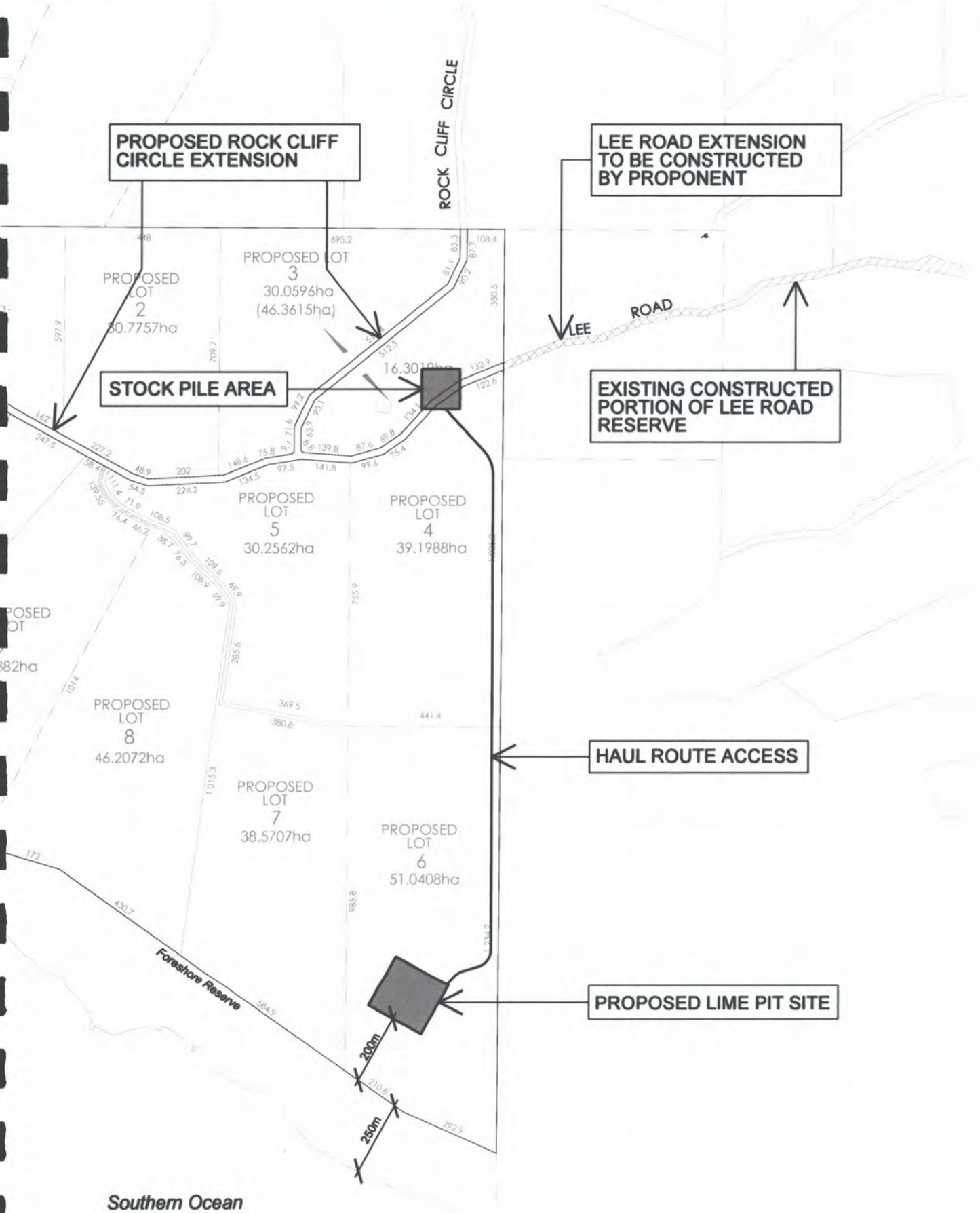


FIGURE 3 - DEVELOPMENT LAYOUT PLAN
 LOT 9005 NULLAKI PENINSULA, NULLAKI ALBANY



4.0 Environmental Consideration

The site will comprise a significantly small footprint on the Nullaki Peninsula (1.7% of Lot 9005 and 0.33% of the total Peninsula) and will have minimal environmental impact. Furthermore, the proponent will be contributing the lesser of 5% of revenue from the lime pit operation or \$30,000 per financial year to the Nullaki Wilderness Association. This money will be used to maintain and protect the environmental attributes of the Nullaki Peninsula for the duration of the lime pit.

With respect to the Environmental consideration for the proposed lime pit, Martin Bowman-Environmental Scientist, has prepared an environmental assessment of the site and undertaken discussion with the Environmental Protection Authority (EPA). The findings from this report and outcomes of discussion with the EPA will be presented as a separate addendum to this report. At the time of preparing this report, Martin Bowman was able to confirm there will be minimal to no environmental impacts resultant from the lime pit and the EPA did not raise any specific objection to the proposal.

5.0 Planning framework

The following documents outline the strategic planning framework applicable to the subject site.

5.1 City of Albany Local Planning Scheme No.1

Under the City of Albany Local Planning No.1 (LPS1), the site is zoned CZ1 – “Nullaki Peninsula Conservation Zone”.

LPS1 currently allows limited land uses activities to occur on site, with all of these requiring planning approval from the City of Albany. Various other development controls, relating to Land Use, Fire Safety, Roads and Access, and Coastal and Foreshore Management also apply to the zone.

“Industry Extractive” is a use class not listed in accordance with the zoning of the site. However, Clause 5.2 of LPS1 is noted below, which states:

5.2 Variations to Site and Development Standards and Requirements

5.2.1 Except for development in respect of which the Residential Design Codes apply, if a development is the subject of an application for planning approval and does not comply with a standard or requirement prescribed under the Scheme,

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the Local Government may, despite that non-compliance, approve the application unconditionally or subject to such conditions as the Local Government thinks fit.

5.2.2 In considering an application for planning approval under this clause, where, in the opinion of the Local Government, the variation is likely to affect any owners or occupiers in the general locality or adjoining the site which is the subject of consideration for the variation, the Local Government is to—

(a) Consult the affected parties by following one or more of the provisions for advertising uses pursuant to clause 9.4; and

(b) Have regard to any expressed views prior to making its determination to grant the variation.

5.2.3 The power conferred by this clause may only be exercised if the Local Government is satisfied that—

(a) Approval of the proposed development would be appropriate having regard to the criteria set out in clause 10.2; and

(b) The non-compliance will not have an adverse effect upon the occupiers or users of the development, the inhabitants of the locality or the likely future development of the locality.

The criteria in Clause 10.2 state as follows:

10.2 MATTERS TO BE CONSIDERED BY THE LOCAL GOVERNMENT

The Local Government in considering an application for planning approval is to have due regard to such of the following matters as are in the opinion of the Local Government relevant to the use or development the subject of the application:

(a) The aims and provisions of the Scheme and any other relevant town planning schemes operating within the Scheme area;

(b) The requirements of orderly and proper planning including any relevant proposed new town planning scheme or amendment, or region scheme or amendment, which has been granted consent for public submissions to be sought;...

(i) The compatibility of a use or development with its setting;...

(l) The likely effect of the proposal on the natural environment and any means that are proposed to protect or to mitigate impacts on the natural environment;...

(o) The relationship of the proposal to development on adjoining land or on other land in the locality including but not limited to the likely effect of the height, bulk, scale, orientation and appearance of the proposal;...

(v) Whether adequate provision has been made for the landscaping of the land to which the application relates and whether any trees or other vegetation on the land should be preserved;...

(aa) Any other planning consideration the Local Government considers relevant."

In considering this, the general objective of the Conservation Zoning, and in particular the Nullaki Peninsula (CZ1) as prescribed in LPS1 is as follows:

4.2.18 Conservation Zone

(a) Provide for residential uses upon large lots adjoining significant environmentally sensitive areas such as coastal or conservation areas where there is a demonstrated commitment to protecting, enhancing and rehabilitating the flora, fauna and landscape qualities of the particular site; and

(b) Require innovative subdivision design and development controls to:

(i) Minimise visual impacts from subdivisional infrastructure, particularly roads;

(ii) Restrict access to any sensitive areas such as beaches, conservation areas or National Parks that adjoin the zone;

(iii) Prevent land uses and development that would adversely impact on the ecological values of the site for conservation purposes; and

(iv) Provide for the safety of future residents from the threat of wild fire.

2. Objectives of Conservation Zone 1

2.1 The purpose of CZ1 is to:

(a) Protect, enhance and rehabilitate the flora, fauna and landscape qualities of the Nullaki Peninsula;

(b) Provide for controlled public access to the Peninsula, the Wilson Inlet Foreshore and Anvil Beach; and

(c) Provide for limited wilderness retreat subdivision and development in a manner that is compatible with the conservation values of the Nullaki Peninsula.

Based on this, the following is established:

- LPS1 provides the ability for Council to determine a Development Application for a proposed development identified as a "Use Class Not Listed".
- In considering a Development Application for a "Use Class Not Listed", Council make a determination on the ability to deal with an Application in accordance with the intent of the underlying zoning of a landholding as prescribed under LPS1.
- For the site, the aim and provision under the CZ1 is to protect the environmental attributes of the Nullaki and provide for controlled development that is compatible with the conservation values of the Nullaki.

Given the above, should Council receive a Development Application that complements the Conservation zoning of the Nullaki, under their LPS1 they have the ability to deal with the application.

Whilst "Industry Extractive" is not a use class normally associated with Conservation zoned land, in the instance of the subject Development Application on the site an exception can be considered. As part of the approval of this Development Application for an Extractive Industry Licence request, the proponent's undertaking to contribute the lesser of 5% of the royalties from the extractive industry or \$30,000 per financial year, will facilitate in the protection of the environmental attributes of the Nullaki.

Currently there is no mechanism in place that guarantees funding for the Nullaki Wilderness Fund and hence the environmental attributes of the Nullaki. The Lime Pit will guarantee these funds and hence protect the environmental attributes of the Nullaki.

5.2 Strategic Planning Context

5.2.1 State Government – Strategic Policies and Guidelines

The WAPC policies and guidelines relevant to this amendment proposal are listed below.

5.2.1.1 Lower Great Southern Strategy 2016

The *Lower Great Southern Strategy* (LGSS) specifically supports the identification and staged use of basic raw materials and minerals within Section 2.9 Mineral Resources and Basic Raw Materials.

The issues of agricultural lime are specifically mentioned the LGSS in relation to the existing limestone quarry at Denmark being in an environmentally sensitive A Class Reserve and the need for a new resource. It is further noted the recently closed Denmark Quarry will be exhausted in 10 years. In this regard the following section is relevant:

2.9.2 Securing access to prospective mineral and basic raw material deposits

Limestone and lime sand are located along the coastal dunes, predominantly to the west of Albany, but access to extract from those areas is increasingly becoming constrained by other land uses. For example, extensions to the Ocean Beach limestone quarry at Denmark could provide long-term supplies of agricultural lime, but this is impeded by its location adjacent to a local government conservation reserve. Although there are other known deposits to the west, these are on private land and scope for mining is regarded as low by the Department of Mines and Petroleum. Geological interpretation and exploration may locate further sites for agricultural lime extraction similar in geological setting to the Ocean Beach deposit. Given the need for agricultural lime in the agricultural industry, funding of a strategic assessment of the prospect under the auspices of the State lime supply strategy is warranted.

This proposal has the potential to supply agricultural lime for the future and in line with the intentions of the LGSS.

5.2.1.2 State Planning Policy 2.0 – Environment and Natural Resources Policy

This policy provides for the protection of all natural resources under a number of sections. In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to *SPP 2.4 Basic Raw Materials* (see below), *State Gravel Strategy 1998* and *State Lime Strategy 2001*.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials. Part of Section 5.7 states:

Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.

Planning strategies, schemes and decision making should:

- ii. *Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 10 (2.4); Basic Raw Materials.*
- iii. *Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, within the *Excavation and Rehabilitation Management Plan*, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

5.2.1.3 State Planning Policy 2.4 – Basic Raw Materials (2000)

State Planning Policy 2.4 – Basic Raw Materials makes many statements on the intent and actions, which local authorities should use to protect and manage basic raw materials. It is restricted to the Perth and Peel Region but is the leading document with respect to guidance on the protection and staged use of basic raw materials including limestone.

Section 3.4 is very specific in explaining that basic raw materials need identification and protection because of increased urban expansion and conservation measures. Sections

3.4.5 and 3.4.6 recognise that environmental and amenity matters need to be considered.

There are specific provisions in Section 6.2 Local Planning Scheme Provisions, such as:

- *No support for the prohibition of extractive industries in zones that permit broad rural land uses.*
- *Not precluding the extraction of basic raw materials on land which is not identified as a Priority Resource Location, Key Extraction Area or Extraction Area (6.4.2).*

The proposal is consistent with SPP 2.4 in that it provides an opportunity to provide a product of a high quality in an area that is agriculturally based, and which will support the sustainable and economic opportunities associated with agricultural activities.

5.2.1.4 State Planning Policy 2.5 – Agricultural and Rural Land Use Planning

State Planning Policy No 2.5, Agricultural and Rural Land Use Planning (SPP2.5), makes provision for the extraction of basic raw materials.

SPP 2.5 states “sensitive land uses such as rural residential estates may limit or sterilise extraction of basic raw materials due to ongoing amenity concerns”

State Planning Policies are required to be considered under the Local Planning Schemes as is the “identification and protection” for staged use, of basic raw materials. The site is located in a remote and access restricted part of Albany, which provides few residential dwellings, and as such the location of the lime pit is consistent with the expectations of SPP 2.5.

Furthermore, the requirements for Basic Raw Material Extraction as stated in SPP2.5 have been adequately addressed in **Appendix 3- Excavation and Rehabilitation Management Plan.**

5.2.1.5 State Planning Policy 4.1 – State Industrial Buffer Policy

State Planning Policy 4.1 – State Industrial Buffer Policy discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise

management, tree planting and operational procedures, are used to mitigate and reduce impacts.

Surrounding Land Uses and Buffers

The site is remote and protected by a vermin proof fence along the eastern boundary of Lot 9005, which includes controlled gates. A number of Government Policies relate to buffer distances and the protection of basic raw materials. SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority (EPA) as the basis for a draft guideline on recommended buffer distances. These formed the basis of the EPA's *Guidance Statement Number 3, Separation Distance between Industrial and Sensitive Land Uses, June 2005* (the "EPA Guidance Statement No. 3").

The Environmental Protection Authority of South Australia recommends a 300 metre separation for a Quarry – Non-Blasting.

The EPA lists the generic buffers for sand and limestone pits as 300 – 500 metres depending on the extent of processing. A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable. The *EPA Guidance Statement No. 3* provides for a case by case separation, based on the potential impacts.

For limestone extraction a generic buffer is suggested of 300 – 500 metres with case by case assessment where grinding and milling are used. SPP 4.1 recommends that all land uses within 1,000 metres be considered. The design of the footprint and the operation have been designed to minimise any impacts outside the disturbance areas. As established, there are no dwellings within 1,000 metres of the proposed lime pit and stockpile area. The excavation of limestone from the site complies with these policies.

5.2.2 Local Government – Strategic Policies and Guidelines

5.2.2.1 Local Planning Strategy

The City's *Local Planning Strategy* (LPS) provides the vision to guide the future growth of the Albany and surrounding areas across a range of different disciplines and interests. One of the key planning objectives of the LPS as it relates to extractive industries is as follows:

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Mineral Resources and Basic Raw Materials – maximise opportunities to enable mineral and raw material exploration and extraction in accordance with accepted environmental standards.

Key actions to be undertaken include:

- *Establish appropriate planning controls in the LPS1 to protect significant mining and basic raw material resources from encroachment by incompatible uses*
- *Require preparation and implementation of management plans (including clean up and rehabilitation measures) for new mining and basic raw materials proposals.*

The proposal is consistent with the intentions of the LPS, as there are significant separation distances between the proposed lime pit and surrounding sensitive uses, and in addition the operation of the lime pit will require both Planning Approval and an Extractive Industry Licence to be issued by the City. As part of this proposal a *Rehabilitation Management Plan* will be required. Noting that one has been prepared (refer to **Appendix 3** the *Excavation and Rehabilitation Management Plan*, prepared by Landform Research), along with the proponents' previous successful rehabilitation of the original lime pit, support for the proposal on the basis that the environmental effects can be minimised and effectively mitigated, should be provided.

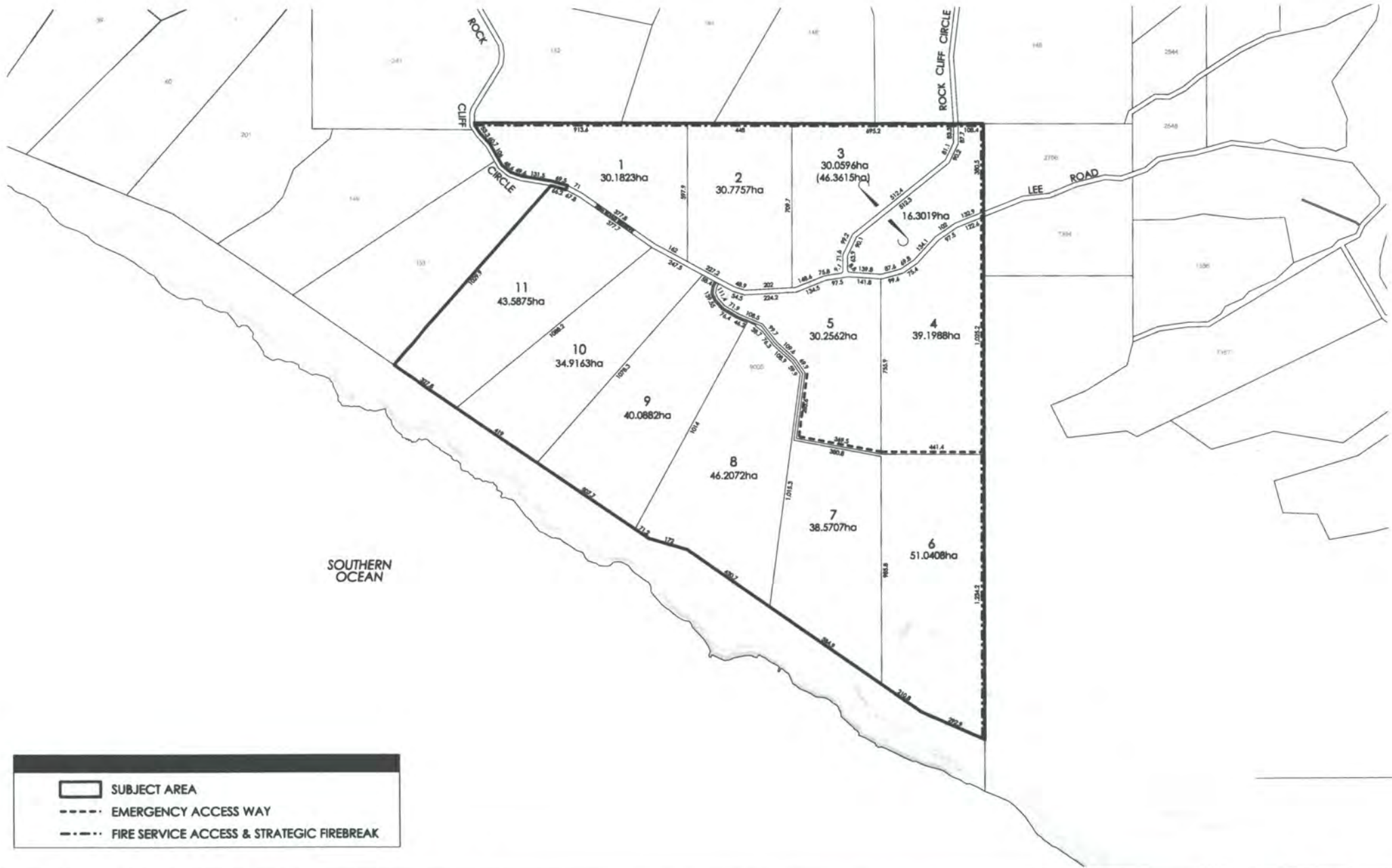
6.0 Conclusion

This Development Application for Extractive Industry Licence applies over a very small portion of the site, which has been identified as containing high quality limestone which is much needed for agricultural and road construction purposes. The proposal is supported in principle by the Department of Agriculture and Food and there is no preliminary objection from the EPA.

The proposal represents a small scale and a logical development opportunity for the City and one that will generate many direct and indirect benefits to the City and surrounding regions. Subject to appropriate management plans and best practice extraction methods being employed, as detailed within the *Excavation and Rehabilitation Management Plan*, it is expected there will be minimal long terms effects as a result of this proposal on the immediate and wider environment.

It has been established through the mechanism in LPS1 and the proposal for the provision of royalties towards environmental management that Council has the ability to deal with and approve this development application.

Appendix 1- Subdivision Application



AMENDED PLAN OF SUBDIVISION

LOT 9005 ROCK CLIFF CIRCLE, NULLAKI
WAPC REF: 152952



SAM WILLIAMS | TOWN PLANNER
ph: 0418 116216 | email: samwilliams@westnet.com.au
scale - 1:15 000 @ A3 | date - 17 Nov 2016
plan no.15-008-004

0m 500m

ALL AREAL DIMENSIONS & COLOUR LEVELS
DISPLAYED ARE SUBJECT TO DETAIL SURVEY



Appendix 2- Certificate of Title

WESTERN



AUSTRALIA

REGISTER NUMBER 9005/DP52008	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 16/5/2007

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2653** FOLIO **12**

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.


REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 9005 ON DEPOSITED PLAN 52008

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

GRAEME JAMES ROBERTSON OF POST OFFICE BOX 140, CLAREMONT
(AF K188013) REGISTERED 11 MAY 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *K205056 MORTGAGE TO BANK OF WESTERN AUSTRALIA LTD REGISTERED 25.5.2007.
2. *N360087 RESTRICTIVE COVENANT TO CONSERVATION AND LAND MANAGEMENT EXECUTIVE BODY AS TO PORTION ONLY - SEE DEPOSITED PLAN 406935. REGISTERED 21.6.2016.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP52008.
PREVIOUS TITLE: 2183-729.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: CITY OF ALBANY.

- NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING K205056
- NOTE 2: N358926 DEPOSITED PLAN (INTEREST ONLY) 406935 LODGED.

Appendix 3- Excavation and Rehabilitation Management Plan

Excavation and Rehabilitation
Management Plan

PROPOSED AGRICULTURAL
LIME QUARRY

Lot 9005
Nullaki Peninsula
City of Albany

Proponent
Graeme Robertson
PO Box 114
Denmark WA 6333

May 2016

Excavation and Rehabilitation Management Plan,
Proposed Agricultural Lime Quarry

Lot 9005
Nullaki Peninsula
Denmark



Prepared by Landform Research

SUMMARY

Graeme Robertson proposes to open an agricultural lime quarry on 10 hectares of a limestone ridge on Lot 9005, Nullaki Peninsula Denmark.

The limestone on Lot 9005 is highly suitable for lime for agriculture and neutralisation of acidity in addition to some road bases. Drilling has been completed and testing of the lime neutralising value carried out.

The proposed excavation lies in the south eastern corner of Lot 9005, set back from the coastal cliffs and Foreshore Reserve (30883) which covers the cliffed slope. It is approximately 10 km south east from Denmark townsite on the Nullaki Peninsula.

To the east lies Reserve 17464, vested in the City of Albany and associated with Lake Sadie. The Bibulum Track runs through the reserve.

Lot 9005 is covered by remnant coastal vegetation. The proposed quarry site has previously been used for a small limestone quarry to provide limestone for road construction on the subdivided part of the Nullaki Peninsula. The pit had been revegetated.

Minor exploration work has been completed for the existing proposal including the preparation of access tracks and drill platforms.

A predator proof fence runs across the Peninsula on the eastern side of Lot 9005.

The limestone will be used to prevent soil acidification, which is a well recognised major environmental issue, highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand and Tamala Coastal Limestone.

The proposal seeks to provide a continued resource of strategically located limestone, suited to a variety of end products. The majority of the lime from this pit will be used in the agricultural industry with lime being transported as far as Hyden in the east through the Great Southern Region. Currently existing supplies are running out and farmers are sourcing material from Lancelin or Redgate at a significant transport cost advantage.

The Lower Great Southern Strategy in Section 2.9 Mineral Resources and Basic Raw Materials supports the identification and staged use of basic raw materials and minerals.

The issues of agricultural lime are specifically mentioned the Lower Great Southern Strategy in relation to the existing limestone quarry at Albany being in an environmentally sensitive area and the need for a new resource. This proposal has the potential to supply agricultural lime for the future and in line with the Strategy.

This proposal seeks Development Approval and an Extractive Industries Licence for an staged extraction area of 10 hectares combined with a stockpile area of 2 hectares on the eastern portion of Lot 9005.

At any one time it is anticipated that only 2.0 hectares of pit will be open. Excavation is anticipated to extend to 8 metres in depth leaving an undulating land surface replicating other parts of the Nullaki Peninsula. An application for 20 years is made.

End Use will be a return to Conservation in compliance with the Town Planning Scheme Zoning.

REPORT ITEM DIS047 REFERS

Excavation – Rehabilitation Management Plan,
Proposed Agricultural Lime Quarry, Lot 9005, Nullaki Peninsula Denmark

There are no dwellings within 1 km of the site and the proposed operation has been designed to minimise or eliminate any dust, noise or visual impact.

The site has an old limestone pit on the proposed disturbance footprint in addition to some drill pads and access roads. The old pit has been very successfully rehabilitated demonstrating that the proposed methods of rehabilitation are proven.

It is anticipated that the life of the pit will be over 20 years. Extraction is anticipated to commence at around 20 000 tonnes per year rising to 50 000 tonnes per year and perhaps 100 000 tonnes per year in the longer term. At 50 000 tonnes that would equate to 10 laden truck movements per day on average (six days per week).

Transport will be along Lees Road to Lake Saide Road to Lower Denmark Road. Discussions are to be held with the City of Albany to determine a satisfactory transport route.

The Excavation and Rehabilitation Management Plan addresses;

- Groundwater quality and quantity protection;
- Land surface stabilisation and interim rehabilitation, including erosion mitigation and topsoil management
- Waste management
- Dust management
- Dieback management
- Contours and final ground surface levels;
- Fire management;
- Site security

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. Dust and noise can be contained by the methods of extraction to be used and the control measures which will be put into place. Measures to protect the site and minimise the influence of dieback are addressed under Environmental Management.

REPORT ITEM DIS047 REFERS

Excavation – Rehabilitation Management Plan,
Proposed Agricultural Lime Quarry, Lot 9005, Nullaki Peninsula Denmark

Project Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Area of proposed new excavation	Proposed Pit – 10.0 hectares in four stages of about 2.5 hectares.
Limestone extraction	Initially 20 000 tonnes per year rising to potentially 50 000 tonnes and perhaps 100 000 per year
Total estimated resource	Limestone - approximately 1 000 000 tonnes.
Life of project	20 years
Area cleared per year	Initially about 2.5 hectares to provide an operational area and then 0.5 hectares – per year depending on the elevation of the ridge.
Total area to be cleared	10.0 hectares in proposed pit progressively Stockpile area and turning circle of 1 - 2 hectares
Area mined per year	0.5 hectares approx.
Dewatering requirements	None
Maximum depth of excavations	8 metres
PROCESSING	
Limestone	Same as the amount extracted.
Water requirements	Only required for dust suppression in excessively dusty situations on site transport and processing. The limestone will be moist when extracted and will not need dust suppression. Water will often clog the processing plant
Water supply source	Local sump on Lot 9005.
INFRASTRUCTURE	
Total area of plant and stock	Mobile plant will be used, located within excavation footprint.
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	
Truck movements	Variable but approximately 10 laden trucks per day maximum depending on the volumes of limestone extracted. Based on a 40 tonne load and 50 000 tonnes per year.
Access	
WORKFORCE	
Construction	2 - 3
Operation	2 - 3
Hours of operation	Monday - Saturday 6.30 am to 5.00 pm excluding public holidays.

An Environmental Risk Assessment has been completed and follows.

ENVIRONMENTAL RISK ASSESSMENT MATRIX AGRICULTURE LIMESTONE MINING LOT 9005 NULLAKI PENINSULA

Environmental Factor	Environmental Objective	Identified Issues and Commitments	Proposed Management	References	Environment Risk	
					Innate Risk - Unmanaged	Risk when Managed
LAND						
FLORA and VEGETATION	To maintain representation, diversity, viability and ecological function at the species, population and community level.	Vegetation communities and/or biodiversity may be significantly impacted by clearing, and degradation by weeds and dieback.	This proposal seeks Development Approval and an Extractive Industries Licence for an staged extraction area of 10 hectares combined with a stockpile are of 2 hectares on the eastern portion of Lot 9005. At any one time it is anticipated that only 2.0 hectares of pit will be open. Excavation is anticipated to extend to 8 metres in depth leaving an undulating land surface replicating other parts of the Nullaki Peninsula. An application for 20 years is made. The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares. The 4 hectares open at any one time represents just 0.06%.	2.5 Flora Attached Flora and Vegetation Report.	Low	Low
		Threatened Communities may be impacted by inadvertent impacts.	Nil		NA	
		Priority species may be affected by clearing, disturbance, weeds, dieback and other impacts.	Considered unlikely. None were recorded in the vegetation assessment. <i>Banksia sessilis</i> var <i>cordata</i> (P4) grows on coastal limestone and may be present. <i>Sphaerolobium calcicola</i> (P3) as occurring within 10 km and may occur in sand over limestone.		NA	
		Threatened Species may be impacted by inadvertent impacts.	Unlikely		NA	
		Weeds may become established and impact on the local and on site biodiversity	A weed management program is in place. The site is largely weed free	Weed Management Plan in 5.6.6	Low	Low
		Dieback disease may be present and impact on the local and onsite vegetation.	Dieback management procedures are in place. No dieback is recorded.	Dieback Management Plan in 5.6.5	Low	Low
		The developments may fragment communities, biodiversity and ecological	Little fragmentation will occur. Natural regrowth is rapid as proved by past revegetation. See also above.	Figures 8 to 10	Nil	

ENVIRONMENTAL RISK ASSESSMENT MATRIX AGRICULTURE LIMESTONE MINING LOT 9005 NULLAKI PENINSULA

		linkages.				
Landforms	To maintain the variety, integrity, ecological functions and environmental values of landforms and soils.	The local landform may be altered to a form that is not compatible with the surrounding geomorphology.	The excavated area will resemble natural deflated dune or undulating surface lowered by some 8 metres.	Figures	Low	Low
		The final land surface should be fit for its required end use.	The excavated area will resemble natural deflated dune headland and will have natural functions.	Sections Figures	Low to Moderate	Low
		The development and final landform will not lead to significant visual impacts,	The excavated area will resemble natural deflated dune headland of the Nullaki Peninsula.	Figures 8 to 10	Low	Low
		The final landform and soils may be subject to erosion by wind, water or other processes.	The sand and limestone is highly porous and not subject to water erosion. Limestone readily cruds and does not blow. Limesand will have been removed wind erosion risk and movement will reduce. No evidence of past erosion.	Attached Water Management Plan Figure 9	Low	Low
		The project has been assessed for karst features and has been designed to mitigate impacts on known and features that may potentially be present.	There is no known karst. Excavation will have a base some 20 or 140 metres above the water table.		Low	Low
Subterranean Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The development may have an impact on an isolated population of subterranean fauna.	There are no known subterranean features.		Low	Low
		The development may fragment subterranean communities.	See above		NA	
		The diversity of subterranean fauna may be reduced at a population or assemblage level.	See above		NA	
		The final formed structures may not support continued subterranean fauna and their ecological functions.	There will be similar regolith to the pre-excavation environment.		NA	
Terrestrial Environment Quality	To maintain the quality of land and soils so that the environment values, both ecological and social, are	At the end of excavation the created soils should be deep enough or of sufficient quality to be sustainable to	The final rehabilitation will be to simulate natural deflated dunes and headland of the Nullaki Peninsula. Natural regrowth is rapid as proved by past	Sections Figures	Low	Low

ENVIRONMENTAL RISK ASSESSMENT MATRIX AGRICULTURE LIMESTONE MINING LOT 9005 NULLAKI PENINSULA

	protected.	meet the long term end use or ecological values.	revegetation. See also above.			
		The area of potential impacts will not impact on essential or desirable land uses.	Then end use will be the same as the pre-excavation land use. End Use is to conservation, the Zoning of the site.	5.9 Rehabilitation	Low	Low
		The development will not adversely impact an area identified as having high agricultural or community values.	The area is private land but has high natural beauty that is not available to the public because of security predator proof fences.		NA	
		Acid soils are not exposed or are managed to ensure that there are no long term adverse effects.	There is no evidence of acid sulfate conditions. The site is elevated in oxidised soils with no prospect of sulfides in the soils. Soils are limesand on a limestone base.	Attached Water Management Plan	NA	
Terrestrial Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	Communities and fauna and/or biodiversity may be significantly impacted by clearing, and degradation by weeds and dieback.	This proposal seeks Development Approval and an Extractive Industries Licence for an staged extraction area of 10 hectares combined with a stockpile are of 2 hectares on the eastern portion of Lot 9005. At any one time it is anticipated that only 2.0 hectares of pit will be open. Excavation is anticipated to extend to 8 metres in depth leaving an undulating land surface replicating other parts of the Nullaki Peninsula. An application for 20 years is made. The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares. The 4 hectares open at any one time represents just 0.06%. A predator proof fence is in place.	Mine Closure Plan	Low	Low
		Threatened Faunal Communities may be impacted by inadvertent impacts.	Unlikely		Low	Low
		Priority Fauna species may be affected by clearing, disturbance, weeds	Unlikely		Low	Low
		Threatened Fauna Species may be impacted by inadvertent impacts.	Unlikely		Low	Low

ENVIRONMENTAL RISK ASSESSMENT MATRIX AGRICULTURE LIMESTONE MINING LOT 9005 NULLAKI PENINSULA

WATER						
Hydrological Processes	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	The ecological functions of watercourses are to be maintained.	There are no watercourses	Attached Water Management Plan	Moderate	Low
		Groundwater may be impacted by changes to recharge, over-pumping, alterations to flow paths or lead to significant evaporation and water loss.	No adverse impacts on water are likely based on excavations of limesand in other areas.	Attached Water Management	Low to moderate	Low
		Wetlands may be altered by draining or flooding, potentially changing their ecological functions and biodiversity.	There are no wetlands on site.	NA		
Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Hydrocarbons, fuels and other chemicals are stored in a manner that they pose no risk to the environment.	Extensive fuel and hydrocarbon management programs are proposed. A Waste inventory found no potentially adverse materials. There are no proposed changes to the methods of operation. See above	Attached Water Management Plan	Low to moderate	Low
		Runoff from operations is contained and all water is either retained or treated to removed sediment and any deleterious materials.	All water is retained on site in the base of the pit and soak into the porous ground.	Attached Water Management Plan.	Low to moderate	Low
		Water quality during and after development and operations is not adversely affected or altered.	Excavation will have a base some 20 and 140 metres above the water table, replicating natural deflated dunes.	Attached Water Management Plan.	Low	Low
AIR						
Air Quality	To maintain air quality for the protection of the environment and human health and amenity.	Dust emissions are minimised or controlled to ensure that the local amenity is protected.	A Dust Management Plan is provided. A DER Licence will be required for crushing and screening if used. The closest sensitive premises are 1 to 2 km away. The access road is similar to any non sealed road and limestone does crust when moist.	Dust Management in attached Offsite Impacts Management Plan	Low	Low
		Dust emissions will not significantly impact on local and on site personnel health or quality of life.	Quarrying must comply with the <i>Mines Safety and Inspection Act</i> for Health and Safety. Officers from the DMP will regularly inspect the site and the site must be registered under the	5.4 Dust Management Plan	Moderate to high for worker impact.	Low

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			DMP SRS system.		Low for local amenity impact.	
		Noise levels will comply with the <i>Environmental Protection (Noise) Regulations 1997</i> .	Noise levels will comply with <i>Environmental Protection (Noise) Regulations 1997</i> . The operations are designed to minimise on site noise and the potential for offsite noise. The closest sensitive premises are 1 to 2 km away.	5.3 Noise Management	Low	Low
		Noise levels and operational procedures will be used to protect on site personnel health and safety.	Excavation must comply with the <i>Mines Safety and Inspection Act</i> for Health and Safety. Officers from the DMP will regularly inspect the site and the site must be registered under the DMP SRS system. With such small operations and the distance to sensitive premises of 1 to 2 km compliance will be readily achieved.	5.3 Noise Management	Low	Low
		Emissions gases and other materials potentially adverse to human health will not be used or will be managed.	There are no gaseous or other potential harmful emissions from the operations.		Low	Low
		Potential impacts from blasting will comply with the <i>Environmental Protection (Noise) Regulations 1997</i> and guidelines for ground vibration.	Blasting is not required	NA		
		Employ procedures and design the operations to minimise the risk of excessive greenhouse emissions.	The operations are designed to minimise fuel use and transport routes. There are no proposed changes to transport routes or operations from past activity.		Low	Low
Heritage	To ensure that historical and cultural associations are not adversely affected.	Known aboriginal heritage sites will be protected.	There are no known aboriginal sites on the DAA database on the extraction area. A commitment is made to stop and assess any site if uncovered. Heritage sites uncovered during operations will be independently assessed and managed through communication with the community, Government and traditional owners.	6.5 Heritage	Low	Low
		Sites of European heritage will be protected.	None known apart from the access road which runs along the alignment of the old rail access and will be retained.		Low	Low

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Human Health Amenity	To ensure that human health is not adversely affected.	Human health is protected from adverse impacts of dust, noise, other emissions and chemicals.	Limestone excavation must comply with the <i>Mines Safety and Inspection Act</i> for Health and Safety. Officers from the DMP will regularly inspect the site and the site must be registered under the DMP SRS system.		Moderate to high for worker impact.	Low
	Transport routes and operations are designed to minimise local impacts	Transport may impact on local, and regional roads or school bus routes.	The proponent has liaised City of Albany.	4.9 Transport Corridors	Low	Low
	Local Amenity – Visual Impact	The operations have been designed to provide sufficient buffers and visual protection.	The operations comply with the EPA Buffer Guidelines and Indian Ocean Drive Planning Guideline The closest dwelling is 1000 - 2000 metres away The operations are designed to minimise visual impact.	5.2 Aesthetics	Low	Low
INTEGRATING FACTORS						
Offsets	To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets	Offsets are provided as necessary to reduce or mitigate the impacts on the development and operation of the project.	The proposed operations are small. The site will be returned to copy natural deflation areas. At any one time it is anticipated that only 2.0 hectares of pit will be open. Excavation is anticipated to extend to 8 metres in depth leaving an undulating land surface replicating other parts of the Nullaki Peninsula. An application for 20 years is made. The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares. The 4 hectares open at any one time represents just 0.06%.	Not required	NA	
		Offsets are used to enhance the local environment, habitats, biodiversity and other identified factors.	See above No offsets are required.	Not required	NA	
Rehabilitation and Closure	To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the	All infrastructure, roads, hardstand, non natural materials are to be removed from site progressively when not required and all removed at the end of the project.	This is proposed	5.9 Rehabilitation	Low	Low
		No materials are to be left on site that may cause long term detrimental outcomes in	The proponent will remove all materials, equipment and plant associated with their operations at the end of excavation.	5.9 Rehabilitation	Low	Low

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	State	terms of impacts to soils, water, heritage, vegetation health or other factors.				
		All contaminated materials are to be removed from site prior to closure.	There are no contaminating materials apart from fuel and lubricants. Commitments are made to do this. Contingencies are in place. Extensive fuel and hydrocarbon management programs are proposed. A Waste inventory found no potentially adverse materials. There are no proposed changes to the methods of operation.	Attached Water Management Plan.	Low to moderate	Low
		Landforms and other geomorphological features are to be compatible with the local area and end use and be sustainable in the long term.	The excavated area will resemble natural deflated dune headland of the Nullaki Peninsula.	Figures 8 to 10	Low - moderate	Low
		Soils are reconstructed to be able to sustain an ecological sustainable vegetation or other cover consistent with the end use and long term proposal for the site.	The open operations are small. The excavated area will resemble natural deflated dune headland of the Nullaki Peninsula.	Figures 8 to 10	Low	Low
		Weed levels are not to cause significant impacts on vegetation.	Managed during excavation and rehabilitation.	5.6.6 Weed Management Plan	Low	Low
		Ongoing monitoring of the rehabilitation will be conducted to ensure that any areas not meeting completion criteria are added to or replaced as necessary to enable the relevant criteria to be met.	This is proposed	5.9 Rehabilitation	Low - moderate	Low
OTHER FACTORS						
Resource Requirements	Basic Raw Materials are required for continued use by the community and for future developments.	There is significant basic raw material on site that is suitable for community resources.	The limestone will be used to prevent soil acidification, which is a well recognised major environmental issue, highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the	1.8 Planning Policies and Zonings	Low	Low

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			<p>agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.</p> <p>The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand and Tamala Coastal Limestone.</p> <p>The proposal seeks to provide a continued resource of strategically located limestone, suited to a variety of end products. The majority of the lime from this pit will be used in the agricultural industry with lime being transported as far as Hyden in the east through the Great Southern Region. Currently existing supplies are running out and farmers are sourcing material from Lancelin or Redgate at a significant transport cost advantage.</p> <p>The Lower Great Southern Strategy in Section 2.9 Mineral Resources and Basic Raw Materials supports the identification and staged use of basic raw materials and minerals.</p>			
Planning Compliance	To comply with Government Policy, planning zones and procedures.	The project is designed to comply with State and Local Planning requirements.	The issues of agricultural lime are specifically mentioned the Lower Great Southern Strategy in relation to the existing limestone quarry at Albany being in an environmentally sensitive area and the need for a new resource. This proposal has the potential to supply agricultural lime for the future and in line with the Strategy.	Lower Great Southern Strategy	Low	Low
Community Consultation	To provide a community consultation process commensurate with the size nature and time line of the project.	Community consultation will be handled by community input within the application and assessment phases, as through direct community consultation as required and contact numbers being displayed at the entrance. An "Open Door Policy" is used to enable ongoing	There has been consultation with the City of Albany and the key residents along the transport route.		Low	Low

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		dialogue between the operator and the community.				
		An effective complaints procedure is provided, combined with effective remedial procedures.	A complaints procedure is proposed.	5.4.9 Complaints Procedure	Low	Low
Safety	To ensure that the project provides high levels of safety to on site personnel and the community	Ensure that the project provides high levels of safety to on site personnel.	Limestone excavation must comply with the <i>Mines Safety and Inspection Act</i> for Health and Safety. Officers from the DMP will regularly inspect the site and the site must be registered under the DMP SRS system. The operations are required to be registered under the DMP SRS system. The proponent proposes extensive fire and safety management systems under the Project Management Plan.		Low	Low
		Ensure that potential impacts are retained on site and do not cause significant risk of safety to the local and wider community.	The operations are designed to comply with this.		Low	Low
		Have in place a transport policy to ensure that transport along public roads is conducted in a safe manner.	Transport has been considered and will be formulated with the City of Albany.	4.9 Transport Corridors	Low	Low
Geotechnical Integrity	To ensure that all ground and geological materials is safe commensurate with the operations and final land surface.	The operational and final land surfaces will be made safe and not subject to subsidence, slippage or other adverse conditions.	The operations are designed to comply and operate to the <i>Mines Safety and Inspection Act 1994</i> . Excavation simply takes limestone from the dune leaving the natural angles of repose of dunes.	Demonstrated by past excavations. Figure 9.	Low	Low
		The quarry and operations will comply with the <i>Mines Safety and Inspection Act 1994</i> .	Mineral Sand Mining and Development is committed to complying with the relevant Acts and Regulations. The pit is regularly inspected by officers from the DMP Safety Division.		Low	Low
		The operational and final surfaces and features are designed to be not affected by extreme climate events.	No impact from extreme weather events result on the pit or to the pit or rehabilitated surface. The final surface will replicate the natural deflation surface under the dunes.		Low	Low

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1.0 INTRODUCTION

1.1 Background and Proposal

Graeme Robertson proposes to open an agricultural lime quarry on 10 hectares of a limestone ridge on Lot 9005, Nullaki Peninsula Denmark.

The limestone on Lot 9005 is highly suitable for lime for agriculture and neutralisation of acidity in addition to some road bases. Drilling has been completed and testing of the lime neutralising value carried out.

Location

The proposed excavation lies in the south eastern corner of Lot 9005, set back from the coastal cliffs and Foreshore Reserve (30883) which covers the cliffed slope. It is approximately 10 km south east from Denmark townsite on the Nullaki Peninsula.

To the east lies Reserve 17464, vested in the City of Albany and associated with Lake Sadie. The Bibulum Track runs through the reserve.

Current Land Use

Lot 9005 is covered by remnant coastal vegetation. The proposed quarry site has previously been used for a small limestone quarry to provide limestone for road construction on the subdivided part of the Nullaki Peninsula. The pit had revegetated.

Minor exploration work has been completed for the existing proposal including the preparation of access tracks and drill platforms.

A predator proof fence runs across the Peninsula on the eastern side of Lot 9005.

Existing Approvals

There are no current approvals.

Proposal

This proposal seeks Development Approval and an Extractive Industries Licence for Agricultural Lime limestone from Lot 9005.

An applicaiotn for a 20 year approval is requested.

1.2 Importance and Rationale

Need for Lime for Mitigating Soil Acidity

The importance of the local lime is recognised in the *Department of Agriculture and Food Bulletin 4660, Survey of Western Australia agricultural lime sources*.

Crushed limestone and limesand is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertiliser and legume crops. The need for crushed limestone for use as agricultural lime is recognised by the *Department of Agriculture and Food (Bulletin 4784)*.

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Acidification of soils is seen as one of the major impediments to continued viable farming in Western Australia. The *State Of the Environment Report Western Australia 2007* shows that about two thirds of the South West agricultural soils are at risk of acidification. When the acidity builds up essential nutrients become unavailable to plants, and the crops reduce in vigour and eventually fail. In addition some other elements such as aluminium become soluble and lead to toxicity in stock and plants.

The normal method of treatment of soil acidity is to add agricultural limesand and crushed limestone as explained in *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants*.

Abeysinghe, P B, 1998, *Limestone and Limesand Resources of Western Australia, Geological Survey of Western Australia*, Mineral Resources Bulletin 18, also summarises the uses for limestone and lime and the deposits, but does not list the limestone in this locality.

The need to mitigate soil acidity is also reiterated by the EPA. Acidification of soils is cited by the Environmental Protection Authority (EPA) in Section 3.3 of its *State of the Environment Report* as a serious threat to the sustainability of WA soils and agriculture. The report calls for the increased use of lime sand to combat soil acidification and to arrest the menace of sub-soil acidification and its effects on crops, water quality and native vegetation (EPA 2007).

The limestone is essential to the local agricultural industry, but is restricted in distribution and grade south of Perth and the South West. Whilst limestone is more common a significant part lies within the Conservation Estate. Much of the limestone and calcareous dunes are located within coastal Crown land and Reserves.

Department of Agriculture and Food have conducted various studies with respect to the need for lime for agriculture and Tim Overheu has provided a letter of support from the Department. The southern agricultural areas currently source their lime from a small pit near Denmark that is located in an A Class Reserve and which is nearing extinction. Alternatively limesand has to be sourced from Lancelin. This is explained in the Lower Great Southern Strategy 2016

To be most effective limestone has to be of the highest grade and, whilst coastal calcareous dunes and limestone do contain calcium carbonate the grades are often too low for efficient and economic use. For example using limestone at half the calcium carbonate content will require double the amount to be excavated, leading to additional land clearing, excavation and transport for no greater gain.

The material on site will be crushed and will form smaller particles of lime than limesand and therefore provide quicker and more efficient sources of CaCO_3 than non crushed limesand.

Therefore whilst the grade of the limestone and neutralising value is up to 80% it averages around 75% and with blending it offers substantial savings to the southern agricultural regions because of reduced transport costs.

Lime is also required for remediation of acid sulphate conditions which occur on the coastal sands in the Albany Walpole area which have been subject to low lying coastal or estuarine processes. Lime is also required for some industrial processes.

The draft *State Lime Supply Strategy (2008)* advocates the use of known lime resources especially from those sites which have minimal impact on the conservation values of native vegetation and are well-positioned in terms of existing infrastructure to serve the farming and rural communities (DMP 2008).

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The resource has been identified by the Geological Survey of Western Australia has studied the Limesand and Limestone Resources of Southern Western Australia in Record 2015/7. They did not test the limestone at this location but tested material to the east and at other locations.

The general geology and deposits have been reviewed by the Western Australian Geological Survey and summarised in Abeysinghe 1998.

Some consideration of the use of limestone for agricultural lime and other purposes is shown in the following documents which examine the resources in each area including the availability. The most relevant documents are listed first.

See;

- Geological Survey of Western Australia, 2015, *Limesand and Limestone Resources of Southern Western Australia*.
- Abeysinghe P B, 1998, *Limestone and Limesand Resources of Western Australia*, Geological Survey of Western Australia, Mineral Resources Bulletin 18.
- *Department of Agriculture and Food Bulletin 4660, Survey of Western Australia agricultural lime sources*
- *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants.*
- Geological Survey of Western Australia, 1989, *1 : 50 000 Environmental Geology Series Torbay*.
- Muhling P C and A T Brakel, 1985, *1 : 250 000 Geological Series*, Geological Survey of Western Australia.
- Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5
- Western Australia, Western Australian Planning Commission, *Statement of Planning Policy 2.4, Basic Raw Materials*.
- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.
- Chamber of Commerce and Industry, 2008, *Basic Raw Materials Access and Availability*.
- Fetherston J M, 2007, *Dimension Stone in Western Australia*, Volume 1, Department of Mines and Petroleum, Mineral Resources Bulletin 23.
- WAPC 2012, *Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*,

The community need for agricultural lime is indicated by the need for resources to be extracted.

If there no community demand for limestone as a building product and for agricultural use it would be unlikely that this natural resource would ever be utilised for any other purpose and would have no economic significance.

The resource is strategically located and has the potential to provide raw materials for the lime for 20 plus years.

If the resource is not taken from this site it will have to be taken from another site where similar or more land clearing is required. The depth of sand on this site also minimises the area of farm land or vegetation that is likely to have to be cleared on an alternative site.

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1.3 Proponent

The proponent is Graeme Robertson

Contact is

Graeme Robertson
PO Box 114
Denmark WA 6333

1.4 Landholding

Lot	LOT 9005 Nullaki Peninsula, City of Albany
-----	--

1.5 Description of the Resource

The site covers part of the Nullaki Peninsula on the ocean side of Wilson's Inlet.

A ridge of limestone to 168 metres in elevation occurs on the peninsula with the ocean side eroded to a steep and cliffed coast. Figures 3 and 5

The limestone consists of interbedded limestone varying from calcarenite, a sandy limestone through to limestone. Figures 1 and 2.

There is also some recalcified capstone development on the current and older buried soil horizons.

The limestone ranges up to 80% CaCO_3 but ranges lower in some beds and with selection and blending is capable of averaging 75% CaCO_3 . Due to dissolution of the calcium carbonate the CaCO_3 drops inland so that some few hundred metres from the coast the grade is typically 60%, hence the resource is located so close to the coast.

The limestone can be crushed for agricultural lime with the harder material being used for road base. The existing subdivisions on the Nullaki Peninsula are constructed from limestone taken from the site.

The limestone on site changes rapidly laterally and vertically through changes in the original dune morphology as does the degree of lithification (hardness). These changes determine the use to which each type of limestone can be put.

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Figure 1 Limestone resource



Figure 2 Limestone resource

Although the resource extends to depth, extraction is likely to be initially limited to 8 metres AHD metres to provide an undulating and consistent final landform and to be consistent with the lower elevations available on site.

An estimated 20 plus years' limestone resources are present, although this depends on the rate of community demand.

1.6 Aims of the Proposal

A major and increasing environmental issue within Western Australian agriculture is the gradual, widespread and increasing levels of acidic soils, created through the use of nitrogenous fertiliser and the growth of leguminous crops. The agricultural industry of Western Australia is one of the most important to our economy through direct value, value added and employment.

Soil Acidification is a well recognised major environmental issue and is highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The trend towards acidification of the soils is unavoidable, because legume rotations are best practise farming, and nitrogen is essential for crop growth.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand, Tamala Coastal Limestone, or other imported limestones, that have to be treated, or dredged lime/shell sand.

Most coastal areas of coastal Limestone are covered by remnant vegetation or are in areas where they are sterilised by increasing numbers of residents.

The aims of the proposal are to;

- Provide reserves of strategically located limestone, suited to a variety of end products.
- Supply lime to the agricultural industry.
- Provide additional limestone materials for a stable long term supply of limestone products in the Great Southern.
- Comply with State Planning Policy No 2.5 which requires that basic raw materials should be taken prior to sterilisation of the area by development.
- Comply with the Lower Great Southern Strategy 2016.

2.0 EXISTING ENVIRONMENT

2.1 Climate

The climate of the area is classified as Mediterranean with warm summers and cool wet winters.

Temperatures closest to Denmark Research Station, where the maximum temperatures in the summer months are 23.2 to 25.9 degrees Celsius. In winter the maxima are 16 to 17 degrees Celsius with the minima dropping to around 7 degrees C in July.

Rainfall for the area is approximately 1000 mm with more than most rain falling during the winter months April to October inclusive.

The wind direction is predominantly from the south.

2.2 Geology and Geomorphology

The site is an eroded high ridge of interbedded sequences of coastal dunes, of limestone 120 to 140 metres, rising to over 160 metres AHD on the highest peaks overlying an undulating Proterozoic granitic basement that outcrops of granite hills in the Denmark - Wilson Inlet area.

The limestone is a calc-arenite made from beach sand containing predominantly shell fragments with minor and variable quartz. The limestone has been lithified and recrystallised on the ridge tops to lift the percentage of calcium carbonate to over 70%. The limestone sequences also include buried soil horizons and recalcified limestone overtopped by younger dunes.

The geology is summarised in;

- Geological Survey of Western Australia, 1989, 1 : 50 000 *Environmental Geology Series Torbay*.
- Muhling P C and A T Brakel, 1985, 1 : 250 000 *Geological Series*, Geological Survey of Western Australia.
- Smith R A 1993, 1 : 250 000 *Hydrogeological Series Mt Barker – Alban*, Department of Minerals and Energy.

The degree of lithification (hardness) changes over the property, and determines the use to which each type of limestone can be put.

The limestone is of Quaternary Age formed during changes to sea level during the Pleistocene.

Bores drilled on site and exposure in the cliffs show variable depths of limestone of over 150 metres thickness.

2.3 Soils

Soils on the site consist predominantly of grey organic sands in the swales over limestone with white to cream limey sands on the youngest dunes and surfaces.

The soils have been mapped at a very broad scale by CSIRO who categorise them with leached sands, but that is not locally correct.

The soil profile can be seen in the site photographs. Figures 1 and 2.

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Figure 3 View west across the proposed quarry in the foreground



Figure 4 View north from the proposed excavation area



Figure 5 View east along the coast onto Reserve 30883

2.4 Hydrogeology

The site lies in the Albany Drainage District.

There is no surface drainage due to the porosity and permeability of the limestone, with precipitation draining to the water table.

The limestone coastal ridge is 120 to 140 metres, rising to over 160 metres AHD on the peak ridges. The proposed limestone quarry is located on the higher ground.

Smith R A 1993, *1 : 250 000 Hydrogeological Series Mt Barker – Albany*, Department of Minerals and Energy does not show the direction of groundwater movement.

Being so close to the ocean the groundwater elevation will be around zero, rising slightly under Nullaki Peninsula and then dropping down again to the north at Wilson Inlet.

The groundwater under the excavation area can be expected to be 0 – 1 metre AHD in elevation. Groundwater flow from under the pit will be towards the ocean to the south.

That means that the separation to groundwater from excavation activities will be over 140 metres.

The stockpile area will be located at an elevation of 20 metres AHD some 18 metres above the groundwater. Groundwater under the stockpile area is likely near the gentle peak of the water table divide but is still likely to flow south to the ocean based on groundwater movement principles under permeable ridges such as this. It is possible that the drains to Lake Saide locally lower the groundwater and the stockpile area lies just over the divide flowing laterally to the drains or north to Wilson Inlet.

It has been estimated that perhaps <10 - 20 % of the rainfall will reach the water table at the processing area with slightly less at the ridge based on the separation to the water table.

2.5 Flora

A detailed Flora and Vegetation Study has been completed by Bio Diverse Solutions specifically covering the proposed excavation area. Kathryn Kinear completed the survey to map the vegetation communities, weeds and dieback to a Level 1 Flora Survey.

Bio Diverse Solutions, 2016, *Vegetation Communities Survey, Lot 9005, Rock Cliff Circle, Denmark.*

A copy of the Vegetation Survey is attached.

The site is within the Southwest Botanical Province and lies on the eastern part of the Warren Interim Bio-geographic Regional Area (IBRA) which extends east and west along the coast.

Limestone Ridge Vegetation

The limestone ridge vegetation is classified as Open Heath which on the excavation area consists of generally low Scrub without the taller species that grow in more sheltered locations.

Lifeform	Species
Trees <10m	<i>Agonis flexuosa</i>
Shrubs >2m	<i>Agonis flexuosa</i> , <i>Agonis theiformis</i> , <i>Acacia cyclops</i> , <i>Spyridium globulosum</i> and <i>Hakea varia</i> .
Shrubs 1-2m	<i>Allocasuarina humilis</i> , <i>Pteridium esculentum</i> , <i>Jacksonia horrida</i> , <i>Pultenaea reticulata</i> and <i>Xanthorrhoea preissii</i>
Shrubs 0.5-1m	<i>Hibbertia cuneiformis</i> , <i>Hibbertia racemosa</i> , <i>Leucopogon obovatus</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon propinquus</i> , <i>Lysinema ciliatum</i> , <i>Pimelea clavata</i> , <i>Pimelea rosea</i> subsp. <i>rosea</i> , <i>Anigozanthos flavidus</i> , <i>Hakea prostrata</i> , <i>Adenanthos cuneatus</i> and <i>Xanthorrhoea gracilis</i>
Shrubs <0.5m	<i>Rhagodia baccata</i> subsp. <i>baccata</i> , <i>Andersonia caerulea</i> , <i>Gompholobium confertum</i> , <i>Boronia crenulata</i> and <i>Synaphea</i> sp.
Sedges and rushes	<i>Lyginia imberbis</i> , <i>Lyginia barbata</i> , <i>Lepidosperma squamatum</i> , <i>Tetraria octandra</i> , <i>Desmociadus flexuosus</i> and <i>Hypolaena exsulca</i>
Herbs and grasses	<i>Carpobrotus</i> sp., <i>Platysace compressa</i> , <i>Trachymene pilosa</i> , <i>Chamaescilla corymbosa</i> , <i>Drosera erythrogynne</i> , and <i>Opercularia hispidula</i>

Bio Diverse Solutions



Figure 6 Typical vegetation of the resource area



Figure 7 Typical vegetation of the resource area

- **Species**

During the flora and vegetation survey a total of 112 species were observed. A species list is provided in the attached flora and vegetation report.

- **Vegetation Communities**

Bio Diverse Solutions broadly mapped the vegetation across the excavation area as Open Heath in Pristine Condition.

- **Vegetation Condition**

Because of the previous excavation, and earthworks associated with exploration for the limestone the vegetation is better shown as partially degraded being degraded where cleared and pristine in uncleared areas.

Very few weed species were recorded and none were noticed on the proposed quarry site by Landform Research in May 2016.

Bio Diverse Solutions did not find any evidence of plant diseases.

- **Threatened and Priority Species**

A search of NatureMap and the EPBC database was completed by Landform Research and is attached with the Flora and Vegetation Survey.

No Threatened taxa were recorded by Bio Diverse Solutions. Two Priority species were recorded across the whole study area, by Bio Diverse Solutions *Billardiera drummondii* and *Banksia sessilis* var *cordata*.

Billardiera drummondii grows in Eucalypt Woodland and is less likely on the quarry footprint. The taxa currently has no priority listing on Florabase 2016-06-08.

Banksia sessilis var *cordata* (P4) grows on coastal limestone and may be present.

NatureMap lists *Gahnia sclerioides* (P4) as occurring within 10 km growing on moist sandy soils which are less likely on the disturbance areas.

Sphaerolobium calcicola (P3) as occurring within 10 km and may occur in sand over limestone.

Isopogon buxifolius var *buxifolius* is listed as occurring within 10 km but is unlikely to be present as it occurs in swampy areas.

- **Threatened and Priority Communities**

No Threatened or Priority Ecological Community was recorded.

Vegetation Representation

EPA Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in 4.1, Clearing in the agricultural areas for agricultural purposes. In 4.3, Clearing in other areas of Western Australia, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 Clearing in other areas of Western Australia, (*EPA Position Statement No 2*, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

The small area of ground open at any one time is very small compared to the large expanse of similar coastal along the Nullaki Peninsula and nearby coast, most of which is protected in Reserves 1764 and 26177.

The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares. The 4 hectares open at any one time represents just 0.06%.

At the end of excavation the site will be rehabilitated as shown by rehabilitation of other limestone pits including the old road base pit on site. Where rehabilitation was effective with no weeds or disease.

2.6 Fauna

A fauna study was not conducted because the resource area represents a very small area within a large area of remnant vegetation with a small area only open at any one time.

A search of NatureMap and the EPBC database was completed by Landform Research and includes the fauna listed within the City of Albany and recorded within 10 km and is attached with the Flora and Vegetation Survey.

The small area of proposed disturbances and the large connectivity remaining in place will not cause any isolation of short range fauna.

The Nullaki Peninsula is protected by a predator proof fence to keep out cats and foxes in particular. The exclusion of these predators forms a significant protection measure for fauna which are advantaged by living within the protected zone. The protection fence is to remain in place.

Stygofauna and Troglifauna

The potential presence of cavities within the limestone has been considered by Lindsay Stephens of Landform Research during the site inspection.

EPA Guidance 54, concentrates on Stygofauna, which occur in caves and "are aquatic subterranean animals, found in a variety of groundwater systems". Environmental Protection Authority, 2013, *Consideration of subterranean fauna in environmental impact assessment in Western Australia* relates to the level of survey. On the limestone ridge a reconnaissance survey was completed by Lindsay Stephens of Landform Research during the site inspection.

The limestone ridge is not an isolated habitat, but is a very small portion of a long stretch of similar limestone based coasting extending to the east and west. The limestone is Quaternary and therefore young in age with little to no calcrete development. The limestone is also likely to be too young to form significant cavities at the water table.

"Troglifauna occur in air chambers in underground caves or smaller voids".

The issues of these organisms is best addressed on a risks basis, because the water table is not proposed to be impacted, on with the base of the pit being approximately 140 metres above the water table. The stockpile area is approximately 15 metres above the water table.

Root mat communities are not known from this area and are unlikely to be present because the local geology, regolith and vegetation do not meet the criteria for their occurrence.

2.7 Wetlands

There are no nearby wetlands. Lake Saide lies to the north east – east surrounded by farmland. The access route will travel on local roads but not near the lake where the transport could impact on the wetland buffer.

3.0 PLANNING ISSUES

3.1 Current Land use

Lot 9005 is covered by remnant coastal vegetation. The proposed quarry site has previously been used for a small limestone quarry to provide limestone for road construction on the subdivided part of the Nullaki Peninsula. The pit had revegetated.

Minor exploration work has been completed for the existing proposal including the preparation of access tracks and drill platforms.

A predator proof fence runs across the Peninsula on the eastern side of Lot 9005. facilities.

3.2 Land Zonings and Policies

State Planning Policies

The State Planning Policy Framework provides for the implementation of a planning framework through the recognition and implementation of Regional Planning Policies above Local Planning Schemes and Policies.

Within each layer of planning, there are a number of key policies and strategies to provide guidance to planning and development to enable sustainable communities to develop, expand and prosper without compromising the environment and future generations.

Planning is governed under the *Planning and Development Act 2005*. This Act enables Government to introduce State and Regional Planning Schemes, Policies and Strategies to provide direction for future planning. The State and Regional Schemes sit above Town Planning Schemes and Strategies introduced by Local Government.

Strategies and Policies provide guidance on how planning is to be undertaken and how proposed developments are to be considered. These Strategies and Policies are at the State, Regional and Local levels.

Schemes are gazetted documents that provide for consideration and approval of proposed developments. These are normally at the Regional and Local Level.

In addition to the documents produced under the *Planning and Development Act 2005*, the *Local Government Act 1995* provides Local Governments with a mechanism to prepare Local Laws to manage issues of local significance.

Some policies do have relevance such as the State Industrial Buffer Policy and Basic Raw Materials Policy.

With respect to the supply of sand and limestone, the overarching document is the;

- State Planning Policy 1.0 State Planning Framework.

Complementing this are a number of Relevant State Policies;

- State Planning Policy 2.0, Environment and Natural Resources Policy
- State Planning Policy 2.4, Basic Raw Materials
- State Planning Policy 4.1, State Industrial Buffer Policy

- **State Planning Policy 2.0, Environment and Natural Resources Policy**

This policy provides for the protection of all natural resources under a number of sections;

- 5.1 General Measures
- 5.2 Water Quality including stormwater and wetlands
- 5.3 Air Quality
- 5.4 Soil and Land Quality
- 5.5 Biodiversity
- 5.6 Agricultural Land and Rangelands
- 5.7 Minerals Petroleum and Basic Raw Materials
- 5.8 Marine Resources and Aquaculture
- 5.9 Landscape
- 5.10 Greenhouse Gas Emissions and Energy Efficiency.

In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to *SPP 2.4 Basic Raw Materials*, *State Gravel Strategy 1998* and *State Lime Strategy 2001*.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials.

Part of Section 5.7 states;

Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.

Planning strategies, schemes and decision making should:

- ii. *Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 10 (2.4); Basic Raw Materials.*
- iii. *Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, by this management plan, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

- **State Planning Policy 2.4, Basic Raw Materials, 2000**

This policy makes many statements on the intent and actions which local authorities should use to protect and manage basic raw materials. It is restricted to the Perth and Peel Region but is the leading document with respect to guidance on the protection and staged use of basic raw materials including limestone.

Section 3.4 is very specific in explaining that basic raw materials need identification and protection because of increased urban expansion and conservation measures, (3.4.1), (3.4.2) and (3.4.4). Sections 3.4.5 and 3.4.6 recognise that environmental and amenity matters need to be considered.

There are specific provisions in Section 6.2 Local Planning Scheme Provisions, such as;

No support for the prohibition of extractive industries in zones that permit broad rural land uses.

Providing an appropriate P, D or A use.

Not precluding the extraction of basic raw materials on land which is not identified as a Priority Resource Location, Key Extraction Area or Extraction Area (6.4.2).

- **SPP 2.5 – Agricultural and Rural Land Use Planning**

State Planning Policy No 2.5, Agricultural and Rural Land Use Planning, makes provision for the extraction of basic raw materials. This document is under revision with the draft document providing even greater protection and consideration for basic raw materials in line with SPP 2.4.

SPP 2.5 in Point 9 states that "The location of rural residential and rural small holdings should avoid unacceptable impacts on, or sterilisation, of natural primary resources including prospective areas for mineralisation and basic raw materials".

State Planning Policies are required to be considered under the Local Authority Town Planning Schemes as is the "identification and protection" for staged use, of basic raw materials.

- **State Planning Policy No 4.1, State Industrial Buffer Policy**

SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise management, tree planting and operational procedures, are used to mitigate and reduce impacts.

This is discussed further in Section 2.8.1 Surrounding Landuses and 3.10 Buffers of this document.

- **State Planning Strategy, 1997**

The Western Australian Planning Commission (WAPC) released the *State Planning Strategy in 1997*. It comprises a range of strategies, actions, policies and plans to guide the planning and development of regional and local areas in Western Australia and assists in achieving a coordinated response to the planning challenges and issues of the future by State and Local Governments.

The State Planning Strategy contains the following five key principles. These are:

- Environment & resources: to protect and enhance the key natural and cultural assets of the State and to deliver to all Western Australians a high quality of life which is based on sound environmentally sustainable principles.
- Community: to respond to social changes and facilitate the creation of vibrant, accessible, safe and self-reliant communities.
- Economy: to actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.
- Infrastructure: to facilitate strategic development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.
- Regional Development: to assist the development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

- **Lower Great Southern Strategy 2016**

The Lower Great Southern Strategy in Section 2.9 Mineral Resources and Basic Raw Materials supports the identification and staged use of basic raw materials and minerals.

The issues of agricultural lime are specifically mentioned in the Strategy, in relation to the existing limestone quarry at Denmark, being in an environmentally sensitive area and the need for a new resource.

This proposal has the potential to supply agricultural lime for the future.

2.9.2 Securing access to prospective mineral and basic raw material deposits

Limestone and lime sand are located along the coastal dunes, predominantly to the west of Albany, but access to extract from those areas is increasingly becoming constrained by other land uses. For example, extensions to the Ocean Beach limestone quarry at Denmark could provide long-term supplies of agricultural lime, but this is impeded by its location adjacent to a local government conservation reserve. Although there are other known deposits to the west, these are on private land and scope for mining is regarded as low by the Department of Mines and Petroleum.

Geological interpretation and exploration may locate further sites for agricultural lime extraction similar in geological setting to the Ocean Beach deposit. Given the need for agricultural lime in the agricultural industry, funding of a strategic assessment of the prospect under the auspices of the State lime supply strategy is warranted.

Objectives and Actions for Mineral Resources and Basic Raw Materials			
Objective	Actions	Timeframe	Responsibility
Maximise opportunities to enable mineral exploration and extraction in accordance with acceptable environmental and amenity standards	Review and update the Albany Regional Basic Raw Materials Study (1996)	Medium term	DMP DoP/WAPC
	Ascertain the implications of the Walpole Wilderness Area for the future mining and extraction of gravel, under the auspices of the State gravel supply strategy	Medium term	DMP DPaW
	Fund a strategic assessment of the prospect for limestone in the Lower Great Southern, under the auspices of the State lime strategy	Medium term	DMP
	Identify existing and potential sites for basic raw material and agricultural mineral extraction in local planning strategies and protect them in local planning schemes, including consideration of neighbouring land uses, visual impact issues and buffer areas where necessary	Short term (completed or partially completed in some LGA's)	LG DMP DoP/WAPC
	Retain areas of high prospective geology as general rural zoning to allow for exploration or extraction	Ongoing	LG DoP/WAPC

- **Western Australian Geological Survey**

The Western Australian Geological Survey has produced new mapping identifying Strategically Important Basic Raw Materials across private land and State Forest.

This mapping is being extended to the Great Southern Region.

Local Government Planning Documents

- **City of Albany Local Planning Scheme No 1**

The site is zoned Rural Conservation under the City of Albany Local Planning Scheme. However the past excavation and success of rehabilitation has demonstrated that the limestone can be extracted and the land returned to conservation.

The Objectives of the zone do not mention extraction or basic raw materials and do not prohibit development as long as it is completed in a ecological sensitive manner.

The proposed quarry is selected and designed to minimise impacts with the past excavation and rehabilitation demonstrating that excavated land can be returned to high quality native vegetation that preserves the conservation values.

Extractive Industries are a use "Not Listed" in the Zoning Table, thereby providing the City with potential to approve the development. Any developments are to conform with Section 5.5.14 of the Town Planning Scheme.

Again Section 5.5.14 does not address Extractive Industries but does carry a number of requirements for developments. The proposed operations are consistent with the intent and provisions of Section 5.5.14.

- **City of Albany Policy Extractive Industries and Mining**

The City of Albany Extractive Industries and Mining Policy prescribes the information required for applications for extractive industries.

This management plan complies with the Policy.

A survey can be completed as a condition of approval when the land can be accurately surveyed and pegs installed to ensure that the approved footprints are complied with.

3.3 End Use

The planned end use of the site is to restore a natural soil and return the ridge to native vegetation and conservation.

3.4 Responsible Authorities

A number of state and local government authorities are responsible for overseeing the safety and management of the proposed quarry. Other authorities have an interest in the proposal but may not hold any responsibility.

City of Albany

- Provides Planning Consent.
- Issues the Extractives Industries Licence for the quarry.
- Regulates land zonings in conjunction with the Western Australian Planning Commission.
- Has control over local roads.

Main Roads

- Has an interest in the transport routes and controls major roads.

Department of Water

- Issues guidelines for water quality management for extractive industries.
- Oversees protection of groundwater and water courses.

Department of Environment Regulation

- Oversees all aspects of environmental impact and management.
- Issues licences for crushing and screening plants.
- Has an interest in the flora and fauna of the area.
- Provides Approval for clearing under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Western Australian Planning Commission

- Responsible for structure plans.
- Responsible for State Planning Policies.
- Responsible with the Shire for land zoning.
- Responsible for State Planning Policy No 2.5, Agriculture and Rural Land Use Planning.

Environmental Protection Authority

- Oversees the potential for significant environmental impacts on environmental matters.

Department of Mines and Petroleum

- Controls the safety and methods of excavation through the *Mines Safety and Inspection Act 1994*.
- Responsible for overseeing the health and safety of the operations and the administration of the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

Department of Aboriginal Affairs

- Oversees the *Native Title Amendment Act* and the *Aboriginal Heritage Act 1972 - 1980*.

Commonwealth of Australia

- Oversees the potential for impacts on matters listed under the *EPBC Act 1999*.
- No matters of significance under the *EPBC Act 1999* were identified.

3.5 Social Impacts

The main potential social impacts are to perceived local recreation values and the need for lime for agriculture.

The Bibulbum walking track runs from Albany in the east before swinging north prior to the eastern boundary of Lot 9005. The track is located some 400 metres from the limestone pit.

The track lies in heathland that is often higher than a person making the excavation area difficult to see. The excavation area is designed to be excavated from the west to the east and to the north, working behind the vegetated eastern and northern faces which will assist in minimising or eliminating any visual impact of the pit from the Bibulbum Track.

The Bibulbum Track moves slightly closer to the stockpile area, but this is located in flat ground set back behind vegetation to provide visual screening.

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The Bibulmum Track will cross the access road. Signs and warning barriers will be used at the crossing point in a similar to other road crossings.

There is no access from the reserve land to the east, because of the private ownership of Lot 9005 and the tall separating predator proof fence.

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4.0 QUARRYING OPERATIONS

The proposed methods of excavation will be the same as those used on the existing limestone pits used for agriculture lime.

The site was previously used for limestone extraction for road base and a small rehabilitated pit is located on site. Access roads, exploration holes and drill pads are on site.

Limestone will predominantly be used for agriculture, although road base and minor other products will be produced as the higher grade material becomes exhausted. The taking of road base is more likely to be a second phase of excavation by another operator after all the limestone suitable for agriculture has been taken.

Quarry operations will be carried out under the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. Dust and noise can be contained by the methods of extraction to be used and the control measures which will be put into place. Measures to protect the site and minimise the influence of dieback are addressed under Environmental Management.

Overall the proposed pit is well isolated from any sensitive premises with none within 1 km.

Project Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Area of proposed new excavation	Proposed Pit – 10.0 hectares in four stages of about 2.5 hectares.
Limestone extraction	Initially 20 000 tonnes per year rising to potentially 50 000 tonnes and perhaps 100 000 per year
Total estimated resource	Limestone - approximately 1 000 000 tonnes.
Life of project	20 years
Area cleared per year	Initially about 2.5 hectares to provide an operational area and then 0.5 hectares – per year depending on the elevation of the ridge.
Total area to be cleared	10.0 hectares in proposed pit progressively Stockpile area and turning circle of 1 - 2 hectares
Area mined per year	0.5 hectares approx.
Dewatering requirements	None
Maximum depth of excavations	8 metres
PROCESSING	
Limestone	Same as the amount extracted.
Water requirements	Only required for dust suppression in excessively dusty situations on site transport and processing. The limestone will be moist when extracted and will not need dust suppression. Water will often clog the processing plant
Water supply source	Local sump on Lot 9005.
INFRASTRUCTURE	
Total area of plant and stock	Mobile plant will be used, located within excavation footprint.
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	
Truck movements	Variable but approximately 10 laden trucks per day maximum depending on the volumes of limestone extracted. Based on a 40 tonne load

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	and 50 000 tonnes per year.
Access	
WORKFORCE	
Construction	2 - 3
Operation	2 - 3
Hours of operation	Monday - Saturday 6.30 am to 5.00 pm excluding public holidays.

4.1 Limestone Extraction

1. Vegetation cleared will be utilised for rehabilitation of the completed pit. See Section 5.9 Rehabilitation.
2. An Application for Clearing will be required with this application to cover the remnant vegetation on site. A Clearing Permit will be applied for to cover the clearing of the proposal area.
3. The excavation footprint has been determined from Landgate contour mapping, field mapping, drilling and sampling, combined with detailed aerial photography
4. Remove the vegetation cover by pushing it into windrows for use on the batters and rehabilitation areas, to minimise soil erosion and assist spreading on the final land surface as part of the final rehabilitation.
5. Where practicable vegetation will be directly transferred to an area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on batter slopes of completed areas.
6. If direct transfer is not possible the vegetation will be stored in dumps, mulched or swapped with a nearby operator to try and ensure that the material is not wasted.
7. All topsoil will be removed for spreading directly onto areas to be revegetated and screening or perimeter bunds. If direct spreading is not possible the top soil will be stored in low dumps, for spreading at a later date. See 5.9.2 Rehabilitation Procedures.
8. Soil and overburden, as dark grey to black sand sand and low grade limestone, will then be removed and either directly transferred to a rehabilitation area or stored in low dumps for later rehabilitation use. Where this is not used overburden will be stored in dumps for future use in rehabilitation or the creation of bunds.
9. Limestone interburden, if encountered, will be incorporated into the overburden dumps for later use in re-contouring the land surface at the conclusion of excavation.
10. The limestone is relatively soft and can be removed with an excavator or loader without the need for a bulldozer or blasting. On occasions it may be safer for a bulldozer to be used.
11. A bulldozer may be used to rip and push the limestone down the excavation face and track roll the limestone in the process if the limestone becomes hard or to increase levels of safety.
12. The preliminary crushed limestone will then be picked up by a rubber tyred loader and fed to the mobile crusher.
13. Excavation will commence on the western ridge, working on the floor of the pit behind the faces to prevent visual impact.

14. Upon completion of each section of quarry the excavated section will be reformed and back filled, where subgrade material is available, to achieve the proposed final contours which will replicate an undulating pre-mined Landform.
15. It is not anticipated that blasting will be required.
16. At the end of excavation the floor of the quarry will be deep ripped, covered by overburden and top soil, and rehabilitated to a constructed soil. Details of the Rehabilitation are listed under 5.9 Rehabilitation.

Processing

All screening and crushing equipment is portable and brought to the site as needed. The necessary Licences for the equipment will be obtained from the Department of Environment Regulation for all plant used on site as required.

A mobile crushing and screening plant will be used to break down the limestone to small fragments to increase the surface area and make the material more readily soluble when applied to agricultural land.

All static and other equipment, such as crushers and screens (where used), will be located on the floor of the quarry to provide visual and acoustic screening.

4.2 Staging and Timing

The excavation footprint has been determined from Landgate contour mapping and detailed aerial photography. A staging plan is attached and shows indicative staging and the direction of excavation being from the south to the north to provide visual protection from Denmark and nearby properties.

At this stage it is difficult to predict the speed of excavation because the amount of material extracted depends on market conditions.

20 000 tonnes of limestone is initially anticipated to be extracted in a year rising to 50 000 and potentially 100 000 tonnes at some future time.

Limestone extraction will generally only be during the summer and autumn months for agricultural lime. Actual quantities will depend on the type and size of contracts won, and sales. It may be more efficient to provide a year round operation, making road bases in the off season for agricultural lime.

This proposal seeks Development Approval and an Extractive Industries Licence for an staged extraction area of 10 hectares combined with a stockpile area of 2 hectares on the eastern portion of Lot 9005. At any one time it is anticipated that only 2.0 hectares of pit will be open.

However it is expected that the quarry will progress by up to 0.5 hectare per year. Over twenty years of resource is anticipated to be available on site.

Depth is anticipated to be 8 metres, but higher grade limestone may extend to depth in places.

The active area needs to be large to enable a range of limestone products to be available at all times, and to provide sufficient area for processing/screening and for stockpiles.

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Wherever possible all completed ground will be rehabilitated as soon as possible to ensure that the amount of ground that is open at any one time is minimised. The nature of the excavation means that it will be difficult to commence rehabilitation of the floor of the quarry until the underlying limestone has been removed.

4.3 Hours of Operation

Hours of operation will be 6.30 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays. See below.

Transporting material on Saturday is requested to enable farmers to access lime in the autumn period prior to sowing their crops.

4.4 Access and Security

Access to the site will be from Lower Denmark Road and Lees Road to Saide Lake Road and then along road reserves to Lot 9005.

The existing perimeter predator proof fences and gates will be maintained. Warning signs will be maintained as required by the Department of Mines and Petroleum and the City of Albany.

The proponent will liaise with the City of Albany with respect to the access and road transport.

4.5 Equipment

All static and operational equipment will work on the quarry floor to provide maximum sound and visual screening.

Site office	A mobile or transportable office may be required at the stockpile area.
Toilet system	Portable serviced system will be used.
Bulldozer	Removal of limestone rubble and road base, track crushing of limestone as required and pushing down the resource on steeper slopes and where it is more efficient or the limestone is harder.
Excavator	Will normally be used to remove limestone.
Crushing and Screening plant	Preparation of road base and agricultural lime using mobile crushing and screening plant.
Water tanker	Used for dust suppression on the access roads and working floors as necessary. Not likely to be required for most of the year or at all.
Loader	Loading and handling materials from the stockpiles.
Fuel Storage	Refuelling will either be undertaken using mobile tankers from Albany or Denmark.

4.6 Final Contours

The slope of the final contours of the proposed pit is an undulating surface at around 8 metres below the existing land surface

Slopes of the batters at the end of excavation will be retained at between 1 : 2 to 1 : 4 vertical to horizontal which has been demonstrated by past excavation to be stable and able to be rehabilitated.

4.7 Workforce

The workforce will vary, depending on the level of operation and market demands, but usually 2 to 3 persons can be expected to be working on site.

4.8 Water Usage

Water is unlikely to be required for dust suppression, apart from dry summer times of active areas such as the stockpile area.

The limestone will stay moist when excavated and crushed and screened.

It is not anticipated that water will be required for dust suppression because of the location and climate with rainfall through all months.

However a contingency remains for excavation and processing which will be carried out as required during drier weather. A water tanker will be used to water the access road, stockpile area and the pit floor whenever necessary to minimise dust generation from transport and during crushing. Normally only small volumes of water will be used for a quarry of this type. A quarry could be expected to require less than 5 000 kL per year.

Water will be drawn from a sump located on the Nullaki Peninsula. A licence from Department of Water will be applied for to enable the taking of up to 5 000 kL water per year for dust suppression if required.

Potable water will be brought to the site as required.

4.9 Transport Corridors

Lime products are to be transported from this site through summer and autumn (January to April).

Access to the site will be from Lower Denmark Road and Road to Lake Saide Road and Lees Road and then along road reserves to Lot 9005.

Lake Saide Road is sealed to Thompson Road and then unsealed. There are few dwellings and those that do occur are set well back from the road.

There appear to be two dwellings near the sealed section of Lake Saide Road, with a further two to three dwellings along the gravel section of the road network with only one close to the road.

Traffic volumes along the access road is anticipated to be around ten laden truck movements per day for 50 000 tonnes of material. Normally the trucks transport agricultural lime first thing in the morning with a smaller number around lunchtime depending on the transport distance.

If the volumes extracted and sold increase so will the number of truck movements, but still they will normally have a peak around start time and a smaller peak at lunch time with few to none at other times.

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When transporting road base to local areas there may be more movements at the non peak times.

That means in general there is little potential to conflict with traffic for schools.

Transport from the site is likely to be via a variety of trucks depending on the contractor and the type of product carried; such as semi-trailers or rigid (8) wheeler trucks to a 5 axle dog trailer.. At times when road making materials are being transported from the site the number of truck movements may be greater.

However for the most efficient long distance transport pocket road trains are used by most cartage contractors. Their use will depend on road conditions.

The destination of the lime is normally in the Wheatbelt and Great Southern Regions and any truck will normally only access the site once on any day.

The access and internal roads will be limestone based and watered as needed in the drier months to suppress dust.

The access roads may have to be upgraded and will be maintained by the proponent.

Discussions will be held the proponent and the City of Albany.

This will mean that;

- The road network will be upgraded to take the required truck traffic.
- Upgraded intersection work and signage if required.
- Trimming of road vegetation to increase sightlines.
- Grading of the road/s.
- Additional signage.
- The road will become safer for all users including local residents and any visitor traffic.

In addition

- Carting will normally be in summer months.
- During transport, a water cart will be provided on site to ensure the road is treated for dust if required.
- Speed restrictions will be placed on the unsealed sections of the road, particularly for truck traffic; 60 kp[h] is suggested but is subject to negotiations.

These measures will benefit all road users.

4.10 Safety

Excavation will be conducted to *Mines Safety and Inspection Act 1994 and Regulations 1995*. Excavation practices, and operations procedures will be in compliance with the Act. Health and safety issues are overseen by the Department of Mines and Petroleum.

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Regular inspections and audits will be carried out by officers of the Department of Mines and Petroleum to inspect safety, operational procedures and workplace health such as dust and noise.

The proponents will have procedures in place to manage safety, health, environmental impact, site completion and rehabilitation. All workers are required to wear full protective safety and high visibility gear when on site.

These will include Safety Management Plans and a site specific Emergency Response Plan to cover operational procedures, which include workforce induction and training to ensure that all employees involved are made aware of the environmental and safety implications associated with all stages of the mining activities.

Workers and staff on all sites are to be trained in the use of the procedures and all employees provided with site induction and training as necessary prior to commencing work on the site.

All vehicles and trucks will be equipped with two way radio capability.

No light vehicles will be permitted on site without registering with mobile plant on site. Full personal protection is required for all persons on site at all times.

The site is to be registered under the Department of Mines and Petroleum SRS reporting system for minesites and quarries.

It is anticipated that the deepest excavation will be a maximum of approximately 8 metres below natural ground level.

At all times excavation will be in compliance with the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

Fencing, locked gates and warning signs will be maintained.

The batter slopes of the pit will be dozed or pulled down at between 1 : 1 and 1 : 2 which will prevent any fall situations during excavation.

Even though the site is remote and on private property, fence will be constructed around the top of any face, installed with warning signs. The fence will be approximately 1.2 metres high and of wire farm type construction.

Emergency

The site is within mobile phone contact and all vehicles will be equipped with two way radios. Safety management and operating procedures will be in place.

Fire

Fire risk is less than the risk from general farming. The open area of excavation will form a natural firebreak and will be used for the emergency muster area.

Fire Safety is incorporated into safety management for the site.

The site is within mobile telephone range which will assist in fire safety.

Earth moving vehicles, and the water tanker when on site during excavation, will be available for fire fighting if required. Operators are trained in the use of fire extinguishers for all types of fire.

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Perimeter fire breaks will be maintained, with the existing access road along the eastern fence of Lot 9005 forming a fire access break.

Final contours of the batter slopes will be 1: 2 to 1 : 4 vertical to horizontal with the floor of the excavation left as gently undulating around 8 metres below the existing land surface

SAFETY			
Potential Impact	Management	Outcome Commitments	Action Required
Operational Safety	<p><i>Mines Safety and Inspection Act 1994 and Regulations 1995.</i></p> <ul style="list-style-type: none"> ▪ The site is within mobile and landline telephone contact. ▪ Safety Management procedures will be implemented prior to commencement. ▪ All workers will be provided with site induction and necessary training prior to entering the site. 	The proponent is committed to maintaining a safe working environment and have standard Safety Management Plans for their operations.	<p>Compliance with <i>Mines Safety and Inspection Act 1994 and Regulations 1995.</i></p> <p>Ongoing</p>
Adjoining properties	<p><i>Mines Safety and Inspection Act 1994 and Regulations 1995.</i></p> <ul style="list-style-type: none"> • Warning signs are erected around the operating area. • Locked gates and fences will be maintained on site. 	The proponent is committed to maintaining a safe working environment and have standard Safety Management Plans for their operations.	<p>Compliance with <i>Mines Safety and Inspection Act 1994 and Regulations 1995</i></p> <p>Compliance operating conditions</p>

5.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

5.1 Surrounding Landuses and Buffers

The site is remote and protected by high predator fence along the eastern boundary of Lot 9005 which includes controlled gates.

A number of Government Policies relate to buffer distances and the protection of basic raw materials. State Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004) discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority as the basis for a Draft guideline on recommended buffer distances. These formed the basis of EPA Guidance Statement Number 3, Separation Distance between Industrial and Sensitive Land Uses, June 2005.

The Environmental Protection Authority of South Australia recommends a 300 metre separation for a Quarry - Non Blasting.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable. EPA Guidance for the Assessment of Environmental Factors 3 June 2005 provides for a case by case separation, based on the potential impacts.

For limestone extraction a generic buffer is suggested of 300 to 500 metres with case by case assessment where grinding and milling are used.

State Planning Policy No 4.1, State Industrial Buffer Policy recommends that all land uses within 1000 metres be considered.

The design of the footprint and the operation have been designed to minimise any impacts outside the disturbance areas.

These are generic buffers and can be varied on the basis of environmental and management studies.

The same type of quarrying therefore has very different generic buffers developed by State Environmental Protection Authorities, illustrating the need to consider separations on on-site environmental impact and not theoretical or generic buffers.

The main issues are the potential generation of dust and noise, which are addressed later.

As far as is known there are no dwellings within 1000 metres of the proposed excavation and stockpile area. The excavation of limestone from the site complies with these policies.

5.2 Aesthetics

Visual impact can occur in a number of circumstances, by the operation being set too high in the landscape, by being too close to neighbours and by insufficient visual protection.

The limestone resource of the highest grade is closest to the coast on the highest ground at an elevation of around 140 to 160 metres AHD. However excavation and all activities can be conducted in a manner that prevents the makes it most unlikely that the operations will be seen from public areas, roads or dwellings.

The limestone ridge can be seen at a long distance on a clear day from the higher parts of Denmark for example. Such as dwellings being visible on the Nullaki Peninsula.

The most relevant visual management guideline is WAPC 2007, *Visual Landscape Planning in Western Australia* which has been viewed and the project considered against that document. The relevant section is Part Three, pages 144 to 152 of the Guideline.

That document recommends a visual impact assessment, which has been completed using contours and sections, in addition to site observations and aerial photography. The context of the visual impact has been reviewed to try and maintain the natural countryside and minimise visual impact.

Section 5.2.5 of the Guideline provides for "extractive industries and utilities". The main directions are;

- the location of facilities to provide maximum screening
- entry points that are not at significant view points
- signage is visible but minimal
- visual management assessment may be required.

By excavating from the south the operations in the pit will not be visible. The stockpile area will be located at an elevation of around 20 metres AHD where it can be screened by the design of the access road and the intervening vegetation.

The limestone will be extracted from a ridge and will result in the ends of the two dunes being reshaped down to the elevation of the intervening swale. The main ridge line will not be effectively be modified in an un-natural way with the excavated land surface being similar to other parts of the Nullaki Peninsula.

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible.

The general management actions are summarised below together with the visual impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise visual impact.

It is felt that the operations are unlikely to be seen from any public location because of the way the pit and stockpile area are designed.

Below is a list of ideal visual management activities with a simple compliance audit for the operations.

IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
<ul style="list-style-type: none"> • Locate exposed features behind natural barriers and landform. 	<ul style="list-style-type: none"> • The quarry and processing facilities are to be worked from the south and west behind the ridge of material being excavated. • The limit of the pit is set back from the eastern

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<ul style="list-style-type: none"> Operate from the floor of the pit below natural ground level. 	<p>boundary of Lot 9005 and the coastal Reserve 30883.</p> <ul style="list-style-type: none"> The pit is to be worked from the inside out, below natural ground level via an internal haul road to the stockpile area. The processing area is to be located on the floor of the pit in the most efficient, safest location that provides the best visual management. Over time as the pit progresses the mobile processing plant will be moved around and across the floor of the pit.
<ul style="list-style-type: none"> Avoid breaks in the skyline due to workings and haul roads. 	<ul style="list-style-type: none"> Excavation will come from the south and west. The main ridge will not be altered and the skyline will not appear to change although it will be lowered slightly in a localised area replicating other parts of the Nullaki Peninsula. There are no sensitive premises or locations from which people are likely to see the pit. At all times the pit and stockpile area will be operated behind a face of natural vegetation.
<ul style="list-style-type: none"> Push overburden and interburden dumps into positions where they will not be seen or can form screening barriers. 	<ul style="list-style-type: none"> Perimeter bunds of overburden and natural face are to be used when material becomes available, just ahead of excavation to increase the potential screening.
<ul style="list-style-type: none"> Construct screening bunds and plant tree and shrub screens to reduce visual impact. 	<ul style="list-style-type: none"> Some screening bunds and natural vegetation are already in place around the perimeter. The bunds will be used as overburden becomes available. The quarry will not be able to be seen from the Bibbulum Track or from a distance within Reserve 17464 which remnant vegetation, vested in the City of Albany and associated with Lake Sadie, based on the design and operation of the activities.
<ul style="list-style-type: none"> Stage workings and progressive rehabilitation to provide visual protection of later activities. 	<ul style="list-style-type: none"> The staging of the pit footprint is designed to minimise visual impact with special attention concentrating on the eastern sightlines. The pit will be excavated from south and west to east and north.
<ul style="list-style-type: none"> Cover barriers and landscaping with forms, colours and textures compatible with the natural environment. 	<ul style="list-style-type: none"> Natural vegetation will be retained around the perimeter.
<ul style="list-style-type: none"> Adopt good house cleaning practices such as orderly storage and removal of disused equipment or waste. 	<ul style="list-style-type: none"> The proponent will maintain a tidy work environment at all their sites. Waste is regularly removed off site to an approved waste facility. Where possible usable materials will be recycled which is part of normal operational procedures.
<ul style="list-style-type: none"> Provide progressive rehabilitation of all completed or disturbed areas. 	<ul style="list-style-type: none"> This has always been used at pits and is proposed. Such rehabilitation is in place at the old excavations and cut slopes that demonstrate that rehabilitation can be effective with good topsoil and vegetation management. Areas not required will be revegetated when each part of the site has reached its final form.
<ul style="list-style-type: none"> Minimise the amount of ground used at any one time. 	<ul style="list-style-type: none"> The amount of ground used will be minimised to that needed for current and future operations and fluctuations.

Light Overspill

No night activities are proposed.

Visual Management - Applicable Legislation / Policies

- None applicable

Commitments to Visual Management

- The proponent is committed to management of visual impact and will implement the measures outlined.
- Every effort will be made to minimise the visual impact using appropriate methods from those listed above.

5.3 Noise

Offsite noise is governed by the *Environmental Protection (Noise) Regulations 1997*.

The *Environmental Protection (Noise) Regulations 1997*, require that sensitive premises including dwellings in non industrial and rural areas, are not subjected to general noise levels (excluding blasting), during the hours 7.00 am to 7.00 pm Monday to Saturday that exceed 45 dBA. Allowable noise to 55 dBA is permitted for up to 10% of the time and to 65 dBA for 1% of the time. Noise levels are not to exceed 65 dBA during normal working hours.

Between 9.00 am and 7.00 pm on Sundays and Public Holidays and between 7.00 pm and 10.00 pm on all days the base level is 40 dBA.

At night, between 10.00 pm and 7.00 am Monday to Saturday, and before 9.00 am on Sundays and Public Holidays, the permitted level drops to 35 dBA.

The 10% and 1% "time above" allowances apply at night and on Sundays and Public Holidays as well.

There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, that are added to the permitted levels. That is, if the noise is tonal or modulated the permitted levels drop by 5 dB. Impulsiveness is not likely to be relevant for the quarry under normal circumstances.

Influencing factors of external noise and nearby land uses such as busy roads, and industrial properties are not applicable to this site.

At a distance greater than 15 metres from the sensitive premises (eg dwelling), and commercial premises a base level of 60 dBA applies at all times with the 10% time permitted to be up to 75 dBA and the 1% permitted to be up to 80 dBA. For Industrial premises the base level is 65 dBA at all times with the 10% time permitted to be up to 80 dBA and the 1% permitted to be up to 90 dBA.

Gazetted and public roads are exempt from the Noise Regulations.

Noise can originate from a number of operations and may impact on onsite workers, or travel offsite and impact on external sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

There are a number of management actions that can be taken in quarries to minimise noise generation or travel.

These actions are routinely used in quarries where applicable and as the opportunity presents to minimise noise on site.

The proponent will comply with the *Environmental Protection (Noise) Regulations 1997*.

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There are no known sensitive premises within 1 km.

Occupational Noise

Occupational noise associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

The management of occupational noise is normally handled by providing all necessary hearing protection, as well as conducting worker inductions and educational programs for all staff. Regular site audits of quarry and mining operations are normally conducted by the Department of Mines and Petroleum.

As part of its commitments, the proponent will be pro-active with its worker safety awareness;

- by providing all necessary safety equipment such as ear protection,
- identifying sections of the plant where hearing protection is required, as well as,
- conducting induction and educational programs for its staff.

The operating noise levels around the site are regularly monitored by independent consultants in accordance with the *Mines Safety and Inspection Act 1994*, and the results communicated to the Department of Mines and Petroleum (DMP). All staff are provided with comprehensive ongoing training on noise protection as part of the commitment to occupational health and safety.

The DMP conducts Occupational Noise Audits of the Operations, on all operations.

Warning signs are to be used to identify areas of potential noise for workers.

All static and processing equipment will be located to provide maximum noise screening, behind bunds if sufficient overburden is available. Excavation will be staged from the west and south, behind the ridge which to provide continuous noise screening.

Not all equipment operates at the same time. Similarly not all resources will be worked at the same time.

Warning signs are to be used to identify areas of potential noise.

IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
<ul style="list-style-type: none"> • Comply with the <i>Environmental Protection (Noise) Regulations 1997</i>. 	<ul style="list-style-type: none"> • The proposed operations are so far from any dwelling, > 1 km and screened by the eastern and northern faces, that they will comply with the Regulations.
<ul style="list-style-type: none"> • Comply with the provisions of the <i>Mines Safety and Inspection Act 1994 and Regulations 1995</i>. 	<ul style="list-style-type: none"> • Like any quarry, the operations will be regularly inspected by officers of the DMP.
<ul style="list-style-type: none"> • Maintain adequate buffers to sensitive premises. 	<ul style="list-style-type: none"> • The quarry complies with the Generic EPA Buffer Guidelines. • There are no dwellings within 1000 metres.
<ul style="list-style-type: none"> • Locate exposed features behind natural barriers and landform. 	<ul style="list-style-type: none"> • The eastern and northern faces of the pit will provide hard screening of the operations which will be located on the floor of the pit.
<ul style="list-style-type: none"> • Operate from the floor of the pit below natural ground level. 	<ul style="list-style-type: none"> • This will be used.

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<ul style="list-style-type: none"> • Push overburden and interburden dumps into positions where they can form screening barriers. 	<ul style="list-style-type: none"> • Perimeter faces, overburden dumps and natural vegetation are proposed where possible.
<ul style="list-style-type: none"> • Design site operations to maximise the separation and protection from sensitive premises. 	<ul style="list-style-type: none"> • The shape of the pit, setbacks and method of operation have been designed to ensure landform protection is to be maximised.
<ul style="list-style-type: none"> • Maintain all plant in good condition with efficient mufflers and noise shielding. 	<ul style="list-style-type: none"> • Efficient equipment that is maintained in good condition and replaced from time to time will be used.
<ul style="list-style-type: none"> • Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades. 	<ul style="list-style-type: none"> • The access road will be maintained in good condition in conjunction with the landholder's access road.
<ul style="list-style-type: none"> • Implement a site code outlining requirements for operators and drivers. 	<ul style="list-style-type: none"> • A site induction and training program for all personnel is to be implemented and maintained.
<ul style="list-style-type: none"> • Shut down equipment when not in use. 	<ul style="list-style-type: none"> • This is normal policy.
<ul style="list-style-type: none"> • Scheduling activities to minimise the likelihood of noise nuisance. 	<ul style="list-style-type: none"> • Activities are proposed to minimise impacts on the local community.
<ul style="list-style-type: none"> • Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible. 	<ul style="list-style-type: none"> • Lights or low frequency beepers are to be used rather than beepers. • The design and shape of the pit will maximise noise screening.
<ul style="list-style-type: none"> • Use transport routes that minimise community disruption. 	<ul style="list-style-type: none"> • There is only one road to access the site, so trucks will be specifically instructed not to interrupt the local community as little as possible. • Gazetted roads are exempt from the Noise Regulations.
<ul style="list-style-type: none"> • Avoid the use of engine braking on product delivery trucks in built up areas. 	<ul style="list-style-type: none"> • The surrounding area along the transport route is generally flat with reduced gradients. • Air brakes are unlikely to be required. Drivers are to be instructed not to use air brakes under normal situations when exiting along the access road.
<ul style="list-style-type: none"> • Minimise and conduct at the least disruptive times, non day to day activities such as vegetation, topsoil or overburden stripping on exposed ridgelines. 	<ul style="list-style-type: none"> • The hours proposed are designed to minimise impact.
<ul style="list-style-type: none"> • Provide a complaints recording, investigation, action and reporting procedure. 	<ul style="list-style-type: none"> • A complaints recording procedure is proposed to cover all site activities.
<ul style="list-style-type: none"> • Conduct training programs on noise minimisation practices. 	<ul style="list-style-type: none"> • Site induction and training to all personnel is proposed.
<ul style="list-style-type: none"> • Provide all workers with efficient noise protection equipment. 	<ul style="list-style-type: none"> • All noise protection personal equipment will be provided to staff.

• Noise Management - Applicable Legislation / Policies

- *Environmental Protection (Noise) Regulations 1997.*
- *Mines Safety and Inspection Act 1994 and Regulations 1995.*
- *Australian Standard AS 2187.*

Commitments to Noise Management

- The proponent is committed to minimising noise emissions and will implement the measures outlined above.
- The proponent will comply with the *Environmental Protection (Noise) Regulations 1997.*

5.4 Dust

5.4.1 Environmental Dust

Background

Excessive dust has the potential to impact on both the workers and the adjoining land. However the potential generation of dust must be taken in context.

There are a number of key aspects to dust impacts;

- What is the source of particles?
- What is the potential for the particles to be disturbed?
- What is the nature of the particles and how are they likely to behave?
- What types of impacts are the particles likely to have if they move?
- What management actions can be used to mitigate or reduce dust impacts?

The most common form of disturbance is by mobile plant and vehicle impacts. In this local area dusty roads have the most potential to produce dust, such as the access road and depending on the substrate, traffic on the pit floor.

In many situations the fine particles are stabilised by vegetation, soil microbial materials and reactions and interactions between particles, particularly limestone of the access road which crusts after being wet but breaks up when trafficked producing dust.

Once disturbed however dust can be generated and may continue to be a problem until the fine particles are wetted down or return to a relatively stable condition. With effective treatment of dust by water, which is proposed, the risks of onsite, and consequently offsite, dust are minimised.

Excessive dust has the potential to impact on both the workers and the adjoining land. However if occupational dust is managed environmental dust will also be managed.

Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines and Petroleum who will regularly inspect the site.

5.4.2 Assessment of Dust Risk

Dust Guidelines

Dust emissions fall under the *Guidance for the Assessment of Environmental Factors, EPA, March 2000*. Assessments of the potential dust risk are normally made using the Land development sites and impacts on air quality, *Department of Environmental Protection and Conservation Guidelines, November 1996*. These are still in place but are incorporated into the *DEC (DER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities*.

The *DEC (DER) in 2008* released a draft *Guideline for the Development and Implementation of a Dust Management Plan*.

The setbacks provide effective dust management and comply with the EPA generic buffer guidelines and Department of Health Guidelines.

Onsite Risks

There are no offsite risks impacting on sensitive premises as these are too far away.

There is a risk of dust generation from the access road and from dust being dragged onto Indian Ocean Drive. These risk are similar to the risks from any unsealed road.

Limesand is calcium carbonate based and is not known to carry any significant health risks to workers based on other operations and recreational use of limesand dunes. Being Aeolian in origin the grain size is greater than the particulate sizes that impact on occupational health.

The key Objectives for the operations are;

- Manage the potential for the generation of dust.
- Visually monitor dust levels and take steps to reduce the potential impact of dust on occupational and environmental aspects of the operation and local area.

5.4.3 Buffers

The setbacks to sensitive premises comply with the EPA generic buffer Guidelines for all operations as noted in Section 6.2 Surrounding land Use in the Mining Proposal.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. As there is no processing on site the minimum generic buffer would apply; that is 300 metres. The minimum separation distances are 2 km for the northern portion of the resource and 1 km for the southern edge well in excess of the EPA generic buffer.

Dust particles are readily stopped by tree belts and distance, with which the site complies. Tree belts slow the wind and allow the dust to settle. See *Planning Guidelines Separating Agricultural and Residential Land Uses, Department of Natural Resources Queensland 1997 (Pages 65 – 111)* and *Department of Health WA, 2012, Guidelines for Separation of Agricultural and Residential Land Uses which uses the same criteria (Pages 112 – 118)*.

The Queensland Guidelines predominantly relate to agricultural spray drift, but based on particle size also relate to dust. They are based on field studies and demonstrate the effectiveness of tree belts and distance in providing screening against particulate travel.

The Guidelines provide for a buffer of 300 metres for open agricultural land, dropping down to 40 metres where an effective tree belt is in place. The Western Australian Department of Health also uses the same guidelines.

Whilst there are no tree belts the distances involved ensure that the operations comply with the Department of Health buffer recommendations.

5.4.4 Occupational Dust

The proponent will provide induction and protective equipment for all persons on site.

The DMP require personal dust monitoring to ensure dust levels comply with health risk guidelines.

The dust management procedures used on site comply with these guidelines.

5.5.5 Actions and Management

Dust management therefore applies to the access road which is no different to any non sealed road.

There are a number of management actions that can be taken in quarries to minimise dust generation or travel and these are used wherever possible. The general management actions are summarised in the tables below, together with the potential dust issues that relate to this site. The actions are used where applicable and as the opportunity presents to minimise dust on this site.

Loads on trucks that have the potential to generate dust are required to be covered.

DESIGN AND SITE

1. Minimising the amount of ground open.
2. Minimising the amount of ground being subject to traffic.
3. Locating access roads away from sensitive premises.
4. Design of the pit to reduce wind speed and potential dust lift off.
5. Maintaining effective setbacks.
6. Constructing perimeter bunds to reduce wind speed.
7. Providing wind break fencing generally and on top of bunds as required.
8. Maintaining a secure, fenced site, to prevent illegal access.
9. Rehabilitate and stabilise all completed areas as soon as practicable.

OPERATIONS

10. Locate active areas away from windy locations.
11. Working on the floor of the pit.
12. Operate some parts of the pit only when conditions are suitable.
13. Locating mobile plant and stockpiles in sheltered areas.
14. Design staging to minimise dust risk.
15. Conduct higher dust risk operations such as topsoil clearing and placement during more favourable conditions.
16. Shut down equipment that is not required.

ACCESS AND HARDSTAND

17. Constructing the access roads from hard materials that resist dust generation.
18. Using a sealant such as a polymer, chemical or emulsified oil or bitumen on the access road to reduce water use.

STOCKPILES

19. Minimise the number of stockpiles.
20. Maintain stockpiles in sheltered areas.
21. Reduce the elevation of stockpiles.
22. Limit the drop height to stockpiles and loading.

TRANSPORT

23. Cover all loads.
24. Ensure all trucks are dust free and not carrying particles and other materials outside the tray.
25. Choose the best transport routes.
26. Wet down or sweep the cross over and access roads.

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HEALTH AND COMMUNITY

27. Maintain air conditioned cabins on all vehicles.
28. Provide a readily auditable trigger of no visible dust to cross the property boundary in line with DER Licence and best practice in WA.
29. Provide a comprehensive visual monitoring program.
30. Conduct effective site induction and awareness training for all staff.
31. Training should include observation and mitigation where possible of all dust emissions.
32. Providing a complaints investigation, mitigation and recording procedure.
33. Liaising with Main Roads City of Albany when required.
34. Ceasing operations when conditions are not favourable or when visible dust is crossing the boundary.
35. Obtain the latest weather conditions to increase the awareness of dust risk.
36. Cease operations during adverse weather conditions.

5.4.6 Dust Management Actions - Risk

ACTIVITY	POSSIBLE RISK SEVERITY and FREQUENCY	OPERATIONAL PROCEDURES AND COMMITMENTS	RISK AFTER MANAGEMENT
GENERAL			
Legislation	----	<ul style="list-style-type: none"> The proponent will comply with the provisions of the <i>Mines Safety and Inspection Act 1994 and Regulations 1995</i>. 	----
Buffers	----	<ul style="list-style-type: none"> Large buffers of 1 to 2 km are provided 	----
Landform	----	<ul style="list-style-type: none"> Activities are designed and located behind the natural ridges, where possible by excavating from the base of the pit. The separation distances mitigate the dust risk to the residences from excavation and processing. Transport dust risks pose the greatest offsite risk. 	----
	----	<ul style="list-style-type: none"> The pit is worked from the floor where possible to reduce wind on the floor and to enable the face to provide barriers to dust lift off and carry. 	----
Vegetation	----	<ul style="list-style-type: none"> Vegetated buffers of 1000 metres are in place. 	----
Pit Design and Staging	----	<ul style="list-style-type: none"> Design and staging have been selected to maximise dust management. 	----
Screening	----	<ul style="list-style-type: none"> The buffer distance are large enough for tree belts not to be required for quarrying and processing. Operating on the floor of the pit reduces wind speed and lessens the risk of dust lift off. 	----
MANAGEMENT			
Occupation	----	<ul style="list-style-type: none"> Air conditioning and enclosed cabs used for on site operational mobile plant. 	----
Monitoring	----	<ul style="list-style-type: none"> A monitoring system is in place. See Trigger Conditions below. 	----
Trigger conditions	----	<ul style="list-style-type: none"> Most dust is generated from vehicle movements and uncontrolled crushing. The trigger for dust management is the generation of visual dust. The site supervisor is normally the loader driver who is in the best position to assess dust generation and to direct remediation. On site operators are instructed to visually monitor dust, report and treat any visible dust. 	----
Adverse weather	Moderate - Uncommon in winter, more common in summer.	<ul style="list-style-type: none"> When winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved. 	Low
Equipment	Low to	<ul style="list-style-type: none"> Machines and site activities are shut down in the event of 	Low

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failure	moderate - Uncommon	breakdowns that prevent adequate dust management.	
Training	----	<ul style="list-style-type: none"> The proponent will use on site induction and training to all personnel at all operations. 	----
Complaints	----	<ul style="list-style-type: none"> A record of all dust complaints is to be maintained together with the mitigation measures to be used to reduce the dust impacts. All complaints relating to dust are to be investigated immediately on receipt of a complaint. As far as is known there have been no complaints within the past ten years 	----
EARTHWORKS			
Land Clearing	Moderate - Once per year	<ul style="list-style-type: none"> The only significant clearing will be for the access road. 	Low
Overburden removal	Moderate - Once per year	<ul style="list-style-type: none"> There is no overburden. Subgrade material will not be excavated or disturbed were possible. 	Low
Land restoration	Moderate - Once or twice per year	<ul style="list-style-type: none"> Land restoration will progressively follow excavation and will mainly consist of the floor being left in an undulating excavated state ready for planting. 	Low
EXCAVATION - PROCESSING			
Excavation	High - Frequent	<ul style="list-style-type: none"> A loader or excavator will extract material from the face and load directly to road trucks. A bulldozer may be used from time to time. A small crusher and screen may be required for calcified and lithified materials. 	Low
Processing	High - Frequent	<ul style="list-style-type: none"> Maintain hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades. Treatment hardstand where possible. Plant location, and approach with respect to wind directions, will be used to minimise impact on operators. Any mobile crushing and screening plant will be located on the pit floor below natural ground level to reduce wind speed and reduce dust lift off. Any crushing or screening plant will be licensed through the DER. 	Low
Stockpiles	Moderate - Moderate	<ul style="list-style-type: none"> Stockpiles will only be required where crushing and or screening is use and will be located on the floor of the pit at generally low elevations. It is the vehicle movements during dry conditions that generate the greatest dust risk. 	Low
		<ul style="list-style-type: none"> Plant location, and approach with respect to wind directions, will be used to minimise impact on operators. The internal roads are graded as required to minimise dust. 	Low
TRANSPORT			
Access Road	Moderate to High - Frequent	<ul style="list-style-type: none"> The access road is no different to any other local unsealed road and is used only to service the pit. The access road is to be maintained in good condition (free of potholes, rills and product spillages). Water or soil stabiliser will be used to wet down the access road as required. 	Low
Loading and Road Transport	Moderate to High - Frequent	<ul style="list-style-type: none"> Trucks are required to install tarpaulins or cover prior to exiting the quarry. Transport and operations are anticipated to be intermittent through the year rather than continuous. 	Low
		<ul style="list-style-type: none"> A site code and induction system is used for the quarry. 	

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	<ul style="list-style-type: none"> • Road trucks are required to be maintained in a clean condition. Loader drivers are instructed on the best means of loading to minimise overflow and spillage. • Trucks are inspected prior to leaving the site and brushed down as necessary. • A policy of instructing drivers to report and clean up spillages will be provided. 	
	<ul style="list-style-type: none"> • This forms part of Italia Stone Group normal operational procedures. • Loader drivers are instructed on the best means of loading to minimise overflow and spillage. • Trucks are inspected prior to leaving the site and brushed down as necessary. 	

5.4.7 Dust Monitoring

The most effective dust monitoring is the sighting of visible dust. Dust can be detected as soon as it leaves the wheels of vehicles and detection is not reliant on dust travelling to a machine monitor located near the boundary.

When trigger conditions are detected and/or alerted, relevant action is taken. This can include additional water suppression, modification of procedure, delay until more favourable conditions are present, use of alternative equipment etc.

Human monitoring can detect potential dust risks prior, and take action prior, to significant dust being generated. They notice dust immediately such as from tyres, whereas machine monitoring has to rely on significant dust being generated, travelling to the boundaries of the premises and triggering an alarm. The operators would be negligent if they let the dust get to that level of impact prior to taking action.

The auditable condition is visible dust crossing the boundary of the premises; the lot boundary. This is the condition used on Department of Environment Regulation Licences and all other quarries such as sand, limestone and hard rock quarries in Western Australia and has worked well in the past.

It is also the method used by the Department of Mines and Petroleum to rapidly assess occupational dust on site.

Most dust generated from processing and vehicle movements has a very large visible component. Lesser risks emanate from excavation and land clearing. As invisible dust can be generated with the visible dust, recognising and dealing with visible dust is a very effective instantaneous method of recognising excessive dust.

The quarry manager and leading hand are ultimately responsible for site supervision of dust. They will travel around the operations and pit frequently and are in two way radio contact with all mobile plant.

All operators on site are to be instructed to be vigilant to dust generation and management and report any excessive dust or potential dust management issues.

Visual monitoring is even more effective when complemented by an extensive reporting and complaints process and this is used and this is proposed.

5.4.8 Greenhouse Gas

Over the years trucks have become more efficient with respect to greenhouse gas emissions, particularly with the use of truck and trailer and road train configurations.

The proponent will seek ways to reduce the amount of fossil fuels used, and has obtained more efficient mobile plant and equipment when this has become economically available.

The internal design of the operations will minimise the haulage route to save energy use and potential impacts.

The location of this pit means that it is closer to some parts of the Wheatbelt which provides for savings in fuel to get the limesand to the agricultural areas.

5.4.9 Complaints Procedure

Visual monitoring is more effective when complemented by an extensive reporting and complaints process.

An effective complaints mechanism is an essential part of the dust identification and management and is proposed.

A complaints book that lists the items below will be used. The book will be available as requested.

- The complaint,
- Nature of the complaint, time and date,
- Source of the complaint,
- Investigations of the complaint,
- Results of the investigation,
- If the complaint is valid, any mitigation actions that result,
- Any communication with the complainant.

<p>Dust Management - Applicable Legislation / Policies</p> <ul style="list-style-type: none"> • <i>Guidance for the Assessment of Environmental Factors, EPA, March 2000.</i> • <i>Land development sites and impacts on air quality, DEP, 1996.</i> • <i>Department of Environmental Protection Guidelines, November 1996 and DEC 2008, A guideline for the development and implementation of a dust management plan</i>
<p>Commitments to Dust Management</p> <ul style="list-style-type: none"> • The proponent will take the necessary steps to manage and contain dust by implementing and maintaining the Dust Management Plan.

5.5 Water Quality

Limestone excavation is a clean operation similar to sand excavation in the nature of the risk to groundwater. No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas*.

Limestone excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Environment Regulation who permit extractive industries in Priority Groundwater areas such as Lake Gnangara where sand excavation occurs within 3 metres of the water table.

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The protection of water, whether groundwater or surface water, is an important part of the management of quarries.

The main Environmental Objective relating to water management is;

- Minimise the impact on surface and ground water quality.

The limestone pit site lies on a ridge that is well elevated and set 2 km away from the edge of Lake Saide.

Groundwater flow is deep and to the ocean under the pit and interpreted to be most likely also to the south to the ocean under the stockpile.

A sump on Nullaki Peninsula will be used for any water requirements which are anticipated to be low.

The base of the excavation will be over 140 metres to the water table.

Potable water will be brought in from scheme supply.

The management actions are considered in the attached Water Management Plan.

The proposal is consistent with all Government Policies for extraction of limestone and sand and complies with the same requirements for extracting in Priority Drinking Water Source Protection Area.

Water Management - Applicable Legislation / Policies

DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *Mechanical servicing and workshop facilities*
- *Mine dewatering*
- *Health Act 1911*

Commitments to Water Management

- The site complies with Department of Water Guidelines for separation to groundwater.
- The nature of the operation and the depth to groundwater will minimise any risk to groundwater systems and Lake Pollard.
- Management procedures outlined above are committed to, to protect water quality.
- There will be no alteration to surface water flows or groundwater levels.
- The proponent will have in place a site code outlining requirements for operators and drivers.
- The proponent will conduct training programs on pollution minimisation practices.

5.6 Biodiversity Management

5.6.1 Vegetation and Flora

A detailed Flora and Vegetation Study has been completed by Bio Diverse Solutions specifically covering the proposed excavation area. Kathryn Kinear completed the survey to map the vegetation communities, weeds and dieback to a Level 1 Flora Survey.

Bio Diverse Solutions, 2016, *Vegetation Communities Survey, Lot 9005, Rock Cliff Circle, Denmark.*

A copy of the Vegetation Survey is attached.

The site is within the Southwest Botanical Province and lies on the eastern part of the Warren Interim Bio-geographic Regional Area (IBRA) which extends east and west along the coast.

- **Vegetation Communities - Limestone Ridge Vegetation**

The limestone ridge vegetation is classified as Open Heath which on the excavation area consists of generally low Scrub without the taller species that grow in more sheltered location.

Lifeform	Species
Trees <10m	<i>Agonis flexuosa</i>
Shrubs >2m	<i>Agonis flexuosa</i> , <i>Agonis theiformis</i> , <i>Acacia cyclops</i> , <i>Spyridium globulosum</i> and <i>Hakea varia</i> .
Shrubs 1-2m	<i>Allocasuarina humilis</i> , <i>Pteridium esculentum</i> , <i>Jacksonia horrida</i> , <i>Pultenaea reticulata</i> and <i>Xanthorrhoea preissii</i>
Shrubs 0.5-1m	<i>Hibbertia cuneiformis</i> , <i>Hibbertia racemosa</i> , <i>Leucopogon obovatus</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon propinquus</i> , <i>Lysinema ciliatum</i> , <i>Pimelea clavata</i> , <i>Pimelea rosea</i> subsp. <i>rosea</i> , <i>Anigozanthos flavidus</i> , <i>Hakea prostrata</i> , <i>Adenanthos cuneatus</i> and <i>Xanthorrhoea gracilis</i>
Shrubs <0.5m	<i>Rhagodia baccata</i> subsp. <i>baccata</i> , <i>Andersonia caerulea</i> , <i>Gompholobium confertum</i> , <i>Boronia crenulata</i> and <i>Synaphea</i> sp.
Sedges and rushes	<i>Lyginia imberbis</i> , <i>Lyginia barbata</i> , <i>Lepidosperma squamatum</i> , <i>Tetraria octandra</i> , <i>Desmocladus flexuosus</i> and <i>Hypolaena exsulca</i>
Herbs and grasses	<i>Carpobrotus</i> sp., <i>Platysace compressa</i> , <i>Trachymene pilosa</i> , <i>Chamaescilla corymbosa</i> , <i>Drosera erythrogyne</i> , and <i>Opercularia hispidula</i>

No Threatened or Priority Ecological Community were recorded.

Bio Diverse Solutions broadly mapped the vegetation across the excavation area as Open Heath in Pristine Condition. However because of the previous excavation, and earthworks associated with exploration for the limestone the vegetation is better shown as partially degraded being degraded where cleared and pristine in uncleared areas.

Very few weed species were recorded and none were noticed on the proposed quarry site by Landform Research in May 2016.

Bio Diverse Solutions did not find any evidence of plant diseases.

During the flora and vegetation survey a total of 112 species were observed. A species list is provided in the attached flora and vegetation report.

No Threatened taxa were recorded by Bio Diverse Solutions.

The following Priority taxa are listed within 10 km or were detected by Bio Diverse Solutions.

- *Billardiera drummondii* grows in Eucalypt Woodland and is less likely on the quarry footprint. The taxa currently has no priority listing on Florabase 2016-06-08.
- *Banksia sessilis* var *cordata* (P4) grows on coastal limestone and may be present.
- NatureMap lists *Gahnia sclerioides* (P4) as occurring within 10 km growing on moist sandy soils which are less likely on the disturbance areas.
- *Sphaerolobium calcicola* (P3) as occurring within 10 km and may occur in sand over limestone.
- *Isopogon buxifolius* var *buxifolius* is listed as occurring within 10 km but is unlikely to be present as it occurs in swampy areas.

Based on the small area to be cleared out of many hectares of similar vegetation along the Nullaki Peninsula and nearby coast, most of which is protected in Reserves 1764 and 26177 the temporary impact of excavation will be very small.

The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares and the 4 hectares open at any one time represents just 0.06% which is not regarded as significant.

At the end of excavation the site will be rehabilitated as shown by rehabilitation of other limestone pits including the old road base pit on site. Where rehabilitation was effective with no weeds or disease.

5.6.2 Vegetation Clearing

Clearing is controlled under the **Environmental Protection (Clearing of Native Vegetation) Regulations 2004**. These regulations provide for a number of principles against which clearing is assessed.

	CLEARING PRINCIPLE <i>(Schedule 5 Environmental Protection Amendment Act, 1986)</i>
1a	<i>High Level of diversity</i>
1b	<i>Significant fauna habitat</i>
1c	<i>Necessary to existence of Rare flora</i>
1d	<i>Threatened Ecological Community</i>
1e	<i>Significant area of vegetation in an area that has been extensively cleared</i>
1f	<i>Wetland or watercourse</i>
1g	<i>Land degradation</i>
1h	<i>Impact on adjacent or nearby conservation areas</i>
1i	<i>Deterioration of underground water</i>
1j	<i>Increase flooding</i>

Although the Clearing Principles consider Biodiversity and other conservation issues, they do not specifically address the issues of the metropolitan area or resource needs. Therefore some additional principles need to be added when considering the need for Basic Raw Materials.

The *Environmental Protection Act 1986 Section 510* states that the "CEO may take into account other matters that the "CEO considers relevant" (*EP ACT 1986 Section 510*). Therefore Section 510 of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy and community need.

A separate Flora and Vegetation Assessment and Report is prepared for the site by Bio Diverse Solutions and is attached.

The procedures used for vegetation clearing are documented in 5.9.2 Rehabilitation. These were used and are included here in case a small area of additional clearing is applied for to the immediate north of the existing permitted area.

Topsoil and overburden treatment is covered in 5.9 Rehabilitation. All suitable materials will be retained for rehabilitation and directly transferred where possible.

5.6.3 Fauna

A fauna study was not conducted because the resource area represents a very small area within a large area of remnant vegetation with a small area only open at any one time; 0.06% of the nearby vegetaation.

A search of NatureMap and the EPBC database was completed by Landform Research and includes the fauna listed within the City of Albany and recorded within 10 km and is attached with the Flora and Vegstation Survey.

The Nullaki Peninsula is protected by a predator proof fence to keep out cats and foxes in particular. The exclusion of these predators forms a significant protection measure for fauna wih are advantaged by living within the protected zone. The protection fence is to remain in place.

The nearby vegetation of similar communities in excellent condition totals over 6 500 hectares. The 4 hectares open at any one time represents just 0.25%. The small area of proposed disturbances and the large connectivity remianing in place will not cause any isolation of short range fauna.

With the small area proposed to be open at any one time, a return to local native habitiat, the proven rehabilitaiton methods and the benefits of the predator proof fence, the impacts on fauna are not considered significant.

- No matters of significance under the *EPBC Act 1999* were identified. The potential feeding habitat of Black Cockatoos impacted is small because the only food source *Dryandra sessilis* is limited. With the staging and small footprints the proposed activities will not trigger referral to the Commonwealth.

5.6.4 Wetlands

The only nearby wetland is Lake Saide which is 2 km from the operational site.

Bibulmum Walking Trail

The Bibulmum walking track runs from Albany in the east before swinging north prior to the eastern boundary of Lot 9005. The track is located some 400 metres from the limestone pit.

The track lies in heathland that is often higher than a person making the excavation area difficult to see. The excavation area is designed to be excavated from the west to the east and to the north, working behind the vegetated eastern and northern faces which will assist in minimising or eliminating any visual impact of the pit from the Bibulum Track.

The Bibulum Track moves slightly closer to the stockpile area, but this is located in flat ground set back behind vegetation to provide visual screening.

The Bibulum Track will cross the access road. Signs and warning barriers will be used at the crossing point in a similar to other road crossings.

Biodiversity - Applicable Legislation / Policies

- None applicable – Likely to be conditioned

Commitments to Biodiversity Management

- The excavation areas are selected and the operations designed to minimise impacts on Biodiversity.
- Biodiversity impacts will be very small and temporary as the land excavation will be staged and rehabilitated as soon as possible.

5.6.5 Dieback Management Plan

Dieback of vegetation is often attributed to *Phytophthora cinamomi* even though there are other *Phytophthora* species and other diseases such as *Armillaria* that can cause dieback like symptoms. Microscopic soil-borne fungi of the genus *Phytophthora* kill a wide range of native plants and can cause severe damage to many vegetation types, particularly those from the families Proteaceae, Epacridaceae, Xanthorrhoeaceae and Myrtaceae.

In most cases dieback is caused by a pathogen which infests the plant and causes it to lose vigour, with leaves dying, and overtime may kill the plant. As such the management of Dieback is essentially related to plant hygiene when coming onto a site and within a site.

Bio Diverse Solutions did not find any evidence of dieback or other plant disease infestations and neither did Landform Research during their site inspection.

There are several guides to the management of Dieback.

- Department of Environment and Conservation (DPaW) Dieback Hygiene Manual 1992 is a practical guide to Dieback management.
- Department of Environment and Conservation (DPaW) Best Practice Guidelines for the Management of *Phytophthora cinamomi*, draft 2004.
- Dieback Working Group 2005, Management of *Phytophthora* Dieback in Extractive Industries.

The Department of Environment Regulation generally recognises that Dieback is less likely to impact on vegetation on limestone and Spearwood/Cottesloe Land Systems, Podger F D and K R Vear, 1998, *Management of Phytophthora and disease caused by it, IN Phytophthora cinnamomi and the disease caused by it - protocol for identifying protectable areas and their priority for management*, EPA 2000. The same is noted in DEC 2009.

Dieback is only likely to be an issue when equipment is brought to the site from a dieback affected area either through vehicles or plant and soil materials, therefore the following general principles are applied to Dieback management.

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Even there is no evidence of infestations strict hygiene measures will be used.

Not all potential impacts will apply to all parts of the proposed quarry operations. E

- Excavation will be undertaken using practices recommended by DEC. See *CALM Dieback Hygiene Manual 1992* which is more practical and *CALM Best Practice Guidelines for the Management of *Phytophthora cinamomi*, draft 2004*. See also *Dieback Working Group 2005, Management of *Phytophthora* Dieback in Extractive Industries*.
- Dieback diseases are more likely to be transported under moist soil conditions.
- All vehicles and equipment to be used during land clearing or land reinstatement, should be clean and free from soil or plant material when arriving at site.
- The site will effectively be a spit system with road traffic restricted to the stockpile loading area.
- Washdown of vehicles and equipment should be prior to arriving on site and to the procedures in CALM Guidelines for Dieback Management.
- No soil and vegetation should be brought to the site apart from that to be used in rehabilitation.
- Plants to be used in rehabilitation should be from dieback free sources.
- Vegetated areas ahead of excavation should be quarantined to onsite access
- Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- Rehabilitated surfaces are to be free draining and not contain wet or waterlogged conditions.
- Illegally dumped rubbish is to be removed promptly.
- No contaminated or suspect soil or plant material is to be brought onto the site.
- When clearing land or firebreaks vehicles are to work from dieback free areas towards dieback areas; or, in situations where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- Roads should be free draining and hard surfaced.
- A hygienic site is to be maintained by not bringing any soil or plant material onto the site except for rehabilitation purposes or from known dieback free areas.
- All plants, seeds and other materials used in rehabilitation will be sourced from dieback free areas.
- The predator proof fence and gate system will be maintained.
- Compliance with the Weed Management Policy.

Dieback principles will be followed even though there is a reduced risk of spread on calcareous soils such as this. (Podger F D and K R Vear, 1998).

The proposed access road will be limestone road.

The aim of dieback management during excavation is to minimise the risk of entry of dieback into the site. The calcareous soils of the remnant vegetation are unlikely to allow *Phytophthora* to spread but there may be other pathogens such as *Armillaria*.

In many ways the management of the site for dieback is similar to that for the management of weeds, and the two management practices should be considered together.

The other management is to ensure that all excavation equipment and road transport vehicles are clean and free from soil and vegetable matter prior to entering the operations.

Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and farm maintenance activities.

Topsoil will be cleared according to 5.9.2 Rehabilitation Procedures.

Dieback - Applicable Legislation / Policies

- DEC (DPaW) *Dieback Hygiene Manual 1992*.
- DEC (DPaW) *Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004*.
- Dieback Working Group 2005, *Management of Phytophthora Dieback in Extractive Industries*.

Commitments to Dieback Management

- The proponent will not impact on the adjoining remnant vegetation by the proposed excavation.
- The proponent maintain the Dieback Management Policy to reduce the spread of Plant Pathogens.

5.6.6 Weed Management Plan

The management of weeds is essentially similar to that for plant diseases. The impact of weeds is really the impact within the local area and the more they are controlled the better. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted at all sites.

Weeds can be declared under the *Agriculture and Related Resources Protection Act 1976* which requires that Declared Weeds are eradicated. Other weeds are not Declared but may be classified as Environmental Weeds because they are well known for impacting on vegetation.

Generally if the actions taken for Dieback are applied they will also control weeds.

Minimal weeds were observed by Bio Diverse Solutions over the whole of Lot 9005, and none were observed on the excavation area by Landform Research in May 2016.

Even so weed management practices will be used.

- All vehicles and equipment to be used during land clearing or land reinstatement, will be clean and free from soil or plant material when arriving at site.
- No soil and vegetation will be brought to the site apart from that to be used in rehabilitation.
- Plants to be used in rehabilitation will be free from weeds.
- Vegetated areas ahead of excavation will be quarantined to excavation vehicles until required.
- Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing.
- Weed affected top soils may need to be taken offsite, used in weed affected areas, buried by 500 mm soil/overburden or taken offsite or sprayed to minimise the weed impact.
- Illegally dumped rubbish is the major source of weeds and is to be removed promptly.
- No weed contaminated or suspect soil or plant material is to be brought onto the site.
- When clearing land or firebreaks vehicles are to work in conjunction with dieback principles and push from areas of better vegetation towards areas of lower quality vegetation.
- Weeds should be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils.

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- Unwanted grasses should be sprayed with grass selective spray prior to seeding or rehabilitation.
- Weed management should work from least affected areas to most affected.
- Declared weeds should be treated promptly by digging out or spraying.
- Weeds will be treated promptly no matter how few there are.
- The predator proof fence and gate system will be maintained.
- Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.

The Dieback Management actions will also be used to assist weed management.

Inspections should be conducted to monitor the presence and introduction of weeds on an annual or more frequent basis. On identification, introduced weeds will either be removed, buried, or sprayed with a herbicide.

Weed - Applicable Legislation / Policies <ul style="list-style-type: none">• <i>Agriculture and Related Resources Protection Act 1976.</i>
Commitments to Weed Management <ul style="list-style-type: none">• The proponent will use the weed policy to try and prevent the introduction of Declared, Environmental or other weeds to the site.

5.7 Fire Protection

Fire risk is normally controlled through the *Bush Fires Act 1954* and local authority bylaws.

The excavation area will form a natural firebreak; the access road will also assist. Water available on site can be used for fire fighting.

Normal eastern and other strategic firebreaks will be maintained, based on the existing track and access network.

The safety of workers is managed through a Safety Management Plan developed through the *Mines Safety and Inspection Act 1994 and Regulations 1995*.

There are a number of management actions that can be taken in quarries to minimise fire risk and these will be used wherever possible. The general management actions are summarised below, together with the potential issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise fire risk.

- Restrict vehicles to the operational area, particularly on high fire risk days.
- Use diesel rather than petrol powered vehicles.
- Maintain perimeter fire breaks as required.
- Ensure fire risk is addressed and maintained through the site Safety Management Procedures.
- Provide an emergency muster area, communications and worker induction and training.
- Establish on site water supplies for potential use in extinguishing fire.
- Secure the site from unauthorised access.
- Maintain normal farm fire breaks and fire prevention procedures.

There is less potential fire risk from quarries than other land uses because quarries clear land, and vehicles are restricted to cleared access roads, the pit floor, processing and stockpile areas.

These cleared areas form a natural firebreak. The main risk comes from an external fire in the surrounding vegetation, impacting on the quarry. As such the fire risk is no greater than a rural property.

If there is a fire the site will be evacuated. If vehicles or plant are left on site, they will be parked in the centre of the pit in line with normal minsite actions and

Fire Management - Applicable Legislation / Policies

- *Bush Fires Act 1954.*
- *City of Albany Bylaws.*

Commitments to Fire Management

- The proponent will ensure the quarry operates to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.*
- The proponent will ensure the quarry complies with the local fire safety requirements and operates in compliance with normal rural fire practise and restrictions.

5.8 Aboriginal Heritage

A search of the Department of Aboriginal Affairs database reveals that there are no recorded sites on the Nullaki Peninsula. An ethnographic survey of the Nullaki Peninsula has been completed.

Aboriginal Sites

- *Aboriginal Heritage Act 1972-1980*

Commitments to Aboriginal Heritage Management

- Should any evidence of early aboriginal occupation be uncovered during the operation of the quarry, development will be stopped pending an assessment by a recognised consultant.
- If the site is confirmed as a site under the provisions of Section 15 of the Aboriginal Heritage Act 1972-1980 and Amendments, the proponent will comply with the provisions of the Act, relating to development in areas of recognised aboriginal sites.

5.9 Rehabilitation

5.9.1 Background

The area is currently remnant coastal heathland vegetation partially disturbed by tracks, a previous small excavation that has been rehabilitated, drill pads and soil test holes.

The old limestone pit that has been rehabilitated demonstrate that the retention and direct spread of topsoil can provide fast and good rehabilitaiton of local native species and communities.

It also demonstrates that excavation can be completed with reduce impacts as there is an absence of weeds and dieback diseases in the previoulsy excavated and disturbed areas.

The best means of revegetation is to use;

- Vegetation and topsoil recovered from clearing.
- Brush cut from adjoining vegetation.

The use of additional seed collection and seeding remains a contingency, but based on other rehabilitation is not considered necessary.

- **End Use**

The extraction of limestone is seen as an interim use of the land prior to utilisation of the area by the current land holder.

The final contours are anticipated to be undulating around 8 metres below the existing land surface replicating other portions of the limestone ridge.

The end use will be Conservation in line with the land zoning.

- **Mine Closure Considerations**

Rehabilitation will be directed towards the final end land use of Conservation, and is to be aimed at the highest level of rehabilitation,

Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.

Appropriate vegetation clearing and reuse combined with topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface.

The following procedures have been selected from observation of the existing operations and experience in the rehabilitation of the old limestone pit and other limestone quarries by worked on by Landform Research.

- **Rehabilitation Objectives**

There are a number of management actions that can be taken in quarries to maximise rehabilitation effort and these will be used wherever possible. The general management actions are summarised below and will be used where applicable and as the opportunity presents.

- **Completion criteria – Interim Final Landuse**

- Stable post-mining landscape, and the minimisation of wind or water erosion.
- Provide for the protection of the local groundwater resource in terms of both quality and quantity.
- Control or eliminate weed species so that they are not likely to threaten the revegetation or local vegetation communities.
- Kept the local vegetation as dieback free.

- Provide a self sustaining cover of local native plants at a minimum of 1200 native plant stems per hectare at 3 years

5.9.2 Rehabilitation Procedures

• Vegetation Clearing – Recovery

1. A Clearing Permit will be required for areas of native vegetation to be cleared under *Section 46 of the Environmental Protection Act 1984*.
2. Dieback and weed management will be undertaken as outlined in the attached Dieback and Weed Management Plans.
3. Essentially all topsoil, vegetation fragments and any overburden will be recovered from cleared areas and retained for use in rehabilitation. The vegetation will be stored with the topsoil in low dumps <1 metre high around the perimeter of the pit.
4. Topsoil clearing will be progressive and minimised to that required for each stage of excavation.
5. Smaller vegetation will be track crushed and directly transferred to areas under rehabilitation to assist soil and habitat generation. The vegetation contains a significant seed source, because of the contained seed on many species, it is also a source of microbial material for soil formation, adds to habitat and assists in managing wind erosion.
6. The vegetation will also be used on the batters to minimise soil erosion and spreading on the final land surface as part of the final rehabilitation.
7. If direct transfer is not possible the vegetation will be stored in low dumps to 1 metre high or swapped with a nearby operator to try and ensure that the material is not wasted.
8. Topsoil will be pushed to one side and formed into low storage dumps for later use for rehabilitation using either a loader or bulldozer.
9. Overburden, as yellow and brown sand and low grade limestone, will then be pushed to the perimeters, normally by bulldozer, to form bunding around the active area.

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Excavation – Rehabilitation Management Plan,
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Rehabilitation at the old limestone pit

Figure 8 Rehabilitation that has been cleared for new testing of limestone



Figure 9 Rehabilitation of a steep slope on the access road to the pit



Rehabilitation of limestone - limesand pit at Lancelin

Figure 10 Rehabilitation on coastal limestone at Lancelin

- **Landform Reconstruction and Contouring**

1. At any one time it is anticipated that around 2.0 hectares of pit ground plus 2.0 hectares of stockpile area will require rehabilitation. Progressive rehabilitation of completed land will be used.
2. Land restoration and rehabilitation of any completed areas will be conducted prior to the site being vacated following the yearly excavation campaign at the end of autumn which is an appropriate time for rehabilitation.
3. All buildings, plant and any other foreign materials will be removed from site.
4. All inert materials associated with processing will either be buried or removed from site. All non inert materials will be removed.
5. Limestone roadbase and hard stand will either be removed from site to an approved disposal situation or buried by 0.5 metres plus of limestone overburden and soil.
6. Any hardstand and roadbase areas will be deep ripped using a tyne attached to a loader, grader or bulldozer.
7. The onsite waste disposal system (septic system) will be removed from site.
8. The land surface will be formed to be geotechnically stable to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface.

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Excavation – Rehabilitation Management Plan,
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9. The final land surface will be smoothed to be compatible with the existing natural landform of the area with some slopes left potentially at the angle of natural repose for limesand to replicate the natural dune system.
10. As the limestone is porous there will be no need for upslope contour or diversion banks to prevent water entering the void. Similarly there will be no need for drainage works on the floor of the void. The floor will be formed to drain to low points to manage storm events.
11. Where possible any disturbed areas that are no longer required will be rehabilitated using the methods described above within 12 months of becoming available.
12. The final landform will be formed to the interim final concept plan.
13. The land surface will be a gently undulating floor with sloping batters at less than 1 : 4 vertical to horizontal and some at 1 : 2 to replicate the pre-excavation limestone ridge.
14. Limestone floor will be deep ripped in two directions. The width between rip lines will be 1 metre intervals.
15. A minimum of 300 mm of overburden will be spread over the surface where available to provide a substrate for revegetation.

- **Pre - Vegetation Establishment**

1. Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species.
2. If required this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broad-scale weed treatment can be detrimental to the germination and growth of native and some pasture species but may be required if the weed load is to be reduced.
3. Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management Plan will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

- **Revegetation**

1. Topsoil will be re-distributed in rehabilitated areas to depths of 50 mm where available.
2. Topsoil provides a useful source of seed for rehabilitation of Limestone Heathlands, when the correct handling of the topsoil is used; stripped and replaced dry (autumn direct return). Maximum depth of 50 mm can be used to optimise revegetation of species-rich plant communities. However this needs to be balanced against the weed load as described under Weed Management.

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3. Native vegetation, plus leaf, root and organic matter collected from the land clearing procedures will be spread across the topsoil. This will increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention. The difference in properties between existing topsoil and subsoils is not considered a major impediment to rehabilitation of native species in the area.
4. Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.
5. Topsoil will be spread directly from an area being cleared where possible, otherwise reclaimed from a topsoil dump.
6. Topsoil will be spread at depths of 50 mm and should be spread during summer, preferably by the end of February.
7. Rehabilitation will take place during the first winter months following the restoration earth works of each particular section of quarry. Leaving the completed earth works for one season will reduce the success of rehabilitation by at least 50%, due to compaction effects.
8. If insufficient revegetation is achieved, local provenance seed will be collected from the site or purchased from commercial seed collectors.
9. Rehabilitation will consist of
 - topsoil spreading
 - seed spreading (if necessary)
 - tube plants (if necessary)

A species list is attached in the Bio Diverse Solutions Report.

10. A combination of the three methods is always preferred by Landform Research and has proven to be the most versatile and successful.
11. Seeding conducted in summer will use scarified leguminous seeds that have been "dry smoked". Seeding conducted in July to August will have the leguminous seeds heat treated and all seeds will be smoke treated by soaking in "smoke water" for 24 hours prior to seeding.
12. Seed spreading will be achieved either using mechanical seed dispersal equipment or using manual methods. Bulking with a spreading agent such as sawdust, vermiculite or sand is desirable.
13. Rehabilitation will progressively follow mining with completed areas of the excavation being revegetated as soon as practicable.

• Irrigation

1. Experience with the previous regeneration on site and by Landform Research in rehabilitation of quarries in limestone has shown that when completed well there is no need for irrigation of the rehabilitation.

- **Erosion Control**

2. Soil erosion occurs when soil is exposed and disturbed by wind or water. Erosion involves soil particles being detached from areas not adequately protected by vegetation, and moved down-slope. This is not normally a significant problem in limestone, which crusts after the first winter. See Figure 9.
3. The limestone soils are very permeable but readily crust during rainfall making them stable. Runoff is normally minimal unless surface materials become non-wetting. Even so experience with limestone extraction shows that there is minimal non wetting and surface particle movement under such conditions.
4. Water erosion on the batter slopes can be avoided by the permeability of the materials and by leaving the surface soft, rough and undulating, with the undulations running along contour. The final machinery run should be along contour and not down slope.
5. Wind erosion will be controlled by rehabilitating the disturbed ground as soon as practicable.
6. For rehabilitation areas, revegetation will take place as soon as possible following landform and soil reconstruction.

- **Monitoring**

1. During late summer an assessment of the success of the rehabilitation will be made to determine the rehabilitation requirements for the following winter.
2. Monitoring includes visual assessments and, where necessary, counts to determine the success of the soil stabilisation.
3. Native vegetation cover and soil stability will be assessed and corrected if found to be non compliant.
4. As necessary steps will be taken to correct any deficiencies in the vegetation.
5. Rehabilitation of each stage will be monitored for a period of three years to ensure that the revegetation meets the completion criteria of providing self sustaining vegetation cover.
6. In areas of rehabilitation that do not meet the completion criteria measures are to be taken to increase the stem density to achieve the completion criteria. This could include but not be limited to additional seeding or planting.

Temporary Closure

1. If for any reason the site is closed on a temporary basis for any period of time the following will be implemented.
2. The faces will be made safe or protected by bunds and/or fencing with signs in compliance with the *Mines Safety and Inspection Act 1994*.
3. All fluids, liquids and other materials that could leak over time, change or potentially impact on the environment will be removed from site, or stored in a manner that will not permit any environmental impact.

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4. Mobile and other plant will be made safe or removed from site in compliance with the *Mines Safety and Inspection Act 1994*.
5. Fencing will be maintained to make the pit safe.
6. Perimeter signage will be maintained.
7. The site will be monitored for weeds and interim rehabilitation success twice per year.
8. Regular site inspections will be made to ensure compliance with the *Mines Safety and Inspection Act 1994*, and any other actions that are required to make the site compliant or environmentally sound will be made as the need arises.

Rehabilitation - Applicable Legislation / Policies
<ul style="list-style-type: none">• <i>EPA, Guidance 6, Rehabilitation of Terrestrial Ecosystems</i>
Commitments to Rehabilitation
<ul style="list-style-type: none">• The proponent will ensure the completed land surface is formed to the standards in the <i>Mines Safety and Inspection Act 1994 and Regulations 1995</i>.• The proponent will rehabilitate the surface as outlined above and monitor the revegetation as described above.

ADDITIONAL REFERENCES - READING

Abeyasinghe P B, 1998, *Limestone and Limesand Resources of Western Australia*, Geological Survey of Western Australia, Mineral Resources Bulletin 18.

Abeyasinghe P B, 2003, *Silica resources of Western Australia*, Geological Survey of Western Australia, Mineral resources Bulletin No 21.

ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*.

Australian Geomechanics Society, 2003, *Engineering Geology of Perth, Parts 1 and 2*, Volume 38 No 3 and No 4.

Australian Government, Department of Environment and Heritage, 2000, *Interim Recovery Plan Aquatic Root Mat Community of Caves of the Swan Coastal Plain 2000-2003*.

Basic Raw Materials Resource Protection Working Plan, prepared for the Department of Planning and Urban Development (DPUD, 1996).

Bastian L V, 1996, *Residual soil mineralogy and dune subdivision, Swan Coastal Plain, Western Australia*, Australian Journal of Earth Sciences 43, 31-44.

Bastian L V, 2007, *Karst Examination of Nowergup Property*, Unpublished report to WA Limestone.

Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Commonwealth of Australia, 2001, *National Objectives and Targets for Biodiversity Conservation 2001 – 2005*.

Csaky D, 2003, *Review of the Karst Hazards in the Wanneroo Area*, Perth, Western Australia, Geoscience Australia.

Department of Environment and Conservation 2009, (Freeman, K, Be Keighery, G Keighery, V Longman, A Black and S Molloy), *Flora and Vegetation of the Dawesville to Binningup Region (Swan Coastal Plain)*, prepared for the DEC.

Department of Environment WA, 2004, *Stormwater Management Manual for Western Australia*.

Department of Environmental Protection (1997b). *Environment Protection (Noise) Regulations 1997: Summary of the Regulations*. Department of Environmental Protection, Perth.

Department of Minerals and Energy (1991). *Environmental Management of Quarries: Development, Operation and Rehabilitation Guidelines*. DOIR, Perth.

Department of Water (1999b). *Water Quality Protection Note: Above Ground Chemical Storage Tanks in Public Drinking Water Source Areas*. Water and Rivers Commission, Perth.

Department of Water (1999a). *Water Resource Protection Series WRP16: Draft Policy and Guidelines on Construction and Silica Sand Mining in Public Drinking Water Source Areas*. Water and Rivers Commission, Perth.

REPORT ITEM DIS047 REFERS

Excavation – Rehabilitation Management Plan,
Proposed Agricultural Lime Quarry, Lot 9005, Nullaki Peninsula, City of Albany

Department of Water (1999c). *Water Quality Protection Note: Recharge Criteria for Public Drinking Water Source Areas*. Water and Rivers Commission, Perth.

Department of Water, *Water Quality Protection Note: Washdown of Mechanical Equipment*, Perth.

Engineers Australia 2003, *Australian Runoff Quality*, National Committee on Water Engineering.

Environmental Protection Authority (2004), *Guidance Statement, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No 51, June 2004*.

Environmental Protection Authority, Guidance 10, *Level of assessment for proposals affecting natural areas within the System 6 Region and Swan Coastal Plain portion of the System 1 Region*.

Environmental Protection Authority, Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*.

Environmental Protection Authority, 2013, *Consideration of subterranean fauna in environmental impact assessment in Western Australia*.

Firman J B, 2006, *Ancient weathering zones, pedocretes and palaeosols on the Australian Precambrian shield and in adjoining sedimentary basins: a review*, IN Journal of the Royal Society of Western Australia, Volume 89 part 2.

Geological Survey of Western Australia, 1990, *Geology and Mineral Resources of Western Australia*, Memoir 3.

Geoscience Australia, 2005, *Natural hazard risk in Perth*, Western Australia.

Gibson, N, Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994), *A Floristic Survey of the Swan Coastal Plain. Unpublished Report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia*.

Government of Western Australia, 2000, *Bush Forever*.

Gozzard J R, 1987, *Information on Industrial Minerals - Coastal Plain between Lancelin and Fremantle*, Geological Survey of Western Australia record 1978/11.

Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5.

Grimes K G, 2006 *Syngenetic karst in Australia: a review*, *Helictite* 39 (2) 200

Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.

Hopkins, A.J.M. & Griffin, E.A. (1989). *Fire in the Banksia Woodlands of the Swan Coastal Plain*. Journal of the Royal Agricultural Society of Western Australia, No.71, pp.93-94.

Jasinke E J, 1997, *Fauna of aquatic root mats in caves of South Western Australia; Origin and Ecology*, unpublished PhD Thesis, University of Western Australia.

Kaesehagen, 1995, *Bushland Condition Mapping*, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University.

REPORT ITEM DIS047 REFERS

Excavation – Rehabilitation Management Plan,
Proposed Agricultural Lime Quarry, Lot 9005, Nullaki Peninsula, City of Albany

Playford, P E, 1988, *Guidebook to the Geology of Rottnest Island*, Geological Survey of Western Australia Excursion Guidebook No 2.

Playford, P E, A E Cockbain and G H Low, 1976, *Geology of the Perth Basin Western Australia*, Geological Survey of Western Australia Bulletin 124.

Rockwater 2009, *Dawesville to Binningup Technical Environmental Studies, Hydrogeology Study*, prepared for the DEC.

Semeniuk V and C, 2009, *Quaternary geology, landforms and wetlands between Dawesville and Binningup – Description, key features and geoheritage significance* prepared by the DEC.

Tiller K G, 1993, *Micronutrients, IN Soils and Australian Viewpoint*, CSIRO

Western Australian Planning Commission, 2012, *Basic Raw Materials Demand and Supply Study for the Bunbury - Busselton Region*

Western Australia, Western Australian Planning Commission, *State Planning Policy 2.4*.

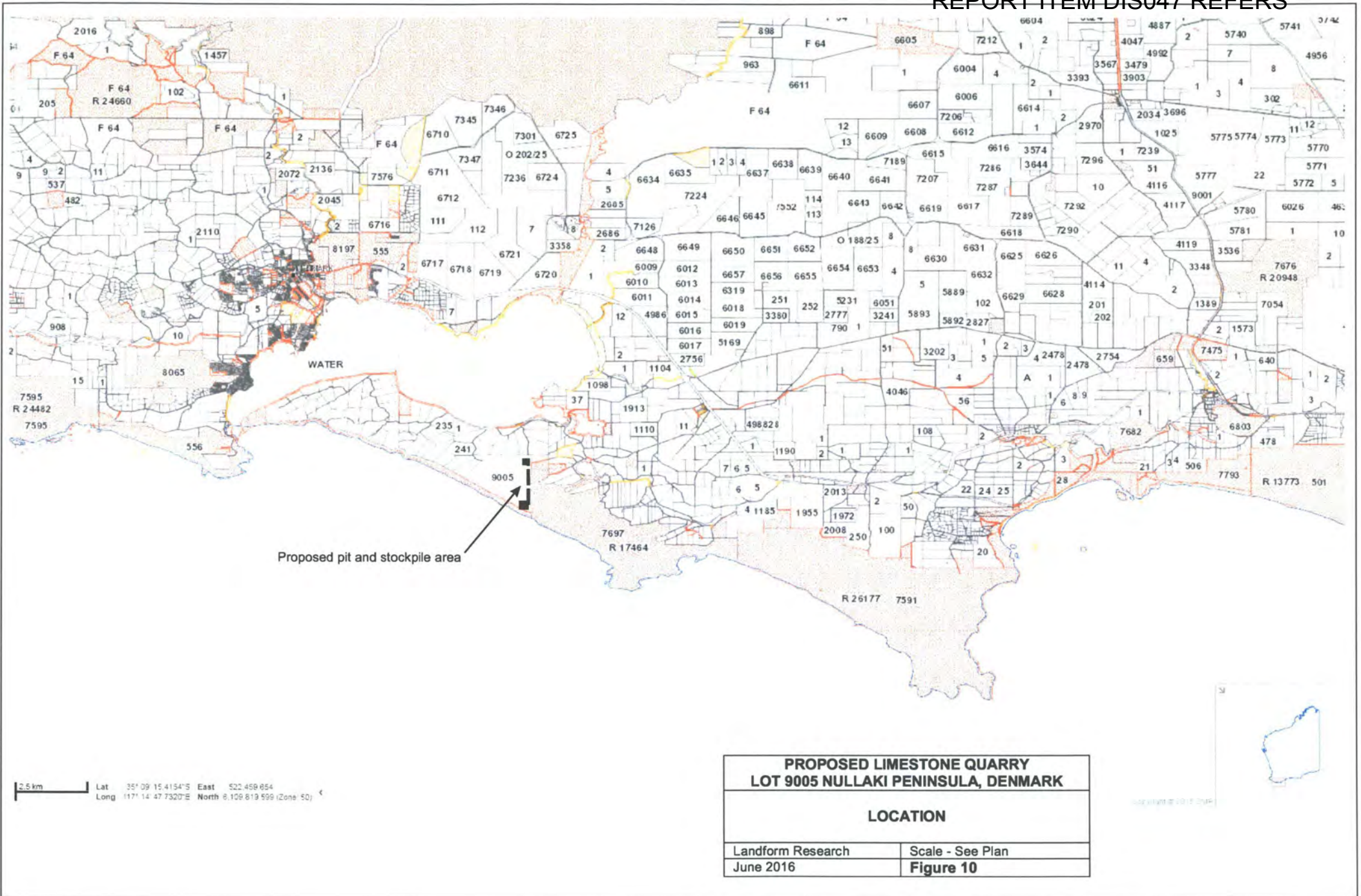
Western Australia, Western Australian Planning Commission, *State Planning Policy 2.5*.

Western Australian Museum, (undated) *Faunal Studies of the Northern Swan Coastal Plain*.

Western Australian Planning Commission, *Statement of Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004)*.

Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.

Willett, I R, 1993, *Oxidation-reduction reactions IN Soils and Australian Viewpoint*,

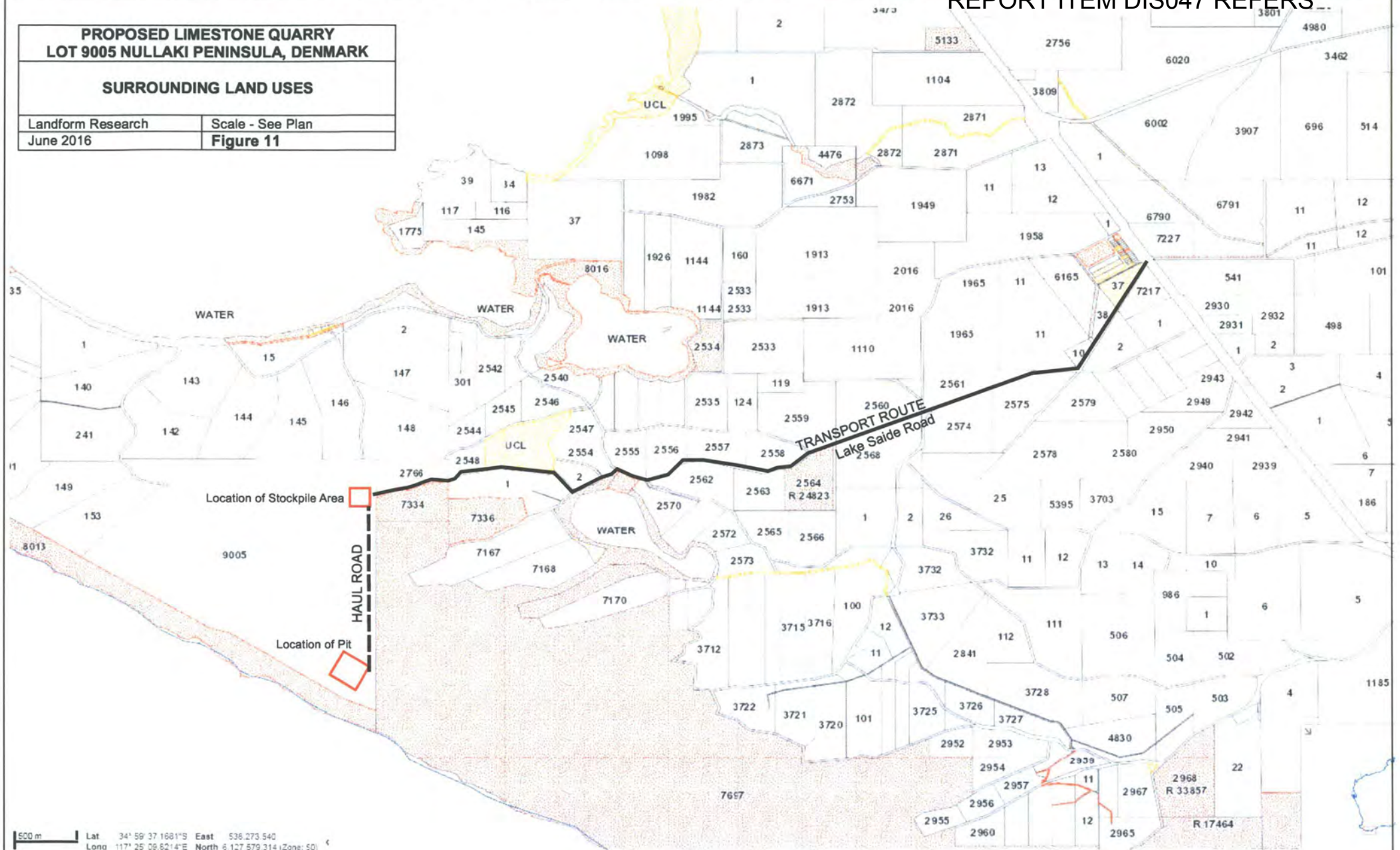


PROPOSED LIMESTONE QUARRY LOT 9005 NULLAKI PENINSULA, DENMARK	
LOCATION	
Landform Research June 2016	Scale - See Plan Figure 10

**PROPOSED LIMESTONE QUARRY
LOT 9005 NULLAKI PENINSULA, DENMARK**

SURROUNDING LAND USES

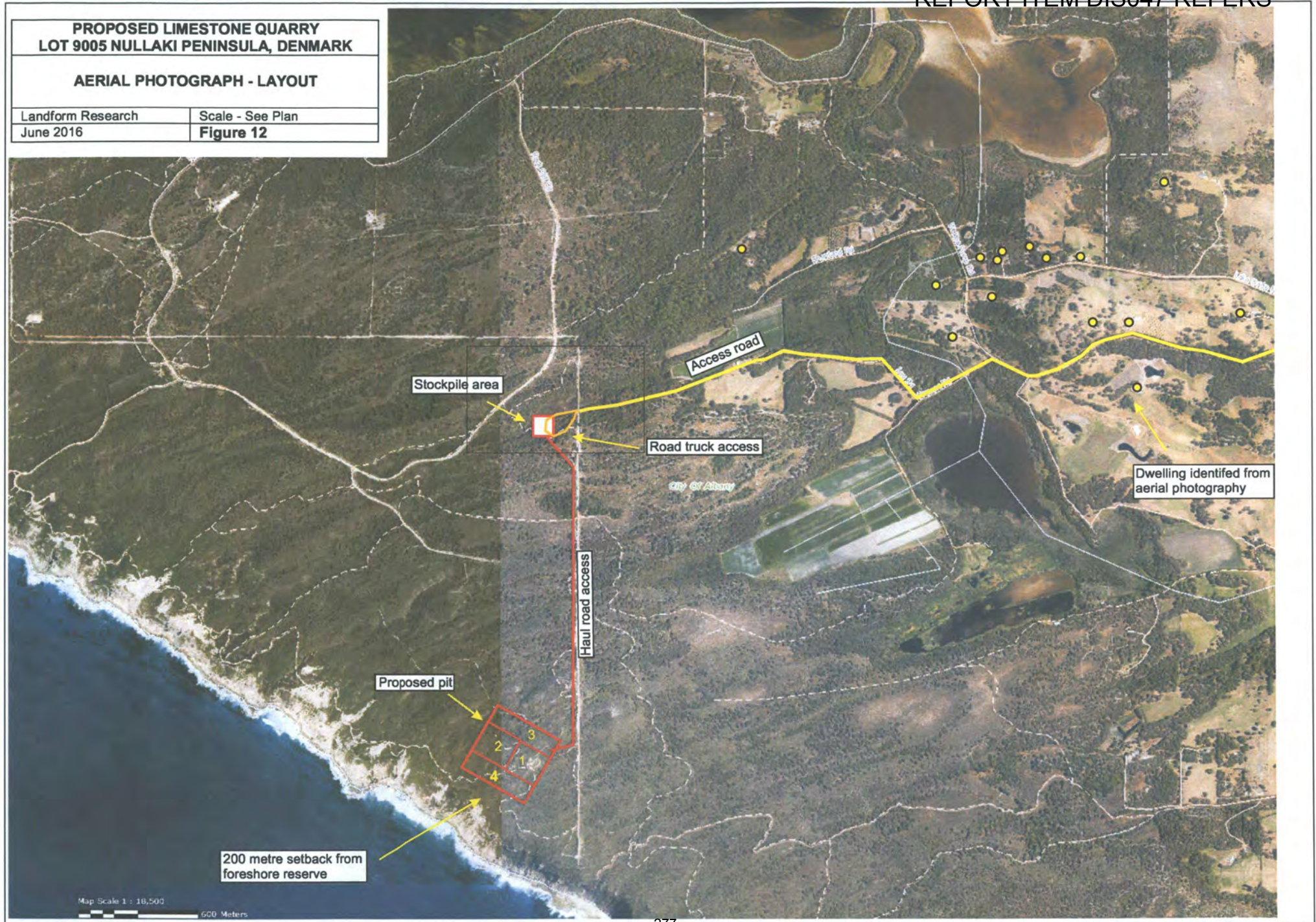
Landform Research	Scale - See Plan
June 2016	Figure 11



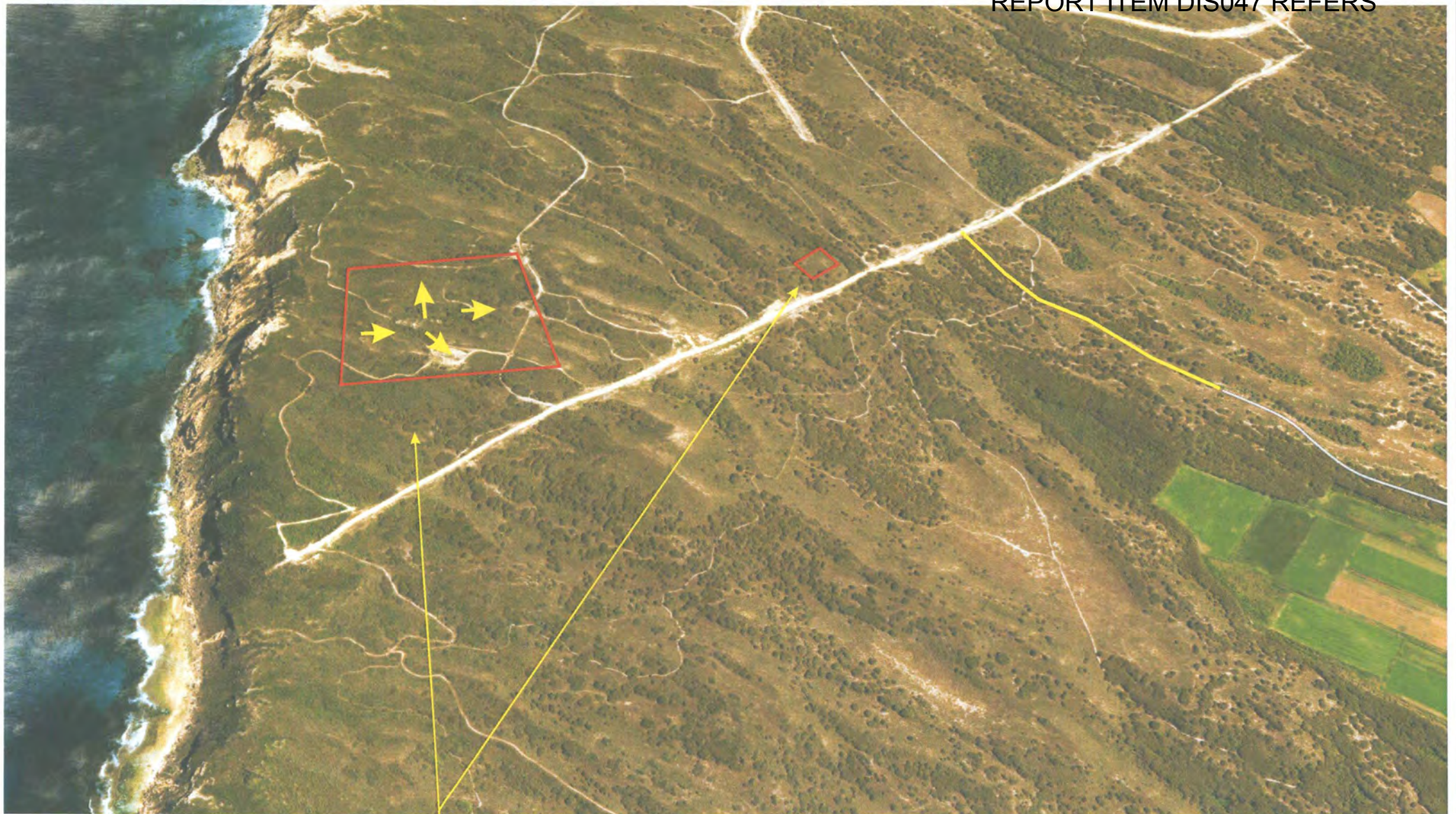
**PROPOSED LIMESTONE QUARRY
LOT 9005 NULLAKI PENINSULA, DENMARK**

AERIAL PHOTOGRAPH - LAYOUT

Landform Research	Scale - See Plan
June 2016	Figure 12



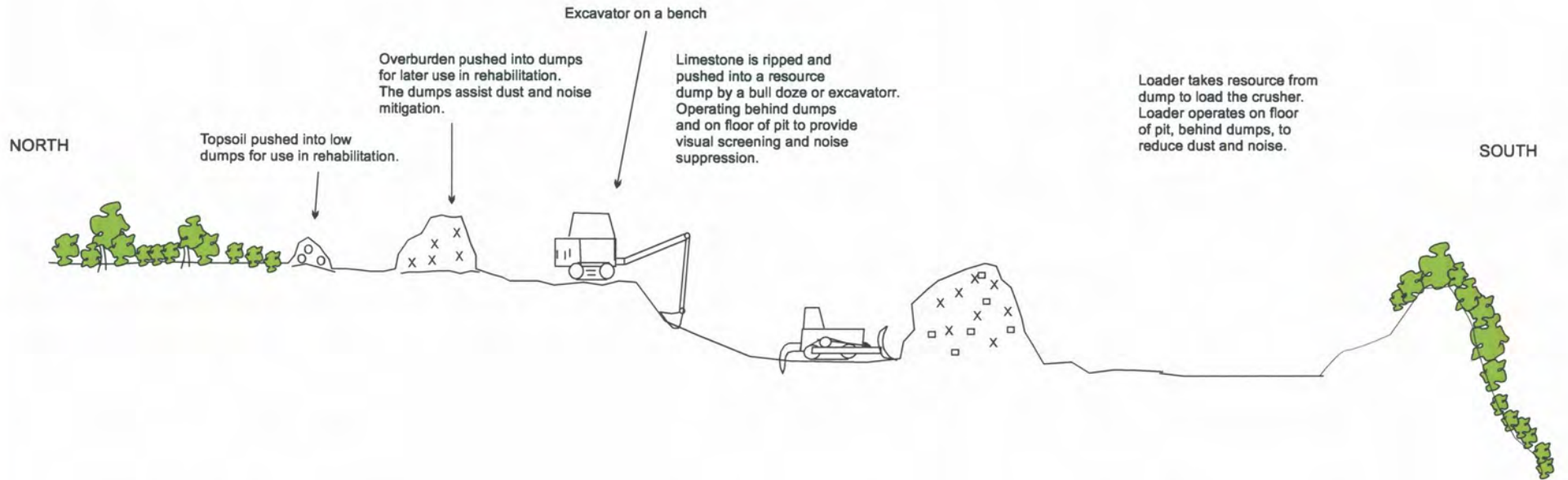
Map Scale 1 : 18,500
600 Meters



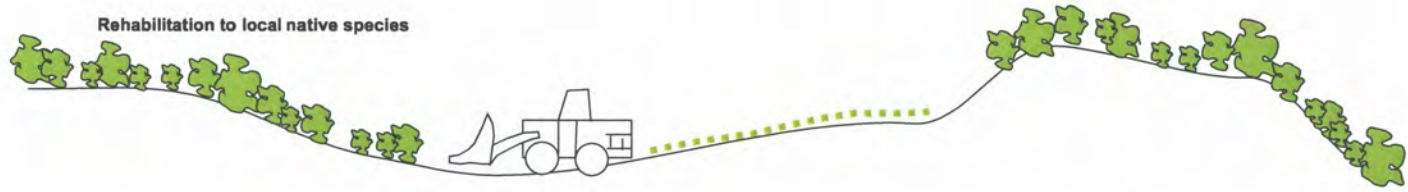
Aerial - Oblique view from the east showing the pit location and stockpile area

The arrows show the direction of excavation, behind the active face providing visual protection.
See also Figure 14.

PROPOSED LIMESTONE QUARRY LOT 9005 NULLAKI PENINSULA, DENMARK	
AERIAL PHOTOGRAPH - OBLIQUE VIEW	
Landform Research	Scale - See Plan
June 2016	Figure 13



LAND RESTORATION



PROPOSED LIMESTONE QUARRY LOT 9005 NULLAKI PENINSULA, DENMARK	
CONCEPT EXCAVATION	
Landform Research June 2016	Scale - See Plan Figure 14



Bulldozer ripping and crushing limestone



Loader feeding a small mobile crusher

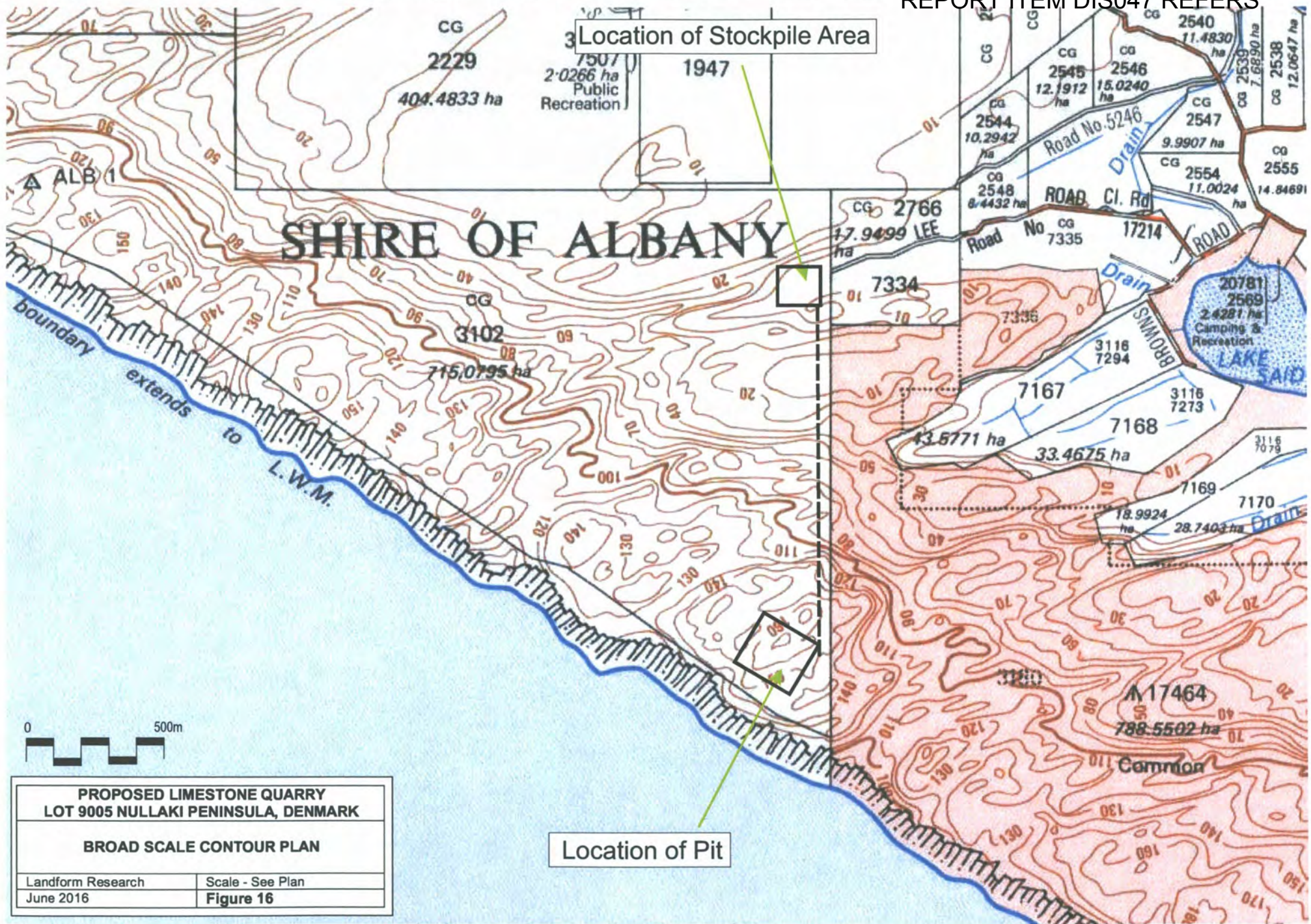


Loader, loading limestone



Loading a road truck

PROPOSED LIMESTONE QUARRY LOT 9005 NULLAKI PENINSULA, DENMARK	
TYPICAL EXCAVATION EQUIPMENT	
Landform Research June 2016	Scale - See Plan Figure 15



Appendix 1

Vegetation Communities Survey



Kathryn Kinnear
Bio Diverse Solutions
19/04/2016



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1.3 Geology, geomorphology and soils

The topography of most of the survey area is dominated by a gently undulating plain sloping to the coast with numerous small drainage lines. The coastal fringe is dominated by coastal dune systems, limestone headlands and cliffs (Churchward *et al.* 1988).

Geologically the area is underlain by Proterozoic rocks including granites and metamorphic gneiss of the Albany Fraser Province which are exposed as hills to 360 meters high along the coastal and near coastal fringe (Muhling and Brakel 1985). Along the coastal fringe the Quaternary sediments of the Tamala Limestone may be present and are overlain by dunes systems.

1.4 Regional context

The survey area lies within the Southwest Botanical Province and forms part of the Southwest Australian Biodiversity Hotspot, one of 34 internationally recognised biodiversity hotspots (Myers *et al.* 2000). It occurs in the eastern portion of the Warren Interim Bio-geographic Regional Area (IBRA), which runs along the coast from just south of Yallingup to south of the Princess Royal Harbour near Albany (IBRA 2012).

The Warren bioregion is described as a combination of hills, plateaux and plains and features four main soil types including loamy soils supporting karri forest; red laterites supporting jarrah-marri forests; leached sandy soils in depressions and as plains supporting low jarrah woodlands and paperbark/sedge swamps, and; holocene marine dunes supporting *Agonis flexuosa* thickets, *Banksia* woodlands and heaths (McKenzie *et al.* 2002).

Notable values of this bioregion include tall forests (karri, jarrah and tingle), which provide a refuge for relictual invertebrates; barren limestone areas with underground drainage systems (karst regions) that support an endemic invertebrate fauna; peat or organic wetland systems that support relictual populations of aquatic invertebrates; mound-forming microbial associations in the west of the region; and a highly endemic flora and fauna, especially in plant groups such as Myrtaceae, Rutaceae, Proteaceae, Papilionaceae, Restionaceae, Stylidiaceae and Sterculiaceae (McKenzie *et al.* 2002).

Gondwanan invertebrate fauna include: the Tingle *Bertmainius* trapdoor spider and Torndirrup's *Austrarchaea mainae* spider, *Dardarus sp.* millipede, *Cynotelopus notabilis* pill millipede and velvet worms. A number of notable critical weight range mammals also persist in the region, including the quokka, southern brown bandicoot, chuditch and brush-tailed phascogale.

The eastern limit of the bio region marks the transition zone from the more mesic forested south west of Western Australia to the drier interior and eastern coastal areas that are vegetated by mallee, woodland and shrubland associations.

2.2 Flora survey outcomes

During the field survey 112 species, consisting of 39 families and 70 genera were found. The most common families were Fabaceae, Cyperaceae, Proteaceae, Myrtaceae and Ericaceae. This list includes 103 native species (Table 1) and nine introduced species (Table 3). Two species of priority flora were found within the survey area including: *Banksia sessilis var cordata* (Priority 2) and *Billardiera drummondii* (Priority 4).

See Appendix B for definitions of the conservation codes.

Table 1: Native flora species recorded within survey area

Family	Species	Common Name
Aizoaceae	<i>Carpobrotus sp.</i>	Pigface
Anarthriaceae	<i>Anarthria prolifera</i>	
Anarthriaceae	<i>Lyginia barbata</i>	
Anarthriaceae	<i>Lyginia imberbis</i>	
Apiaceae	<i>Platysace compressa</i>	Tapeworm Plant
Araliaceae	<i>Trachymene pilosa</i>	
Asparagaceae	<i>Chamaescilla corymbosa</i>	Blue Squill
Asparagaceae	<i>Lomandra pauciflora</i>	
Asteraceae	<i>Olearia axillaris</i>	Coastal Daisybush
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle
Casuarinaceae	<i>Allocasuarina humilis</i>	Dwarf Sheoak
Chenopodiaceae	<i>Rhagodia baccata subsp. baccata</i>	Coastal Salt Bush
Colchicaceae	<i>Burchardia multiflora</i>	Dwarf Burchardia
Cyperaceae	<i>Baumea juncea</i>	Bare Twigrush
Cyperaceae	<i>Cyathochaeta avenacea</i>	
Cyperaceae	<i>Cyathochaeta equitans</i>	
Cyperaceae	<i>Ficinia nodosa</i>	Knotted Club Rush
Cyperaceae	<i>Gahnia decomposita</i>	
Cyperaceae	<i>Gahnia trifida</i>	Coast Saw-sedge
Cyperaceae	<i>Lepidosperma effusum</i>	Spreading Sword-sedge)
Cyperaceae	<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
Cyperaceae	<i>Lepidosperma gracile</i>	Slender Sword Sedge
Cyperaceae	<i>Lepidosperma squamatum</i>	
Cyperaceae	<i>Mesomelaena graciliceps</i>	
Cyperaceae	<i>Mesomelaena tetragona</i>	Semaphore Sedge
Cyperaceae	<i>Tetaria octandra</i>	
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken
Dilleniaceae	<i>Hibbertia cuneiformis</i>	Cutleaf Hibbertia
Dilleniaceae	<i>Hibbertia furfuracea</i>	
Dilleniaceae	<i>Hibbertia racemosa</i>	Stalked Guinea Flower
Droseraceae	<i>Drosera erythrogyne</i>	

Table 1 continued: Native flora species recorded within survey area

Family	Species	Common Name
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Tetrarrhena laevis</i>	Forrest Ricegrass
Polygalaceae	<i>Comesperma confertum</i>	
Polygonaceae	<i>Muehlenbeckia adpressa</i>	Climbing Lignum
Polygonaceae	<i>Persicaria capitata</i>	
Proteaceae	<i>Adenanthos cuneatus</i>	Coastal Jugflower
Proteaceae	<i>Banksia attenuata</i>	Slender Banksia
Proteaceae	<i>Banksia grandis</i>	Bull Banksia
Proteaceae	<i>Banksia littoralis</i>	Swamp Banksia
Proteaceae	<i>Banksia sessilis var cordata (P2)</i>	Parrot Bush
Proteaceae	<i>Hakea prostrata</i>	Harsh Hakea
Proteaceae	<i>Hakea ruscifolia</i>	Candle-spike Hakea
Proteaceae	<i>Hakea varia</i>	Variable Leaved Hakea
Proteaceae	<i>Synaphea sp</i>	
Ranunculaceae	<i>Clematis pubescens</i>	Common Clematis
Restionaceae	<i>Desmocladius flexuosus</i>	
Restionaceae	<i>Hypolaena exsulca</i>	
Restionaceae	<i>Leptocarpus tenax</i>	Slender Twine Rush
Restionaceae	<i>Loxocarya cinerea</i>	
Rhamnaceae	<i>Spyridium globulosum</i>	Basket Bush
Rhamnaceae	<i>Trymalium odoratissimum</i>	
Rubiaceae	<i>Opercularia hispidula</i>	Hispid Stinkweed
Rubiaceae	<i>Opercularia vaginata</i>	Dog Weed
Rutaceae	<i>Boronia crenulata</i>	Aniseed Boronia
Rutaceae	<i>Crowea angustifolia var. angustifolia</i>	
Santalaceae	<i>Exocarpos sparteus</i>	Broom Ballart
Solanaceae	<i>Anthocercis littorea</i>	Yellow Tailflower
Thymelaeaceae	<i>Pimelea clavata</i>	
Thymelaeaceae	<i>Pimelea rosea subsp. rosea</i>	Coastal Banjine
Xanthorrhoeaceae	<i>Xanthorrhoea gracilis</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i>	Grass Tree
Zamiaceae	<i>Macrozamia reidlei</i>	Zamia

2.3.2 *Banksia Woodland*

Description: Occurs on lower slopes. The overstorey consists of a canopy of large, mature *Banksia littoralis*, with *Banksia attenuata* co-dominant in some areas and occasional *Eucalyptus marginata* subsp. *marginata*. The understorey consists of an open heath over a low shrubland and sedgeland. Common understorey species include *Jacksonia horrida*, *Pultenaea reticulata*, *Adenanthos cuneatus*, *Leucopogon obovatus*, *Acacia pulchella*, *Hibbertia racemosa*, *Anarthria scabra*, *Anarthria prolifera*, *Lyginia barbata*, *Cyathochaeta equitans*, *Lepidosperma squamatum*, *Mesomelaena graciliceps* and *Desmocladius flexuosus*.

Floristic Summary:

Lifeform	Species
Trees <10m	<i>Banksia littoralis</i> , <i>Banksia attenuata</i> and <i>Eucalyptus marginata</i> subsp. <i>marginata</i>
Shrubs 1-2m	<i>Jacksonia horrida</i> , <i>Pultenaea reticulata</i> , <i>Adenanthos cuneatus</i> , <i>Leucopogon obovatus</i> , <i>Leucopogon parviflorus</i> , <i>Acacia pulchella</i> , <i>Hovea elliptica</i> and <i>Spyridium globulosum</i>
Shrubs 0.5-1m	<i>Hibbertia racemosa</i> and <i>Leucopogon propinquus</i>
Sedges and rushes	<i>Anarthria scabra</i> , <i>Anarthria prolifera</i> , <i>Lyginia barbata</i> , <i>Cyathochaeta equitans</i> , <i>Lepidosperma squamatum</i> , <i>Mesomelaena graciliceps</i> , <i>Mesomelaena tetragona</i> , <i>Desmocladius flexuosus</i> and <i>Loxocarya cinerea</i>
Herbs and grasses	<i>Opercularia hispidula</i>



2.3.4 Coastal Scrub

Description: Occurs in the western portion of the survey area and is characterised by dense shrubs and mallees that form a tall (1.5-3m), closed canopy. On the crests the overstorey is dominated by *Eucalyptus angulosa*, and in the more protected swales the overstorey is dominated by *Scaevola nitida* with some *Banksia sessilis* var. *cordata* (P2) in the southern areas. Other common shrubs include *Acacia littoralis*, *Leucopogon parviflorus*, *Spyridium globulosum* and *Agonis flexuosa*. Common sedges and rushes include: *Anarthria prolifera*, *Lepidosperma gladiatum*, *Desmocladius flexuosus* and *Loxocarya cinerea*.

Floristic Summary:

Lifeform	Species
Trees <10m	<i>Eucalyptus angulosa</i>
Shrubs >2m	<i>Scaevola nitida</i> , <i>Banksia sessilis</i> var. <i>cordata</i> (P2), <i>Acacia littoralis</i> , <i>Leucopogon parviflorus</i> , <i>Spyridium globulosum</i> and <i>Agonis flexuosa</i>
Shrubs 1-2m	<i>Exocarpos sparteus</i>
Shrubs 0.5-1m	<i>Olax phyllanthi</i>
Shrubs <0.5m	<i>Lysinema ciliatum</i> and <i>Conostylis aculeata</i> subsp. <i>aculeata</i>
Sedges and rushes	<i>Anarthria prolifera</i> , <i>Lepidosperma gladiatum</i> , <i>Desmocladius flexuosus</i> and <i>Loxocarya cinerea</i>
Herbs and grasses	<i>Clematis pubescens</i> and <i>Opercularia vaginata</i>



2.3.6 Open Heath

Description: Occurs in swales, flats and on crests of dunes. Where overstorey is present, it consists of low and scattered *Agonis flexuosa*, *Acacia cyclops* or *Banksia attenuata* in flats with low thickets of *Agonis flexuosa* on ridgelines and in swales. The southern areas closest to the coast have a complete absence of overstorey. The understorey consists of a diverse mix of species. Those most dominant include: *Hakea varia*, *Allocasuarina humilis*, *Jacksonia horrida*, *Pultenaea reticulata*, *Spyridium globulosum*, *Adenanthos cuneatus* and *Banksia attenuata*. A mix of sedges, herbs and grasses form the basis of the groundcover, some of which include: *Lyginia imberbis*, *Lyginia barbata*, *Lepidosperma squamatum*, *Desmocladius flexuosus*, *Hypolaena exsulca* and *Opercularia hispidula*.

Floristic Summary:

Lifeform	Species
Trees <10m	<i>Agonis flexuosa</i>
Shrubs >2m	<i>Agonis flexuosa</i> , <i>Agonis theiformis</i> , <i>Acacia cyclops</i> , <i>Spyridium globulosum</i> and <i>Hakea varia</i> .
Shrubs 1-2m	<i>Allocasuarina humilis</i> , <i>Pteridium esculentum</i> , <i>Jacksonia horrida</i> , <i>Pultenaea reticulata</i> and <i>Xanthorrhoea preissii</i>
Shrubs 0.5-1m	<i>Hibbertia cuneiformis</i> , <i>Hibbertia racemosa</i> , <i>Leucopogon obovatus</i> , <i>Leucopogon parviflorus</i> , <i>Leucopogon propinquus</i> , <i>Lysinema ciliatum</i> , <i>Pimelea clavata</i> , <i>Pimelea rosea subsp. rosea</i> , <i>Anigozanthos flavidus</i> , <i>Hakea prostrata</i> , <i>Adenanthos cuneatus</i> and <i>Xanthorrhoea gracilis</i>
Shrubs <0.5m	<i>Rhagodia baccata subsp. baccata</i> , <i>Andersonia caerulea</i> , <i>Gompholobium confertum</i> , <i>Boronia crenulata</i> and <i>Synaphea sp.</i>
Sedges and rushes	<i>Lyginia imberbis</i> , <i>Lyginia barbata</i> , <i>Lepidosperma squamatum</i> , <i>Tetraria octandra</i> , <i>Desmocladius flexuosus</i> and <i>Hypolaena exsulca</i>
Herbs and grasses	<i>Carpobrotus sp.</i> , <i>Platysace compressa</i> , <i>Trachymene pilosa</i> , <i>Chamaescilla corymbosa</i> , <i>Drosera erythroyne</i> , and <i>Opercularia hispidula</i>



2.3.8 *Sessilis Thicket*

Description: Occurs on coastal dunes with a southerly aspect in the southern portion of the survey area. Tall shrub layer (2-4m) dominated by *Banksia sessilis* var. *cordata* (P2) over a dense sedge layer dominated by *Lepidosperma gladiatum*.

Floristic Summary:

Lifeform	Species
Shrubs >2m	<i>Olearia axillaris</i> , <i>Scaevola nitida</i> , <i>Spyridium globulosum</i> and <i>Exocarpos sparteus</i>
Sedges and rushes	<i>Lepidosperma gladiatum</i> , <i>Desmocladius flexuosus</i> and <i>Loxocarya cinerea</i>



2.3.10 Tree Mallee

Description: Occurs on slopes and in protected swales within the coastal scrub vegetation in the western portion of the survey area. The mallees form a tall (5-15 m) closed woodland dominated by *Eucalyptus angulosa*. *Banksia sessilis* var. *cordata* (P2) is a common co-dominant or sub-dominant canopy species. The understory is dominated by *Spyridium globulosum*, *Acacia littoralis*, *Lepidosperma gladiatum*, *Desmocladius flexuosus* and *Loxocarya cinerea*.

Floristic Summary:

Lifeform	Species
Trees <10m	<i>Eucalyptus angulosa</i>
Shrubs >2m	<i>Scaevola nitida</i> , <i>Banksia sessilis</i> var. <i>cordata</i> (P2), <i>Acacia littoralis</i> , <i>Leucopogon parviflorus</i> , <i>Spyridium globulosum</i> and <i>Agonis flexuosa</i>
Shrubs 1-2m	<i>Exocarpos sparteus</i>
Shrubs 0.5-1m	<i>Olax phyllanthi</i>
Shrubs <0.5m	<i>Lysinema ciliatum</i> and <i>Conostylis aculeata</i> subsp. <i>aculeata</i>
Sedges and rushes	<i>Anarthria prolifera</i> , <i>Lepidosperma gladiatum</i> , <i>Desmocladius flexuosus</i> and <i>Loxocarya cinerea</i>
Herbs and grasses	<i>Clematis pubescens</i> and <i>Opercularia vaginata</i>





Figure 3: Vegetation condition mapped within survey area

2.5 Weeds

Of the 112 species recorded within the survey area, nine (<1%) were introduced species (Table 3).

Table 3: Weed species recorded from the survey area

Family	Species	Common Name	BAM Rating	EWS Rating
Asteraceae	<i>Conyza bonariensis</i>	Fleabane	None	Low
Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	None	Moderate
Asteraceae	<i>Hypochaeris radicata</i>	Flatweed	None	None
Geraniaceae	<i>Pelargonium capitatum</i>	Rose Pelargonium	None	High
Poaceae	<i>Cynodon dactylon</i>	Couch	None	Moderate
Poaceae	<i>Ehrharta longiflora</i>	Annual Veldt Grass	None	Moderate
Primulaceae	<i>Anagallis arvensis var. arvensis</i>	Scarlett Pimpernel	None	Mild
Solanaceae	<i>Solanum nigrum</i>	Blackberry Nightshade	None	Moderate
Typhaceae	<i>Typha orientalis</i>	Bulrush	None	High

Overall the main weed invaded area was associated a drainage line on the eastern boundary, which has resulted in the movement of aggressively invasive weeds such as *Typha orientalis* into the sedgeland.

Of the weeds recorded, none are declared agricultural weeds under the *Biosecurity and Agriculture Management Act 2007* and two species have been assigned a high priority for control in the Environmental Weeds Strategy for Western Australia (CALM 1999). These species include: *Pelargonium capitatum* (Rose Pelargonium) and *Typha orientalis* (Bulrush). The strategy classifies weeds according to their relative level of threat to conservation (high medium or low) and this rating is based their distribution, relative level of invasiveness and environmental impact (Appendix D).

3 SUMMARY

The survey area contains a high diversity of vegetation communities ranging from open heath, coastal scrub and sedgelands through to tree mallees, woodlands and forests with a range of dominant canopy species and a diverse range of shrub, sedge and herbs comprising the understorey. Most vegetation is in pristine condition, with no sign of *Phytophthora*, *Armillaria* or Cankers. The only area with any evidence of degradation is a small sedgeland on the eastern boundary where weeds have invaded as a result of roadwork and drainage from off-site. Targeted threatened flora surveys were not undertaken as a part of the scope of works, however two priority listed flora species were located during the vegetation mapping, including *Billardiera drummondii* (P4) and *Banksia sessilis var cordata* (P2).

5 APPENDICES

APPENDIX A: Flora and Fauna Species Identified within 5 km of Survey area Through Nature Map
Generated from Nature Map (DPaW 2016) on 6 April 2016

865. 15429 *Acacia alata* var. *alata*
 866. 3247 *Acacia browniana*
 867. 11731 *Acacia browniana* var. *browniana*
 868. 3262 *Acacia cochlearis* (Rigid Wattle)
 869. 3282 *Acacia cyclops* (Coastal Wattle)
 870. 3307 *Acacia divergens*
 871. 3331 *Acacia extensa* (Wiry Wattle)
 872. 3347 *Acacia gilbertii*
 873. 3363 *Acacia hastulata*
 874. 18217 *Acacia iteaphylla* Y
 875. 3424 *Acacia littorea*
 876. 3428 *Acacia luteola*
 877. 3453 *Acacia myrtifolia*
 878. 3484 *Acacia pentadenia* (Karri Wattle)
 879. 35624 *Acacia pentadenia* subsp. *pentadenia*
 880. *Acacia provincialis* Y
 881. 3502 *Acacia pulchella* (Prickly Moses)
 882. 15482 *Acacia pulchella* var. *goadbyi*
 883. 15483 *Acacia pulchella* var. *pulchella*
 884. 3523 *Acacia robiniae*
 885. 30036 *Acacia saligna* subsp. *stolonifera*
 886. 3530 *Acacia scalpelliformis*
 887. 3576 *Acacia tetragonocarpa*
 888. 3588 *Acacia uliginosa*
 889. 3591 *Acacia urophylla*
 890. 15487 *Acacia varia* var. *varia*
 891. 3602 *Acacia willdenowiana* (Grass Wattle)
 892. 3185 *Acaena novae-zelandiae* Y
 893. 1208 *Acanthocarpus preissii*
 894. 13146 *Acetabularia peniculus*
 895. 17774 *Acetosella vulgaris* Y
 896. 10824 *Acidonia microcarpa*
 897. 6295 *Acrotriche cordata* (Coast Ground Berry)
 898. 5315 *Actinodium cunninghamii* (Albany Daisy)
 899. 6203 *Actinotus glomeratus*
 900. 6206 *Actinotus omnifertilis*
 901. 1773 *Adenanthos cuneatus* (Coastal Jugflower)
 902. 1791 *Adenanthos obovatus* (Basket Flower)
 903. 5316 *Agonis flexuosa* (Peppermint, Wonil)
 904. 17202 *Agonis flexuosa* var. *flexuosa*
 905. 17203 *Agonis flexuosa* var. *latifolia*
 906. *Agonis* sp.
 907. 19789 *Agonis theiformis*
 908. 177 *Agrostis capillaris* Y
 909. *Agrostis* sp.
 910. 182 *Agrostis stolonifera* (Creeping Bent) Y
 911. 23474 *Agrostocrinum hirsutum*

963. 20249 *Astartea leptophylla*
 964. 45213 *Astartea pulchella*
 965. 20283 *Astartea scoparia*
 966. *Astartea* sp.
 967. *Asterella drummondii*
 968. 7851 *Asteridea pulverulenta* (Common Bristle Daisy)
 969. 6325 *Astroloma drummondii*
 970. *Astroloma* sp.
 971. 2462 *Atriplex hypoleuca*
 972. 2471 *Atriplex prostrata* (Hastate Orache) Y
 973. 17240 *Austrostipa flavescens*
 974. 17241 *Austrostipa hemipogon*
 975. 17245 *Austrostipa mollis*
 976. 17253 *Austrostipa semibarbata*
 977. 231 *Avellinia michelii* Y
 978. 233 *Avena barbata* (Bearded Oat) Y
 979. 20013 *Axonopus fissifolius* Y
 980. 5364 *Baeckea pygmaea*
 981. 1800 *Banksia attenuata* (Slender Banksia, Piara)
 982. 1819 *Banksia grandis* (Bull Banksia, Pulgarla)
 983. 1822 *Banksia ilicifolia* (Holly-leaved Banksia)
 984. 1830 *Banksia littoralis* (Swamp Banksia, Pungura)
 985. 1837 *Banksia occidentalis* (Red Swamp Banksia)
 986. 1844 *Banksia quercifolia* (Oak-leaved Banksia)
 987. 1848 *Banksia seminuda* (River Banksia)
 988. 32084 *Banksia serra* (Serrate-leaved Dryandra) P4
 989. 32315 *Barbula calycina*
 990. 739 *Baumea acuta* (Pale Twig-rush)
 991. 741 *Baumea articulata* (Jointed Rush)
 992. 743 *Baumea juncea* (Bare Twigrush)
 993. 744 *Baumea laxa*
 994. 745 *Baumea preissii*
 995. 747 *Baumea rubiginosa*
 996. 5381 *Beaufortia decussata* (Gravel Bottlebrush)
 997. 5392 *Beaufortia sparsa* (Swamp Bottlebrush)
 998. 3154 *Billardiera coriacea*
 999. 25787 *Billardiera drummondii*
 1000. 3157 *Billardiera floribunda* (White-flowered Billardiera)
 1001. 25798 *Billardiera fusiformis* (Australian Bluebell)
 1002. 25796 *Billardiera heterophylla* (Australian Bluebell)
 1003. 3159 *Billardiera laxiflora*
 1004. *Billardiera* sp.
 1005. 3165 *Billardiera variifolia*
 1006. 749 *Bolboschoenus caldwellii* (Marsh Club-rush)
 1007. 4403 *Boronia alata* (Winged Boronia)
 1008. 4413 *Boronia crenulata* (Aniseed Boronia)
 1009. 11503 *Boronia crenulata* var. *crenulata*
 1010. 4416 *Boronia denticulata*
 1011. 4422 *Boronia gracilipes* (Karri Boronia)
 1012. 4423 *Boronia heterophylla* (Kalgan Boronia)
 1013. 16631 *Boronia juncea* subsp. *micrantha*

1065. 32338 *Campylopus introflexus* Y
 1066. 7909 *Carduus pycnocephalus* (Slender Thistle) Y
 1067. 2956 *Cassytha pomiformis* (Dodder Laurel)
 1068. 2957 *Cassytha racemosa* (Dodder Laurel)
 1069. 11799 *Cassytha racemosa* forma *racemosa*
 1070. 41564 *Cenchrus clandestinus* (Kikuyu Grass) Y
 1071. 6539 *Centaurium erythraea* (Common Centaury) Y
 1072. 6542 *Centaurium tenuiflorum* Y
 1073. 6214 *Centella asiatica*
 1074. 7367 *Centranthus ruber* (Red Valerian) Y
 1075. 35322 *Centranthus ruber* subsp. *ruber* Y
 1076. 1121 *Centrolepis aristata* (Pointed Centrolepis)
 1077. 1125 *Centrolepis drummondiana*
 1078. 1133 *Centrolepis pilosa*
 1079. 1134 *Centrolepis polygyna* (Wiry Centrolepis)
 1080. 3148 *Cephalotus follicularis* (Albany Pitcher Plant)
 1081. *Cephalaziella varians*
 1082. 13119 *Cerastium balearicum* Y
 1083. 32462 *Ceratodon purpureus* subsp. *convolutus*
 1084. 17685 *Chaetanthus aristatus*
 1085. 1065 *Chaetanthus leptocarpoides*
 1086. 17687 *Chaetanthus tenellus*
 1087. *Chaetophyllopsis whiteleggei*
 1088. 1280 *Chamaescilla corymbosa* (Blue Squill)
 1089. 3169 *Cheiranthra preissiana*
 1090. 2483 *Chenopodium album* (Fat Hen) Y
 1091. 2494 *Chenopodium murale* (Nettle-leaf Goosefoot) Y
 1092. *Chiloscyphus semiteres* var. *semiteres*
 1093. 17689 *Chordifex laxus*
 1094. 2335 *Choretrum lateriflorum* (Dwarf Sour Bush)
 1095. 4448 *Chorilaena quercifolia* (Chorilaena)
 1096. 763 *Chorizandra enodis* (Black Bristlerush)
 1097. 13112 *Chorizema aciculare* subsp. *aciculare*
 1098. 8971 *Chorizema cordatum*
 1099. 3754 *Chorizema diversifolium*
 1100. 3758 *Chorizema ilicifolium* (Holly Flame Pea)
 1101. 3760 *Chorizema reticulatum* (Showy Flame Pea)
 1102. 13107 *Chorizema retrorsum*
 1103. 3761 *Chorizema rhombeum*
 1104. 14586 *Chorizema spathulatum*
 1105. 7937 *Cirsium vulgare* (Spear Thistle, Scotch Thistle) Y
 1106. 2929 *Clematis pubescens* (Common Clematis)
 1107. 4550 *Comesperma calymega* (Blue-spike Milkwort)
 1108. 4551 *Comesperma ciliatum*
 1109. 4552 *Comesperma confertum*
 1110. 4554 *Comesperma flavum*
 1111. 4557 *Comesperma nudiusculum*
 1112. *Comesperma* sp.
 1113. 4564 *Comesperma virgatum* (Milkwort)
 1114. 40863 *Commersonia corylifolia* (Hazel-leaved Rulingia)
 1115. 40864 *Commersonia cygnorum*

1167. 10871 *Daucus carota* (Wild Carrot) Y
 1168. 6218 *Daucus glochidiatus* (Australian Carrot)
 1169. 3791 *Daviesia alternifolia*
 1170. 3811 *Daviesia flexuosa*
 1171. 3817 *Daviesia inflata*
 1172. 17691 *Desmocladius fasciculatus*
 1173. 16595 *Desmocladius flexuosus*
 1174. 299 *Deyeuxia quadriseta* (Reed Bentgrass)
 1175. 16326 *Dianella brevicaulis*
 1176. 7487 *Diaspasis filifolia* (Thread-leaved Diaspasis)
 1177. 306 *Dichelachne crinita* (Longhair Plumegrass)
 1178. 32344 *Dicranoloma diaphanoneuron*
 1179. 32346 *Didymodon torquatus*
 1180. 40865 *Dielsiodoxa lycopodioides*
 1181. 38261 *Dielsiodoxa tamariscina* P2
 1182. 320 *Digitaria sanguinalis* (Crab Grass) Y
 1183. 3011 *Diplotaxis muralis* (Wall Rocket) Y
 1184. 3867 *Dipogon lignosus* (Dolichos Pea) Y
 1185. 19649 *Disa bracteata* Y
 1186. 7962 *Dittrichia viscosa* Y
 1187. 11049 *Diuris corymbosa*
 1188. 1638 *Diuris setacea* (Bristly Donkey Orchid)
 1189. *Diuris* sp.
 1190. 4765 *Dodonaea humifusa*
 1191. 1640 *Drakaea glyptodon* (King-in-his-carriage)
 1192. 1642 *Drakaea thynniphila*
 1193. 13218 *Drosera erythrogyne*
 1194. 3110 *Drosera microphylla* (Golden Rainbow)
 1195. 3112 *Drosera myriantha* (Star Rainbow)
 1196. 3113 *Drosera neesii* (Jewel Rainbow)
 1197. 11768 *Drosera neesii* subsp. *neesii*
 1198. 3118 *Drosera pallida* (Pale Rainbow)
 1199. 3122 *Drosera platypoda* (Fan-leaved Sundew)
 1200. 3124 *Drosera pulchella* (Pretty Sundew)
 1201. 13186 *Drosera roseana*
 1202. 3131 *Drosera stolonifera* (Leafy Sundew)
 1203. 8914 *Drosera sulphurea* (Sulphur-flowered Sundew)
 1204. 33480 *Dysphania pumilio* (Clammy Goosefoot)
 1205. 32351 *Eccremidium pulchellum*
 1206. 11105 *Echinochloa crus-galli* Y
 1207. 6681 *Echium plantagineum* (Paterson's Curse) Y
 1208. 347 *Ehrharta calycina* (Perennial Veldt Grass) Y
 1209. 349 *Ehrharta longiflora* (Annual Veldt Grass) Y
 1210. 1643 *Elythranthera brunonis* (Purple Enamel Orchid)
 1211. 1644 *Elythranthera emarginata* (Pink Enamel Orchid)
 1212. 1067 *Empodisma gracillimum*
 1213. 32353 *Entosthodon apophysatus*
 1214. 32354 *Entosthodon productus*
 1215. 1645 *Epiblema grandiflorum* (Babe-in-a-cradle)
 1216. 11992 *Epilobium billardiereanum* subsp. *intermedium*
 1217. 373 *Eragrostis brownii* (Brown's Lovegrass)

1269. 10909 *Gompholobium confertum*
 1270. 3950 *Gompholobium knightianum*
 1271. 3954 *Gompholobium polymorphum*
 1272. 11083 *Gompholobium scabrum*
 1273. 3957 *Gompholobium tomentosum* (Hairy Yellow Pea)
 1274. 3958 *Gompholobium venustum* (Handsome Wedge-pea)
 1275. 11115 *Gompholobium villosum*
 1276. 16746 *Gonocarpus benthamii* subsp. *benthamii*
 1277. 7505 *Goodenia eatoniana*
 1278. 7523 *Goodenia leptoclada* (Thin-stemmed Goodenia)
 1279. 13165 *Goodenia pusilla*
 1280. 1977 *Grevillea cirsiifolia* (Varied-leaf Grevillea)
 1281. 13084 *Grevillea fuscolutea* T
 1282. 2052 *Grevillea occidentalis*
 1283. 15991 *Grevillea pulchella* subsp. *pulchella*
 1284. 2080 *Grevillea quercifolia* (Oak-leaf Grevillea)
 1285. 2112 *Grevillea trifida*
 1286. 908 *Gymnoschoenus anceps*
 1287. 32390 *Gymnostomum calcareum*
 1288. 2787 *Gyrostemon sheathii*
 1289. 1474 *Haemodorum sparsiflorum*
 1290. 2137 *Hakea ceratophylla* (Horned Leaf Hakea)
 1291. 2150 *Hakea cucullata* (Hood Leaved Hakea)
 1292. 2171 *Hakea laurina* (Pincushion Hakea, Kodjet)
 1293. 2174 *Hakea linearis*
 1294. 2191 *Hakea oleifolia* (Dungyn)
 1295. 2197 *Hakea prostrata* (Harsh Hakea)
 1296. 2203 *Hakea ruscifolia* (Candle Hakea)
 1297. *Hakea* sp.
 1298. 2212 *Hakea sulcata* (Furrowed Hakea)
 1299. 6183 *Haloragodendron racemosum* (Shrubby Raspwort)
 1300. 3961 *Hardenbergia comptoniana* (Native Wisteria)
 1301. 32391 *Hedwigia ciliata*
 1302. 32392 *Hedwigidium integrifolium*
 1303. 29594 *Helichrysum luteoalbum* (Jersey Cudweed)
 1304. 439 *Hemarthria uncinata* (Matgrass)
 1305. 11451 *Hemarthria uncinata* var. *uncinata*
 1306. 6839 *Hemiandra pungens* (Snakebush)
 1307. 6855 *Hemigenia humilis*
 1308. 6856 *Hemigenia incana* (Silky Hemigenia)
 1309. 6865 *Hemigenia podalyrina*
 1310. 5109 *Hibbertia amplexicaulis*
 1311. 5114 *Hibbertia commutata*
 1312. 5117 *Hibbertia cuneiformis* (Cutleaf Hibbertia)
 1313. 5118 *Hibbertia cunninghamii*
 1314. 5119 *Hibbertia depressa*
 1315. 5126 *Hibbertia furfuracea*
 1316. 5132 *Hibbertia grossulariifolia*
 1317. 5135 *Hibbertia hypericoides* (Yellow Buttercups)
 1318. 5144 *Hibbertia microphylla*
 1319. 19687 *Hibbertia notibractea*

1371. 1188 *Juncus pallidus* (Pale Rush)
 1372. 1190 *Juncus planifolius* (Broadleaf Rush)
 1373. *Juncus* sp.
 1374. 1196 *Juncus usitatus* (Common Rush) Y
 1375. 4036 *Kennedia carinata*
 1376. 4037 *Kennedia coccinea* (Coral Vine)
 1377. 1221 *Kingia australis* (Kingia, Pulonok)
 1378. 5832 *Kunzea ericifolia* (Spearwood, Pondil)
 1379. 17506 *Kunzea ericifolia* subsp. *ericifolia*
 1380. 15498 *Kunzea glabrescens* (Spearwood)
 1381. 5841 *Kunzea recurva*
 1382. 5844 *Kunzea sulphurea*
 1383. 20019 *Lachnagrostis filiformis*
 1384. 2253 *Lambertia uniflora*
 1385. 5033 *Lasiopetalum floribundum* (Free Flowering Lasiopetalum)
 1386. 4047 *Lathyrus tingitanus* (Tangier Pea) Y
 1387. 4048 *Latrobea brunonis*
 1388. 4049 *Latrobea diosmifolia*
 1389. 4050 *Latrobea genistoides*
 1390. 1303 *Laxmannia grandiflora*
 1391. 1302 *Laxmannia jamesii* (James' Paperlily) P4
 1392. 7572 *Lechenaultia expansa*
 1393. 7590 *Lechenaultia tubiflora* (Heath Leschenaultia)
 1394. *Leionema lamprophyllum* subsp. *lamprophyllum*
 1395. 8099 *Leontodon saxatilis* (Hairy Hawkbit) Y
 1396. *Leontodon* sp. Y
 1397. 3021 *Lepidium bonariense* (Peppercress) Y
 1398. 19989 *Lepidium didymum* Y
 1399. 3042 *Lepidium pseudotasmanicum* P4
 1400. 925 *Lepidosperma angustatum*
 1401. 932 *Lepidosperma effusum* (Spreading Sword-sedge)
 1402. 933 *Lepidosperma gladiatum* (Coast Sword-sedge, Kerbin)
 1403. 934 *Lepidosperma gracile* (Slender Sword Sedge)
 1404. 937 *Lepidosperma longitudinale* (Pithy Sword-sedge)
 1405. *Lepidosperma* sp.
 1406. 945 *Lepidosperma squamatum*
 1407. 946 *Lepidosperma striatum*
 1408. 948 *Lepidosperma tetraquetrum*
 1409. 19833 *Leptocarpus laxus*
 1410. *Leptocarpus* sp.
 1411. 1082 *Leptocarpus tenax* (Slender Twine Rush)
 1412. 17703 *Leptomeria ellytes*
 1413. 2350 *Leptomeria pauciflora* (Sparse-flowered Currant Bush)
 1414. 2353 *Leptomeria scrobiculata*
 1415. 2355 *Leptomeria squarrulosa*
 1416. 17852 *Leptorhynchus scaber* (Lanky Buttons)
 1417. 1084 *Lepyrodia drummondiana*
 1418. 1087 *Lepyrodia hermaphrodita*
 1419. 1089 *Lepyrodia monoica*
 1420. 1090 *Lepyrodia muirii*
 1421. *Lethocolea pansa*

1473. 1244 *Lomandra sonderi*
 1474. 1246 *Lomandra suaveolens*
 1475. 4059 *Lotus angustissimus* (Narrowleaf Trefoil) Y
 1476. 8564 *Lotus subbiflorus* Y
 1477. 4063 *Lotus uliginosus* (Greater Lotus) Y
 1478. 1092 *Loxocarya cinerea*
 1479. 1097 *Lyginia barbata*
 1480. 18049 *Lyginia imberbis*
 1481. 1656 *Lyperanthus serratus* (Rattle Beak Orchid)
 1482. 6456 *Lysinema ciliatum* (Curry Flower)
 1483. 6457 *Lysinema conspicuum*
 1484. 34736 *Lysinema pentapetalum*
 1485. 5281 *Lythrum hyssopifolia* (Lesser Loosestrife) Y
 1486. 18119 *Macrozamia fraseri*
 1487. 85 *Macrozamia riedlei* (*Zamia*, Djiridji)
 1488. 36522 *Malva pseudolavatera* Y
 1489. 17637 *Marianthus candidus* (White Marianthus)
 1490. 17636 *Marianthus coeruleopunctatus* (Blue-spotted Marianthus)
 1491. 25822 *Marianthus sylvaticus*
 1492. 4072 *Medicago arabica* (Spotted Medic) Y
 1493. 4076 *Medicago lupulina* (Black Medic) Y
 1494. 4079 *Medicago polymorpha* (Burr Medic) Y
 1495. 17679 *Meeboldina coangustata*
 1496. 1098 *Meeboldina denmarkica*
 1497. 17694 *Meeboldina scariosa*
 1498. *Meeboldina* sp.
 1499. 17693 *Meeboldina thysanantha* P3
 1500. *Meeboldina thysanantha* MS
 1501. 34676 *Meionectes brownii* (Swamp Raspwort)
 1502. 40780 *Melaleuca citrina* Y
 1503. 5900 *Melaleuca cuticularis* (Saltwater Paperbark)
 1504. 5902 *Melaleuca densa*
 1505. 5921 *Melaleuca incana* (Grey Honey Myrtle)
 1506. 5922 *Melaleuca lanceolata* (Rottnest Teatree, Moonah)
 1507. 5926 *Melaleuca lateritia* (Robin Redbreast Bush)
 1508. 5938 *Melaleuca microphylla*
 1509. 13274 *Melaleuca ordinifolia* P2
 1510. 5946 *Melaleuca pauciflora*
 1511. 5952 *Melaleuca preissiana* (Moonah)
 1512. 5959 *Melaleuca raphiophylla* (Swamp Paperbark)
 1513. *Melaleuca* sp.
 1514. 5968 *Melaleuca spathulata*
 1515. 5980 *Melaleuca thymoides*
 1516. 37683 *Melaleuca viminalis* P2
 1517. 5987 *Melaleuca viminea* (Mohan)
 1518. 4085 *Melilotus indicus* Y
 1519. 6883 *Mentha pulegium* (Pennyroyal) Y
 1520. 957 *Mesomelaena tetragona* (Semaphore Sedge)
 1521. 485 *Microlaena stipoides* (Weeping Grass)
 1522. 1657 *Microtis alba* (White Mignonette Orchid)
 1523. 34158 *Microtis alboviridis*

1575. 2306 *Petrophile rigida*
 1576. 17765 *Petrophile squamata* subsp. *squamata*
 1577. 548 *Phalaris aquatica* (*Phalaris*) Y
 1578. 20460 *Pheladenia deformis*
 1579. 18530 *Philothea nodiflora*
 1580. 1173 *Philydrella pygmaea* (*Butterfly Flowers*)
 1581. 16177 *Phyllangium paradoxum*
 1582. 4140 *Phyllota barbata*
 1583. 2793 *Phytolacca octandra* (*Red Ink Plant*) Y
 1584. 5231 *Pimelea angustifolia* (*Narrow-leaved Pimelea*)
 1585. 5239 *Pimelea clavata*
 1586. 5242 *Pimelea erecta*
 1587. 5243 *Pimelea ferruginea*
 1588. 5249 *Pimelea hispida* (*Bristly Pimelea*)
 1589. 11402 *Pimelea imbricata* var. *piligera*
 1590. 5252 *Pimelea lanata*
 1591. 5255 *Pimelea longiflora*
 1592. 11639 *Pimelea longiflora* subsp. *longiflora*
 1593. 5261 *Pimelea rosea* (*Rose Banjine*)
 1594. 18117 *Pimelea rosea* subsp. *rosea*
 1595. *Pimelea* sp.
 1596. 5264 *Pimelea spectabilis* (*Bunjong*)
 1597. 5266 *Pimelea suaveolens* (*Scented Banjine*)
 1598. 5269 *Pimelea sylvestris*
 1599. 5270 *Pimelea tinctoria*
 1600. 42281 *Pithocarpa cordata*
 1601. 18352 *Pithocarpa pulchella* var. *melanostigma*
 1602. 42260 *Pithocarpa ramosa*
 1603. 7303 *Plantago lanceolata* (*Ribwort Plantain*) Y
 1604. 6249 *Platysace compressa* (*Tapeworm Plant*)
 1605. 6253 *Platysace filiformis*
 1606. 6258 *Platysace pendula*
 1607. 4524 *Platytheca galioides*
 1608. 4525 *Platytheca juniperina*
 1609. 32478 *Pleurophragma nervosum* var. *nervosum*
 1610. 19062 *Pleurophragma occidentale* P4
 1611. *Plumatictilos turfosa*
 1612. 573 *Poa drummondiana* (*Knotted Poa*)
 1613. 577 *Poa poiformis* (*Coastal Poa*)
 1614. 16098 *Poa poiformis* var. *poiformis*
 1615. 578 *Poa porphyroclados*
 1616. *Poa* sp.
 1617. 86 *Podocarpus drouynianus* (*Wild Plum, Kula*)
 1618. 8175 *Podolepis gracilis* (*Slender Podolepis*)
 1619. 8182 *Podotheca angustifolia* (*Sticky Longheads*)
 1620. 29919 *Polianthion wichurae*
 1621. 2905 *Polycarpon tetraphyllum* (*Fourleaf Allseed*) Y
 1622. 4578 *Polygala virgata* Y
 1623. 2419 *Polygonum aviculare* (*Wireweed*) Y
 1624. 582 *Polypogon monspeliensis* (*Annual Beardgrass*) Y
 1625. 4688 *Poranthera drummondii*

1677. 40425 *Rytidosperma caespitosum*
 1678. 40430 *Rytidosperma pilosum*
 1679. 40428 *Rytidosperma racemosum*
 1680. 40427 *Rytidosperma setaceum*
 1681. 2906 *Sagina apetala* (Annual Pearlwort) Y
 1682. 79 *Salvinia molesta* (*Salvinia*) Y
 1683. 6483 *Samolus junceus*
 1684. 6484 *Samolus repens* (Creeping Brookweed)
 1685. 3192 *Sanguisorba minor* (Sheep's Burnet) Y
 1686. 2593 *Sarcocornia quinqueflora* (Beaded Samphire)
 1687. 7598 *Scaevola auriculata*
 1688. 7613 *Scaevola glandulifera* (Viscid Hand-flower)
 1689. 7614 *Scaevola globulifera*
 1690. 7624 *Scaevola microphylla* (Small-leaved *Scaevola*)
 1691. 7626 *Scaevola nitida* (Shining Fanflower)
 1692. 7634 *Scaevola phlebopetala* (Velvet Fanflower)
 1693. 7646 *Scaevola striata* (Royal Robe)
 1694. 13175 *Scaevola striata* var. *striata*
 1695. 41660 *Schenkia australis*
 1696. 24 *Schizaea fistulosa* (Narrow Comb Fern)
 1697. 6263 *Schoenolaena juncea*
 1698. 970 *Schoenus acuminatus*
 1699. 983 *Schoenus cruentus*
 1700. 986 *Schoenus efoliatus*
 1701. 8312 *Schoenus maschalinus*
 1702. 1001 *Schoenus multiglumis*
 1703. 1004 *Schoenus nitens* (Shiny Bog-rush)
 1704. 1006 *Schoenus odontocarpus*
 1705. 1017 *Schoenus subbulbosus*
 1706. 1018 *Schoenus subfascicularis*
 1707. 1021 *Schoenus sublaxus*
 1708. 1023 *Schoenus tenellus*
 1709. 7651 *Selliera radicans* P1
 1710. 32433 *Sematophyllum homomallum*
 1711. 32483 *Sematophyllum subhumile* var. *contiguum*
 1712. 8208 *Senecio hispidulus* (Hispid Fireweed)
 1713. 20663 *Senecio multicaulis* subsp. *multicaulis*
 1714. 25884 *Senecio pinnatifolius* var. *latilobus*
 1715. 8218 *Senecio ramosissimus* (Auricled Groundsel)
 1716. *Senecio* sp.
 1717. 19453 *Setaria parviflora* Y
 1718. 11803 *Silene gallica* var. *quinquevulnera* Y
 1719. 8225 *Siloxerus humifusus* (Procumbent *Siloxerus*)
 1720. *Siloxerus* sp.
 1721. 7017 *Solanum laciniatum* (Kangaroo Apple) Y
 1722. 9259 *Solanum nodiflorum* (Glossy Nightshade)
 1723. 8231 *Sonchus oleraceus* (Common Sowthistle) Y
 1724. 1312 *Sowerbaea laxiflora* (Purple Tassels)
 1725. 4200 *Sphaerolobium alatum*
 1726. 20348 *Sphaerolobium calcicola* P3
 1727. 17551 *Sphaerolobium drummondii*

1779. 7802 *Stylidium squamosotuberosum* (Fleshy-rhizomed Trigger Plant)
 1780. 1260 *Stypandra glauca* (Blind Grass)
 1781. 2322 *Synaphea favosa*
 1782. 16859 *Synaphea incurva* P1
 1783. 12911 *Synaphea obtusata*
 1784. 16864 *Synaphea petiolaris* subsp. *petiolaris*
 1785. 16863 *Synaphea petiolaris* subsp. *triloba*
 1786. 2326 *Synaphea polymorpha* (Albany *Synaphea*, Pinda)
 1787. 2328 *Synaphea reticulata*
 1788. 32439 *Syntrichia papillosa*
 1789. 15827 *Taraxis grossa*
 1790. 20100 *Taxandria angustifolia*
 1791. 20114 *Taxandria fragrans*
 1792. 20115 *Taxandria juniperina*
 1793. 20135 *Taxandria linearifolia*
 1794. 20134 *Taxandria marginata*
 1795. 20133 *Taxandria parviceps*
 1796. 32440 *Tayloria octoblepharum*
 1797. *Tecticornia* sp.
 1798. 4256 *Templetonia retusa* (Cockies Tongues)
 1799. 2823 *Tetragonia implexicoma* (Bower Spinach)
 1800. 1034 *Tetraria capillaris* (Hair Sedge)
 1801. 1036 *Tetraria octandra*
 1802. *Tetraria* sp.
 1803. 35578 *Tetraria* sp. Blackwood River (A.R. Annel 3043) P3
 1804. 35579 *Tetraria* sp. Jarrah Forest (R. Davis 7391)
 1805. 667 *Tetrarrhena laevis* (Forrest Ricegrass)
 1806. 4526 *Tetratheca affinis*
 1807. 4536 *Tetratheca hispidissima*
 1808. 1701 *Thelymitra antennifera* (Vanilla Orchid)
 1809. 10856 *Thelymitra benthamiana* (Leopard Orchid)
 1810. 1704 *Thelymitra cornicina* (Lilac Sun Orchid)
 1811. 1706 *Thelymitra cucullata* (Swamp Sun Orchid)
 1812. 1707 *Thelymitra flexuosa* (Twisted Sun Orchid)
 1813. 11053 *Thelymitra macrophylla*
 1814. 5091 *Thomasia paniculata*
 1815. 5092 *Thomasia pauciflora* (Few Flowered *Thomasia*)
 1816. 5094 *Thomasia purpurea*
 1817. 5096 *Thomasia quercifolia* (Oak Leaved *Thomasia*) P4
 1818. 5097 *Thomasia rynchocarpa*
 1819. 5100 *Thomasia solanacea* P4
 1820. 33488 *Thomasia* sp. Vasse (C. Wilkins & K. Shepherd CW 581)
 1821. 32442 *Thuidium sparsum*
 1822. 1333 *Thysanotus glaucifolius*
 1823. 1339 *Thysanotus multiflorus* (Many-flowered Fringe Lily)
 1824. 1351 *Thysanotus sparteus*
 1825. *Tortula* sp.
 1826. *Tradescantia* sp.
 1827. 4547 *Tremandra diffusa*
 1828. 4548 *Tremandra stelligera*
 1829. 17684 *Tremulina tremula*

1881. 1149 *Xyris lacera*

1882. 1150 *Xyris lanata*

1883. 32457 *Zygodon intermedius*

APPENDIX C: Structural Classification used for Vegetation Mapping (Keighery 1994)

Life form/ height class	Canopy Cover			
	100-70%	70-30%	30-10%	<10%
Trees > 30	Tall Closed Forest	Open Forest	Tall Woodland	Tall Open Woodland
Trees 10-30	Closed Forest	Open Forest	Woodland	Open Woodland
Trees < 10m	Low Closed Forest	Low open Forest	Low Woodland	Low Open Woodland
Tree Mallee	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs >2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs <1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

Table 9.1 Structural Classification (Keighery 1994)

Life form / height class	Canopy cover			
	100-70%	70-30%	30-10%	10-2%
Trees over 30 Trees 10-30m Trees under 10 m	Tall Closed Forest Closed Forest Low Closed Forest	Open Forest Open Forest Low Open forest	Tall woodland Woodland Low Woodland	Tall Open Woodland Open Woodland Low Open Woodland
Tree Mallee Shrub Mallee	Closed Tree Mallee Closed Shrub Mallee	Tree mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs over 2m Shrubs 1-2m Shrubs under 1m	Closed Tall Scrub Closed Heath Closed Low Heath	Tall Open Scrub Open Heath Open Low Heath	Tall Shrubland Shrubland Low Shrubland	Tall Open Shrubland Open Shrubland Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

NatureMap Species Report

Created By Guest user on 08/06/2016

Current Names Only Yes
 Core Datasets Only Yes
 Method 'By Circle'
 Centre 117° 25' 00" E 35° 05' 00" S
 Buffer 10km
 Group By Family

Family	Species	Records
Acanthizidae	9	107
Accipitridae	9	46
Anarthriaceae	3	6
Anatidae	10	114
Apiaceae	4	9
Archaeidae	1	1
Ardeidae	6	54
Arthoniaceae	1	1
Asparagaceae	2	2
Asteraceae	11	19
Bittacidae	1	1
Blenniidae	1	7
Bolbitaceae	1	1
Boletaceae	1	1
Bucconidae	3	3
Bulimulidae	1	1
Burhinidae	1	1
Caliciaceae	1	1
Campanulaceae	2	2
Campephagidae	1	8
Casuarinaceae	1	4
Centrolepidaceae	2	3
Certhiidae	1	1
Certhiopsidae	2	2
Charadriidae	7	24
Cheloniidae	1	1
Chenopodiaceae	3	3
Chernetidae	1	1
Chironomidae	1	1
Cinclosomatidae	2	2
Cladoniaceae	2	2
Climacteridae	1	1
Clinidae	1	1
Coccothraupidae	1	1
Columbellidae	3	3
Columbidae	3	22
Conidae	1	1
Corallanidae	1	1
Corvidae	1	43
Cracticidae	4	51
Crassulaceae	1	1
Creedidae	1	1
Cuculidae	3	7
Cyperaceae	13	19
Dicruridae	2	19
Dilleniaceae	7	16
Diomedelidae	1	3
Elaeocarpaceae	2	2
Elapidae	1	1
Epitoniidae	1	1
Ericaceae	10	16
Estrilidae	2	8
Euphorbiaceae	1	2
Fabaceae	28	43
Falconidae	4	12
Fasciolaridae	1	1
Galaxiidae	1	1
Gekkonidae	1	10
Gentianaceae	1	1
Geoglossaceae	1	1
Geraniaceae	1	1
Gobiidae	3	18
Goodeniaceae	9	11
Gyrostemonaceae	1	1
Haematopodidae	2	14
Haemodoraceae	2	5
Halcyonidae	2	37
Haloragaceae	3	3
Hemeroptillidae	2	4
Hemiramphidae	1	1
Heterodontidae	1	1
Hirundinidae	1	16
Hygrophoraceae	2	2
Hylidae	1	1
Iridaceae	1	3
Ischyroceridae	2	2
Juncaceae	2	2

Labridae	2	2
Lamiaceae	1	1
Lamiaceae	5	77
Lecanoraceae	3	3
Loganiaceae	1	3
Lottiidae	1	1
Macropodidae	1	2
Malvaceae	5	88
Malvaceae	2	3
Marginellidae	1	1
Meliphagidae	7	103
Menyanthaceae	1	1
Mugilidae	1	1
Muridae	1	3
Myrtaceae	18	23
Nannoperidae	1	1
Neosittidae	1	1
Oiacaceae	1	2
Olividae	1	1
Orchidaceae	16	19
Orbanchaceae	1	1
Otaridae	1	2
Oxalidaceae	1	1
Pachycephalidae	2	45
Paralichthyidae	1	1
Pardalotidae	2	6
Parmeliaceae	5	5
Pelecanidae	1	29
Peronosporaceae	1	3
Petroicidae	1	17
Phalacrocoracidae	5	39
Phasianidae	1	1
Phyllanthaceae	1	1
Physaraceae	1	1
Pittosporaceae	1	1
Platycephalidae	1	4
Plotosidae	1	2
Poaceae	11	20
Podargidae	1	2
Podicipedidae	3	16
Poeciliidae	1	1
Polygalaceae	2	2
Polygonaceae	2	2
Polyporaceae	1	2
Portulacaceae	2	3
Potamogetonaceae	1	1
Primulaceae	1	1
Procellariidae	1	1
Proteaceae	14	19
Psittacidae	15	104
Rallidae	6	28
Ranellidae	2	2
Recurvirostridae	3	26
Restionaceae	5	8
Rhamnaceae	1	2
Rubiaceae	1	2
Rutaceae	6	11
Santalaceae	2	4
Scincidae	2	2
Scolopacidae	6	28
Scrophulariaceae	1	1
Siliquariidae	1	1
Sillaginidae	1	1
Solanaceae	1	2
Sparidae	2	3
Sphaeromatidae	2	2
Strigidae	1	3
Stylidiaceae	8	10
Sulidae	1	7
Sylviidae	4	12
Teloschistaceae	3	3
Terapontidae	1	1
Threskiornithidae	3	49
Thymelaeaceae	7	12
Turnicidae	1	1
Venidae	2	2
Zamiaceae	1	1
Zosteropidae	1	48
TOTAL	453	1781

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Acanthizidae				
1	<i>Acanthiza (Acanthiza) apicalis</i> subsp. <i>apicalis</i>			
2	<i>Acanthiza (Geobasileus) chrysorrhoa</i> subsp. <i>chrysorrhoa</i>			
3	<i>Acanthiza (Geobasileus) inornata</i>			
4	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
5	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
6	24262 <i>Acanthiza inornata</i> (Western Thornbill)			
7	25530 <i>Gerygone fusca</i> (Western Gerygone)			
8	24271 <i>Gerygone fusca</i> subsp. <i>fusca</i> (Western Gerygone)			
9	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
Accipitridae				
10	<i>Accipiter (Leucospiza) fasciatus</i> subsp. <i>fasciatus</i>			
11	<i>Accipiter (Paraspizias) cirrocephalus</i> subsp. <i>cirrocephalus</i>			
12	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
13	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
14	24288 <i>Circus approximans</i> (Swamp Harrier)			
15	<i>Elanus axillaris</i>			
16	24293 <i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)		IA	
17	24295 <i>Haliaeetus sphenurus</i> (Whistling Kite)			
18	<i>Pandion cristatus</i>			
Anarthriaceae				
19	1060 <i>Anarthria laevis</i>			
20	1062 <i>Anarthria prolifera</i>			
21	1097 <i>Lyginia barbata</i>			
Anatidae				
22	24310 <i>Anas castanea</i> (Chestnut Teal)			
23	24312 <i>Anas gracilis</i> (Grey Teal)			
24	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
25	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
26	24318 <i>Aythya australis</i> (Hardhead)			
27	24319 <i>Biziura lobata</i> (Musk Duck)			
28	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
29	<i>Cygnus (Chenopsis) atratus</i>			
30	24322 <i>Cygnus atratus</i> (Black Swan)			
31	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
Apiaceae				
32	6214 <i>Centella asiatica</i>			
33	6249 <i>Platysace compressa</i> (Tapeworm Plant)			
34	6284 <i>Xanthosia candida</i>			
35	6289 <i>Xanthosia huegelii</i>			
Arachnidae				
36	42361 <i>Zephyrarchaea mainae</i> (Western Arachnid Spider)			T
Ardidae				
37	25558 <i>Ardea ibis</i> (Cattle Egret)		IA	
38	41324 <i>Ardea modesta</i> (Eastern Great Egret)		IA	
39	<i>Egretta garzetta</i>			
40	<i>Egretta novaehollandiae</i>			
41	24347 <i>Ixobrychus flavicollis</i> subsp. <i>australis</i> (Australian Black Bittern)		P1	
42	25563 <i>Ixobrychus minutus</i> (Little Bittern)		P4	
Arthoniaceae				
43	27584 <i>Arthonia ilicina</i>			
Asparagaceae				
44	1280 <i>Chamaescilla corymbosa</i> (Blue Squill)			
45	1354 <i>Thysanotus tenellus</i>			
Asteraceae				
46	7851 <i>Asteridea pulverulenta</i> (Common Bristle Daisy)			
47	8086 <i>Hypochaeris glabra</i> (Smooth Catsear)	Y		
48	8127 <i>Olearia axillaris</i> (Coastal Daisybush)			
49	8143 <i>Olearia paucidentata</i> (Autumn Scrub Daisy)			
50	42281 <i>Pithocarpa cordata</i>			
51	18352 <i>Pithocarpa pulchella</i> var. <i>melanostigma</i>			
52	42260 <i>Pithocarpa ramosa</i>			
53	8175 <i>Podolepis gracilis</i> (Slender Podolepis)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
54	8182 <i>Podotheca angustifolia</i> (Sticky Longheads)			
55	8195 <i>Quinetia urvillei</i>			
56	8225 <i>Siloxerus humifusus</i> (Procumbent Siloxerus)			
Bittacidae				
57	<i>Harpobittacus similis</i>			
Blenniidae				
58	<i>Parablennius tasmanianus</i>			
Bolbitiaceae				
59	38784 <i>Descomyces albus</i>			
Boletaceae				
60	<i>Austroboletus</i> sp.			
Buccinidae				
61	<i>Buccinum bednalli</i>			
62	<i>Cominella</i> (<i>Cominella</i>) <i>eburnea</i>			
63	<i>Fusus</i> sp.			
Bulimulidae				
64	<i>Bothriembryon</i> (<i>Bothriembryon</i>) <i>kingii</i>			
Burhinidae				
65	<i>Burhinus</i> (<i>Burhinus</i>) <i>grallarius</i>			
Caliciaceae				
66	27708 <i>Cyphelium trachyloides</i>			
Campanulaceae				
67	7403 <i>Lobelia heterophylla</i> (Wing-seeded Lobelia)			
68	7408 <i>Lobelia tenuior</i> (Slender Lobelia)			
Campephagidae				
69	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
Casuarinaceae				
70	1732 <i>Allocasuarina humilis</i> (Dwarf Sheoak)			
Centrolepidaceae				
71	1117 <i>Aphelia cyperoides</i>			
72	1121 <i>Centrolepis aristata</i> (Pointed Centrolepis)			
Cerithiidae				
73	<i>Cacozeliana granarium</i>			
Cerithiopsidae				
74	<i>Ataxocerithium serotinum</i>			
75	<i>Seila magna</i>			
Charadriidae				
76	<i>Charadrius</i> (<i>Charadrius</i>) <i>ruficapillus</i>			
77	24376 <i>Charadrius rubricollis</i> (Hooded Plover)		P4	
78	24377 <i>Charadrius ruficapillus</i> (Red-capped Plover)			
79	<i>Eiseyornis melanops</i>			
80	24382 <i>Pluvialis fulva</i> (Pacific Golden Plover)		IA	
81	24383 <i>Pluvialis squatarola</i> (Grey Plover)		IA	
82	<i>Thinornis rubricollis</i>			
Cheloniidae				
83	25335 <i>Caretta caretta</i> (Loggerhead Turtle)		T	
Chenopodiaceae				
84	2471 <i>Atriplex prostrata</i> (Hastate Orache)	Y		
85	11341 <i>Rhagodia baccata</i> subsp. <i>baccata</i>			
86	<i>Tecticornia</i> sp.			
Chernetidae				
87	<i>Conicochernes crassus</i>			
Chironemidae				
88	<i>Threpterus maculosus</i>			
Cinclosomatidae				
89	25579 <i>Psophodes nigrogularis</i> (Western Whipbird)			
90	24388 <i>Psophodes nigrogularis</i> subsp. <i>nigrogularis</i> (Western Whipbird (western heath))		T	
Cladoniaceae				
91	27672 <i>Cladonia calyciformis</i>			
92	28208 <i>Cladonia cervicornis</i> subsp. <i>verticillata</i>			

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Climacteridae				
93.	24396 <i>Climacteris rufa</i> (Rufous Treecreeper)			
Clinidae				
94.	<i>Heteroclinus eckloniae</i>			
Coccocarpiaceae				
95.	28063 <i>Spilonema paradoxum</i>			
Columbellidae				
96.	<i>Mitrella (Dentimitrella) austrina</i>			
97.	<i>Mitrella (Dentimitrella) semiconvexa</i>			
98.	<i>Mitrella (Zemitrella) menkeana</i>			
Columbidae				
99.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
100.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
101.	25587 <i>Phaps elegans</i> (Brush Bronzewing)			
Conidae				
102.	<i>Conus anemone</i>			
Corallanidae				
103.	<i>Argathona</i> sp.			Y
Corvidae				
104.	25592 <i>Corvus coronoides</i> (Australian Raven)			
Cracticidae				
105.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
106.	25595 <i>Cracticus torquatus</i> (Grey Butcherbird)			
107.	<i>Strepera (Neostrepera) versicolor</i> subsp. <i>plumbea</i>			
108.	25597 <i>Strepera versicolor</i> (Grey Currawong)			
Crassulaceae				
109.	3137 <i>Crassula colorata</i> (Dense Stonecrop)			
Creedliidae				
110.	<i>Limnichthys fasciatus</i>			
Cuculidae				
111.	25598 <i>Cacomantis labelliformis</i> (Fan-tailed Cuckoo)			
112.	24431 <i>Chrysococcyx basalis</i> (Horsfield's Bronze Cuckoo)			
113.	24432 <i>Chrysococcyx lucidus</i> subsp. <i>plagosus</i> (Shining Bronze Cuckoo)			
Cyperaceae				
114.	739 <i>Baumea acuta</i> (Pale Twig-rush)			
115.	743 <i>Baumea juncea</i> (Bare Twigrush)			
116.	20216 <i>Ficinia nodosa</i> (Knotted Club Rush)			
117.	17744 <i>Gahnia sclenoides</i>			P4
118.	917 <i>Isolepis marginata</i> (Coarse Club-rush)			
119.	<i>Isolepis</i> sp.			
120.	925 <i>Lepidosperma angustatum</i>			
121.	932 <i>Lepidosperma effusum</i> (Spreading Sword-sedge)			
122.	933 <i>Lepidosperma gladiatum</i> (Coast Sword-sedge, Kerbin)			
123.	946 <i>Lepidosperma striatum</i>			
124.	986 <i>Schoenus efolius</i>			
125.	1004 <i>Schoenus nitens</i> (Shiny Bog-rush)			
126.	1034 <i>Tetrana capillaris</i> (Hair Sedge)			
Dicruridae				
127.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
128.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
Dilleniaceae				
129.	5109 <i>Hibbertia amplexicaulis</i>			
130.	5117 <i>Hibbertia cuneiformis</i> (Cutleaf Hibbertia)			
131.	5126 <i>Hibbertia turfuracea</i>			
132.	5132 <i>Hibbertia grossularifolia</i>			
133.	5135 <i>Hibbertia hypericoides</i> (Yellow Buttercups)			
134.	5155 <i>Hibbertia pilosa</i> (Hairy Guinea Flower)			
135.	5162 <i>Hibbertia racemosa</i> (Stalked Guinea Flower)			
Diomedidae				
136.	34007 <i>Thalassarche chlororhynchos</i> (Atlantic Yellow-nosed Albatross)			T
Elaeocarpaceae				
137.	4525 <i>Platytheca juniperina</i>			

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138	4536 <i>Tetratheca hspidissima</i>			
Elapidae				
139	25251 <i>Echiopsis curta</i> (Bardick)			
Epitoniidae				
140	<i>Opalia (Opalia) australis</i>			
Ericaceae				
141	6306 <i>Andersonia caerulea</i> (Foxtails)			
142	6321 <i>Andersonia sprengelioides</i>			
143	6352 <i>Cosmelia rubra</i> (Spindle Heath)			
144	6360 <i>Leucopogon australis</i> (Spiked Beard-heath)			
145	6396 <i>Leucopogon glabellus</i>			
146	6417 <i>Leucopogon obovatus</i>			
147	40941 <i>Leucopogon obovatus</i> subsp. <i>revolutus</i>			
148	6436 <i>Leucopogon propinquus</i>			
149	<i>Leucopogon</i> sp.			
150	6456 <i>Lysinema ciliatum</i> (Curry Flower)			
Estrilidae				
151	<i>Stagonopleura (Zonaeginthus) oculata</i>			
152	24645 <i>Stagonopleura oculata</i> (Red-eared Firetail)			
Euphorbiaceae				
153	4585 <i>Amperea ericoides</i>			
Fabaceae				
154	15429 <i>Acacia alata</i> var. <i>alata</i>			
155	3262 <i>Acacia cochlearis</i> (Rigid Wattle)			
156	3282 <i>Acacia cyclops</i> (Coastal Wattle)			
157	3363 <i>Acacia hastulata</i>			
158	3424 <i>Acacia littorea</i>			
159	3453 <i>Acacia myrtifolia</i>			
160	3502 <i>Acacia pulchella</i> (Prickly Moses)			
161	3523 <i>Acacia robiniae</i>			
162	30036 <i>Acacia saligna</i> subsp. <i>stolonifera</i>			
163	3588 <i>Acacia uliginosa</i>			
164	3713 <i>Bossiaea linophylla</i>			
165	3718 <i>Bossiaea rufa</i>			
166	10861 <i>Callistachys lanceolata</i> (Wonnich)			
167	3754 <i>Chorizema diversifolium</i>			
168	3758 <i>Chorizema ilicifolium</i> (Holly Flame Pea)			
169	13107 <i>Chorizema retrorsum</i>			
170	20214 <i>Eutaxia myrtifolia</i>			
171	3891 <i>Gastrolobium bilobum</i> (Heart Leaf Poison)			
172	10909 <i>Gompholobium confertum</i>			
173	3957 <i>Gompholobium tomentosum</i> (Hairy Yellow Pea)			
174	3961 <i>Hardenbergia comptoniana</i> (Native Wistena)			
175	3965 <i>Hovea elliptica</i> (Tree Hovea)			
176	4017 <i>Jacksonia horrida</i>			
177	4037 <i>Kennedia coccinea</i> (Coral Vine)			
178	4155 <i>Psoralea pinnata</i> (African Scurfpea)	Y		
179	4181 <i>Pultenaea reticulata</i>			
180	20348 <i>Sphaerolobium calcicola</i>		P3	
181	4256 <i>Templetonia retusa</i> (Cockies Tongues)			
Falconidae				
182	<i>Falco (Falco) longipennis</i> subsp. <i>longipennis</i>			
183	25621 <i>Falco berigora</i> (Brown Falcon)			
184	25622 <i>Falco cenchroides</i> (Australian Kestrel)			
185	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
Fasciolaridae				
186	<i>Microcolus dunkeri</i>			
Galaxiidae				
187	<i>Galaxias</i> sp.			
Gekkonidae				
188	24980 <i>Christinus marmoratus</i> (Marbled Gecko)			
Gentianaceae				
189	6539 <i>Centaureum erythraea</i> (Common Centaury)	Y		
Geoglossaceae				

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
190.	<i>Trichoglossum</i> sp.			
Geraniaceae				
191.	4346 <i>Pelargonium littorale</i>			
Gobiidae				
192.	<i>Favonigobius lateralis</i>			
193.	<i>Favonigobius</i> sp.			
194.	<i>Pseudogobius olorum</i>			
Goodeniaceae				
195.	7487 <i>Diaspasis filifolia</i> (Thread-leaved Diaspasis)			
196.	7523 <i>Goodenia leptoclada</i> (Thin-stemmed Goodenia)			
197.	13165 <i>Goodenia pusilla</i>			
198.	7572 <i>Lechenaultia expansa</i>			
199.	7614 <i>Scaevola globulifera</i>			
200.	7626 <i>Scaevola nitida</i> (Shining Fanflower)			
201.	7634 <i>Scaevola phlebopetala</i> (Velvet Fanflower)			
202.	7662 <i>Velleia macrophylla</i> (Large-leaved Velleia)			
203.	7665 <i>Velleia trinervis</i>			
Gyrostemonaceae				
204.	2787 <i>Gyrostemon sheathii</i>			
Haematopodidae				
205.	25627 <i>Haematopus fuliginosus</i> (Sooty Oystercatcher)			
206.	24487 <i>Haematopus longirostris</i> (Pied Oystercatcher)			
Haemodoraceae				
207.	1407 <i>Anigozanthos flavidus</i> (Tall Kangaroo Paw)			
208.	11826 <i>Conostylis aculeata</i> subsp. <i>aculeata</i>			
Halcyonidae				
209.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)			
210.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
Haloragaceae				
211.	6183 <i>Haloragodendron racemosum</i> (Shrubby Raspwort)			
212.	34676 <i>Meioneclis brownii</i> (Swamp Raspwort)			
213.	6198 <i>Myriophyllum salsugineum</i>			
Hemerocallidaceae				
214.	1285 <i>Corynotheca micrantha</i> (Sand Lily)			
215.	1260 <i>Stypandra glauca</i> (Blind Grass)			
Hemiramphidae				
216.	<i>Hemiramphus</i> sp.			
Heterodontidae				
217.	? ?			
Hirundinidae				
218.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
Hygrophoraceae				
219.	38795 <i>Hygrocybe conica</i>			
220.	<i>Hygrocybe viscidibrunea</i>			
Hyllidae				
221.	25388 <i>Litona moorei</i> (Motorbike Frog)			
Iridaceae				
222.	1550 <i>Patersonia occidentalis</i> (Purple Flag, Koma)			
Ischyroceridae				
223.	<i>Cerapus</i> sp.			
224.	<i>Rhinoecetes</i> sp.			
Juncaceae				
225.	11922 <i>Juncus kraussii</i> subsp. <i>australiensis</i>			
226.	<i>Juncus</i> sp.			
Labridae				
227.	<i>Pseudolabrus</i> sp.			
228.	<i>Siphonognathus beddomei</i>			
Lamiaceae				
229.	6939 <i>Westringia dampieri</i>			
Laridae				

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230.	<i>Chroicocephalus novaehollandiae</i>			
231.	<i>Hydroprogne caspia</i>			
232.	25638 <i>Larus pacificus</i> (Pacific Gull)			
233.	25644 <i>Sterna nereis</i> (Fairy Tern)			
234.	<i>Thalasseus bergii</i>			
Lecanoraceae				
235.	33645 <i>Ramboldia arandensis</i>			
236.	28036 <i>Ramboldia soredata</i>			
237.	28037 <i>Ramboldia stuartii</i>			
Loganiaceae				
238.	13128 <i>Logania serpyllifolia</i> subsp. <i>angustifolia</i>			
Lottiidae				
239.	<i>Lottia onychitis</i>			
Macropodidae				
240.	24145 <i>Setonix brachyurus</i> (Quokka)		T	
Maluridae				
241.	<i>Malurus (Leggeornis) elegans</i>			
242.	25650 <i>Malurus elegans</i> (Red-winged Fairy-wren)			
243.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
244.	25655 <i>Stipiturus malachurus</i> (Southern Emu-wren)			
245.	24554 <i>Stipiturus malachurus</i> subsp. <i>westernensis</i> (Southern Emu-wren)			
Malvaceae				
246.	5033 <i>Lasiopetalum floribundum</i> (Free Flowering Lasiopetalum)			
247.	5094 <i>Thomasia purpurea</i>			
Marginellidae				
248.	<i>Balanetta baylii</i>			
Meliphagidae				
249.	24560 <i>Acanthorhynchus superciliosus</i> (Western Spinebill)			
250.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
251.	24562 <i>Anthochaera lunulata</i> (Western Little Wattlebird)			
252.	<i>Gliciphila melanops</i> subsp. <i>melanops</i>			
253.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
254.	<i>Phylidonyris (Meliornis) novaehollandiae</i> subsp. <i>longirostris</i>			
255.	24596 <i>Phylidonyris novaehollandiae</i> (New Holland Honeyeater)			
Menyanthaceae				
256.	36178 <i>Liparophyllum lasiospermum</i>			
Mugilidae				
257.	<i>Aldrichetta forsteri</i>			
Muridae				
258.	24215 <i>Hydromys chrysogaster</i> (Water-rat)		P4	
Myrtaceae				
259.	5316 <i>Agonis flexuosa</i> (Peppermint, Wonil)			
260.	17203 <i>Agonis flexuosa</i> var. <i>latifolia</i>			
261.	20127 <i>Astartea glomerulosa</i>			
262.	5364 <i>Baeckea pygmaea</i>			
263.	5425 <i>Calothamnus preissii</i>			
264.	5430 <i>Calothamnus schaueri</i>			
265.	5605 <i>Eucalyptus cornuta</i> (Yate, Yeid)			
266.	5709 <i>Eucalyptus megacarpa</i> (Bullich, Pulidj)			
267.	5763 <i>Eucalyptus rudis</i> (Flooded Gum, Kukurda)			
268.	5841 <i>Kunzea recurva</i>			
269.	5900 <i>Melaleuca cuticularis</i> (Saltwater Paperbark)			
270.	5902 <i>Melaleuca densa</i>			
271.	5921 <i>Melaleuca incana</i> (Grey Honey Myrtle)			
272.	5959 <i>Melaleuca raphiophylla</i> (Swamp Paperbark)			
273.	5987 <i>Melaleuca viminea</i> (Mohan)			
274.	20100 <i>Taxandria angustiloba</i>			
275.	20115 <i>Taxandria juniperina</i>			
276.	20134 <i>Taxandria marginata</i>			
Nannoperidae				
277.	<i>Edelia vittata</i>			
Neosittidae				
278.	25673 <i>Daphoenositta chrysoptera</i> (Vaned Sittella)			

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Oiacaceae				
279	2366 <i>Olix phyllanthi</i>			
Olividae				
280	<i>Amalda</i> sp.			
Orchidaceae				
281	15328 <i>Caladenia applanata</i> subsp. <i>applanata</i>			
282	15329 <i>Caladenia applanata</i> subsp. <i>erubescens</i>			
283	1580 <i>Caladenia cairnsiana</i> (Zebra Orchid)			
284	15348 <i>Caladenia flava</i> subsp. <i>flava</i>			
285	1596 <i>Caladenia huegelii</i> (Grand Spider Orchid)		T	
286	1599 <i>Caladenia latifolia</i> (Pink Fairy Orchid)			
287	1605 <i>Caladenia marginata</i> (White Fairy Orchid)			
288	1627 <i>Cryptostylis ovata</i> (Slipper Orchid)			
289	10916 <i>Cyrtostylis huegelii</i>			
290	1636 <i>Diuris pauciflora</i>			
291	1643 <i>Elythranthera brunonis</i> (Purple Enamel Orchid)			
292	1644 <i>Elythranthera emarginata</i> (Pink Enamel Orchid)			
293	<i>Plumatiichilos turfosa</i>			
294	1680 <i>Prasophyllum parvifolium</i> (Autumn Leek Orchid)			
295	18658 <i>Pterostylis</i> sp. <i>short sepals</i> (W. Jackson BJ259)			
296	1698 <i>Pterostylis vittata</i> (Banded Greenhood)			
Orobanchaceae				
297	7122 <i>Orobanche minor</i> (Lesser Broomrape)	Y		
Otaridae				
298	24210 <i>Neophoca cinerea</i> (Australian Sea Lion)		S	
Oxalidaceae				
299	4358 <i>Oxalis purpurea</i> (Largeflower Wood Sorrel)	Y		
Pachycephalidae				
300	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
301	25679 <i>Pachycephala pectoralis</i> (Golden Whistler)			
Paralichthyidae				
302	<i>Pseudorhombus jenynsii</i>			
Pardalotidae				
303	25681 <i>Pardalotus punctatus</i> (Spotted Pardalote)			
304	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
Parmeliaceae				
305	43942 <i>Austroparmelia pruinata</i>			
306	27743 <i>Flavoparmelia diffractaica</i>			
307	<i>Parmotrema</i> sp.			
308	28114 <i>Xanthoparmelia congensis</i>			
309	29033 <i>Xanthoparmelia glabrans</i>			
Pelecanidae				
310	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
Peronosporaceae				
311	<i>Phytophthora cinnamomi</i>			
Petroicidae				
312	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
Phalacrocoracidae				
313	<i>Microcarbo melanoleucos</i>			
314	25697 <i>Phalacrocorax carbo</i> (Great Cormorant)			
315	24664 <i>Phalacrocorax carbo</i> subsp. <i>novaeollandiae</i> (Great Cormorant)			
316	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
317	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
Phasianidae				
318	25701 <i>Coturnix ypsilophora</i> (Brown Quail)			
Phyllanthaceae				
319	4691 <i>Poranthera microphylla</i> (Small Poranthera)			
Physaraceae				
320	39033 <i>Fuligo septica</i>			
Pittosporaceae				
321	<i>Billardiera</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Platycephalidae				
322	<i>Platycephalus speculator</i>			
Plotosidae				
323	<i>Cnidogobius macrocephalus</i>			
Poaceae				
324	185 <i>Aira cupaniana</i> (Silvery Hairgrass)	Y		
325	187 <i>Aira praecox</i> (Early Hairgrass)	Y		
326	35159 <i>Ammophila arenaria</i> subsp. <i>arenaria</i>	Y		
327	17240 <i>Austrostipa flavescens</i>			
328	231 <i>Avellinia micheli</i>	Y		
329	244 <i>Briza maxima</i> (Blowfly Grass)	Y		
330	245 <i>Briza minor</i> (Shivery Grass)	Y		
331	306 <i>Dichelachne crinita</i> (Longhair Plumegrass)			
332	533 <i>Paspalum vaginatum</i> (Salt Water Couch)	Y		
333	573 <i>Poa drummondiana</i> (Knotted Poa)			
334	11137 <i>Vulpia fasciculata</i>	Y		
Podargidae				
335	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
Podicipedidae				
336	25704 <i>Podiceps cristatus</i> (Great Crested Grebe)			
337	24681 <i>Poliiocephalus poliiocephalus</i> (Hoary-headed Grebe)			
338	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
Poeciliidae				
339	<i>Gambusia affinis</i>			
Polygalaceae				
340	4550 <i>Comesperma calymega</i> (Blue-spike Milkwort)			
341	4552 <i>Comesperma confertum</i>			
Polygonaceae				
342	2412 <i>Muehlenbeckia adpressa</i> (Climbing Lignum)			
343	2432 <i>Rumex conglomeratus</i> (Clustered Dock)	Y		
Polyporaceae				
344	<i>Laccocephalum myliiatae</i>			
Portulacaceae				
345	2845 <i>Calandrinia brevipedata</i> (Short-stalked Purslane)			
346	2856 <i>Calandrinia liniflora</i> (Parakeelya)			
Potamogetonaceae				
347	44492 <i>Stuckenia pectinata</i>			
Primulaceae				
348	6484 <i>Samolus repens</i> (Creeping Brookweed)			
Procellariidae				
349	24715 <i>Puffinus huttoni</i> (Hutton's Shearwater)		T	
Proteaceae				
350	1819 <i>Banksia grandis</i> (Bull Banksia, Pulgarla)			
351	1830 <i>Banksia littoralis</i> (Swamp Banksia, Pungura)			
352	1841 <i>Banksia praemorsa</i> (Cut-leaf Banksia)			
353	1844 <i>Banksia quercifolia</i> (Oak-leaved Banksia)			
354	1863 <i>Conospermum capitatum</i>			
355	1944 <i>Franklandia fucifolia</i> (Lanoline Bush)			
356	2137 <i>Hakea ceratophylla</i> (Horned Leaf Hakea)			
357	2191 <i>Hakea oleifolia</i> (Dungyn)			
358	2197 <i>Hakea prostrata</i> (Harsh Hakea)			
359	2222 <i>Isopogon attenuatus</i>			
360	12908 <i>Isopogon buxifolius</i> var. <i>buxifolius</i>		P2	
361	2226 <i>Isopogon cuneatus</i> (Coneflower)			
362	2262 <i>Persoonia elliptica</i> (Spreading Snottygobble)			
363	2282 <i>Petrophile acicularis</i>			
Psittacidae				
364	<i>Barnardius zonarius</i>			
365	<i>Calyptorhynchus (Calyptorhynchus) banksii</i> subsp. <i>naso</i>			
366	<i>Calyptorhynchus (Zanda) baudinii</i>			
367	<i>Calyptorhynchus (Zanda) latirostris</i>			
368	24733 <i>Calyptorhynchus baudinii</i> (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)		T	

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
369.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)		T	
370.	<i>Calyptorhynchus</i> sp.			
371.	24735 <i>Glossopsitta porphyrocephala</i> (Purple-crowned Lorikeet)			
372.	<i>Neophema</i> (<i>Neonanodes</i>) <i>elegans</i> subsp. <i>carteri</i>			
373.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
374.	24739 <i>Neophema petrophila</i> (Rock Parrot)			
375.	41348 <i>Pezoporus flaviventris</i> (Western Ground Parrot)		T	
376.	<i>Platycercus</i> (<i>Violania</i>) <i>icterotis</i> subsp. <i>icterotis</i>			
377.	25720 <i>Platycercus icterotis</i> (Western Rosella)			
378.	<i>Purpureicephalus spurius</i>			
Rallidae				
379.	25727 <i>Fulica atra</i> (Eurasian Coot)			
380.	<i>Porphyrio</i> (<i>Porphyrio</i>) <i>porphyrio</i> subsp. <i>bellus</i>			
381.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
382.	<i>Porzana</i> (<i>Porzana</i>) <i>pusilla</i> subsp. <i>palustris</i>			
383.	<i>Porzana</i> (<i>Porzana</i>) <i>tabuensis</i>			
384.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
Ranellidae				
385.	<i>Charonia lampas</i>			
386.	<i>Cymatium</i> (<i>Turriton</i>) <i>labiosum</i>			
Recurvirostridae				
387.	24774 <i>Ciadorhynchus leucocephalus</i> (Banded Stilt)			
388.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
389.	24776 <i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
Restionaceae				
390.	17685 <i>Chaetanthus aristatus</i>			
391.	17692 <i>Cyrtogonidium leptocarpoides</i>			
392.	16595 <i>Desmocladius flexuosus</i>			
393.	1070 <i>Hypolaena exsulca</i>			
394.	18381 <i>Stenotalis ramosissima</i>			
Rhamnaceae				
395.	4828 <i>Spyridium globulosum</i> (Basket Bush)			
Rubiaceae				
396.	7348 <i>Opercularia hispidula</i> (Hispid Stinkweed)			
Rutaceae				
397.	4416 <i>Boronia denticulata</i>			
398.	4422 <i>Boronia gracilipes</i> (Karri Boronia)			
399.	4429 <i>Boronia molloyae</i> (Tall Boronia)			
400.	4448 <i>Chorilaena quercifolia</i> (Chorilaena)			
401.	4451 <i>Crowea angustifolia</i> (Crowea)			
402.	18547 <i>Rhadinothamnus anceps</i>			
Santalaceae				
403.	10765 <i>Exocarpos sparteus</i> (Broom Ballart, Djuk)			
404.	2355 <i>Leptomeria squarrolosa</i>			
Scincidae				
405.	25049 <i>Ctenotus labillardieri</i>			
406.	25096 <i>Egernia kingii</i> (King's Skink)			
Scolopacidae				
407.	<i>Calidris</i> (<i>Erolia</i>) <i>acuminata</i>			
408.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
409.	24784 <i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
410.	24788 <i>Calidris ruficollis</i> (Red-necked Stint)		IA	
411.	30932 <i>Limosa lapponica</i> (Bar-tailed Godwit)		IA	
412.	24808 <i>Tringa nebularia</i> (Common Greenshank)		IA	
Scrophulariaceae				
413.	7107 <i>Verbascum virgatum</i> (Twiggy Mullein)	V		
Siliquariidae				
414.	<i>Siliquaria</i> (<i>pyxipoma</i>)			
Sillaginidae				
415.	<i>Sillaginodes punctatus</i>			
Solanaceae				
416.	6949 <i>Anthocercis littorea</i> (Yellow Tailflower)			

Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Sparidae				
417	<i>Acanthopagrus butcheri</i>			
418	<i>Rhabdosargus sarba</i>			
Sphaeromatidae				
419	<i>Exosphaeroma</i> sp.			
420	<i>Paracassidina</i> sp.			
Strigidae				
421	25748 <i>Ninox novaeseelandiae</i> (Boobook Owl)			
Stylidiaceae				
422	7670 <i>Levenhookia dubia</i> (Hairy Stylewort)			
423	7676 <i>Levenhookia pusilla</i> (Midget Stylewort)			
424	7677 <i>Levenhookia stipitata</i> (Common Stylewort)			
425	7678 <i>Stylidium adnatum</i> (Common Beaked Triggerplant)			
426	7695 <i>Stylidium caespitosum</i> (Fly-away Triggerplant)			
427	7774 <i>Stylidium piliferum</i> (Common Butterfly Triggerplant)			
428	7785 <i>Stylidium repens</i> (Matted Triggerplant)			
429	7799 <i>Stylidium spathulatum</i> (Creamy Triggerplant)			
Sulidae				
430	<i>Morus serrator</i>			
Sylviidae				
431	<i>Acrocephalus (Acrocephalus) australis</i> subsp. <i>gouldi</i>			
432	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
433	25758 <i>Megalurus gramineus</i> (Little Grassbird)			
434	<i>Megalurus gramineus</i> subsp. <i>thomasi</i>			
Telochistaceae				
435	41654 <i>Caloplaca dahlia</i>			
436	<i>Caloplaca</i> sp.			
437	28065 <i>Telochistes chrysophthalmus</i>			
Terapontidae				
438	<i>Pelates octolineatus</i>			
Threskiornithidae				
439	24841 <i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
440	24844 <i>Threskiornis molucca</i> (Australian White Ibis)			
441	24845 <i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
Thymelaeaceae				
442	5231 <i>Pimelea angustifolia</i> (Narrow-leaved Pimelea)			
443	5239 <i>Pimelea clavata</i>			
444	5243 <i>Pimelea ferruginea</i>			
445	5251 <i>Pimelea imbricata</i>			
446	5252 <i>Pimelea lanata</i>			
447	5261 <i>Pimelea rosea</i> (Rose Banjine)			
448	18117 <i>Pimelea rosea</i> subsp. <i>rosea</i>			
Turnicidae				
449	<i>Turnix (Australturnix) varius</i> subsp. <i>varius</i>			
Veneridae				
450	<i>Eumarcia fumigata</i>			Y
451	<i>Irus (Irus) carditoides</i>			
Zamiaceae				
452	85 <i>Macrozamia nedlei</i> (<i>Zamia</i> , Djindji)			
Zosteropidae				
453	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silvereye)			

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

For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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 2

Water Management Plan

Limestone Extraction for Agricultural Lime

Lot 9005
Nullaki Peninsula
City of Albany

May 2016

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FIGURES

See figures within the Management Plan

WATER QUALITY MANAGEMENT

1.0 BACKGROUND

1.1 Overview

An agricultural lime quarry is proposed to be opened on 10 hectares of a limestone ridge on Lot 9005, Nullaki Peninsula City of Albany.

The limestone on Lot 9005 is highly suitable for lime for agriculture and neutralisation of acidity in addition to some road bases. Drilling has been completed and testing of the lime neutralising value carried out.

Location

The proposed excavation lies in the south eastern corner of Lot 9005, set back from the coastal cliffs and Foreshore Reserve (30883) which covers the cliffed slope. It is approximately 10 km south east from Denmark townsite on the Nullaki Peninsula.

To the east lies Reserve 17464, vested in the City of Albany and associated with Lake Sadie. The Bibulum Track runs through the reserve.

Current Land Use

Lot 9005 is covered by remnant coastal vegetation. The proposed quarry site has previously been used for a small limestone quarry to provide limestone for road construction on the subdivided part of the Nullaki Peninsula. The pit had revegetated.

Minor exploration work has been completed for the existing proposal including the preparation of access tracks and drill platforms.

A predator proof fence runs across the Peninsula on the eastern side of Lot 9005

1.2 Water Source Protection Areas

There are no water source protection areas, although the ocean edge of the Nullaki Peninsula is listed as being part of the Albany Drainage District.

1.3 Water Source

It is not anticipated that any water will be required for dust suppression. The first 60 metres of access road will be sealed.

1.4 Water Quality Protection Guidelines

The protection of water whether groundwater or surface water is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Guidance on the quality of water can be found in;

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*
- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*

Documents specific to the mining and quarrying operations are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing.

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *Mine dewatering*
- *WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004)*
- *WQPN 11 Water quality management in mining and mineral processing: mine dewatering.*
- *WQPN 15 Extractive Industries near sensitive water resources.*
- *Department of Water – Water resource considerations for extractive industries.*
- *Department of Water South West Region Guideline – Water resource considerations for extractive industries.*

The continued excavation complies with all the documents above. The most relevant documents are WQPN 15 *Extractive Industries near sensitive water resources* and *South West Region Guideline – Water resource considerations for extractive industries.*

Potable water will be brought to the site. Serviced portable support facilities and ablutions are to be at the western end of the site.

2.0 PHYSICAL ATTRIBUTES

2.1 Geology and Geomorphology

The site is an eroded high ridge of interbedded sequences of coastal dunes, of limestone 120 to 140 metres, rising to over 160 metres AHD on the highest peaks overlying an undulating Proterozoic granitic basement that outcrops of granite hills in the Denmark - Wilson Inlet area.

The limestone is a calc-arenite made from beach sand containing predominantly shell fragments with minor and variable quartz. The limestone has been lithified and recrystallised on the ridge tops to lift the percentage of calcium carbonate to over 70%. The limestone sequences also include buried soil horizons and recalcified limestone overtopped by younger dunes.

The geology is summarised in;

- Geological Survey of Western Australia, 1989, *1 : 50 000 Environmental Geology Series Torbay*.
- Muhling P C and A T Brakel, 1985, *1 : 250 000 Geological Series*, Geological Survey of Western Australia.
- Smith R A 1993, *1 : 250 000 Hydrogeological Series Mt Barker – Alban*, Department of Minerals and Energy.

The degree of lithification (hardness) changes over the property, and determines the use to which each type of limestone can be put.

The limestone is of Quaternary Age formed during changes to sea level during the Pleistocene.

Bores drilled on site and exposure in the cliffs show variable depths of limestone of over 150 metres thickness.

2.2 Regolith and Soils

Soils on the site consist predominantly of grey organic sands in the swales over limestone with white to cream limey sands on the youngest dunes and surfaces.

The soils have been mapped at a very broad scale by CSIRO who categorise them with leached sands, but that is not locally correct.

2.3 Climate

The climate of the area is classified as Mediterranean with warm summers and cool wet winters.

Temperatures closest to Denmark Research Station, where the maximum temperatures in the summer months are 23.2 to 25.9 degrees Celsius. In winter the maxima are 16 to 17 degrees Celsius with the minima dropping to around 7 degrees C in July.

Rainfall for the area is approximately 1000 mm with more than most rain falling during the winter months April to October inclusive.

The wind direction is predominantly from the south.



Figure 1 Rainfall Intensity Chart

3.0 Hydrogeology

3.1 Background

Limestone and sand excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Water who permit extractive industries in Priority Groundwater areas.

3.2 Surface Water

The area has no surface drainage because of the permeable and porous nature of the limesand and limestone. Groundwater in the area flows south to the ocean.

3.3 Groundwater

The site lies in the Albany Drainage District.

There is no surface drainage due to the porosity and permeability of the limestone, with precipitation draining to the water table.

REPORT ITEM DIS047 REFERS

Limestone Extraction for Agricultural Lime, Lot 9005, Nullaki Peninsula, City of Albany

The limestone coastal ridge is 120 to 140 metres, rising to over 160 metres AHD on the peak ridges. The proposed limestone quarry is located on the higher ground.

Smith R A 1993, *1 : 250 000 Hydrogeological Series Mt Barker – Albany*, Department of Minerals and Energy does not show the direction of groundwater movement.

Being so close to the ocean the groundwater elevation will be around zero, rising slightly under Nullaki Peninsula and then dropping down again to the north at Wilson Inlet.

The groundwater under the excavation area can be expected to be 0 – 1 metre AHD in elevation. Groundwater flow from under the pit will be towards the ocean to the south.

That means that the separation to groundwater from excavation activities will be over 140 metres.

The stockpile area will be located at an elevation of 20 metres AHD some 18 metres above the groundwater. Groundwater under the stockpile area is likely near the gentle peak of the water table divide but is still likely to flow south to the ocean based on groundwater movement principles under permeable ridges such as this. It is possible that the drains to Lake Saide locally lower the groundwater and the stockpile area lies just over the divide flowing laterally to the drains or north to Wilson Inlet.

It has been estimated that perhaps <10 - 20 % of the rainfall will reach the water table at the processing area with slightly less at the ridge based on the separation to the water table. With an annual rainfall of around 1000 mm this equates the 100 to 200 mm recharge per year.

4.0 PROTECTION OF WATER QUALITY

4.1 Surface Water, Dewatering and Drainage

There is no surface water and will be no dewatering or drainage because the limesand and limestone are so porous.

4.2 Groundwater Protection and Water Use

There will be no activities on site that will change the levels of solute in soils, ground or surface water.

4.3 Salinity Protection

The amount of clearing is minimal in the context of the areas involved, and there is no evidence of subsurface salinity with the groundwater being fresh as shown in bores and dams on the Nullaki Peninsula. Therefore the proposed clearing will not change the local recharge.

Groundwater on site is fresh, flushed by high rainfall and porous soils.

There will be no activities on site that will change the levels of solute in soils, ground or surface water.

4.4 Recharge and Water use

The groundwater was considered by the *Environmental Protection Authority in Bulletins 512, 788, 821 and 818*, and whilst these do not specifically refer to the extraction of basic raw materials they do consider the impact of clearing, planting trees and rural residential developments. The figure the EPA used for recharge from native vegetation was 10 – 15% rainfall, whereas cleared land had a recharge of 30 – 40 %. The floor of the quarry is also cleared and so there is not expected to be any reduction in recharge to the site.

Based on Environmental Protection Authority Bulletins for the Lake Clifton Area, 512, 788, 821 and 818, and an annual average rainfall in that area of 900 mm.

It has been estimated that perhaps <10 - 20 % of the rainfall will reach the water table at the processing area with slightly less at the ridge based on the separation to the water table.

Cleared land such as the pit floor will have an estimated recharge of 40% annual rainfall on the 2.0 hectare stockpile area and perhaps 20 % under the pit. Therefore for one hectare of pit the additional recharge will result in an increase of 10 – 20 % or rainfall or 100 to 200 mm per year or 1 000 to 2 000 kL per hectare.

This proposal seeks Development Approval and an Extractive Industries Licence for an staged extraction area of 10 hectares combined with a stockpile area of 2 hectares on the eastern portion of Lot 9005. At any one time it is anticipated that only 2.0 hectares of pit will be open.

The total ground open at any one time will be around 4 hectares which will result in a temporary increase in groundwater of around 5 000 to 8000 kL which will drop back to the normal recharge on closure and revegetation.

Potable water is to be brought to the site as needed.

4.5 Acid Sulfate Risk

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64. However the interest has been over reactive and conditions and risk applied in many areas where there is no geological risk or evidence of acid sulfate.

Definitive survey procedure is produced in DEC (DER) 2013, *Identification of Acid Sulfate Soils and acidic Landscapes* and within document Acid Sulfate Soil Management Advisory Committee NSW, 1998, *Acid Sulfate Manual*. This information forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment Regulation.

The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Acid Sulfate Soils can potentially form under reducing conditions when there is a source of carbon and a source of sulfur (normally from sea or saline water). Micro-organisms are thought to play an important role in reducing the sulfates within the sediments to form the iron sulfide. It is a natural phenomena, that can be exacerbated by disturbance.

Potential acid sulfate conditions most commonly form under current or past estuarine conditions, peaty conditions, and may also result from weathering of some geological formations and situations which contain sulfides.

The soils most at risk are normally saline/estuarine soils, gley soils, peat and some organoferricretes when exposed to the atmosphere.

Acid sulfate only becomes a potential risk when a number of circumstances are present.

- There is rock, soil or regolith present that is carrying sulfides.
- Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
- Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
- Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
- Exposure of peat or organoferricrete materials, that were permanently under reducing conditions, to the air.

None of these at risk conditions occur on site.

The site is elevated high CaCO₃ content limesand that is alkaline and oxidised with no evidence or potential of reducing conditions or other risk factors and none would be expected in this geological environment. This type of material is used to neutralize acidic conditions whether it be on agricultural soils or acidic conditions arising from acid sulfate impacts.

Therefore there is no risk of acid sulfate conditions.

4.6 Waste Rock and Tailings Management

Waste and Tailings management is considered in;

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Limestone Extraction for Agricultural Lime, Lot 9005, Nullaki Peninsula, City of Albany

- *Department of Mines and Petroleum, 1999, Mining Environmental Management Guidelines, Safe Design and Operating Standards for Tailings Storage.*

As all the limesand is used in one type of product or another and any sub grade will be natural and suitable for rehabilitation there are no waste rock or tailings.

Potential "at risk" Waste Inventory - Characterisation

Type	Comment	Treatment	Reference
Saline surface water	Not present		
Saline ground water	Not present		
Acidic materials and drainage	Not present		
Sodic or dispersive materials	Not present		
Asbestos – asbestiform minerals	None present		
Radioactive materials	Not present		
Metallic or chemical materials	Not present		
Tailings storage	Not required		
Ablutions waste		Serviced portable facilities	Water Management Plan
Dangerous Goods and Hazardous Materials	<i>None will remain on closure.</i>	There are normally no hazardous materials used for hard rock quarrying, apart from fuel, blasting and servicing. The only other materials are for tasks such as weed management and are dealt with under those sections.	
	EXPLOSIVES	Not used	
	FUEL The various plant will be refueled from mobile tanker. <i>None will remain on closure.</i>	Any soil or other materials with drips and spills will be removed offsite to an approved waste site or location. Fuel is discussed in the Water Management Plan.	Water Management Plan
	SERVICE MATERIALS Only minor lubrication will be conducted on site All major servicing will be conducted offsite. <i>None will remain on closure</i>	Any wastes will be collected and removed from site promptly to an approved recycling or waste disposal area. Servicing is discussed in the Water Management Plan.	Water Management Plan
General waste		Regularly removed from site to an approved disposal area	Water Management Plan

- Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site.

4.7 Unauthorised Access and Illegal Dumping

The potential for rubbish to be dumped relates mainly to unauthorised access and is low as the site is set back from roads. Access restrictions such as gates or barriers will be installed when the site is unmanned and equipment retained on site.

- Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

4.8 Solid Domestic and Light Industrial Wastes

Non essential or old plant and materials will be removed from the site. Locked gates and the existing fences will be maintained to prevent illegal dumping and contamination of water.

All solid domestic and light industrial wastes will be stored in commercial waste storage containers and/or removed to an approved landfill facility. There will be no waste disposal on site. Waste storage containers will be sealed so that rainfall cannot enter, therefore preventing the formation of leachates.

Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site. Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

Regular inspections (at least weekly) are conducted to ensure no wastes, litter and the like are present in or around the excavation and processing area.

4.9 Wastewater Disposal

A service portable toilet system will be used when the site is manned. Serviced means they are pumped out by a licensed contractor from Albany or Denmark.

4.10 Refuelling

The protection of water from fuels and other chemicals is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed

Extraction of hard rock is a clean operation similar to sand excavation in the nature of the risk to groundwater. Similar quarries have operated locally for many years with no known significant pollution incidents.

No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas*.

All spills are to be cleaned up in accordance with the summarised procedures following.

Documents specific to the fuel and maintenance are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *WQPN 15 Extractive Industries near sensitive water resources.*
- *Department of Water – South West Region Guideline – Water resource considerations for extractive industries.*

A list of the management actions for maintenance is provided. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

Italia have safety and pollution management procedures for all their operations. They also use self contained service and recovery vehicles to undertake minor servicing in the field.

Fuel Management Plan

Fuel Storage

Currently it is proposed to use mobile tankers to refuel mobile and fixed plant when the site is manned.

Minor fuels will also be required for smaller mobile and fixed plant.

Any drums for smaller plant will be retained on trucks and if placed on site will be stored in a bunded lined facility to retain 110% of the volume stored.

Fuel Spill Management Plan

- Fuel and maintenance will be carried out in accordance with the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing, *Mechanical servicing and workshop facilities and Above-ground fuel and chemical storage*.
- Soils, limestone and roadbase hardstand such as those on this site are adsorptive. The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter.
- Refuelling and lubricating activities only occur in designated areas. Equipment for the containment and cleanup of spills is to be provided in these areas.
- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).
- In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved.
- Any spills will be contained by the excavation or processing area. A fluid spill emergency response kit is in place. For larger spills soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated aggregate/loam soils will be scooped up and removed to an approved landfill or other approved site.
- All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, are recorded, investigated and remediated. A record is to be kept of incidents and the Local Authority and Department of Environment notified within 24 hours. No such incidences have been recorded at the quarry.
- The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. A commitment is made to notify Department of Environment Regulation/Department of Water and Shire of Harvey of any spill greater than 5 litres in one dump. This is much less than the DOW requirement trigger of 100 litres. Soil contaminated by large spills will be removed from the site to an approved disposal area.
- No significant non compliances have been recorded.

- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).
- Transport chemicals in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

4.11 Dangerous Goods and Hazardous Substances

There is no transport, storage or handling of hazardous materials involved in hard rock extraction.

Fuel will be carried on vehicles when brought to site for refuelling. Fuel cartage will be governed by normal mobile fuel transport management and the DMP/DOW guidelines listed above. Minor fuel may be required for small on site mobile and fixed plant and hand equipment and this will not be stored on site unless personnel are on site.

4.12 Servicing and Maintenance

Documents specific to the fuel and maintenance are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*

The main risk of contamination comes from tank or hose rupture on earth moving machines. A spill kit containing absorbent granules is located on site for emergency use. A commitment is made to notify Department of Water and DMP of any spill greater than 5 litres. DER Guidelines suggest 100 litres but this is felt to be too high.

- All major servicing of vehicles will be conducted off site.
- Servicing plant and equipment will be in accordance with a maintenance schedule.
- Lubricating and maintenance activities are to occur in designated areas in the processing area and pit. Equipment for the containment and cleanup of spills is to be provided.
- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).
- Waste substances and chemicals will be stored in accordance with the Site Waste Guidelines.
- Waste oil and other fluids derived from the routine maintenance of mobile machinery, will be transported off site and disposed off at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up oils will be stored in appropriate containers in a shed or brought to the site as required.
- Vehicle washdown is not proposed.
- Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines will be carried out for wear or faults.
- Accidental spill containment and cleanup protocol will be implemented as necessary.

- Any waste chemicals derived during routine maintenance activities will be stored in appropriate sealed containers within a designated storage area or taken from site and disposed of at an approved facility.
- Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site.
- The site will be maintained in a tidy manner by removing all rubbish regularly offsite.

5.0 Monitoring

As there is no surface water and the groundwater is not being accessed, combined with the low inherent risk of excavating limesand and past experience, no water monitoring is required or proposed.

REFERENCES

- DOW and DMP (2000). *Water Quality Protection Guideline: Above Ground Fuel and Chemical Storage*.
- DOW and DMP (2000). *Water Quality Protection Guideline: Mechanical and Servicing Workshop Facilities*.
- DOW and DMP (2000). *Water Quality Protection Guideline: Mine Dewatering*.
- DOW and DMP (2000). *Water Quality Protection Guideline: Minesite Water Quality Monitoring*.
- DOW (2000). *WQPN 11 Water quality management in mining and mineral processing: mine dewatering*.
- DOW (2004), *Water Resource Protection Series WRP16: Draft Policy and Guidelines on Construction and Silica Sand Mining in Public Drinking Water Source Areas*. Water and Rivers Commission, Perth.
- DOW (2013). *WQPN 13 Extractive Industries near sensitive water resources*.
- Department of Environment WA, 2004, *Stormwater Management Manual for Western Australia*.
- Department of Environmental Protection and Conservation Guidelines, 2011, *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities*.
- Department of Industry and Resources, 1999, *Mining Environmental Management Guidelines, Safe Design and Operating Standards for Tailings Storage*.
- Department of Minerals and Energy (1991). *Environmental Management of Quarries: Development, Operation and Rehabilitation Guidelines*. DOIR, Perth.
- Department of Resources Development, 1999, *Mining Below the Water Table in the Pilbara*, Pilbara Iron Ore Environmental Committee.
- Engineers Australia 2003, *Australian Runoff Quality*, National Committee on Water Engineering.
- Environmental Protection Authority Victoria/ Melbourne Water, undated, *Urban Stormwater, Best Practice Environmental Management Guidelines*
- Environmental Protection Authority, 2007, *State Of the Environment Report Western Australia*
- Environmental Protection Authority, Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*.
- Firman J B, 2006, *Ancient weathering zones, pedocretes and palaeosols on the Australian Precambrian shield and in adjoining sedimentary basins: a review*, IN Journal of the Royal Society of Western Australia, Volume 89 part 2.
- Geological Survey of Western Australia, 1990, *Geology and Mineral Resources of Western Australia*, Memoir 3.
- Guidelines for Groundwater Protection in Australia*, ARMCANZ, ANZECC, September 1995.
- Jasinke E J, 1997, *Fauna of aquatic root mats in caves of South Western Australia; Origin and Ecology*, unpublished PhD Thesis, University of Western Australia.

REPORT ITEM DIS047 REFERS

Limestone Extraction for Agricultural Lime, Lot 9005, Nullaki Peninsula, City of Albany

Western Australian Planning Commission, *Statement of Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004)*.

Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.

Willett, I R, 1993, *Oxidation-reduction reactions IN Soils and Australian Viewpoint*.

Appendix 4- Correspondence from Department of Agriculture & Food.



Government of **Western Australia**
Department of **Agriculture and Food**



Your reference:
Our reference: **A1402199**
Enquiries: 9892 8444
Date: 15 July 2016

Jan van der Mescht
City of Albany
PO Box 484
Albany WA 6330

LIME DEMAND AND QUALITY – ALBANY, WESTERN AUSTRALIA

Dear Jan,

On behalf of the Department of Agriculture and Food, WA (DAFWA) please find below a brief commentary on the quality and demand for agricultural lime as it may relate to the Albany Region. This information has been compiled in response to a request from the City of Albany to the Graeme Robertson Group in reference to a proposed lime extraction development application in the Nullaki area, west of Albany.

Lime sand or crushed limestone is extracted and made available for use in the building industry, roads and engineering and as a soil ameliorant for agriculture. The primary use of lime in agriculture is to treat soil acidity.

Soil acidity is a major degradation problem across Western Australian, especially in the South Coast Region with the dominance of light textured and highly leached sand plain soils. Soil acidity is estimated to cost broadacre agriculture approximately \$498 million per year in WA. It is one of the few soil constraints that can be treated with appropriate management. Bulk lime, in the form of limesand, crushed limestone or dolomite is currently the cheapest way to ameliorate acid soils.

The DAFWA publication "*Report card on sustainable natural resource use in agriculture Status and trend in the agricultural areas of the south-west of Western Australia*" provides an excellent condition assessment and risk analysis of increasing soil acidity over the South Coast Region. Figure 2.1.5 from the same publication illustrates the progressive increase in agricultural lime sales from 2005 to 2012. More recent statistics (Figure 1, below) acknowledges the same trend to 2016 with the rate of lime use continuing to increase substantially in Western Australia following sustained promotion for the better management of soil acidity.

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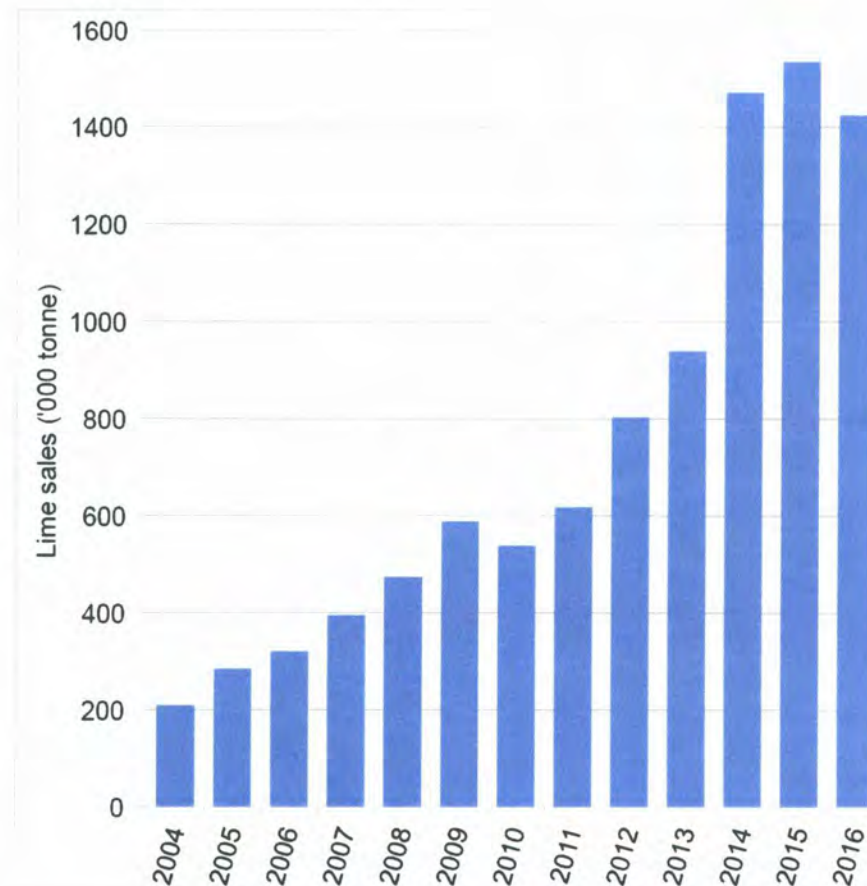


Figure 1. Lime use in Western Australia to treat acidifying soils, 2004–2016. These data represent the aggregate agricultural lime sales figures for each year for Lime WA Inc. members. It is estimated that these current members represent approximately 80 percent of the total market share.

There is increasing recognition amongst agriculturalists that lime use needs to increase and the trend in use is positive (Figure 1). A report prepared for South Coast Natural Resource Management Inc. – “*Lime Situation Report 2015 South Coast NRM Region*” (Fry, 2015) estimated the agricultural lime required in the South Coast Region over the next 10 years to be approximately 8 million tonnes. If most soils are remediated in the next 5 years, this will require close to a million tonnes per year. To maintain South Coast soils at target pH would require approximately 20 million tonnes over the next 30 years and 30 million tonnes over the next 50 years.

Current lime supply on the South Coast from existing extraction sites is limited and often the quality from many of the regional sources is low (in the form of carbonate available within the liming agent and the particle size of the product). If used at a rate required to ameliorate South Coast soils, based on recent investigation and analysis of demand, current pits may only have enough lime resources to last a few more years.

DAFWA has discussed the lime pit proposal with Mr Robertson, including examining several analytical results on face value from random site sampling across the proposed development area, together with reviewing an early draft of the 'Excavation and Rehabilitation Management Plan' for the proposed lime pit.

Based on the information supplied and knowledge of current demand and supply for agricultural lime product in the South Coast Region, DAFWA acknowledges that:

- the quality of the Nullaki lime source is high, with an average Neutralising Value (NV) of about 74%. (NV of lime is the ability for a unit mass of lime to change soil pH – a measure of efficiency expressed as a percentage). The Nullaki result is considered to be very good for the South Coast Region, acknowledging that current sources in the region range from 35% to 80%. This places the Nullaki source in the better or higher quality range for the region.
- there is a definite need for improving the supply of good quality lime product for agricultural use in the Southern Region. It is understood that the Bornholm lime pit is due to close shortly; the Ocean Beach lime pit in Denmark generally only supplies to Denmark rate payers, the Nannup lime pit isn't always operational, and the supply of WALCO Manypeaks lime is seasonal.
- the proposed lime pit will be developed and expanded in a sensitive environmental landscape, necessitating comment from the Department of Environmental Regulation;
- the draft 'Excavation and Rehabilitation Management Plan' is adequate in addressing immediate development needs, although DAFWA would prefer to review a final version of the Plan. The discussion on site rehabilitation was limited in view of options for retiring some areas and potentially extending or expanding the pit extraction area.
- it is highly recommended that the Robertson Group takes up membership with WA Lime Inc. (www.limewa.com.au). This group serves as an independent association to further advance industry issues and more actively promote the implementation of the Code of Practice for lime supply in Western Australia.

I trust that this addresses the enquiry from the City of Albany in regard to lime supply and quality in the Southern Region. There are no lime sales statistics specifically for the Albany area, but the aggregated results for agricultural lime sales across WA (dominantly within the South West land division) infers a high and increasing demand for lime product. If you have further queries about agricultural lime, lime quality or lime supply for WA, please contact Tim Overheu on 98928444 or landuse.planning@agric.wa.gov.au.

Yours sincerely



Timothy Overheu
 Manager, Land Use Planning and Policy
 Department of Agriculture and Food, WA



**CITY OF ALBANY LOCAL PLANNING SCHEME 1 REPORT ITEM DIS047 REFERS
EXTRACTIVE INDUSTRY – 9005 Eden Road, Nullaki
OVERVIEW OF SUBMISSIONS**

Issue	Comment
<ul style="list-style-type: none"> • Lime is a required resource within the region • There is a demand for lime within the region • High quality lime is not readily available in the Denmark area 	<p>It is acknowledged the availability lime is key resource for construction and soil management.</p> <p>DAFWA has provided correspondence reinforcing the importance of Lime within the agricultural sector.</p> <p>In respect to the Denmark area, it is understood the Denmark lime pit is in the process of re-opening. However, whether the Denmark facility is operating or not is not a consideration for the matter.</p> <p>While it is acknowledged the availability lime is key resource for construction and soil management, the shortage or abundance and quality of a commodity is not a consideration within the planning framework.</p>
<ul style="list-style-type: none"> • The proposal will have detrimental amenity impacts on adjoining properties 	<p>Amenity is defined within Local Planning Scheme No.1 as;</p> <p><i>“All those factors which combine to form the character of an area and include the present and likely future amenity”</i></p> <p>The Department of Environmental Regulation has advised that depending on operational output, the proposal may be a prescribed activity and require a licence. It should be noted that screening and crushing are subject to a separate licence and assessment through the Department of Environment Regulation.</p> <p>The Extractive Industry and Mining Policy requires that buffer distances are to be in accordance with the setbacks outlined within the Environmental Protection Authority requirements - <i>the Environmental Protection Authority’s Separation Distances between Industrial and Sensitive Land Uses guidelines</i>. The closest dwelling is approximately 1200 from haul road on the subject site.</p>

Issue	CORRECTED REPORT ITEM DIS047 REFERS
	<p>Any operations would be subject to ongoing compliance with the Environmental Protection (Noise) Regulations 1997.</p> <p>In addition to the above, the Department of Environment Regulation is the responsible body for the assessment of the emissions and buffers for screening and crushing plants. The applicant is therefore responsible and obligated to ensure that they have the required licences from DER prior to any activity onsite.</p>
<ul style="list-style-type: none"> • Impact on property value 	<p>Property value in itself is not a valid planning concern. However, a number of the underlying factors which lead to this concern are, for example, consistency within the conservation zone and amenity.</p> <p>Residents have advised they have purchased properties (at a significant cost) within the conservation zone, on the reasonable expectation of a high level of amenity, and on the basis that the zone would not be shared with an extractive industry or similar uses.</p>
<ul style="list-style-type: none"> • Health impacts of lime dust • Impact on adjoining agriculture activities 	<p>The <i>Extractive Industry and Mining Policy</i> requires that buffer distances are to be in accordance with the setbacks outlined within the Environmental Protection Authority requirements.</p> <p>The Department of Environment Regulation is the responsible body for the assessment of the emissions and buffers for screening and crushing plants. The applicant is responsible for ensuring that they have the required licences from DER prior to undertaking this activity onsite. The applications for screening and crushing are subject to process by DER whereby the potential impact on Dust on either dwellings or nearby agricultural uses (outside of the CZ1 zone)</p> <p>A dust and noise management plan have been submitted.</p> <p>The Department of Health state that unless adequately treated, rainwater is not reliably safe to drink, it is almost impossible to completely protect rainwater from contamination. However, our advice is that installing screens, filters and first flush devices will reduce contamination if people are using rainwater for this purpose.</p>

Issue	CORRECTED REPORT ITEM DIS047 REFERS
<ul style="list-style-type: none"> The Nullaki wilderness association is not a suitable organisation to distribute funds 	<p>Noting the officer recommendations. In the event that approval was to be granted, and a monetary contribution as seen as an acceptable situation, the allocation of funds to a body which has the expertise to expend the funds in a suitable matter would be a matter for consideration. It is acknowledged that there may be more suitable and qualified organisations.</p>
<ul style="list-style-type: none"> The existing road network is not suitable and is dangerous The extension of Lee Road is unsuitable There will be passing issues Who pays for the infrastructure improvements and maintenance resulting from the proposal? 	<p>If the applicant was to be granted approval they would be required to fully construct Lee road and upgrade associated roads/infrastructure along the route to accommodate trucks. Upgrades may be substantial as it could potentially involve bridges and road widening. If approved, it is recommended the applicant be required to undertake a road infrastructure audit to identify roads and infrastructure that require upgrading to accommodate the proposal.</p> <p>It is acknowledged that trucks on the proposed route would be shared with other users, and create an additional safety risk for cyclists and road users. However, as it is a public road, all users, be it pedestrians, cyclist, or trucks, are required to use the road in a safe manner in accordance with relevant legislation.</p> <p>Associated issues with the extension of Lee Road has also been submitted by DPAW;</p> <ul style="list-style-type: none"> The extension of Lee Road comes to within approximately 140m of an overnight track Shelter, 80 metres from the emergency helicopter extraction point and will cross over the Bibbulmun Track; If the proposal was to proceed the Bibbulmun Track Shelter would need to be relocated. Relocation of the Bibbulmun Shelter and possible track re-alignments would be at a significant cost due to not only the physical removal and relocation but the rehabilitation of existing site and alteration of associated publications (maps, guidebooks). <p>If the applicant was to be granted approval they would be required to fully construct Lee road and upgrade associated roads/infrastructure along the route to accommodate trucks. Upgrades may be substantial as it could potentially involve bridges and road widening. If approved, it is recommended the applicant be required to undertake a road infrastructure audit to identify roads and infrastructure that require upgrading to accommodate the proposal.</p>

Issue	Comments REPORT ITEM DIS047 REFERS
<ul style="list-style-type: none"> • The proposal will impact on the Bibbulmun track and nearby overnight stay shelter • The proposal would disturb the secluded experience of the track • Moving the shelter would be a significant cost 	<p>These comments were confirmed and elaborated further on in the referral response from DPAW, reaffirming concerns raised with;</p> <ul style="list-style-type: none"> • Proximity of the proposal to the Bibbulmun track • Potential impact on the Bibbulmun track and the amenity of the users, noting that there is a campsite in the proximity of the proposed haulage road. • The Bibbulmun Track Foundation also raised similar concerns in respect to the trail being a world class long distance
<ul style="list-style-type: none"> • The Munda Bidi Trail travels along sections of the proposed haul route and would increase the risk to users. 	<p>It is acknowledged that trucks on the proposed route would be shared with the Munda Bidi trail, and create an additional safety risk for cyclists and road users. However, as it is a public road, all users, be it pedestrians, cyclist, or trucks, are required to use the road in a safe manner in accordance with relevant legislation.</p> <p>The Bibbulmun track foundation also raised these matters.</p> <p>If the applicant was to be granted approval they would be required to fully construct Lee road and upgrade associated roads/infrastructure along the route to accommodate trucks. Upgrades may be substantial as it could potentially involve bridges and road widening. If approved, it is recommended the applicant be required to undertake a road infrastructure audit to identify roads and infrastructure that require upgrading to accommodate the proposal.</p>
<p>There are a number of errors within the proposal, including the distance to the closest dwelling</p>	<p>It is noted that there were a number of discrepancies within the report. When the proposal was assessed, the dwelling on Lee Road which was omitted was included.</p> <p>DPAW has advised the Bibbulmun alignment shown was incorrect.</p>
<p>The proposal has not considered Aboriginal Heritage</p>	<p>The Department of Aboriginal Affairs (DAA) has advised that there are no reported Aboriginal sites or heritage places within the area of the proposal. However, the DAA</p>

Issue	CORPORATE REPORT ITEM DIS047 REFERS
	<p>recommend the developers utilise the Aboriginal due diligence guideline when undertaking developments.</p>
<p>Department of Planning</p> <p>While the applicant does have the right, under cl 9.1.1 of LPS1, to apply for planning approval for a use not listed and for the application to be advertised in accordance with cl 9.4.3, the proposal fails to meet the land use provisions of Cl 4.2.18(a), cl 5.5.14 and Schedule 12.</p> <p>The primary objective of the zone is for Residential uses. The secondary objective (b) (iii) directs the local government to provide for land use and development provisions which prevent impacts to the zone's conservation purpose.</p> <p>The proposal also fails to meet the following development provisions of Schedule 12:</p> <ul style="list-style-type: none"> • it proposes a maximum of 4ha development area which exceeds the 1ha maximum allowable development footprint (cl 3.4 (e) and 4.3) • the flora study is not a targeted flora or fauna survey and has not surveyed the proposed lime pit site for rare, endangered and/or threatened flora or fauna species (cl 4.5) • proposed pit #4 is within the 200m exclusion area of the foreshore reserve (cl 4.6(i)); and • the pits are located along a significant ridgeline (cl 4.6(v)). <p>In summary the proposal does not meet the land use and development provisions for the zone and the Department of Planning recommends that the development application be refused in order for LPS1 to be effectively enforced and for the</p>	<p>Submission noted. The Department of Planning submission is discussed within the item.</p> <p>The Department of Planning comments regarding the acceptability of the proposal has been given significant weight in the consideration of the matter. .</p>

Issue	Completed REPORT ITEM DIS047 REFERS
<p>local government to avoid any representations made against it under s211 of the Planning and Development Act 2015 .</p> <p>Other matters to note</p> <ul style="list-style-type: none"> • The land use is not supported within the Albany Local Planning Strategy ; <p>The Lower Great Southern Strategy notes environmental or conservation considerations may have a higher priority than resource extraction in the region. It notes basic raw material and agricultural mineral extraction areas need to be identified in local planning strategies and protected in local planning schemes, with consideration given to neighbouring land uses, visual impact issues and buffer areas to accord with acceptable environmental and amenity standards. The development application area is not identified in the local planning strategy and does not comply with local planning scheme provisions.</p> <p>The proposal does not comply with cl 6.2.3 of State Planning Policy 2.4 'Basic Raw Materials' as it does not comply with planning and environmental requirements of LPS1.</p> <p>The proposal does not comply with State Planning Policy 2.5 'Rural Planning' . The policy identifies Conservation zones within the 'Rural living' zone definition . Basic raw material extraction is a use associated with 'Rural land uses' of a 'Rural land' zone. The definition explicitly excludes rural land use in the 'Rural living' zone . The policy also reiterates that basic raw material resources and sites should be identified in local planning strategies and schemes as required.</p> <p>The proposal does not comply with cl 6.5 of SPP 3.7 'Planning in Bushfire Prone Areas' as no bushfire assessment has been included with the application. It should also be noted that Lot 9005 is the subject of two subdivision planning applications (WAPC 151916 and WAPC 152952) which were recently considered by the WAPC Statutory Planning Committee and subsequently refused because the proposals failed to prove that</p>	

Issue	Comments
<p>bushfire risk to life and property could be appropriately mitigated .</p> <p>Approval would set an undesirable precedent for similar uses within all other lots within the Conservation zone ;</p> <p>There is no mechanism that can guarantee proposed royalties from the sale of lime extracted will be reinvested across the whole of the Nullaki Peninsula Conservation zone;</p> <p>The DAFWA letter should only be considered regarding its comments on lime quality and resources within a greater context of the region and the State . It is not a letter of support for this particular proposal as more detail was requested on impacts of the proposal over the life of the project; and</p> <p>The original amendment over area CZ1 from Rural zone to Conservation zone was supported by the Environmental Protection Authority on the proviso that 'Extractive Industry' uses were removed from the permissible uses.</p> <p>The Department encourages the City of Albany to undertake a strategic assessment of limestone and lime sand locations within the local government area as soon as possible, as recommended in the Albany Regional Basic Raw Material Study (1996), in order for the identification and long term planning of extractive industries in suitably zoned areas.</p>	<p>REPORT ITEM DIS047 REFERS</p>
<p>Department of Water</p> <p>The DoW has no objection to the proposal. As the extractive site is located high on the coastal ridge, there will be no impact on groundwater, nor is there any waterways at this location. It is not anticipated that the stockpile activities will have any impacts on water resources.</p>	<p>Submission noted.</p>

Issue	Comments
<p>The DoW also supports the rehabilitation management plan, and recommends that extractive industry be approved, there should be strict compliance with this plan to ensure that the conservation values of the Nullaki Peninsula are not compromised by the extractive industry.</p>	<p>REPORT ITEM DIS047 REFERS</p>
<p>Department of Mines and Petroleum</p> <p>In September 2016, the Geological Survey of Western Australia (GSWA) commented on a town planning scheme amendment over this area that would facilitate this proposal. supported in principle because a continuing supply of these materials is important for agriculture and infrastructure purposes.</p>	<p>Submission noted.</p>
<p>Department of Aboriginal Affairs</p> <p>The Department of Aboriginal Affairs (DAA) advises there are no reported Aboriginal sites or Aboriginal heritage places within the areas of the Proposal.</p> <p>The DAA recommends that developers take into consideration the DAA's Aboriginal Heritage Due Diligence Guidelines when planning specific developments associated with the Proposal. These have been developed to assist proponents to identify any risks to Aboriginal heritage and to mitigate risk where heritage sites may be present.</p>	<p>Submission noted.</p>
<p>Department of Parks and Wildlife</p> <p>The Department of Parks and Wildlife South Coast Region objects to this development application for the following reasons.</p>	<p>Submission noted.</p>

Issue

Comments
REPORT ITEM DIS047 REFERS

The Nullaki Peninsula represents a key ecological linkage point in the coastal Macro Corridor as identified in the Western Australian South Coast Macro Corridor Network (Wilkins et al. 2006).

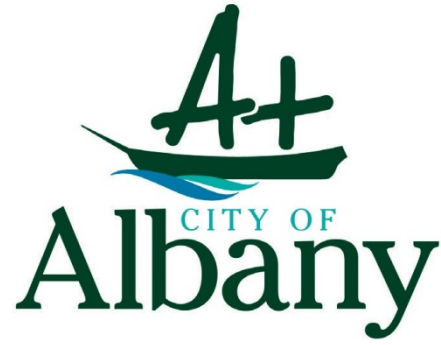
This report forms a bioregional strategy for ensuring landscape scale connectivity between the forested south west of Western Australia and the intact rangeland vegetation and Great Western Woodlands. Corridors of native vegetation provide ecological linkages that assist the retention and maintenance of the keys components of biodiversity such as genetics, species and ecosystems.

Bibbulmun Track alignment as shown on Figure 2 of proposal is incorrect and does not indicate the location of the Bibbulmun Track Nullaki Shelter (Overnight Shelter and tent camping) which is a critical piece of recreational infrastructure that will be affected by the lime pit haul road proposal

- Proposed road extension of Lee Road comes to within approximately 140m of the Shelter, -80m from the emergency Helicopter extraction point and will cross over the Bibbulmun Track;
- Ambience, sense of place, solitude, sensation of wilderness experience is what people are looking for as part of the Bibbulmun Track experience. These values will be impacted by haul road being so close (-140m, noise and dust), the stockpile management noise levels (-400m away from Shelter with loading/unloading operations), hours of operation being proposed as Mon-Sat 6:30am-5:00pm and increased campsite security issues from access by opportunistic road users along Lee Road extension;

If the proposal was to proceed the Bibbulmun Track Shelter

Issue	Comments REPORT ITEM DIS047 REFERS
<p>would need to be relocated. Relocation of the Bibbulmun Shelter and possible track re-alignments would be at a significant cost due to not only the physical removal and relocation but the rehabilitation of existing site and alteration of associated publications (maps, guidebooks).</p> <p>Relocating the shelter is problematic in terms of finding a new appropriate location that would be positioned within the necessary parameters of meeting distance requirements for walkers heading south or north from the previous shelter location. City of Albany approvals for a new location would need to be sought along with potential Aboriginal Heritage assessments being undertaken for any proposed re-location site.</p>	



Development Services

NON-HABITABLE STRUCTURES

(i.e. Outbuildings, Sheds, Gazeboes, Carports, Sea-containers, Shade houses)

1. Objective

1. To achieve a balance between providing for various legitimate storage needs of residents whilst minimising any adverse impacts non-habitable structures may have on the locality.

2. Scope

1. Non-habitable structures include structures that are not attached to a dwelling and commonly known as outbuildings, sheds, gazeboes, carports, sea containers and shade houses.
2. Garden structures (i.e. structures without a solid roof - pergolas with shade cloth and arbours) are considered exempt from the provisions of the policy.
3. This policy applies to non-habitable structures on lots designated for 'Residential', 'Tourist Residential', 'Future Urban', 'Special Residential', 'Rural Residential', 'Rural Village', Yakamia Creek, 'General Agriculture and Priority Agriculture' (<4ha) and 'Conservation' purposes. This Policy does not apply to non-habitable structures on lots designated 'General Agriculture and Priority Agriculture' (>4ha), 'Industrial' or 'Commercial'.
4. Setbacks for non-habitable structures in the 'Residential', 'Tourist Residential' and 'Future Urban' zones are to conform to the Table 1, 2a or 2b of the Residential Design Codes WA. Setbacks for non-habitable structures in the 'General Agriculture and Priority Agriculture', 'Conservation', 'Rural Residential', 'Special Residential' and 'Rural Village' zones are to comply with the provisions listed in the scheme applicable to each area. Where requirements are not clearly defined, compliance shall be in accordance with the objective of this policy.
5. A non-habitable structure with a floor area of 10m² or less and under 2.4m in height is considered exempt from the provisions of the policy (i.e. small garden shed). A second non-habitable structure with a floor area of 10m² or less and under 2.4m in height is to be assessed in accordance with the Non-habitable structure Policy.

3. Definitions

“Reflective Materials” includes factory applied finishes such as zincalume, galvabond and light colorbond colours such as white, off-white and surfmist.

“Height” is the height of the non-habitable structure as measured vertically from the natural ground level to the highest point of the building above that point, as stipulated in the Residential Design Codes of Western Australia, and not the measurement taken above the proposed finished floor level of the non-habitable structure.

“Maximum Floor Area” the combined total floor area of all existing and proposed non-habitable structures on a lot.

4. Policy Provisions

1. Non-habitable structures do not require planning approval except under the following circumstances:
 - a. Where the *Local Planning Scheme 1* requires planning scheme consent or a proposal varies from a Scheme or Residential Design Code provision.
 - b. For the development of a sea container.

Applications for sea containers are to include:

- i. Plans indicating re-development measures to make more visually appealing. This can be done by painting and/or re-cladding to a colour and design similar to surrounding development; and
- ii. Referral to neighbours (neighbours comments).

Screening by planting trees or shrubs or by any other methods shall be considered to reduce the visual impact of the sea container.

- c. For the development of a non habitable structure on a vacant lot that is zoned Residential, Tourist Residential, Future Urban, Residential Development or Special Residential.

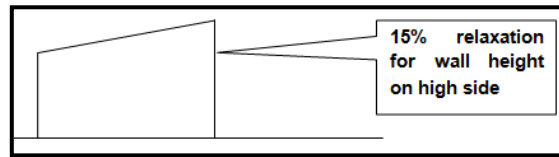
Approval will be conditional upon:

- i. A Building Permit for a dwelling being issued by the City; and
- ii. Referral to neighbours (neighbours comments).

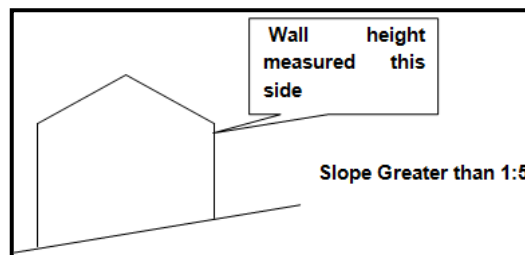
Screening by planting trees or shrubs or by any other methods may be required to reduce the visual impact of the non-habitable structure on the vacant lot.

- d. Where development varies from standards defined in Table 1 and the following provisions (i-iv):

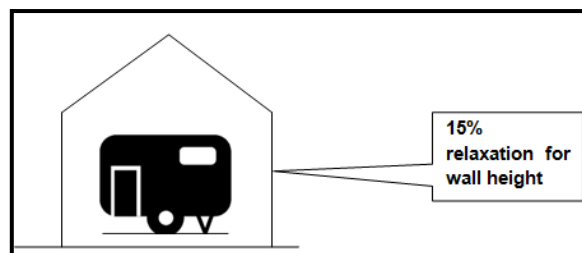
- i. For mono-pitched (skillion) roofed non-habitable structures (not ridged roofs), a relaxation of the height of the wall (on high side - up to 15%) may be supported; or



- ii. where the land upon which the non-habitable structure is to be erected has a slope greater than 1 in 5, the height of the wall shall be measured on the wall that is located at the higher point of the site where the land has not been subject to cut and/or fill; or



- iii. where in order to accommodate larger boats, caravans or motor-homes, the applicant is to demonstrate proof of ownership of such vehicle/vessel and a relaxation of the height of the wall (up to 15%) may be supported on Residential / Tourist Residential / Future Urban / Zone lots that are less than 4000m²; or



- iv. A discretionary allowance of an extra 5m² over the maximum permitted floor area may be considered in cases where the stated maximum floor area allowed is unworkable due to the dimensions of a standard design.

2. Non-habitable structures shall be located away from the primary or secondary street areas (i.e. to the rear of the lot).
3. Non-habitable structures that exceed 60m² in floor area shall be constructed out of non-reflective materials.

TABLE 1: NON-HABITABLE STRUCTURE SPECIFICATIONS			
Zoning	Max. Wall Height	Max. Ridge Height	Max. Floor Area (combined floor area of all non-habitable structures on lot)
Residential / Tourist Residential / Future Urban / Zone (Lots < 450m ²)	2.4 metres	3 metres	<60m ² in area or 10% in aggregate of the site area, whichever is the lesser
Residential / Tourist Residential / Future Urban / Zone (Lots 450m ² - 600m ²)	3 metres	4.2 metres	<60m ² in area or 10% in aggregate of the site area, whichever is the lesser
Residential / Tourist Residential / Future Urban / Zone (Lots 600m ² - 1000m ²)	3 metres	4.2 metres	100m ²
Residential / Tourist Residential / Future Urban / Zone (Lots 1000m ² – 2000m ²)	3 metres	4.2 metres	120m ²
Residential / Tourist Residential / Future Urban / Zone (Lots 2000m ² – 4000m ²)	3 metres	4.5 metres	150m ²
Residential / Tourist Residential / Future Urban / Zone (Lots > 4000m ²)	3.5 metres	4.5 metres	170m ²
Yakamia Creek Zone (Lots < 3000m ²).	3.5 metres	4.5 metres	120m ²
Yakamia Creek Zone (Lots > 3000m ²).	3.5 metres	4.5 metres	150m ²
Special Residential Zone (Lots < 4000m ²)	4.2 metres	4.8 metres	150m ²
Special Residential (Lots > 4000m ²)	4.2 metres	4.8 metres	170m ²
Rural Residential Zone (Lots < 2ha)	4.2 metres	4.8 metres	200m ²
Rural Residential Zone (Lots 2ha to 4ha)	4.2 metres	4.8 metres	220m ²
Rural Residential Zone (Lots 4ha to 6ha)	4.2 metres	4.8 metres	240m ²
Rural Residential Zone (Lots > 6ha)	4.2 metres	4.8 metres	300m ²
Rural Village Zone (Lots < 4000m ²)	3 metres	4.5 metres	150m ²
Rural Village Zone (Lots 4000m ² - 1ha)	4.2 metres	4.8 metres	170m ²
Rural Village Zone (Lots > 1ha)	4.2 metres	4.8 metres	220m ²
Rural Small Holding Zone (Lots < 1ha)	4.2 metres	4.8 metres	220m ²
Rural Small Holding Zone (Lots 1 - 4ha)	4.2 metres	4.8 metres	240m ²
Rural Small Holding Zone (Lots > 4ha)	4.2 metres	4.8 metres	300m ²
General Agriculture and Priority Agriculture Zone (Lots < 2ha)	4.2 metres	4.8 metres	200m² 220m ²
General Agriculture and Priority Agriculture Zone (Lots 2ha to 3.99ha)	4.2 metres	4.8 metres	220m 240m ²
Conservation Zone (Lots < 2ha)	3.5 metres	4.8 metres	170m ²
Conservation Zone (Lots > 2ha)	4.2 metres	4.8 metres	220m ²

Note: Prior to considering an application for a non-habitable structure that proposes a variation to this policy, it is recommended that the Council first consider varying the policy. In order to do so, the Council will need to seek comment from the public and the Western Australian Planning Commission. Alternatively, it is recommended that such an application be refused.