



ATTACHMENTS

Development and Infrastructure Services Committee Meeting

10 June 2020

6.00pm

City of Albany Council Chambers

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Lake Mullocullup Reserve 16367

Post-Gazettal Environmental Monitoring Report



Lake Mullocullup – Warriup Swamp

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Date:

May 2020

File Reference:

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INTRODUCTION

Lake Mullocullopp, also known as Warriup Lake, is a City-managed reserve located on Warriup Road in Green Range. The lake is an inland freshwater wetland which has significant environmental and cultural values, and has been registered as an Aboriginal Site for mythological reasons. The local community have been using this lake historically for water skiing although it was never formally gazetted for this purpose. Following community consultation, collection of baseline environmental data and Noongar consultation, the lake was officially gazetted for water skiing in March 2019.

This report provides the data and details from the monitoring undertaken to provide baseline data prior to the gazettal and for the year post-gazettal to determine any significant impacts on the environmental or cultural values.

BACKGROUND

Council supported the gazettal of Lake Mullocullopp by the Department of Transport in October 2018. An Annual monitoring program commenced to compare data with baseline survey which has included:

- a) Field Visit Assessment Monitoring and Traffic Data Logging to determine any increased activity
- b) Establishment of baseline and annual testing for Hydro Carbon (PAH) levels in the lake and at least one other in a similar lake nearby that has no history of Water Skiing.
 - A lake nearby located on private property has been used as a control site for comparison between lakes with and without the activity of water skiing
- c) Bird Surveys conducted in February 2016 and February 2019.
- d) Research and monitoring for the presence of freshwater fish in the lake. A permit was issued to a resident with a scientific background to undertake this survey.

In addition further consultation was undertaken with the local Noongar community to identify appropriate stories and other information for use on interpretive signage to be installed at Lake Mullocullopp as per the request from the initial consultation.

FINDINGS

1. ENVIRONMENTAL MONITORING

1.1 FIELD VISIT ASSESSMENT MONITORING

Environmental monitoring at Lake Mullocullopp has been undertaken in the form of field visit assessments by City of Albany staff over a period of more than one year from 3 December 2018 to 29 March 2020. Field visits were conducted on a monthly basis throughout this period, increasing to fortnightly assessments over the summer months, alternating mid-week and weekend times from December to March 2020. A total of 22 field visits were conducted, with visitation impacts assessed including: recreational activities (people sighted, number of vehicles, boats, recreational activities being undertaken) and environmental issues (illegal camping, litter, vandalism, firewood collection, water quality).

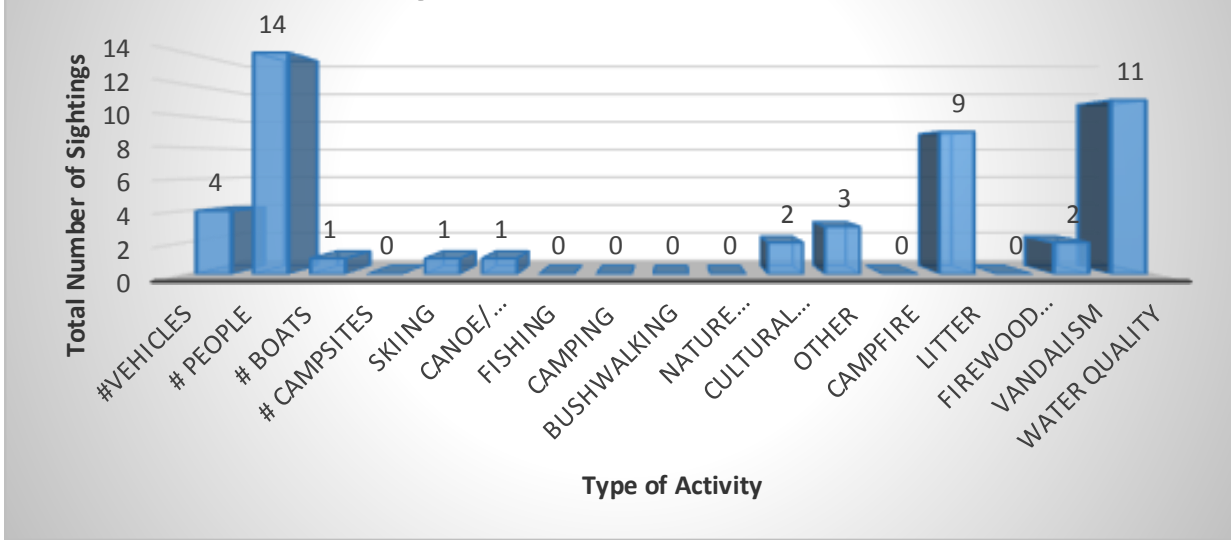
Findings include that there were four reports of sightings of people, only one of which was of people undertaking recreational activities. There was numerous evidence of vehicle tracks to the water's edge indicating boat/kayak launching; however there was minimal litter and vandalism nor any observable negative environmental impacts from visitation.

Findings are summarised in the following graph and table:

FIELD VISIT ASSESSMENTS UNDERTAKEN FROM 3 DECEMBER 2018 TO 29 MARCH 2020

TOTAL VISITS = 22	Monthly visits throughout the year 2019; fortnightly over summer months alternating mid-week and weekends from December to March 2020 Mid-week visits = 18; Weekend visits = 4
VEHICLES	3 Sightings; total of 4 vehicles Numerous evidence of vehicle tracks (4WD, cars, quad bikes and motorbikes) undertaking boat launching (kayaks and motorised craft) to water's edge - usually over weekends
PEOPLE	4 Sightings; total of 14 people, 12 adults and 2 children - 7 x undertaking 2 separate cultural activities; 2 x DoT sign installation; 5 x multi-generational family undertaking swimming and kayaking Evidence of people utilising area for boat launching, also of children due to sandcastles present
BOATS	1 sighting - kayak
CAMPING	No sightings, but one report of evidence of camping in cleared area opposite boat launching site
RECREATION	1 sighting of multi-generational family of 5 undertaking swimming and kayaking Numerous evidence of boat launching; evidence of children due to sandcastles
CULTURAL	2 sightings of cultural activities; one group of 3 undertaking research UWA; 4 people including 3 indigenous trainees undertaking seed collection
OTHER	3 reports of Evidence of signage installation from DoT and CoA; 2 reports of evidence of dogs
BIRD LIFE	7 sightings of abundant bird life on lake; frogs; dragonflies; fish
LITTER	9 sightings of small amount of litter including: twine, bottle cap, used toilet paper, chocolate wrapper
VANDALISM	2 reports of evidence of vandalism: one removal of temporary blue-green algae health warning sign; one of trampling of vegetation adjacent to boat launching area
WATER QUALITY	11 sightings of green scum on surface and water's edge; water sampling has confirmed Cyanobacteria blue-green algae on at least 2 separate occasions <i>Coelosphaerium spp.</i> and <i>Nodularia spumigena</i>

Lake Mullocullup Field Visit Assessment Activity - Dec 2018-March 2020



The raw data and associated findings can be referred to in the *Lake Mullocullup Field Visit Assessment Spreadsheet and Summary (April 2020)*.

1.2 BLUE-GREEN ALGAE SIGNAGE

As a result of the water quality observations of intermittent algal blooms over the field visit site assessments, and confirmed Cyanobacteria sampling - educational signage on the presence of naturally occurring potentially harmful cyanobacteria was developed by the City of Albany in collaboration with inter-government agencies (Department of Health, Department of Water and Environmental Regulations, WALGA Wetland Management Algal Group) and was installed in March 2019. The blue green algae sign was developed with the view for permanent installation at City of Albany recreational water body sites where harmful cyanobacteria have been known to occur. It is intended as an educational sign, to be non-site specific, and informative rather than regulatory.

CAUTION

BLUE - GREEN ALGAE HAS BEEN KNOWN TO OCCUR IN THIS WATER BODY!

ALGAL BLOOMS:
Algae & Algal blooms naturally occur in aquatic environments, however some, such as Blue - Green Algae (Cyanobacteria) can be hazardous to your health.

WHAT THEY LOOK LIKE:
Harmful algal blooms are most common in early Spring through to late Autumn and can appear as:






WHAT TO DO:
If you see or suspect algal blooms in this water.

AVOID CONTACT WITH WATER

- Do not eat shellfish (toxins are not removed by boiling)
- Ensure pets do not drink or come into contact with the water
- Please report it to the City of Albany on (08) 6820 3000 or 1800 633 000





TREATMENT:
If exposed to water with suspected harmful algal blooms:

- Rinse off with clean water
- Seek medical assistance (phone: 000) if required

FOR FURTHER INFORMATION:
Refer to the Department of Health website
https://ww2.health.wa.gov.au/Articles/A_E/Algal-blooms-monitoring



1.3 TRAFFIC DATA LOGGER MONITORING

A traffic data logger was installed adjacent to the boat launching access track at Lake Mullocullup over two consecutive summer periods. The first for a period of 48 days from 4 December 2018 to 20 January 2019. The second summer period was for a period of 83 days from 11 December 2019 and was left in situ until 4 March 2020. Traffic counter settings were set to Mode VEH-4D Period: 1 = hourly totals Delay: 8 = 1 second.

The traffic counter logs metallic material moving in the vicinity, and collects data every second. Data therefore does not indicate exact vehicle numbers, rather data can be extrapolated to identify peak periods of vehicular activity. The data collected was analysed and findings are summarised according to peak dates including peak visitation periods, peak months, peak days of the week, and peak times of day.

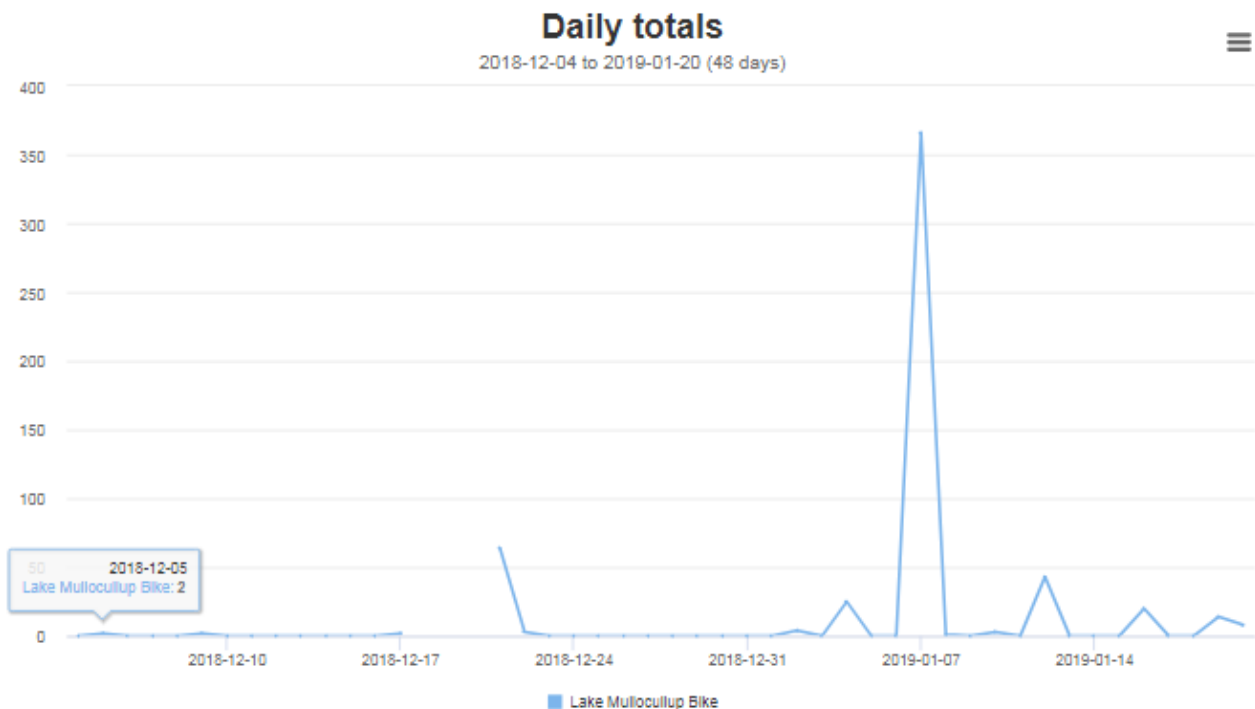
1.3.1 Peak Dates

Data was collected the first summer session via the traffic data logger from 4 December 2018 to 20 January 2019 over the peak Christmas period. Daily data indicates that over 48 days of data collection, 14 days showed some form of activity. Of these, only 6 days show significant activity above 20 hits.

Peak dates included:

Friday	21 December 2018
Friday	4 January 2019
Monday	7 January 2019
Saturday	12 January 2019
Wednesday	16 January 2019
Saturday	19 January 2019

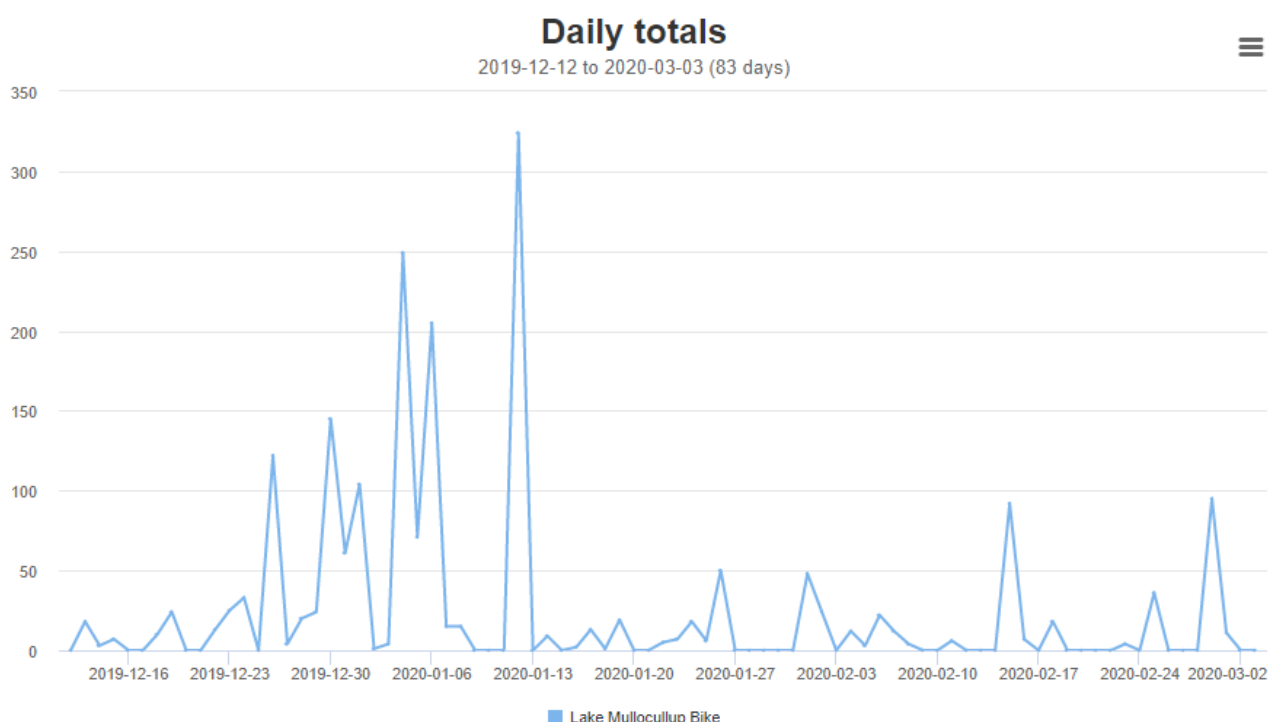
(The most significant activity was that recorded on the 7 January 2019, however this is attributed to the presence of the City of Albany Reserves Officer carrying out field visit assessments rather than visitation by community members).



Data was also collected via a traffic data logger from 12 December 2019 to 3 March 2020 over the following peak summer period. Daily data indicates that over the 83 days of data collection, 48 days showed some form of activity. Of these, only 20 days show significant activity above 20 hits.

Dates indicating peak activity in excess of 20 hits include:

- Thursday - 19/12/2019 (end of school term 4)
- Christmas New Year period - 23/12/2019-01/01/2020 (excluding Christmas day)
- Saturday-Monday - 04/01-06/01/2020
- Sunday - 12/01/2020
- Sunday – 26/01/2020 (Australia Day)
- Saturday & Sunday – 01/02-02/02/2020
- Thursday – 06/02/2020
- Saturday – 15/02/2020
- Tuesday – 25/02/2020
- Saturday – 29/02/2020 (March public holiday long weekend)



6 days out of 83 days in total showed in excess of 100 hits.

These dates include:

- Thursday 26/12/2019 (Boxing Day - Public Holiday)
- Monday 30/12/2019
- Wednesday 01/01/2020 (New Years Day - Public Holiday)
- Saturday 04/01/2020
- Monday 06/01/2020
- Sunday 12/01/2020

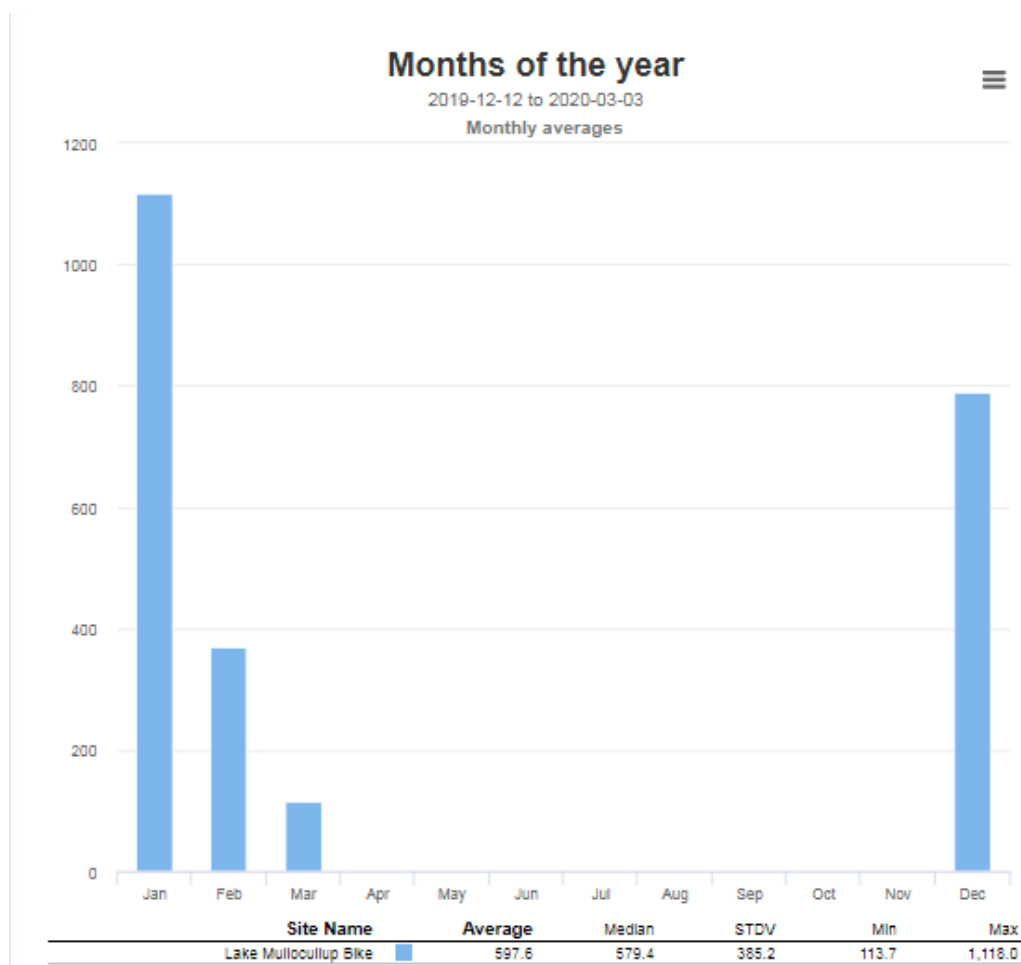
Of these 6 days, 3 of them correlate with written complaints made to the Department of Transport of illegal jet-skiing activities on the Lake. These were reported to occur on: 30 December 2019, 1 January 2020 and 12 January 2020.

1.3.2 Peak Month

The peak month for visitation between 4 December 2018 to 20 January 2019 was January 2019 with 9 recorded days of visitation while December data indicated only 5 days of visitation.

The peak month for visitation between 12 December 2019 to 3 March 2020 was also January, with 19 days of visitation and a total of 1,118 data logged hits. December data indicated 789 logged hits over 14 days of visitation. It should be noted that the data collection did not begin until 12 December 2019, so data from December could be under-represented.

February data also indicated 14 days of visitation, with a total of 370 logged hits. March logged one day of visitation with 114 hits, however it should be noted that data collection in March was only over a 3 day period, however it did include a public holiday weekend.

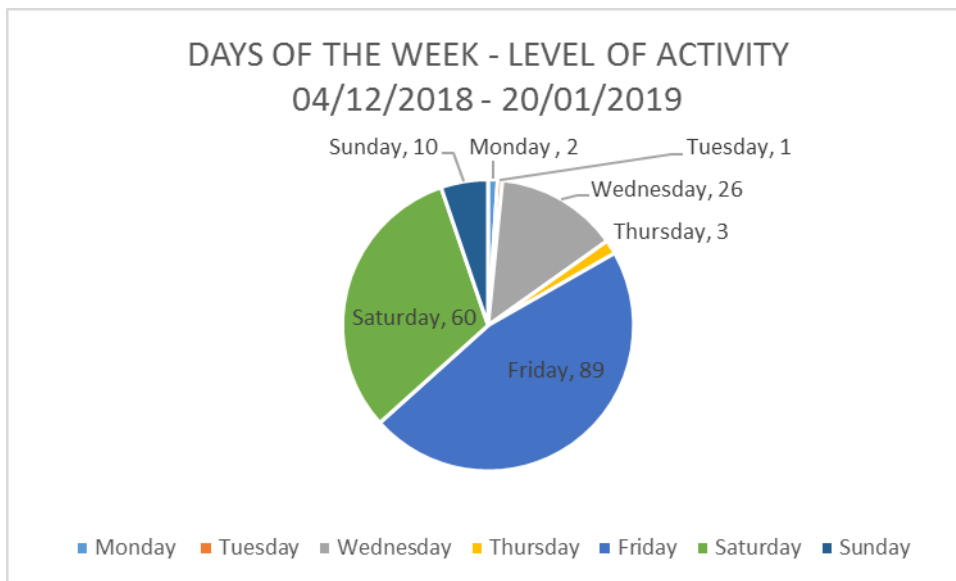


Month	Lake Mullocullup Monthly averages	Number of days visited per Month
December	789.0	14
January	1,118.0	19
February	369.8	14
March	113.7	1

It is worthy of note that the peak visitation occurred during the school holiday period which was from 20 December 2019 to 3 February 2020.

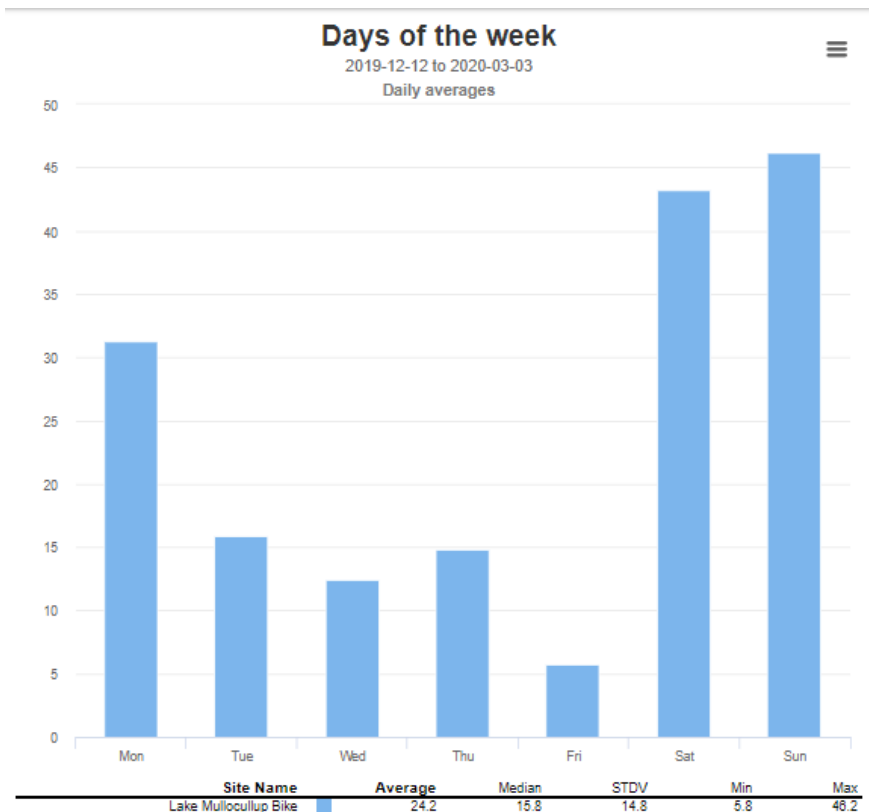
1.3.3. Peak Days

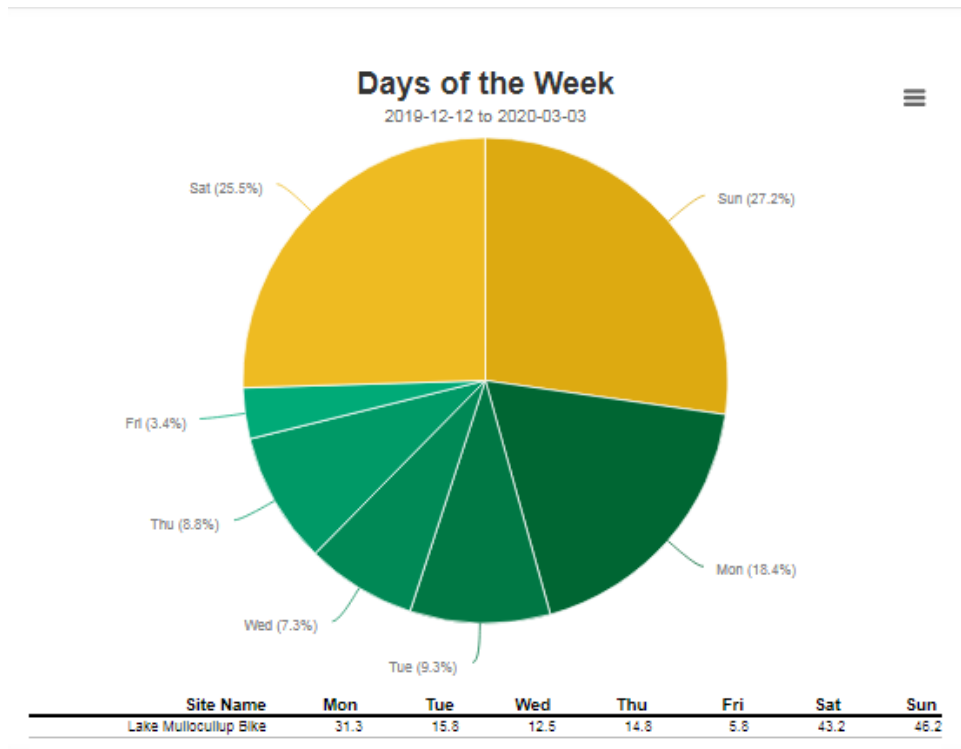
Peak days (excluding the field visit assessment day on 7 January 2019 by City staff) for the period from 4 December 2018 to 20 January 2019 was predominantly Fridays with a total of 89 hits, followed by Saturday with 60 hits.



Peak days over the time period from 12 December 2019 to 3 March 2020 was primarily Sundays with a daily average of 46.2 hits, followed closely by Saturdays at 43.2 hits. Mondays also indicated a relatively high visitation rate at a daily average of 31.3 hits.

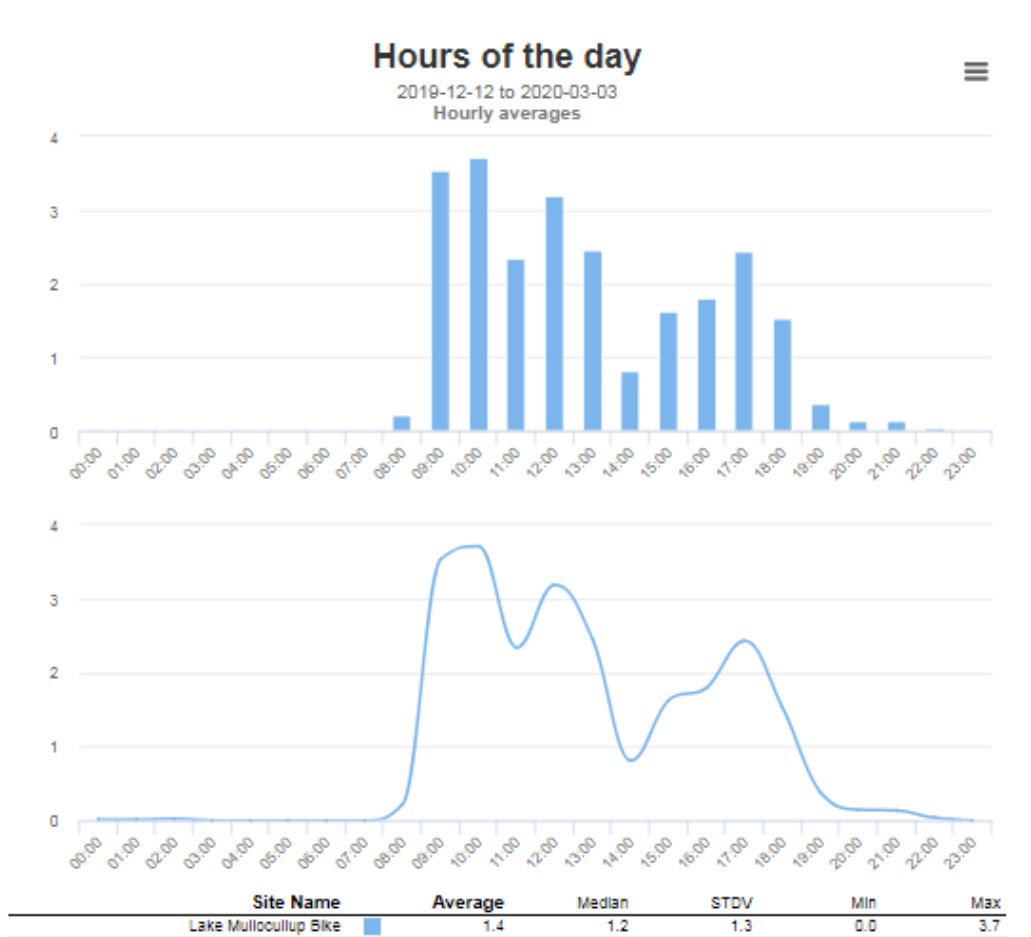
Day	Lake Mullocullup Daily averages
Monday	31.3
Tuesday	15.8
Wednesday	12.5
Thursday	14.8
Friday	5.8
Saturday	43.2
Sunday	46.2





1.3.4. Peak Times of Day

Visitation times throughout the day both on weekends and weekdays were primarily between 09:00 and 18:00. Peak times of activity were recorded to occur between 09:00-13:00 on both weekdays and weekends; as well as occurring between 16:00-17:00 on a weekday and 15:00-18:00 on weekends.

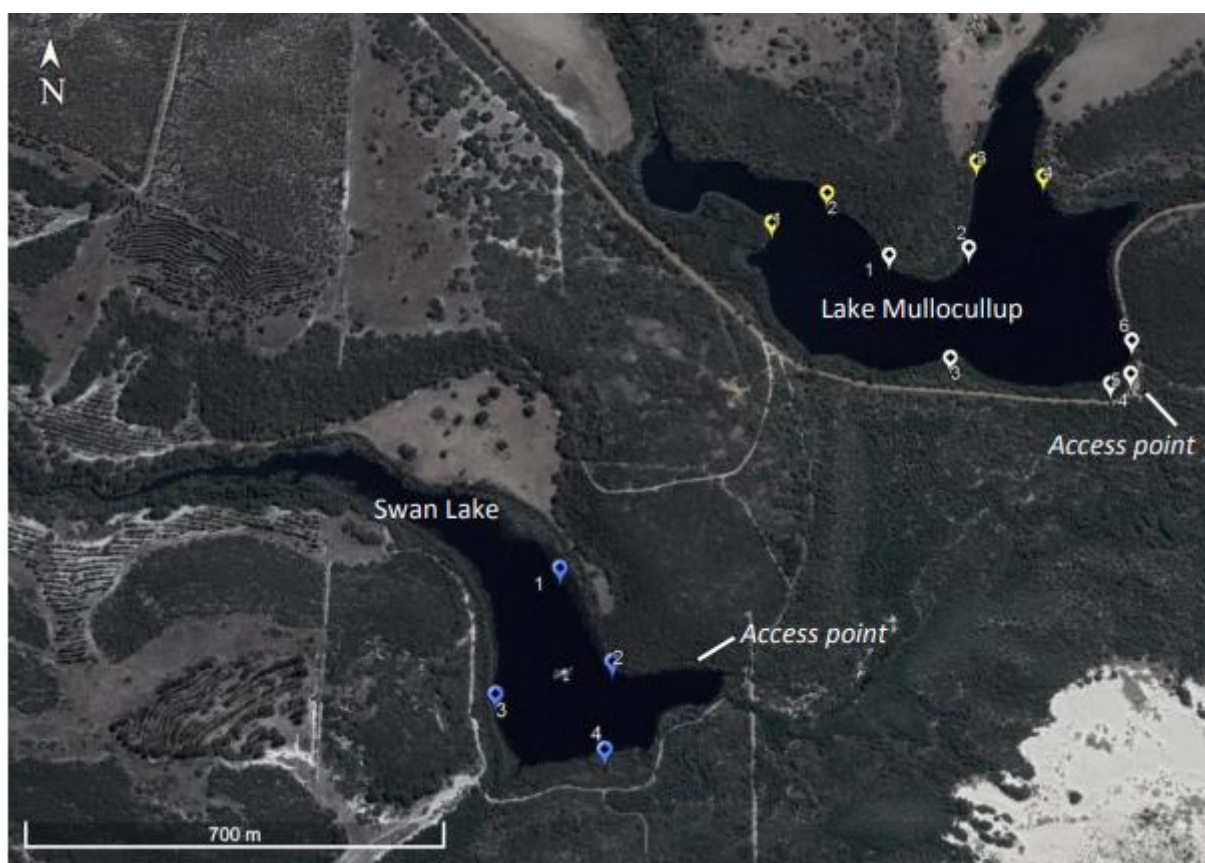


The findings can be referred to in the *Lake Mullocullup Trafx Report (April 2020)*.

1.4 WATER QUALITY MONITORING OF HYDROCARBONS AND CHLOROPHYLL A:

In November 2018 staff from The Centre of Excellence in Natural Resource Management, UWA School of Agriculture and Environment undertook baseline sampling for the physical and biological aspects of water quality, as well as chemical contamination (polycyclic aromatic hydrocarbons (PAHs)) of the lake sediment. Fourteen sampling locations were chosen in total, comprising six experimental transects within the skiing area, four control transects within the no-skiing area, and four control transects in nearby Swan Lake. The most significant finding of the survey sampling from 2018 was that at all of the sixteen selected sites PAH's were below detectable limits in the lake sediments. Overall, this suggests that water-skiing has had no long-term effect on sediment contamination up to this point.

Subsequent monitoring was undertaken in March 2020 comprising again of the fourteen sampling locations across six experimental transects, and four control transects at Lake Mullocullup, with an additional four transects at the control site at adjacent Swan Lake. The measured parameters included a combination of physical, biological and chemical elements to test various aspects of water quality encompassing: pH, turbidity, dissolved oxygen, conductivity, temperature, Chlorophyll A, as well as chemical contaminants polycyclic aromatic hydrocarbons (PAH's) found in the lake sediments.



Water Quality Monitoring Study Area Transect Sites at Lake Mullocullup and Swan Lake.

The primary finding of the second round of sampling, consistent with the findings of the baseline monitoring in 2018, is that all of the sixteen selected PAHs were below detectable limits in the lake sediments. This indicates that water skiing activity, both historical occurrence as well as post-gazettal activities, have not caused significant contamination of lake sediments to date.

A significant finding of the second round of sampling undertaken in March 2020 indicated that there has been an increase of more than 10-fold from baseline measurements of Chlorophyll A, an indicator of algal presence, at Lake Mullocullup, whilst there has been a decrease by 26-46% in the adjacent control site at Swan Lake. Presence of blue-green algae scum was observable at Lake Mullocullup as well as higher turbidity, whereas the water column at Swan Lake remained very clear. The algal abundance cannot be definitively attributed to causes of recreational activity or natural occurrence due to summer conditions of low rainfall, higher temperatures, and stagnant water activity. The report recommended continued monitoring of algal blooms “...as they could pose health concerns for people swimming and boating in the lake. This should include sampling for toxic algal species.” The City of Albany has subsequently installed a permanent sign at the Lake educating the public as to recognising the potential for harmful bacteria to occur, and to avoid contact with water when presence of algal blooms is detected.

Overall report recommendations included:

1. *Water quality monitoring should continue, particularly during summer months, including efforts to detect harmful blue-green algal species such as Microcystis flos-aquae. Blooms of such species could reduce the viability of the lake for water skiing due to human health concerns, so appropriate signage should be installed and maintained.*
2. *As the gazettal of Lake Mullocullup could increase the number of people accessing the area, it would be worthwhile to continue monitoring the level of use.*
3. *Sediment should be monitored for the accumulation of PAHs over time.*
4. *The CoA should continue monitoring conditions in the area. In particular, it would be useful to:*
 - (i) *document the nature, frequency and extent of visitor activities;*
 - (ii) *monitor for evidence of camp-fire use; and*
 - (iii) *establish photo-points or quadrats to monitor gradual retreat of vegetation caused by increased use.*

The findings can be referred to in the *Lake Mullocullup Water-ski Zone Monitoring Report: Summary of Results from Baseline Monitoring in November 2018* and the *Lake Mullocullup Water-ski Zone Monitoring Report: Summary of Results from March 2020* by Justin Benson - Centre of Excellence in Natural Resource Management UWA.

2. CONTROL SITE

The adjacent lake colloquially known as Swan Lake was used as a control site for comparison between lakes with and without the activity of water skiing, on both water quality sampling dates in both November 2018 and March 2020.

3. FRESHWATER FISH MONITORING

A permit was issued to University of Western Australia Science staff and volunteer Paul Close and Dale Roberts in March 2018 to undertake catch and release surveys of freshwater and estuarine fish, crayfish and turtles. The research undertaken was primarily to discern whether there was presence of endangered species particularly Western Trout Minnow (*Galaxias truttaceus hesperius*).

A one-off survey was conducted by setting a series of fyke nets (cone shaped netting bags) in suitable pools situated up-stream from Lake Mullocullup in 2018. Findings were unremarkable, with no fresh or estuarine fish caught in the study, only tadpoles, turtles and yabbies. It was therefore deemed unnecessary by the research scientists to repeat or continue the study, as the trapping undertaken in the sites chosen was seen as an adequate representation of what was likely to occur within the Lake Mullocullup and surrounding stream system.

4. BIRD SURVEY

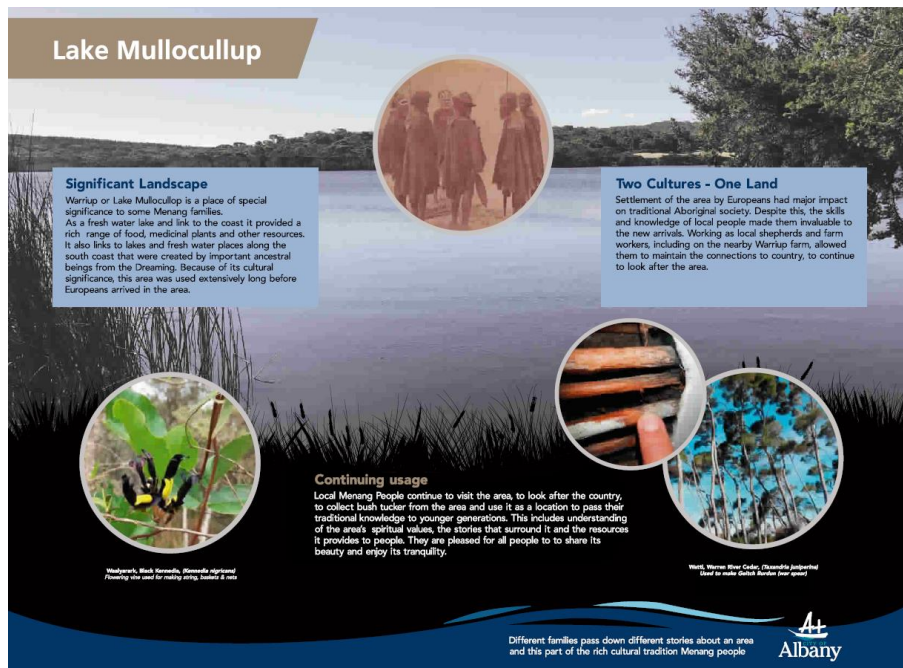
A bird survey was conducted at Lake Mullocullup in February 2016 prior to gazettal and again in February 2019 by ornithologist Anne Bondin. "...nineteen species of waterbirds were recorded with a total of 210 individuals counted. Numbers were very similar as in February 2016 when 215 waterbirds were recorded. This time the number of species counted was considerably higher, however. As is the case with the majority of Australian lakes, waterbird numbers on Mullocullup Lake will show constant variations as will the number of species present. Due to the ephemeral nature of many wetlands the majority of Australian waterbirds is highly nomadic, opportunistically seeking out habitat suitable for both feeding and breeding."

"Apart from Carnaby's Black Cockatoos no other threatened species protected under the Wildlife Conservation Act 2015 were recorded at the reserve."

The findings can be referred to in the *Avian Fauna Survey at Mullocullup Nature Reserve (February 2019)* by Anne Bondin.

5. INTERPRETIVE SIGNAGE

The City has developed and installed a sign at Lake Mullocullup on Noongar heritage and significance of the area based on information provided in *Results of Noongar Community Consultation Regarding Recreational Use at Lake Mullocullup (Warriup Swamp) Report (February 2018)* by qualified archaeologist and anthropologist Dr Myles Mitchell undertaken in consultation with the Noongar people indigenous to the area. Consultation for the material on this sign was undertaken by another independent consultant, Rob Reynolds. All Noongar representatives involved in the initial consultation were contacted and invited to provide input.



CONCLUSION

The results of the environmental monitoring - encompassing field assessment monitoring, traffic logger data, water quality monitoring, fish and avian surveys – when comparing pre and post gazettal data indicates no significant increased activity, change or adverse environmental impacts sustained at Lake Mullocullup since the gazettal by Department of Transport allowing recreational speed-boating activities in October 2018.

REFERENCE DOCUMENTS

- *Lake Mullocullup Field Visit Assessment Spreadsheet and Summary (April 2020)*
- *Lake Mullocullup Trafx Report (April 2020)*
- *Avian Fauna Survey at Mullocullup Nature Reserve (February 2019)* by Anne Bondin
- *Lake Mullocullup Waterski Zone Monitoring Report: Summary of Results from Baseline Monitoring in November 2018* by Justin Benson - The Centre of Excellence in Natural Resource Management UWA School of Agriculture and Environment
- *Lake Mullocullup Waterski Zone Monitoring Report: Summary of Results from March 2020* by Justin Benson - The Centre of Excellence in Natural Resource Management UWA School of Agriculture and Environment (April 2020)
- *Results of Noongar Community Consultation Regarding Recreational Use at Lake Mullocullup (Warriup Swamp)* by Dr Myles B. Mitchell (February 2018)

All Reference documents are available on request.



City of Albany
Policy

Trading in Public Places

REPORT ITEM DIS213 REFERS

Document Approval			
Document Development Officer:		Document Owner:	
Manager Planning Services (MPS)		Executive Director Development Services	
Document Control			
File Number - Document Type:	CM.STD.7 – Policy		
Document Reference Number:	To be updated post adoption.		
Meta Data: Key Search Terms	Vendors, Trading, Public Places		
Status of Document:	Council decision: Reviewed, Pending adoption.		
Quality Assurance:	For example: Chief Executive Officer, Executive Management Team, Council Committee, and Council.		
Distribution:	Public Document		
Document Revision History			
Version	Author	Version Description	Date Completed
1.0	Manager Building & Health Services	Adoption Reference: OCM 15/09/2009 Report Item 13.5.1	15/09/2009
2.0	EDPDS	Executive Director Planning & Development Services (EDPDS). Revised: Minor formatting only.	29/12/2010
3.0	MPS	Revision Reference: OCM 23/05/2017 Resolution CCCS028. Synergy Ref: NP1767036	20/06/2017
4.0	MGR	Reviewed, Recommended amendments: <ul style="list-style-type: none"> • Associated documents references updated. • Fully reviewed, see document compare. 	07/05/2018

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Objective

The City of Albany is committed to promoting small business initiatives in a sustainable fair manner and acknowledging the historic use of some of the areas.

The purpose of this policy is;

- To provide direction to City staff in the processing of applications for trading in public places, in accordance with the City of Albany's *"Activities on Thoroughfares and Public Places and Trading Local Law 2011"*.
- To provide a clear set of controls for operators to trade under.

Policy Statements:

The City supports traders operating on a regulated basis to ensure equity and fairness to all business proprietors.

The City's Local Law provides regulation for the management of public property and the activities that may be conducted on public property that is owned or managed by the City, including City halls, car parks, parks and reserves.

This also applies to private property, if being used for public purposes such as fetes and markets.

Assessment of an application considers the proposed location and impact the activity may have on established businesses close by, other traders, traffic flow and the amenities at the desired location.

The City reserves the right to refuse any application for any reason.

A. Trading – General Requirement applicable to all traders;

- All Stallholders and Street Traders (Traders) must ensure that the trading location is kept clean and tidy at all times. The permit holder is responsible for the disposal of all litter associated with the provision of the goods or services and the cleaning of the permit location.
- Traders shall depart from a trading location upon the direction of any person or body, authorised to carry out any works in the street, thoroughfare, local government property or public place in which the trader is situated.
- Traders shall not have any claim for compensation or damages as a result of any disruption to business or loss incurred due to an event, market, parade, thoroughfare works or any other contingency.
- The City is under no obligation to relocate the trader or stallholder, however, an alternate location may be offered if an appropriate location is available.
- Trading shall only take place in a suitable area with landowner permission and where it does not cause a safety or nuisance concern or in a car parking area/space and complying with local parking restrictions.
- To ensure public safety, trading must be conducted in areas that are serviced by adequate lighting.

REPORT ITEM DIS213 REFERS

- Advertising signs are restricted to the vehicle/stall from which the business is conducted.
- To apply for permission to operate a mobile trading vehicle within the City, the following documentation will be required:
 - A copy of current public liability insurance;
 - A complete application for a trading licence including proposed payment details; and
- If food is sold, a current copy of your *Food Act 2008* Certificate of Registration (noting the vehicles internal fit out must comply with the requirements of the *Food Regulations 2009*, applicable ASNZ Food Standards Codes and the City of Albany Health Local Laws) is required.

B. Trading - Approved Events and Markets:

Subject to approval from event holders:

- If your food business is based within the City of Albany, no Food stall approval is required to trade at an event or market.
- If your business is located outside of the City of Albany an Application for a Temporary Food Stall Approval will be required.

C. Trading – Approved Fixed Locations:

- The City of Albany has identified fixed trading locations where trading may be permitted only by the approved street trader in accordance with their licence.
- A fixed location street trader licence may be issued for a maximum fixed term, the maximum fixed terms for the various sites are contained in annexure A.
- A fixed trading location becomes available for reallocation if the trader ceases trading for a period of six months or advises that they wish to cease trading.
- The City of Albany will call for applications for fixed trading licences prior to when a licence expires or when a trading location becomes available.
- Annual trading site hire fees will be set each year by Council through the budget process and fees may differ depending on the location/desirability of the site (as shown in annexure A).
- Trading licences for these sites are determined at the discretion of the City, on their individual merit and against the following criteria:
 - How the business will benefit the community (i.e. authenticity, unique culinary experience and celebrating local produce);
 - Experience of the street trader (e.g. food van or restaurant that is currently operating);
 - Already in possession of a well-designed and well-maintained vehicle that is aesthetically pleasing and complies with the City's environmental health requirements.
 - Historic use of a specific location by the trader and existing patronage by the community.
 - Risk management plans provided by the street trader.
 - Knowledge of food safety principles.
 - Litter management plan.

- Marketing plan and social media presence.

D. Trading – Itinerant Varied Locations:

- Traders may apply for a Permit to sell to the public by traveling from place to place throughout the City in accordance with this Policy.

D.1 Trading – Zones:

- **CBD:** Traders are precluded (unless a special permit is approved) from selling within the Albany Regional Business Trading Centre, also known as the Central Business District (CBD), as defined by the local planning scheme and as delineated within the Street Traders Map published by the City.

D.2 Special Permit

Traders may apply for a special permit to trade;

- On Stirling Terrace (east)
 - Friday nights between 10pm and 2am Saturday morning.
 - Saturday nights between 10pm and 12am.
- In the CBD on;
 - Saturdays between: 1 pm and dusk
 - Sundays: All Day during daylight hours:

Trading under this arrangement shall not occur closer than 150 m from any shop open for business and generally offering the same goods for sale.

Please note the City is not obligated to issue any special permits and reserves the right to apply additional conditions of operation.

D.3 Outside the CBD:

Trading is permitted in areas outside of the Albany CBD on condition that:

- It occurs a minimum of 150 metres away from any shop or other permit holder, who is trading at the time and offering a similar product for sale, except when the Trader has been invited onto a property by the property owner/occupier and/or is participating in a special / community event, such as a weekend market or sporting event;
- It occurs a minimum of 150 metres away from a school between the hours of 7.00am and 9.00am and 2:30pm and 4.00pm during school days.
- The trader moves on when all customers at a particular location have been serviced or;
- If parked in a safe location within a public car parking area/space (complying with local parking restrictions and not on a designated fixed trading location) in City of Albany controlled Beach or Park move on within the following maximum daily time limits permitted;
 - 2 hours - < 2 km away from the CBD
 - 4 hours - < 10 km away from the CBD

E. Stallholder

- Approval for stalls, other than stalls which are part of an approved market or extend the service area of an existing business onto the adjacent footpath, will be restricted to community associations.
- A stallholder proposing to operate a food stall, which will offer for sale to the public potentially hazardous food (e.g. sausage sizzles) is required to submit an application for approval to the City's Environmental Health team.
- All food products that are not for immediate consumption must be labelled in accordance with the relevant food regulations.
- Community associations are exempt from permit fees.

F. Alfresco-Dining

- Operators of alfresco-dining areas are required to hold a permit under the provisions of the *Activities on Thoroughfares and Public Places and Trading Local Law*, where they are referred to as outdoor eating facilities.
- Applications may only be submitted by proprietors of existing food premises who wish to extend their serving area onto the adjacent footpath (generally) in front of their premises.
- A proprietor granted approval to operate an alfresco dining area is required to indemnify the City in writing against any action taken against the City by a person injured or suffering loss due to the presence of the alfresco-dining area.
- The boundaries of an approved alfresco-dining area are to be marked and maintained by the registered proprietor. Markers can be purchased from the City.
- Tactile directional tiles, removable railings or planter boxes may be required by the City, at the business proprietor's expense, to provide delineation to a dining area for the visually impaired.
- Tables and chairs used in the alfresco-dining area should be designed for commercial outdoor use. Domestic furniture is not permitted, and the furniture must be located within the delineated boundaries of the alfresco-dining area at all times.
- Tables and chairs used in the alfresco-dining area must be located no closer than 600 millimetres from the adjacent kerb to allow passengers to alight from vehicles.
- In addition, a minimum 1800mm clearway for pedestrians must be maintained at all times.
- Only table service will be permitted within an alfresco-dining area.
- No advertising signs, other than the logo or name of the outlet, will be permitted in an alfresco-dining area.

G. Market Operators

- Operators of markets on public land are required to hold a permit under the provisions of the *Activities on Thoroughfares and Public Places and Trading Local Law*. Please note, Development Approval is required for a Market on private land.
- Individual stalls, other than stalls selling food, are covered by the market operator's licence - individual licencing fees will not be charged.

REPORT ITEM DIS213 REFERS

- Stallholders proposing to operate a food stall, which will offer for sale to the public potentially hazardous food (e.g. sausage sizzles) are required to be registered/hold registration under the provisions of the Food Act 2008.
- All food products that are not for immediate consumption must be labelled in accordance with the relevant health regulations.

Scope

This policy applies to all public land within the City of Albany as well as private land used for public purposes, and all businesses and individuals seeking to use public land to operate a business or for financial gain.

Legislative and Strategic Context

Both the *Food Act 2008* and the City's *Activities on Thoroughfares and Public Places and Trading Local Law 2011* require street traders to obtain a licence for trading and selling food.

This policy aims to provide direction and guidance for City officers assessing applications and to ensure equity for all commercial outlets.

Review Position and Date

This policy and procedure is to be reviewed by the document owner every 5 years.

Associated Documents

Strategies, procedures, references, guidelines or other documents that have a bearing on this policy and that may be useful reference material for users of this policy:

- [Food Act 2008](#)
- [Food Regulations 2009](#)
- [Australia New Zealand Food Standards Code](#)
- *Activities on Thoroughfares and Public Places and Trading Local Law 2011*
- *Local Government Property Local Law 2011*
- *Environmental Protection (Noise) Regulations 1997*
- [National Competition Policy](#): Noting Australia's National Reform Agenda is the successor program to the National Competition Policy. Clause 7 of the [Competition Principles Agreement](#) extended elements of the National Competition Policy reform agenda to local government.

Definitions

Key terms and acronyms used in the policy, and their definitions:

Approved Locations	means locations from which vendors can trade with City approval.
Approved Event	means an event that has been approved under the City of Albany's event approval process.
Community Association	means an organisation which can demonstrate that its objectives are charitable, benevolent, religious, cultural, educational, recreational or sporting.
Food Stalls	means a stall from which any perishable or potentially hazardous food, other than fruit or vegetables, is sold or offered for sale, unless approved by the City of Albany.

REPORT ITEM DIS213 REFERS


Food Van	means any vehicle, caravan, trailer or other similar mobile structure selling or offering for sale any food and or drink (excluding alcoholic beverages).
Itinerant Food Vendor	means a form of Street Trader who sells food from a vehicle parked temporarily on the road to customers who stop them or come to them while they are so parked.
Potentially Hazardous Food	means all prepared or cooked food which consists in whole or in part of milk or milk products, eggs, meat, poultry, fish, crustaceans, molluscs, gravy, cooked rice and pasta or ingredients capable of supporting the growth of infectious or toxigenic micro-organisms.
Public place	Includes: (a) any thoroughfare or place which the public are allowed to use whether or not the thoroughfare is on private property; and (b) local government property; but does not include premises on private property from which trading is lawfully conducted under a written law.
Stall	means a movable or temporarily fixed structure, stand or table in, on or from which goods or services are sold, hired or offered for sale or hire.
Stallholder	means a person in charge of a stall.
Street Trader	means a person who sells food, goods and/or services from a vehicle parked temporarily on the road/public place while they are parked.
Trader's permit	means a permit issued to a street trader.
Trading in public places	refers to long-term or periodic occupation of City controlled land for the purposes of either selling or displaying goods or providing services to customers.

Annexures:

- [Annexure A: Fixed Trading Locations](#)
- [Annexure B: Street Traders Map](#)


Annexure A: Fixed Trading Locations


MIDDLETON BEACH	
Trading Term	5 Years
Desirability	A



CENTENNIAL PARK	
Trading Term	5 Years
Desirability	A



SANDPATCH	
Trading Term	1 Year
Desirability	C
	

NANARUP BEACH	
Trading Term	1 Year
Desirability	C
	

LAKE WEERLARA PARK	
Trading Term	1 Year
Desirability	B

FOUNDATION PARK	
Trading Term	1 Year
Desirability	B

GOODE BEACH	
Trading Term	1 Year
Desirability	C
	

'SURFERS' BEACH MIDDLETON	
Trading Term	1 Year
Desirability	A
	

Goods and/or Services (other than food)

There is currently one non-food location, other than leased areas, and is located within the Middleton Beach carpark:

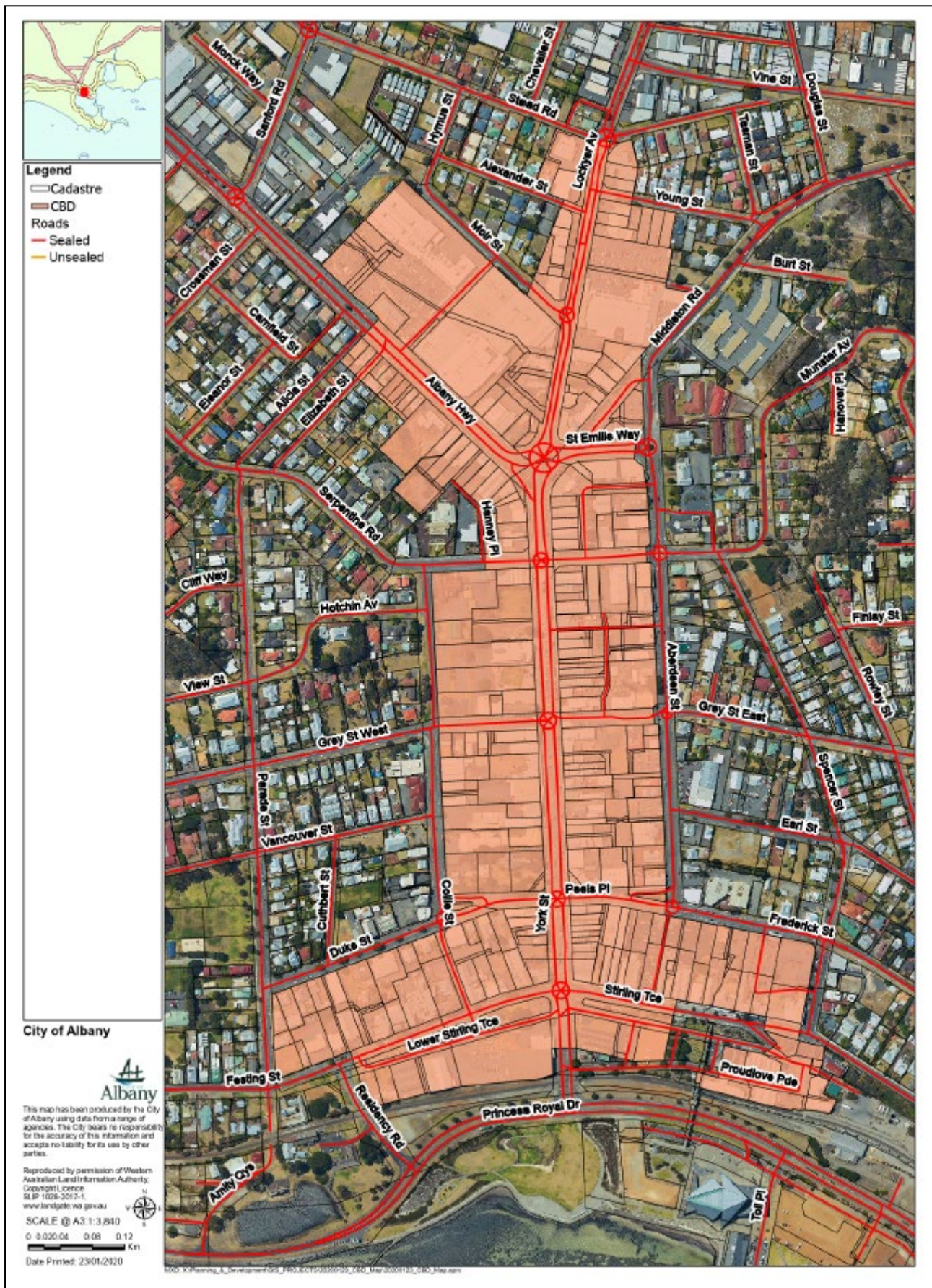
MIDDLETON BEACH

Approved location for non-food street trader in the Marked location (1.5 Bays maximum)

Trading Term	5 Year/s
Desirability	A



Annexure B: Street Traders Map





CITY OF ALBANY

LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

Lot 105 on Deposited Plan 230421,
House 795 Frenchman Bay Road,
Big Grove

(Certificate of Title 2182/323)

PART A – REPORT AND APPENDICES

CITY OF ALBANY

LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

Lot 105 on Deposited Plan 230421,
House 795 Frenchman Bay Road,
Big Grove

(Certificate of Title 2182/323)

MAY 2020 (Rev. 1)

PREPARED BY:



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File No: _____

WAPC Ref: _____

MINISTER FOR PLANNING

PROPOSAL TO AMEND A TOWN PLANNING SCHEME

1.	LOCAL AUTHORITY	:	City of Albany
2.	DESCRIPTION OF SCHEME	:	Local Planning Scheme No. 1
3.	TYPE OF SCHEME	:	District Zoning Scheme
4.	SERIAL No. OF AMENDMENT	:	Amendment No. 34
5.	PROPOSAL	:	<ol style="list-style-type: none">1. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Future Urban.2. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Parks and Recreation3. Amending the Local Planning Scheme map accordingly.

**Resolution to prepare or adopt a
Local Planning Scheme Amendment**

Regulation 35(1)

Planning and Development Act 2005

**RESOLUTION TO PREPARE AMENDMENT TO
LOCAL PLANNING SCHEME**

CITY OF ALBANY LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

Resolved that the local government pursuant to section 75 of the Planning and Development Act 2005, amend the above Local Planning Scheme by:

1. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Future Urban.
2. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Parks and Recreation
3. Amending the Local Planning Scheme map accordingly.

The amendment is standard under the provisions of the Planning and Development (Local Planning Schemes) Regulations 2015 for the following reason(s):

- The amendment is consistent with a local planning strategy for the scheme that has been endorsed by the Commission.

Dated this day of 20.....

.....
Andrew Sharpe
CHIEF EXECUTIVE OFFICER

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1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Able Planning & Project Management represents the registered proprietor of Lot 105, House 795 Frenchman Bay Road, Big Grove.

The subject lot is described as Lot 105 on Deposited Plan 230421, as contained within Certificate of Title Volume 2182 Folio 323. The street address is House 795 Frenchman Bay Road, Big Grove. It is a freehold lot held in fee simple without any limitations, interests, encumbrances or notifications under the second schedule of the title.

The lot is 20.2343 ha in area and is approximately 10 km from the Albany city centre via road (refer to **Appendix 1 – Location Plan**). The land ranges in height from approximately 8.5 m AHD near the southern corner adjoining Frenchman Bay Road to below 2.0 m AHD at the high-water mark (HWM) of Princess Royal Harbour which is the lot's northeast boundary.

Lot 105 is vacant and contains a wide coverage of remnant vegetation of varying condition. Historic, intentional clearing has generally been limited to boundary and internal firebreaks, access tracks and other incidental disturbances. However, with no on-site management, each year the property is subjected to further weed infestation, illegal dumping of rubbish and unauthorised clearing / vegetation damage caused by trespassing day-users and campers.

Legal access to the lot is provided by Frenchman Bay Road, which abuts the entire length of the southwest boundary. Frenchman Bay Road is constructed to a two-way asphalt / bitumen sealed standard.

In September 2010, the first Albany Local Planning Strategy (ALPS) was endorsed by the Western Australian Planning Commission (WAPC). Map 9B (Strategic Plan: Urban) of the ALPS identified the subject lot as Future Urban.

Following the endorsement of the ALPS in 2010 various representations were made to amend the then *City of Albany Town Planning Scheme No. 3 (TPS 3)* to rezone the land away from its incorrect Public Purpose reservation, to something matching the ALPS. While the City of Albany and Western Australian Planning Commission (WAPC) would not support the subject lot being rezoned as part of the scheme review at the time, on 15 March 2011 the City of Albany council resolved to support a scheme amendment request, subject to the completion of several studies and their peer review by various authorities.

The last of these studies, the local water management strategy, was completed and signed off by the Department of Water and Environmental Regulation (DWER) in March 2018. Now that all studies required have been completed in accordance with the 2011 resolution, plus-

- a bushfire management plan has been prepared to comply with the introduction of *State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP 3.7)*; and
- a coastal processes allowance assessment has been prepared in accordance with Schedule One of *State Planning Policy No. 2.6 State Coastal Planning Policy (SPP 2.6)*,

it is now requested that the City of Albany adopt an amendment to *City of Albany Local Planning Scheme No. 1* to rezone the lot from Public Use to Future Urban.

1.2 BACKGROUND

21 FEBRUARY 2006

On 21 February 2006 the then Minister for Planning and Infrastructure refused to approve Amendment No. 232 to TPS 3 which proposed to rezone Lots 1, 2, 16 and Part Lot 109 Frenchman Bay Road to the southeast to Special Rural. The intention of the amendment was to enable an interim level of rural residential development.

The Minister's reasons for refusing the amendment are summarised as follows:

- The land is identified for urban growth as part of the draft ALPS.
- WAPC policies have a general presumption against interim subdivision of land identified for future urban development, primarily because of the difficulties (i.e. including different aspirations of landowners) and considerable expense when attempting to convert fragmented land to fully serviced subdivisions.
- The protection and management of the coastal foreshore reserve would be more effectively achieved at the time of considering the land for urban development.
- Rural residential lots, which are reliant upon traditional onsite effluent disposal (i.e. septic tanks and leach drain systems), would export further nutrients into Princess Royal Harbour.
- Other attributes make the location suitable for urban development, including –
 - the adjacency of the Big Grove locality to the Little Grove residential area;
 - that is to be connected to reticulated sewer in the near future;
 - the adjacency to Princess Royal Harbour;
 - the northern aspect affording views across the harbour to the city; and
 - the proximity of attractions such as Torndirrup National Park, Frenchman Bay and a number of beaches on King George Sound and the Indian Ocean.

As a concluding remark, the Minister advised that other areas in Albany designated for shorter-term residential development may take some time to be given environmental approvals. Accordingly, the Minister recommended the City of Albany designate the Big Grove locality for shorter term development in the draft ALPS based on the possibility of earlier servicing.

The Minister also advised that she had instructed her department to discuss with the Water Corporation with a view to facilitate the servicing of Big Grove with reticulated sewerage.

SEPTEMBER 2006

In September 2006, the draft ALPS was referred to relevant government agencies and advertised for public comment. The draft ALPS identified Lot 105 as Local Reserve.

5 DECEMBER 2006

On 5 December 2006 the owner of Lot 105 lodged a submission on the draft ALPS with the City of Albany. This submission quite clearly outlines that –

- Lot 105 is a freehold lot held in fee simple estate;
- the land's reservation for Public Purposes under TPS 3 is inappropriate due to its private ownership and is most likely confused with similarly-sized Lot 104 (Reserve 931) Frenchman Bay Road adjoining to the northwest;
- the land's identification as Local Reserve on Map 9B of the draft ALPs is inappropriate for the same reasons above;
- adjoining Lot 104 (Reserve 931) Frenchman Bay Road is identified Existing Residential on the same Map 9B of the draft ALPS, and is presumably wrong and mistaken for Lot 105;
- the direction of the Minister for Planning and Infrastructure for residential development in the Big Grove locality in the shorter term is supported by the owner of Lot 105; and
- the Minister's request that the Water Corporation facilitate reticulated sewerage in Big Grove is supported by the owner of Lot 105.

21 AUGUST 2007

On 21 August 2007 the City of Albany council resolved to finally adopt the ALPS. In doing so, it also endorsed the schedule of submissions and recommendations contained within the schedule. The schedule of submissions summarises the owner's submission by stating that it –

- provides support for ALPS;
- seeks clarification of the existing zoning of Lot 105 Frenchman Bay Road; and
- supports residential development and reticulated sewer for Big Grove.

Rather than acknowledging the points and requests in the owner's submission, the officer comment simply notes and advises that the subject land is in a locality where Future Urban and Local Reserves are proposed. No modification to the ALPS is recommended to the City of Albany council by its officers in response to the owner's submission.

17 FEBRUARY 2009

On 17 February 2009, LPS 1 was initiated by the City of Albany showing Lot 105 as Parks and Recreation reserve.

27 OCTOBER 2009

On 27 October 2008 Amendment No. 279 to TPS 3 is published in the *Government Gazette* having force and effect from that day. Amongst other things, Amendment No. 279 effectively rezones Lots 2, 4, 16, 301 - 303 and 9000 Frenchman Bay Road and Lots 9 - 12 Panorama Road, Big Grove to Residential Development.

15 JUNE 2010

On 15 June 2010 the City of Albany council resolved to finally adopt the draft ALPS identifying Lot 105 as Future Urban within the Priority 3 development area on Map 9B.

29 JUNE 2010

On 29 June 2010 Amendment No. 284 to TPS 3 is published in the *Government Gazette*. Amendment No. 284 effectively rezones Lots 1, 2, 2, 7, 20, 21, 109 and 110 Frenchman Bay Road, Big Grove to Residential Development.

14 SEPTEMBER 2010

On 14 September 2010 the ALPS was endorsed by the WAPC.

27 OCTOBER 2010

On 27 October 2010 the owner submitted a scheme amendment request (SAR) with the City of Albany. The SAR requests that TPS 3 be amended to rezone Lot 105 to Residential Development, consistent with the ALPS.

15 MARCH 2011

On 15 March 2011 the City of Albany council resolved as follows in respect to the SAR:

"THAT Council ADVISE the proponent that it is PREPARED to consider a formal scheme amendment to rezone Lot 105 Frenchman Bay Road, Big Grove from the 'Public Purpose' reserve to the 'Residential Development zone, subject to the following matters being addressed and/or included as part of that formal amendment application:

- A. Studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation.***
- B. The identification of an appropriate foreshore reserve in accordance with the Western Australian Planning Commission Statement of Planning Policy 2.6.***
- C. The protection of the South Coast Water Reserve and the existing well-head on Reserve 931 to the satisfaction of the Department of Water and the Water Corporation.***
- D. The land required for vegetation protection, water resource protection, foreshore reserve and fauna habitat and corridor protection should be designated as 'Park and Recreation' reserve.***

- E. *The inclusion of a Local Water Management Strategy to the satisfaction of Council and the Department of Water.***

- F. *The addressing of infrastructure provision and servicing requirements, inclusive of any associated buffers and easements to the satisfaction of the various servicing authorities."***

16 AUGUST 2011

On 16 August 2011 the City of Albany council final adopted the outline development plan (structure plan) for Lots 2, 4, 16, 301 - 303 and 9000 Frenchman Bay Road and Lots 9 - 12 Panorama Road, Big Grove.

21 DECEMBER 2011

On 21 December 2011 the WAPC endorsed the outline development plan for Lots 2, 4, 16, 301 - 303 and 9000 Frenchman Bay Road and Lots 9 - 12 Panorama Road, Big Grove.

JULY 2012

In July 2012 Opus International Consultants (PCA) Pty. Ltd. completed the additional environmental studies required in order to satisfy parts of the 15 March 2011 City of Albany council resolution regarding the SAR.

30 APRIL 2013

On 30 April 2013 the City of Albany council adopted LPS 1 for final approval reserving Lot 105 for Parks and Recreation Reserve.

28 APRIL 2014

On 28 April 2014 LPS 1 is published in the *Government Gazette* reserving Lot 105 for Public Use.

4 JUNE 2014

The owner of Lot 105 receives a letter from Minister for Planning dated 4 June 2014 advising that he determined it inappropriate to rezone the land to Future Urban without the necessary environmental assessment by the Office of the Environmental Protection Authority and public advertising.

The Minister encourages owner to engage with the City of Albany and the Department of Planning to discuss preparing an amendment to LPS 1, which was gazetted on 28 April 2014.

11 MARCH 2015

Department of Water advises in its letter dated 11 March 2015, following review of the Addendum to Environmental Opportunities and Constraints Analysis report prepared by Opus, that it supports the area identified in the constraints mapping for reservation and protection of vegetation for the South Coast Water Reserve.

21 JULY 2015

On 21 July 2015 the then Department of Parks and Wildlife (DPaW) advises that the Addendum to Environmental Opportunities and Constraints Analysis (including revisions), subsequent submissions by the owner's consultants and advice provided by DPaW are sufficient to allow the proponent for Lot 105 to progress a scheme amendment request and subsequent planning stages. The constraints map within the Opus report covers items A - D of the City of Albany council resolution from 2011.

10 FEBRUARY 2016

The final infrastructure servicing report is submitted to the City of Albany including changes and additional information requested in comments provided by City engineers and planners. The servicing report covers item F of the City of Albany council resolution from 2011.

15 MARCH 2018

In its advice dated 15 March 2018, DWER advises that the local water management strategy (LWMS) as submitted, reflects current DWER policy and principles, only lacking in some technical detail which is best delivered when the urban form is finalised. On this basis, DWER advised that is supportive of finalisation of the LWMS document being deferred to later in the planning process (i.e. structure plan). The LWMS effectively satisfies the last outstanding item, item E of the City of Albany council resolution from 2011.

21 AUGUST 2018

Bushfire management plan (BMP) is completed in strategic proposal template and referred to Department of Planning, Lands and Heritage (DPLH) and City of Albany for opportunity to review / comment prior to packaging up as part of formal scheme amendment documentation.

28 NOVEMBER 2019

On 28 November 2019, the second City of Albany Local Planning Strategy (LPS) was endorsed by the WAPC. This LPS superseded the 2010 ALPS and but similarly identifies the subject land for 'Urban Growth'.

30 APRIL 2020

The final version of the coastal processes allowance assessment (CPAA), prepared in accordance with Schedule One of SPP 2.6, is submitted to the DPLH and City of Albany along with a tracking register of changes / updates. The coastal processes allowance is measured from a horizontal setback datum and calculated as the sum of the factors: S1 Erosion; S2 Erosion; and S3 Erosion, plus 0.2 metres per year allowance for uncertainty.

2.0 SUBJECT SITE

2.1 LOCATION AND SITE DESCRIPTION

The subject lot is described as Lot 105 on Deposited Plan 230421, as contained within Certificate of Title Volume 2182 Folio 323 (refer to **Appendix 2 – Record of Certificate of Title**). The street address is House 795 Frenchman Bay Road, Big Grove. The lot is freehold and is held in fee simple by the Roman Catholic Bishop of Bunbury without any limitations, interests, encumbrances or notifications under the second schedule of the title.

The subject lot is 20.2343 ha in area and is approximately 10 km from the Albany city centre via road (refer to **Appendix 3 – Superseded Title and Sketch**). The land grades away from a height of approximately 8.5 m AHD near the southern corner adjoining Frenchman Bay Road to approximately 2.5 m AHD near the northern corner in proximity to the foreshore. It then rises between 4.5 - 5.0 m AHD in the form of a relatively steep foreshore dune, then falls away to below 2.0 m AHD near the waterline.

The subject lot contains bands of remnant four main vegetation complexes; sedge-land, low woodland, closed shrubland and medium to tall woodland. Historical, intentional clearing has been limited only to boundary and internal firebreaks / access tracks and other incidental disturbances. The condition and quality of this remnant vegetation has been documented by Opus and peer reviewed by the now Department of Biodiversity, Conservation and Attractions. The land is not currently used for any purpose.

Legal access to the lot is provided by Frenchman Bay Road, which abuts the entire length of the southwest boundary. Frenchman Bay Road is constructed to a two-way asphalt / bitumen sealed standard.

2.2 SURROUNDING LAND

Lot 7122 (Reserve 29669) and Lot 104 (Reserve 931) adjoin the northwest boundary of the subject lot. Lot 7122 is 1,616 m² in area and vested with the Water Corporation. It is used as a bore site for drinking water. Lot 104 is 20.840 ha in area and is not currently used for any purpose. Lot 104 is reserved for Parks and Recreation under LPS 1, while Lot 7122 is reserved for Public Use: Government. The 2019 LPS identifies both lots as Parks and Gardens.

The southeast boundary of the subject property abuts Lots 4, 10 - 12 and 18. Lot 4 (House 797) Frenchman Bay Road and Lots 10 - 12 (Houses 15, 35 and 49) Panorama Road are zoned Future Urban and are 1,143 m², 2.8592 ha, 2.7622 ha and 2.4066 ha in area respectively. Lot 18 (House 71) Panorama Road is zoned Caravan and Camping pursuant to LPS 1 and is 3.743 ha in area. With the exception of Lot 18 which is occupied by tourist accommodation and owner's / caretaker's dwellings, these lots are generally used for rural living. The 2019 LPS identifies these lots as Urban Growth and Existing Tourism Accommodation Sites at the northeast tip adjoining the foreshore reserve (i. e. taking in the tourist accommodation site). In 2011 the WAPC endorsed an outline development plan (structure plan) for part of Big Grove which included these lots (refer **Appendix 4 – Outline Development Plan - Big Grove**).

Lot 6926 (Reserve 27052) also adjoins the southeast boundary, and this forms part of the Princess Royal Harbour foreshore reserve system. This lot is shown as Parks and Recreation on the LPS and

reserved for Parks and Recreation under LPS 1. Lot 66 adjoins the southeast also. At just over 20 m wide, it is thought that this strip of land was / is intended to form part of a foreshore road. Lot 66 is owned by the State of WA. It is also reserved for Parks and Recreation under LPS 1 and identified as Parks and Recreation on the LPS.

The northeast boundary of the subject property is the waterline of Princess Royal Harbour.

2.2.1 ROADS

As already mentioned, legal access to the lot is provided by Frenchman Bay Road, which abuts the entire length of the southwest boundary. Frenchman Bay Road is constructed to a two-way asphalt / bitumen sealed standard with extensive gravel shoulder and central and outer line-marking. The current posted speed limit of Frenchman Bay Road is 80 km / h.

Under the structure plan proposal for the land adjoining to the south-east, a series of road connections and direct road frontages to Lot 105 will be provided via subdivision of the Panorama Road lots. This will enable permeable vehicle and cycle / pedestrian access through the eventual Big Grove residential area.

2.2.2 SHARED USE PATHS / FOOTPATHS

There are currently no footpaths or shared paths connecting to the site or the localities of Little Grove and Big Grove.

Under the structure plan proposal for the land adjoining to the south-east, a dual-use / shared path network will eventually run through the series of foreshore reserves (including Lot 105) and connect to Little Grove. The ceding of the foreshore reserve from Lot 105 will enable this dual-use / shared path connection to be realised.

2.2.3 SERVICES

The site currently has capability to connect to the Water Corporation's reticulated water supply and Western Power's overhead power network both found in the Frenchman Bay Road verge. Connection to NBN Co's high-speed telecommunications network is also available.

There is currently no access to reticulated sewerage, however, Water Corporation has a long-term strategy to place a wastewater pump station central to the future Big Grove gravity catchment and pump to a discharge point in Little Grove via pressure main.

3.0 PROPOSAL

The proposal is to amend LPS 1 pursuant to section 75 of the *Planning and Development Act 2005* by rezoning Lot 105 Lot 105 on Deposited Plan 230421, Frenchman Bay Road, Big Grove from Public Use to Future Urban.

The justification for this is as follows:

1. The property is not Crown land, nor is it subject to a Crown grant or lease. It is an unencumbered freehold lot held in fee simple. To continue to reserve the land for Public Use has potential compensation implications for the City of Albany should it refuse an application to develop the land in the future.
2. The long-term intention and aspirations of the owner to develop this freehold lot for private purposes; a natural entitlement which comes with holding fee simple real estate.
3. The lot holds a highly strategic position between the fully serviced areas of Little Grove and minimally serviced and underutilised areas of Big Grove. For this reason, in 2006 the then Minister for Planning and Infrastructure –
 - recommended the City of Albany designate the Big Grove locality for shorter term development in the draft ALPS based on the possibility of earlier servicing; and
 - instructed her department to discuss with the Water Corporation with a view to facilitate the servicing of Big Grove with reticulated sewerage.

For the same reason the ALPS was amended to identify Lot 105 as Future Urban on Map 9B (Strategic Plan: Urban) upon endorsement in 2010.

4. The positive outcomes of correctly zoning Lot 105 for Future Urban, as follows:
 - The eventual ceding of land for the protection of the Water Corporation water field (bore) in perpetuity.
 - The eventual ceding of foreshore land to enable coastal processes and to provide public access.
 - The ceding of land for biodiversity and conservation purposes.
 - The provision of roads, car parks and footpaths to provide access to and enjoyment of the foreshore in accordance with *State Planning Policy No. 2.6 – State Coastal Planning Policy* (SPP 2.6).
 - An extension of services into the Big Grove locality, including reticulated sewerage which will assist in reducing nutrient export into Princess Royal Harbour.
 - An increased level of fire protection, through the introduction of asset protection zones, hazard separation zones and fire-fighting hydrants (through the provision of reticulated water).

Following rezoning very little will alter materially. Before any subdivision approval may be granted, a structure plan will need to be prepared and advertised for public comment to guide the future subdivision and development of the land. For now, a map has been prepared to show the constraints acting on the land to flag the relevant considerations for more detailed review at the structure planning stage (refer **Appendix 5 – Constraints Mapping**).

Supporting the rezoning is a bushfire management plan (BMP) prepared by Bushfire Prone Planning (refer **Appendix 6 – Bushfire Management Plan**) and a coastal processes allowance assessment (CPAA) prepared by Seashore Engineering (refer to **Appendix 11 – Allowance for Coastal Processes Assessment**).

The BMP follows the strategic proposal template provided by the DPLH and shows indicative areas for development, the purpose being to prove that the subject land is capable of managing risks associated with bushfire, without impacting of adjacent properties. The indicative areas are not necessarily planned for development, due to allowance required to manage coastal processes.

The CPAA follows procedures defined by the SPP 2.6.

4.0 STATE AND LOCAL PLANNING FRAMEWORK

4.1 CITY OF ALBANY LOCAL PLANNING SCHEME No. 1 (2014)

The whole of Lot 105 is currently reserved Public Use pursuant to LPS 1, with the southwest portion closest to Frenchman Bay Road identified as part of the Public Drinking Water Sources Special Control Area (refer to **Appendix 7 – Local Planning Scheme No. 1 Map Sheet**).

Pursuant to clause 3.4.1. of LPS 1, a person may use and / or carry out development on a scheme reserve after having obtained planning approval under Part 9. While the current reservation does not preclude the registered proprietor from using or developing the land with development approval, it does remove certainty for all, including the local community. Without an ultimate and legitimate purpose intended for a scheme reserve not already Crown land (i.e. land purchased by the State or ceded for conservation, recreation, drainage etc.), a responsible authority has tenuous grounds for keeping the land within a local scheme reservation, as is the case in this instance.

4.2 POLICY IMPLICATIONS

4.2.1 STATE PLANNING POLICY No. 2 – ENVIRONMENT AND NATURAL RESOURCES POLICY (2003)

State Planning Policy No. 2 – Environment and Natural Resources (SPP 2) broadly defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.

The objectives of the policy are –

- “* **to integrate environment and natural resource management with broader land use planning and decision-making.**
- * **to protect, conserve and enhance the natural environment; and**
- * **to promote and assist in the wise and sustainable use and management of natural resources.”**

The above objectives provide the context for the policy measures which are logical and aimed at preserving water resources, air quality, soil and land quality, biodiversity, landscapes etc. The scheme amendment proposal in this instance is consistent with the broad applying policy measures and objectives of SPP 2.

4.2.2 STATE PLANNING POLICY No. 3 – URBAN GROWTH AND SETTLEMENT (2006)

The scheme amendment is broadly consistent with the objectives and policy measures of *State Planning Policy No. 3 – Urban Growth and Settlement*. Most relevant are the policy measures under section 5.1 below:

"The key requirements for sustainable communities are-

- * ***sufficient and suitable serviced land in the right location for housing, employment, commercial, recreational and other purposes, coordinated with the efficient and economic provision of transport, essential infrastructure and human services;***
- * ***variety and choice in the size, type and affordability of housing to support a range of household sizes, ages and incomes and which is responsive to housing demand and preferences;***
- * ***affordable land for housing and affordable housing products in both greenfield and brownfield locations to ensure the housing needs of all the community can be met including those with special needs;***
- * ***making the most efficient use of land in existing urban areas through the use of vacant and under-utilised land and buildings, and higher densities where these can be achieved without detriment to neighbourhood character and heritage values; the cost-effective use of urban land and buildings, schools and community services, infrastructure systems and established neighbourhoods; and promoting and encouraging urban development that is consistent with the efficient use of energy;"***
- * ***directing urban expansion into designated growth areas which are, or will be, well serviced by employment and public transport;***
- * ***supporting higher residential densities in the most accessible locations, such as, in and around town and neighbourhood centres, high frequency public transport nodes and interchanges, major tertiary institutions and hospitals, and adjacent to high amenity areas such as foreshores and parks;***
- * ***proper consideration of the environment, recognising the need to restore and enhance as well as protect biodiversity and to minimise development impacts on land, water, energy, minerals, basic raw materials, agriculture and other natural resources that help sustain urban economies and society;"***

It should be noted here that the scheme amendment will provide a statutory head of power for the land to be subjected to proper structure planning processes (including formal community consultation) that address the above requirements among the other policy / strategy considerations. For now, the rezoning meets the stated objective of directing land into a designated growth area without causing notable change to the locality (as viewed from Frenchman Bay Road and surrounding properties) and without significant environmental impact, in an area that is serviceable with infrastructure but currently under-utilised.

4.2.3 STATE PLANNING POLICY No. 2.6 – STATE COASTAL PLANNING POLICY (2013)

The CPAA submitted as an attachment to this amendment document addresses the requirements of SPP 2.6.

In 2010 MP Rogers completed a coastal setback assessment of an adjacent landholding to the south at Big Grove under the 2003 version of SPP 2.6. In 2013, the SPP 2.6 was amended with numerous variations to the method of assessing the coastal process allowance, in particular an increase in the allowance for sea level rise from 40 metres to 90 metres and revised interpretation of the horizontal setback datum (HSD).

SPP 2.6 notes that on a sandy coast such as Big Grove, the allowance for erosion should be measured from the HSD and calculated as the sum of the factors: S1 Erosion; S2 Erosion; and S3 Erosion plus 0.2 metres per year allowance for uncertainty.

The total allowance for coastal processes on Lot 105, Frenchman Bay Road has been calculated as 137 metres, as outlined in Table 4.5 of the CPAA below:

Scenario	100-year timeframe
S1 Allowance	5 metres
S2 Allowance	22 metres
S3 Allowance	90 metres
Uncertainty	20 metres
Total	137 metres

4.2.4 GOVERNMENT SEWERAGE POLICY (2019)

Under the provisions of section 6.1 of the WAPC's 2019 *Government Sewerage Policy*, development of the subject lot will be required to connect to reticulated sewerage, as it does not meet any exemptions. In this respect:

- The City of Albany has advised that connection to reticulated sewerage is required on planning grounds. It advises that any absence of reticulated sewerage may prejudice the ability to provide sewerage to Big Grove generally and jeopardise future land development which is supported by existing strategies and plans (i.e. 2019 LPS and structure plan for the land to the immediate southeast).
- The Water Corporation has prepared a long-term strategy map to service Big Grove with reticulated sewerage and has determined the site can be reasonably connected to reticulated sewerage, in consideration of the most practicable servicing option.
- The cumulative impact of on-site sewage disposal is deemed likely to have a detrimental impact on the water quality of a public drinking water source area, sewage sensitive area or other waterway or wetland. In this respect the mapping associated with the draft Government Sewerage Policy indicates the land as being within 2 kilometres of a selected estuary / inlet, and with that the risks are considered too great to entertain on-site effluent disposal, notwithstanding the proximity of the site to a Water Corporation bore.

4.2.5 CITY OF ALBANY LOCAL PLANNING STRATEGY (2019)

A review of the 2010 ALPS commenced in 2014 and has now culminated in the LPS that was endorsed by the WAPC in November 2019.

Like the superseded ALPS, the Local Planning Strategy 2019 map (i.e. Figure 2 of Part 1) identifies the subject lot as Urban Growth.

The relevant statements concerning this Urban Growth category are contained on page 6, with the following overleaf most relevant:

- “1. The land designated as ‘Urban Growth’ in Figure 2 will accommodate predicted population growth beyond the 10 – 15 years lifetime of this Strategy. The development of land designated as ‘urban growth’ and existing vacant, serviced lots are a priority for the City, as this will result in the utilisation of existing infrastructure and services.

In accordance with this direction, the land is proposed to be rezoned such that future structure planning may be undertaken.

4.2.6 STATE PLANNING POLICY No. 3.7 – PLANNING IN BUSHFIRE PRONE AREAS (2015)

State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7) requires fire hazard to be considered in planning decisions to avoid increasing the risk through inappropriately located or designed land use and development.

For more strategic proposals such as a local scheme amendment, SPP 3.7 requires:

- A bushfire attack level (BAL) contour map to determine the indicative acceptable BAL ratings across the subject site, in accordance with the guidelines (i.e. where the lot layout of the proposal is known). The BAL contour map should be prepared by an accredited bushfire planning practitioner.
- The identification of any bushfire hazard issues arising from the relevant assessment.
- Clear demonstration that compliance with the bushfire protection criteria in the guidelines can be achieved in subsequent planning stages.

To meet the requirements of SPP 3.7 and the underlying *Guidelines for Planning in Bushfire Prone Areas* (including appendices) a BMP for strategic proposal has been prepared for the consideration of the City of Albany, Department of Fire and Emergency Services and DPLH. This BMP includes a BAL contour map based on conceptual structure plan that has been presented to City of Albany on a ‘without prejudice’ basis to provide an indicative lot / reserve layout and yield and road / access configuration to enable the advancement of the local water management strategy, BMP etc.

The BMP identifies the bushfire hazard issues arising from the assessment, then demonstrate that compliance with the bushfire protection criteria in the guidelines can be achieved in subsequent planning stages. This includes detailed compliance notes regarding Elements 1 (Location) and 2 (Siting and Design of Development), 3 (Vehicle Access) and 4 (Water).

4.2.7 BETTER URBAN WATER MANAGEMENT (2008)

As has been mentioned, a strategic-level LWMS has been prepared to accompany this rezoning request. The LWMS embodies the water sensitive design principles in accordance with the direction of the *Better Urban Water Management* policy.

Stormwater runoff generated from the development will be dealt with under best practice stormwater management to avoid adverse environmental impacts. The impact of stormwater runoff will be negated by adopting appropriately sized drainage swales and basins with nutrient-stripping measures in the areas of road and drainage reserves and / or easements. This approach to stormwater management will adequately address drainage issues within the study area.

As agreed with the DWER, the LWMS will be refined at the structure planning stage to include further technical details. Then beyond this, a detailed UWMP will be required to be prepared as a condition of approval prior to the subdivision construction stage, consistent with policy and the approach taken with other similar projects

5.0 PLANNING COMMENT

The March 2011 City of Albany council resolution set down several precursory requirements that were required to be fulfilled before it would formally consider a local planning scheme amendment and subsequent structure plan, subdivision application etc. At the time, the SAR process identified six key items to be addressed. These are identified in italics below with a comment in response identifying the work that has been carried out over the ensuing seven years to address each item:

“A. Studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation.”

Opus prepared the initial Environmental Opportunities and Constraints Analysis in 2008 to support the initial SAR application. Following review of this by the then Department of Environment and Conservation, it recommended the following further studies in its correspondence from 10 August 2011:

“* A Level 2 Survey, as per EPA guidance statements 20, 33, 51 and 56, including a comprehensive fauna and invertebrate survey, over more than one season.

**** Flora and vegetation survey and units needs to be consistent with the Albany Regional Vegetation Survey, Sandiford and Barrett 2010 as identified in EPA Bulletin No 13 as a key information source to guide land use planning.***

This will include further field survey and validation of vegetation mapping to enable an assessment of regional significance.

This survey particularly needs to give attention to vegetation unit 44 Banksia littoralis Woodland/ Melaleuca incana Shrubland which was mapped as occurring on the site during the survey.

The Western Australian Threatened Ecological Communities Scientific Committee recommended that the “Banksia littoralis Woodland/ Melaleuca incana Shrubland” be ranked as Critically Endangered under Criteria B) iii), but ranked P1 in the interim; an

**** Survey and analysis should consider conservation and biodiversity values in total and not be restricted to significant species or communities. Connectivity, habitat value and minimisation of fragmentation are all issues of conservation significance that need to be addressed; the juxtaposition of the site with the Torndirrup National Park, the adjoining City of Albany Crown reserve to the north-west and connectivity along the foreshore reserve are all important in this regard;”***

Opus subsequently commissioned a flora and vegetation survey and level 2 fauna survey in accordance with the direction above. The report findings and recommendations deduced from these 2012 surveys were placed into Addendum to Environmental Opportunities and Constraints Analysis report and presented to the what became DPaW in June 2014.

DPaW reviewed this report and identified three main areas of contention / concern in its letter dated 27 March 2015, namely:

- The site should be considered significant habitat for Western Ringtail Possum and Carnaby's Black Cockatoo based on EPBC Act guidelines.
- Priority Ecological Community (PEC) ARVS 44 *Banksia littoralis* woodland / *Melaleuca incana* shrubland should be identified as an ecological constraint.
- Phytophthora dieback survey needs to be undertaken by a certified dieback interpreter rather than relying on comments made by botanist.

In response, the owner's environmental consultant, Accendo Australia, advised on 10 June 2015:

- “• ***While the subject site supports habitat associated with Western Ringtail Possums and Carnaby's Black Cockatoo, the significance of this habitat in terms of the species' persistence has not been demonstrated in studies, and therefore it may not constitute 'significant habitat'.***
- ***Sandilands and Barrett's (2010) explanation for the degraded condition of the PEC is supported by the groundwater monitoring results from DoW groundwater bore No. 60218179 (1977 – 1995). Further, if the subject site is also infected with dieback, then the changing state of the PEC is unlikely to be reversible.***
- ***A dieback survey does not need to be considered at this planning stage as the outcomes will not impact the overall design of the subdivision, whereas the more practical approach (which has been used successfully in the past) is to deem the site 'Uninterpretable' and apply suitable management measures accordingly (as opposed to undertaken additional surveys)."***

In its final reply on 21 July 2015, DPaW advised as follows:

- “• ***Sandiford and Barrett Parks and Wildlife supported the statement in the Addendum regarding 'significant habitat' for black cockatoo species and western ringtail possum with respect to EPBC Act Guidelines. Assessment and determination of significance under these guidelines is a matter for the Australian Government Department of Environment through an EPBC Act referral. Parks and Wildlife acknowledge that a referral assessment may determine the habitat as not significant;***
- ***Sandiford and Barrett (2010) suggested there are possibly multiple threats impacting on the Priority Ecological Community ARVS 44 *Banksia littoralis* Woodland / *Melaleuca incana* Shrubland and there have not been any detailed studies to determine which of these threats are key drivers of decline. Therefore the PEC should not be discounted as an ecological constraint on hydrology alone. Parks and Wildlife considers that the PEC should be a consideration in the assessment of a Scheme Amendment Request; and***

- ***Parks and Wildlife recommended dieback survey prior to construction which would occur after a scheme amendment request has been considered and approved. Therefore would not be required at this stage in the planning. However the term 'uninterpretable' refers to an area that does not have sufficient indicator species (due to vegetation type or impacts such as fire) and therefore it would not be accurate to use this term for Lot 105.***

Most importantly, DPaW was satisfied that sufficient consideration had been given to the issues at hand and concluded its advice by stating (refer to **Appendix 9 – Comments on Addendum to Environmental Opportunities and Constraints Analysis**):

“The department considers the advice provided previously and above to be sufficient to allow the proponent for Lot 105 to progress a Scheme Amendment Request and subsequent planning stages.”

It should be noted that the ecological constraints are mapped as part of the overall constraints mapping within Appendix E of the Addendum to Environmental Opportunities and Constraints Analysis report.

“B. The identification of an appropriate foreshore reserve in accordance with the Western Australian Planning Commission Statement of Planning Policy 2.6.”

A proposed foreshore reserve is mapped on the overall constraints mapping within Appendix E, however this has since been updated by a coastal processes allowance assessment (2020), undertaken in accordance with the SPP 2.6. The total allowance for coastal processes on Lot 105, Frenchman Bay Road has been calculated as 137 metres. In addition to the allowance for coastal processes, an additional area needs to be considered as a future foreshore management area.

“C. The protection of the South Coast Water Reserve and the existing well-head on Reserve 931 to the satisfaction of the Department of Water and the Water Corporation.”

A specific area category, Public Drinking Water Sources Special Control Area already applies to the subject lot via the local planning scheme and the intention is that this would be left untouched (i.e. existing remnant vegetation cover) and ceded as reserve as part of any future development. Such is shown on the overall constraints mapping within Appendix E.

The reservation and retention of vegetation in this area was supported by the Department of Water in its letter dated 11 March 2015 following review of the overall Addendum to Environmental Opportunities and Constraints Analysis.

“D. The land required for vegetation protection, water resource protection, foreshore reserve and fauna habitat and corridor protection should be designated as 'Park and Recreation' reserve.”

As per responses to items A, B and C, the constrained areas that are likely to be required for vegetation protection, water resource protection, foreshore reserve and fauna habitat and corridor protection (and ultimately reservation as part of a future structure plans) are mapped as part of the overall constraints mapping at Appendix 5 of this report, which includes the coastal processes allowance line from the CPAA.

“E. The inclusion of a Local Water Management Strategy to the satisfaction of Council and the Department of Water.”

Following address of items A - D and F by 2016, attention was turned to preparing a LWMS to address item E.

Under the terms of the *Better Urban Water Management* policy, a local water management strategy is typically prepared in conjunction with a local structure plan, where the subdivision design can be aided by depth to groundwater information, while the lot layout and road configuration can introduce elements of water-sensitive design and best-practice water management. In this instance, because the City of Albany council resolution related to the initiation of rezoning (local planning scheme amendment), to bring the land under an appropriate zone for freehold land with development potential (rather than scheme reserve), the LWMS was initially submitted in early 2016 as a more strategic document. It was constructed on hypothetical development scenarios and reliant on groundwater data from monitoring bores on adjoining sites.

In May 2016 the City of Albany and the then Department of Water (DoW) requested an indicative / conceptual subdivision layout to review the proposals of LWMS against. To satisfy this request, a conceptual structure plan was prepared to advance the assessment of the LWMS. The DoW then requested that site-specific groundwater monitoring be undertaken throughout 2017, as it was unsupportive of relying on data from adjoining sites.

Bores were installed on-site in the early 2017 and measurements taken each month from April until November (inclusive). This data was then incorporated into a revised version of the LWMS and resubmitted to the now DWER in late 2017. Several minor issues were identified by DWER, which were subsequently addressed in a final version (version 3). On 15 March 2018 the DWER confirmed the LWMS as submitted, reflected current DWER policy and principles, but lacked some technical detail, best delivered when the urban form is finalised (i.e. structure plan phase) (refer to **Appendix 10 – Comments on Local Water Management Strategy**). On this basis the LWMS is considered to have addressed item E of the 2011 City council resolution.

“F. The addressing of infrastructure provision and servicing requirements, inclusive of any associated buffers and easements to the satisfaction of the various servicing authorities.”

On 10 February 2016 a final version of the infrastructure servicing report was submitted to the City of Albany including changes and additional information requested in comments provided earlier by City engineers and planners.

6.0 CONCLUSION

Having given due regard to relevant statutes, policies, property attributes and precedents, the proposed rezoning proposed by this amendment to LPS 1 are considered to be in accordance with the planning objectives and framework for the locality.

This document is therefore submitted to underpin the processing of this amendment.

7.0 APPENDICES LIST

- APPENDIX 1 – LOCATION PLAN (CITY OF ALBANY, 2018)
- APPENDIX 2 – RECORD OF CERTIFICATE OF TITLE (LANDGATE, 2010)
- APPENDIX 3 – SUPERSEDED TITLE AND SKETCH (LANDGATE, 2010)
- APPENDIX 4 – OUTLINE DEVELOPMENT PLAN - BIG GROVE (CITY OF ALBANY, 2011)
- APPENDIX 5 – CONSTRAINTS MAPPING (ABLE PLANNING & PROJECT MANAGEMENT, 2020)
- APPENDIX 6 – BUSHFIRE MANAGEMENT PLAN (BUSHFIRE PRONE PLANNING, 2018)
- APPENDIX 7 – LOCAL PLANNING SCHEME No. 1 MAP SHEET (DEPARTMENT OF PLANNING, 2018)
- APPENDIX 8 – ALBANY LOCAL PLANNING STRATEGY MAP (DEPARTMENT OF PLANNING, 2012)
- APPENDIX 9 – COMMENTS ON ADDENDUM TO ENVIRONMENTAL OPPORTUNITIES AND CONSTRAINTS ANALYSIS (VARIOUS AGENCIES, 2015)
- APPENDIX 10 – COMMENTS ON LOCAL WATER MANAGEMENT STRATEGY (DEPARTMENT OF WATER AND ENVIRONMENTAL REGULATION, 2018)
- APPENDIX 11 – COASTAL PROCESSES ALLOWANCE ASSESSMENT (SEASHORE ENGINEERING, 2020)

Planning and Development Act 2005

CITY OF ALBANY LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

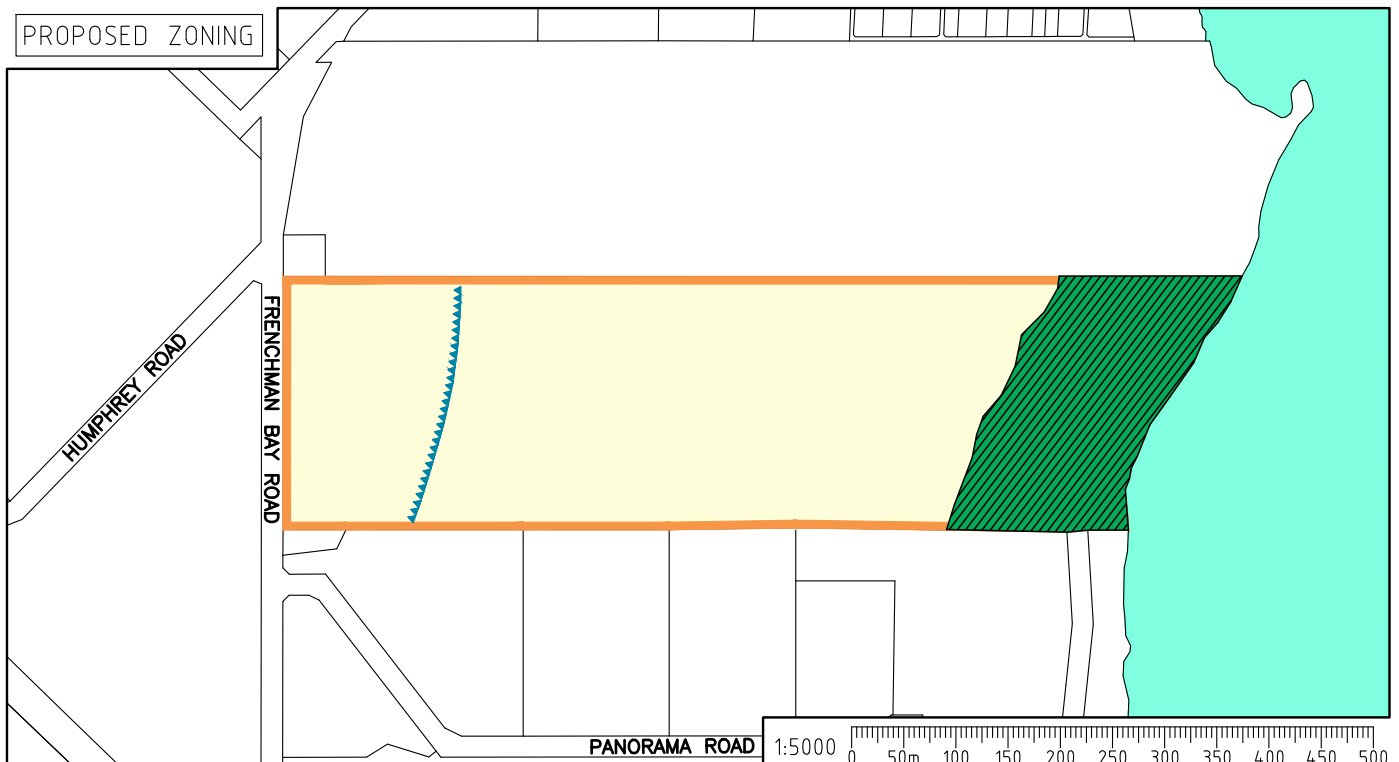
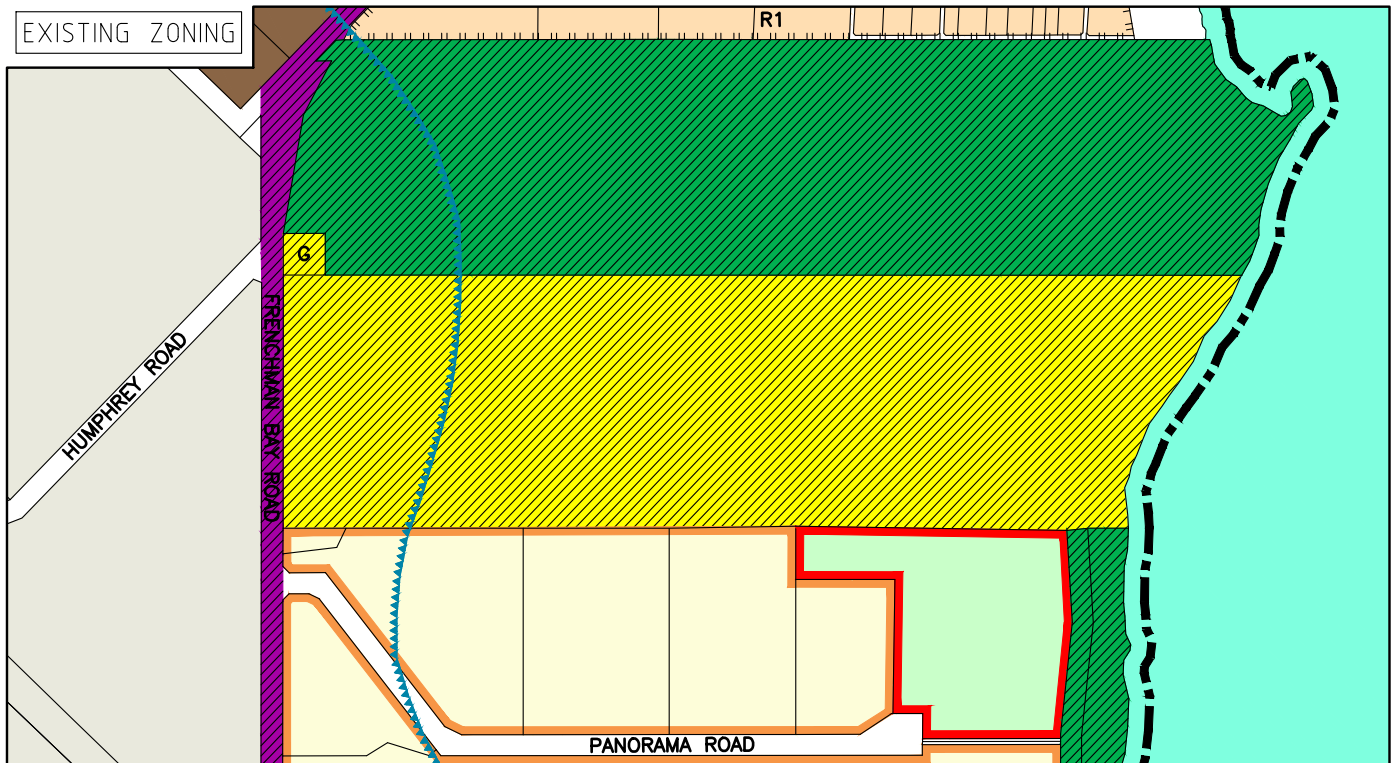
The City of Albany under and by virtue of the powers conferred upon it in that behalf by the *Planning and Development Act 2005*, hereby amend the above local planning scheme by:

1. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Future Urban.
2. Rezoning portion of Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road, Big Grove from Public Use to Parks and Recreation
3. Amending the Local Planning Scheme map accordingly.



SCHEME AMENDMENT MAP

City of Albany
Local Planning Scheme No. 1 - Amendment No. 34



LOCAL SCHEME ZONES		LOCAL SCHEME RESERVES		OTHER CATEGORIES	
	Residential		Local Road		R1 R Codes
	Caravan and Camping		Priority Road		Waterbodies
	Rural Residential		Parks and Recreation		Scheme Area Boundary
	General Agriculture		Public Use : Government		Public Drinking Water Sources
			Future Urban		Special Control Areas
			Public Use		



ADOPTION

Adopted by resolution of the Council of the City of Albany at the Meeting of the Council held on the day of 20.....

.....
MAYOR

.....
CHIEF EXECUTIVE OFFICER

FINAL APPROVAL

Adopted for final approval by resolution of the City of Albany at the Meeting of the Council held on the day of 20..... and the Common Seal of the City of Albany was hereunto affixed by the authority of a resolution of the Council in the presence of:

.....
MAYOR

.....
CHIEF EXECUTIVE OFFICER

Recommended / Submitted for final approval

.....
Delegated under S.16 of the
Planning and Development Act 2005

Date

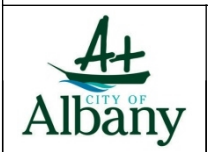
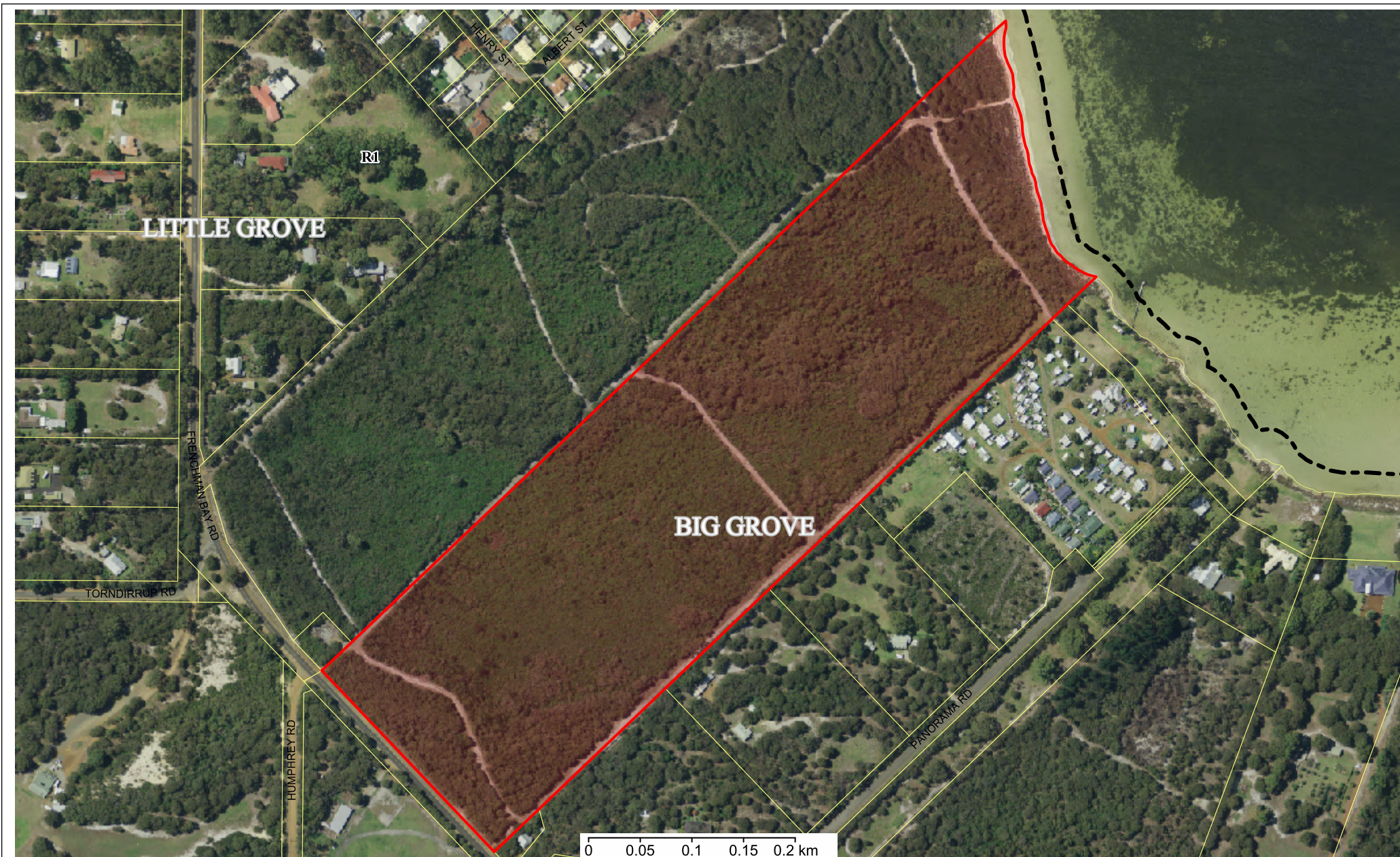
Final Approval Granted

.....
MINISTER FOR PLANNING

Date

APPENDIX 1 – LOCATION PLAN

(City of Albany, 2018)



This web map has been produced by the City of Albany using data from a range of agencies. The City bears no responsibility for the accuracy of this information and accepts no liability for its use by other parties. Landgate and West Australian Planning Commission information contained on this website is for personal and non-commercial use and is to be used as a guide only. Use for commercial advantage or monetary compensation is strictly prohibited and no responsibility is taken as to the reliability, currency or accuracy of the data contained on this website or any output derived from the data. © Landgate (2017)



29/10/2018
1:5000



APPENDIX 2 – RECORD OF CERTIFICATE OF TITLE

(Landgate, 2010)

WESTERN



AUSTRALIA

REGISTER NUMBER 105/DP230421	
DUPLICATE EDITION N/A	DATE DUPLICATE ISSUED N/A

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **2182** FOLIO **323**

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.

R. Roberts

REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 105 ON DEPOSITED PLAN 230421

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

THE ROMAN CATHOLIC BISHOP OF BUNBURY OF PARKFIELD STREET, BUNBURY
(XE H355902) REGISTERED 11 JANUARY 2000

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

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: 2182-323 (105/DP230421).
PREVIOUS TITLE: 35-120.
PROPERTY STREET ADDRESS: 795 FRENCHMAN BAY RD, BIG GROVE.
LOCAL GOVERNMENT AREA: CITY OF ALBANY.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PLANTAGENET LOCATION 105 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 105 ON DEPOSITED PLAN 230421 ON 03-OCT-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.

APPENDIX 3 – SUPERSEDED TITLE AND SKETCH

(Landgate, 2010)

ORIGINAL: Not to be removed from the Department of Land Administration.

Sundry Document H355902

Volume 35 Folio 120

WESTERN



AUSTRALIA

VOLUME FOLIO
2182 323
IN THE REGISTER



CERTIFICATE OF TITLE

UNDER THE "TRANSFER OF LAND ACT, 1893" AS AMENDED

The person described in the First Schedule hereto is the registered proprietor of the undermentioned estate in the undermentioned land subject to the easements, encumbrances and notices shown in the Second Schedule hereto.

Dated 11th January, 2000

J. Hyle
REGISTRAR OF TITLES

ESTATE AND LAND REFERRED TO

Estate in fee simple in Plantagenet Location 105, delineated on the map in the Third Schedule hereto.

FIRST SCHEDULE (continued overleaf)

The Roman Catholic Bishop of Bunbury of Parkfield Street, Bunbury.

SECOND SCHEDULE (continued overleaf)

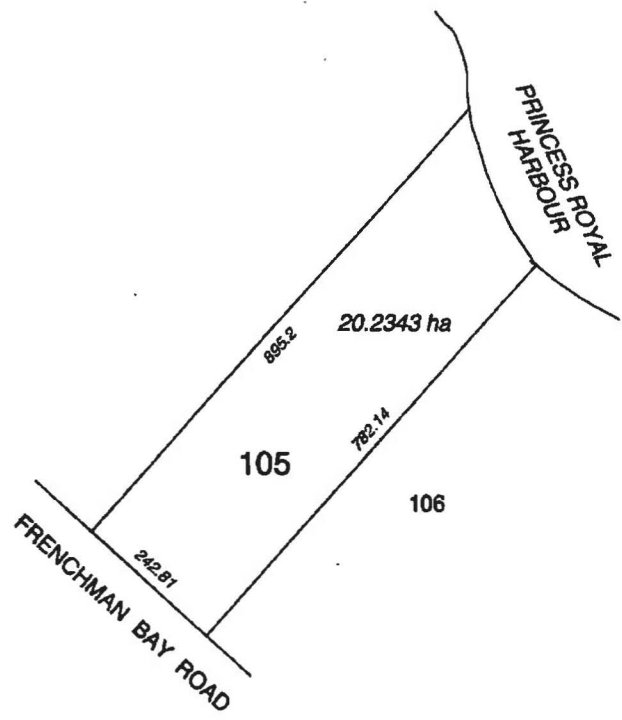
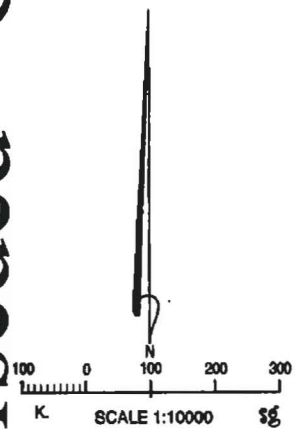
CAVEAT 340/1953. Lodged 24.3.53 at 9.00 o'clock.

THIRD SCHEDULE

Superseded - Copy for Sketch Only

ORIGINAL CERTIFICATE OF TITLE

ORIGINAL CERTIFICATE OF TITLE



NOTE: Entries may be affected by subsequent endorsements.

LAND OFFICE OF ORIGINAL TITLE TO SCALE WCD OCT 27 11:00:30 2010 JOD 3349/2330

FIRST SCHEDULE (continued)

NOTE: ENTRIES MAY BE AFFECTED BY SUBSEQUENT ENDORSEMENTS

Superseded - Copy for Sketch Only

PARTICULARS	INSTRUMENT		REGISTERED	TIME	SEAL & INITIAL
	NATURE	NUMBER			

VOLUME FOLIO
 2182 323
 IN THE REGISTER

SECOND SCHEDULE (continued)	REGISTERED or LODGED	TIME	SEAL & INITIAL	CANCELLATION		REGISTERED or LODGED	SEAL & INITIAL
				NATURE	NUMBER		

APPENDIX 4 – OUTLINE DEVELOPMENT PLAN - BIG GROVE

(City of Albany, 2011)



Planning & Development Services

City of Albany Policy

OUTLINE DEVELOPMENT PLAN - BIG GROVE

OUTLINE DEVELOPMENT PLAN - BIG GROVE

1) **General Requirements**

The purpose of the Big Grove ODP is to guide and coordinate future land use, subdivision and development for land zoned 'Residential Development' within the plan area, in accordance with the provisions of the City of Albany's Town Planning Scheme. The plan area also includes land currently zoned 'Motel' and 'Rural' and reserved for 'Public Purposes' and 'Parks and Recreation', with the ODP also providing guidance on preferred future land use, subdivision and development for these areas.

Land not zoned Residential Development may require rezoning prior to subdivision and development in accordance with the ODP.

Minor variations to the requirements of the ODP may be supported subject to complying with the ODP Objectives described in Section 2 below.

1.2 **Land Use**

Land use within the ODP area is regulated by Table 1 of the City of Albany Town Planning Scheme, which nominates the permissibility of specific land 'Use Classes' within the various zones. The Big Grove ODP provides guidance to the City of Albany in the exercising of discretion for the location and layout of land uses within the ODP area.

Residential density as nominated on the ODP plan shall be in accordance with the provisions of the R Codes except where varied by this ODP.

Where there is a discrepancy between the provisions of the Scheme and this ODP, the provisions of the Scheme shall apply.

1.3 **Subdivision**

Subdivision within the ODP area is to be consistent with the objectives provided in Section 2, and the ODP plan with regard to the design of movement networks, distribution of public open space areas, residential densities and lot configuration.

Residential density as nominated on the ODP plan shall be in accordance with the provisions of the R Codes except where varied by this ODP.

1.4 **Development**

Council shall be guided by the ODP and any Detailed Area Plans within the ODP area when giving consideration to development which requires Council approval for all land zoned or reserved within the plan area.

2) **Objectives**

- To facilitate an urban form that provides for housing and associated community facilities which is responsive to the character of the site and the locality, as depicted on the ODP Plan;
- To respond to the natural features of the land including the natural vegetation, foreshore and visual amenity;
- To provide safe and convenient vehicle and pedestrian access;

- To provide a stormwater system that minimises risk to public health and amenity, protects the built environment from flooding and water logging, protects existing waterways, wetland and foreshore and is economically viable in the long term;
- To maintain vegetation, where possible, within road reserves, public open space, foreshore areas, and individual lots; and
- To provide a range of public open spaces catering for both passive and active recreational use by the local community.

3) Residential

Land designated Low Density Residential or Medium Density Residential on the ODP Plan shall be used predominantly for residential housing purposes, consistent with City of Albany Town Planning Scheme objectives for the 'Residential Development' zone. In relation to the R25 density coding, the ODP amends Table 1 of the R-Codes by increasing the minimum average site area from 350m² to 400m².

Land designated 'Residential' (with no density indicator) is included within the South Coast Water Source P2 Protection Area and is to be combined with a building area / lot outside the P2 area. No further subdivision of this land will be permitted. Future land uses in this area must also take into account the Department of Water's Water Quality Protection Guidelines and Codes of Practice. Minor modification to the road layout will be required to facilitate this outcome.

Where an existing house is located within the foreshore (or future foreshore) as shown on the ODP, that house may be subdivided from that lot onto a lot of not less than 1ha subject to the provisions of section 10.

4) Mixed Use

Land designated Mixed Use should be used predominantly for residential purposes, with 'Home Business' and 'Home Occupation' uses also permissible (as provided for in the 'Residential Development' zone under the Scheme).

5) Rural Residential

Land designated rural residential is located within the South Coast Public Drinking Water Source Protection Area and as such no further subdivision of these lots will be supported. Future land uses are also required to be in accordance with the Department of Water's Water Quality Protection Guidelines and Codes of Practice.

6) Tourism

Land designated Tourism is currently used as a caravan park. Continuation of this tourism use is provided for in the ODP. Redevelopment of the site for tourist purposes is also provided for in the ODP subject to meeting other applicable provisions of the ODP particularly height limits, visual amenity, retention of existing vegetation, the provision of reticulated water and reticulated sewerage, etc.

7) Village Centre

The ODP nominates that land designated 'Village Centre' for convenience shopping and commercial uses, along with complementary residential uses, consistent with those permitted by the Scheme within the 'Residential Development' zone.

Development within the Village Centre shall be restricted to 3 storeys in height, and shall be required to accord with a Detailed Area Plan approved for the site. Adaptable residential and commercial use of the ground floor area shall be provided for through a minimum requirement for a 3m floor to ceiling height and provision of disabled access through primary entrances.

8) Primary School

A site for a new primary school is identified on the ODP Plan.

The Primary School shall be subject to an Access and Parking Strategy which shall be provided to the satisfaction of Council and the WAPC (upon advice from the Department of Education) prior to creation of this lot. There is to be no direct access from the school site to Frenchman Bay Road.

9) Public Open Space

The ODP Plan shows the indicative locations for public open space (POS) within the plan area. POS is to be located generally in accordance with the outline development plan. Variations to the location of POS may be supported subject to complying with the objectives of the Plan and State and local government policy.

POS Schedules have also been prepared. Updated POS schedules shall be submitted at the time of subdivision detailing the existing POS and the land proposed for POS in the ODP area at the time of subdivision. The indicative locations for public open space as shown on the ODP plan may need to be modified consistent with updates of the POS schedule. Modifications to the POS schedules shall be considered minor by the WAPC and not require advertising of the ODP.

Where a lot is not required by the ODP to provide at least 10% of the area of the lot as POS, a minimum of 10% of the subdivisible area is to be provided as either land if requested by Council or cash in lieu of land. Any monetary contribution paid to Council shall be used for the purpose of purchase of land for POS or improvements to POS in the ODP area.

10) Foreshore Reserve

A foreshore reserve shall be provided along the length of Princess Royal Harbour as shown on the ODP plan.

Land designated as 'Future Foreshore' on the ODP plan includes either:

- a part of a lot which contains an existing dwelling which may be retained on a lot of not less than 1ha in area; or
- part of the land within the existing caravan park.

Further intensification of land uses within the Future Foreshore area is not supported. The land owner is required to enter into an agreement to this effect at the time of subdivision of an existing house on a retained lot. A notification on the title of the retained lot shall also be required, advising of its vulnerability to coastal processes over the next 100years, and that upon further subdivision or development of the land the future foreshore area as shown on the ODP shall be ceded to the Crown free of cost.

Land designated Future Foreshore shall be dedicated to the Crown as Foreshore Reserve free of cost at the time that the retained lot is further subdivided in accordance with the ODP.

Once the Future Foreshore area has been ceded to the Crown free of cost as a condition of subdivision or development approval, development within the Future Foreshore area shall be in accordance with the approved Big Grove ODP Foreshore Management Plan.

A conceptual Big Grove ODP Area Foreshore Management Plan has been prepared for the ODP area. Development within the Foreshore Reserve shall be in accordance with this Foreshore Management Plan and include (ultimately) a continuous Dual Use Path and specified activity nodes with associated infrastructure (bins, seats etc). Implementation of the Plan shall be either in stages in accordance with subdivision of the adjoining land or via a contribution towards the cost of providing such works. The road abutting the Foreshore Reserve shall be provided with on-street parking and access to the foreshore restricted by bollards and gates / chains to the specification of Council.

Any existing structures within the land ceded free of cost as Foreshore Reserve shall be removed or retained for public use, as agreed with Council. Any buildings proposed within the Foreshore Reserve shall be designed to the satisfaction of Council to ensure acceptable visual impact.

11) Remnant Vegetation

The ODP retains significant remnant vegetation within the foreshore reserve and public open space areas as shown on the ODP plan.

Following detailed assessment by the proponent and State Government agencies the value of remnant vegetation on Lots 7 and 109 could not be determined. The proponent shall undertake further consultation with the EPA to confirm the value of remnant vegetation and appropriate land use prior to any further subdivision and development within that area shown as 'Remnant Vegetation' on the ODP plan. Should the existing ODP design remain appropriate, no further modification to the ODP shall be required.

12) South Coast Water Reserve

The south-western corner of the OPD area is included in the South Coast Water Reserve. A Water Corporation production bore is located within this reserve.

Three existing houses are located within the water reserve, and are shown as rural residential lots on the ODP. Two areas of vacant land are shown as Residential within the reserve which shall be combined with a lot (including building envelope) outside the water reserve to create one single lot each. These lots shall not be further subdivided. The balance of the area within the water reserve is shown as public open space.

Due to the need to protect the integrity of the water reserve, no additional subdivision other than that mentioned above is to be created within the reserve area. Development within the reserve area shall be required to address the water quality management objectives specified in the '*Land Use Compatibility in Public Drinking Water Source Areas*' Water Quality Protection Note and any other applicable policy to the satisfaction of the Council upon the advice of the Department of Water.

13) Road Infrastructure

Road alignments are generally to be located in accordance with the ODP. Variations to the locations may occur where local circumstances dictate in order to protect existing vegetation, provide a better traffic management outcome, refine lot orientations, increase public access to public open space and foreshore areas, etc.

To the extent that the creation of any road shown on the ODP requires any easements or other interest in that land to be extinguished, the proponent must at its cost (including any compensation that may be payable) arrange for the interest to be extinguished.

Intersection treatments are required for the roads within the ODP area intersecting Frenchman Bay Road.

Access to the foreshore is to be maintained from Panorama Road. The road abutting the foreshore shall be provided with on-street parking and access to the foreshore restricted by bollards and gates / chains to the specification of Council.

A Shared Use Path is to be constructed along the foreshore either within the reserve (subject to compliance with the approved Foreshore Management Plan and detailed plans) and/or along parallel roads. The path is to be constructed at the earliest opportunity (with the option for interim alignment/temporary arrangement for staged development). Paths are to be constructed or a contribution paid towards their future construction by each lot owner as a condition of subdivision or development.

Upgrading of Frenchman Bay Road contiguous with the ODP area to be defined by the City of Albany based on impact of development, with costs shared by Big Grove proponents. A proportionate contribution to upgrading other parts of Frenchman Bay Road including intersection treatments in accordance with a Road Contribution Policy to be adopted by Council shall also be required.

Frenchman Bay Road and Hanrahan Road intersection upgrade requirements are to be further defined by the City of Albany in consultation with MRWA, with costs based on apportioned impact of development.

14) Sewer and Water Infrastructure

All future development and subdivision (except for the creation of retained lots to excise existing dwellings adjacent to the foreshore and South Coast Water Reserve Priority 2 Protection Area) within the ODP area is to be provided with reticulated water and reticulated sewerage infrastructure. Subdivision and development within the ODP area shall not be supported unless the proposal can provide reticulated water and sewerage services.

15) Electricity

All future subdivision and development within the plan area shall provide underground reticulated electricity.

16) Urban Water Management

A Local Water Management Strategy (2011) has been prepared and approved for the ODP area.

An Urban Water Management Plan (UWMP) shall be submitted with all subdivision and/or development applications in accordance with the objectives, principles and delivery approach outlined in the Stormwater Management Manual for Western Australia and the principles of the Big Grove Local Water Management Strategy. Prior to designing a UWMP, developers shall consult with the Department of Water (DOW), City of Albany and other relevant stakeholders.

As a means to manage nutrient inputs; design and development is required to retain the post development hydrology as close as possible to the pre-development hydrology. Adequate field investigations shall be undertaken to determine the appropriate hydrologic regime for the site.

Runoff from the constructed impervious areas (e.g. roofs and paved areas) is to be retained or detained on-site through the use of tanks, soak wells, pervious paving, vegetated swales and/or native gardens.

17) Fire Management

A conceptual Fire Management Strategy - Big Grove has been prepared for the ODP area.

A detailed Fire Management Plan shall be prepared for any subdivision and development in the ODP area. Development shall accord with an approved Fire Management Plan in accordance with FESA/WAPC Planning for Bush Fire Protection Edition 2, and the City of Albany Fire Management requirements, which shall accord with the provisions of the Fire Management Strategy for the area, namely:

- Development abutting POS areas within which remnant vegetation is to be retained (namely POS area A, B, C and M) shall provide an adequate (21m) Building Protection Zone (which may include road reserve, foot or dual use path and setback area) and appropriate dwelling construction standard in accordance with AS 3959-2009;
- Development abutting the reserves outside the ODP area at the western and eastern ends of the ODP shall provide a 20m Building Protection Zone (which may include road reserve, foot or dual use path and setback area) and a 20m Fire Hazard Separation Zones (which may include road reserve and setback area as well as cleared areas of

Open Space) to adjacent lots. Buildings within these lots shall comply with AS3959-2009 *Construction of Buildings in Fire Prone Areas*

- Development abutting POS areas which are predominantly cleared (and proposed to remain so – below 2 tonnes fuel load / ha) shall be provided with either a road reserve between the lot and
- POS or an adequate Building Protection Zone, and to comply with an appropriate dwelling construction standard in accordance with AS 3959-2009;
- Development abutting the foreshore shall provide a 20m Building Protection Zone (which may include road reserve, foot or dual use path and setback area) where the adjoining foreshore is vegetated or a lesser setback (to be determined through the applicable Fire Management Plan) if the adjoining foreshore is cleared and designated in the approved Foreshore Management Plan to remain so. Buildings within these lots shall comply with AS3959-2009, with the applicable construction standard determined through the Fire Management Plan;
- A minimum of two entrance / egress points must be maintained from the site to Frenchman Bay Road at all times;
- During development construction, a 6 m wide gravel access (or other suitable buffer) shall be provided between development and non development areas;
- Fire hydrants shall be installed at each stage of development at 200m intervals;
- Remnant vegetation retained on lots shall be maintained below a maximum of 4.6 tonnes fuel load / ha.

18) Geotechnical Investigation and Acid Sulphate Soils Management

A Geotechnical Survey will be required for subdivision or development proposals to determine acidity, contamination and building capability.

The areas defined as having acidity present will need to be treated during the subdivision or development phases.

19) Visual Management

A Visual Amenity Impact Assessment (VAIA) has been prepared for the ODP area. The assessment contains recommendations for the management of visual impacts from the development. All subdivision and development within the ODP area shall be required to comply with the management recommendations of the VAIA including those listed below.

A vegetation screen/buffer is required adjacent to Frenchman Bay Road to screen development from the road. Development along Frenchman Bay Road will be required to be screened to minimise visual impact to the road. Fencing along Frenchman Bay Road to be low visibility and low maintenance to the satisfaction of the City of Albany.

Light colours (zincalume, off white, cream) for roofs of building are not permitted in the Outline Development Area. Preference is for dark tonings, particularly for building facades on the northern edge of the development, including black, dark blue brown, dark red, grey and dark green. Subject to later detailed site specific assessment buildings should be generally limited in height to 3 Storeys. This assessment should also deal with the need for measures (overhanging eaves, recessed windows) to minimise light reflection and glare.

Retention of existing trees (where practical) and planting of additional semi-mature trees along all roads is desirable, and shall be required along boulevard style roads shown on the ODP Plan. Rooflines shall not extend above Grove Hill / Snake Hill ridgeline when viewed from the panorama location identified in the Visual Amenity Impact Assessment.

Where potential for retention of native vegetation is identified on the ODP, native trees shall represent the predominant form of the POS. This may involve some remediation and revegetation,

and some landscape development, as approved in the POS applicable development concept. Areas with regionally or locally significant vegetation shall maintain and enhance this.

Active and passive areas of POS (including the foreshore) are to be developed with appropriated infrastructure and the cost of the developer in accordance with approved plans.

20) Detailed Area Plans

At the time of subdivision and / or development, Council may request the provision of Detailed Area Plans (to be adopted as a Local Planning Policy) for:

- The Village Centre,
- Medium Density Residential R40 sites;
- Mixed Use sites;
- Sites with direct frontage to Public Open Space and Foreshore; and
- Other sites considered significant in the ODP area.

DAPs should reference Requirements 34 to 36 of Element 3 of Liveable Neighbourhoods and may be required to address the following:

- Positioning of building envelopes;
- Orientation of buildings and provision of surveillance;
- Vegetation protection and rehabilitation areas;
- Fencing;
- Vehicle access points; and
- Private Open Space

Uniform fencing shall be provided along existing lot boundaries to protect the amenity of neighbouring landowners.

21) Subdivision

Subdivision applications shall be assessed against the provisions of this Plan and applicable State and local government policies.

Standard conditions expected to be imposed relate to:

- Provision and connection to infrastructure (power, water, sewer, telecommunications);
- Design and construction of road infrastructure and intersections;
- Provision, design (including retention of vegetation) and construction of public open space areas;
- Approval and implementation of a Fire Management Plan;
- Transfer of Foreshore and/or Future Foreshore areas to the Crown free of cost (whichever is applicable under 10);
- Approval and implementation of a Foreshore Management Plan
- Dedication of the land for the primary school or a contribution towards the primary school site acquisition; and
- Preparation of Detailed Area Plans.









Staged subdivision shall consider and address access arrangements, infrastructure co-ordination, fire management, foreshore upgrading obligations and integration with existing and future adjoining development.


Subdivision within the ODP area shall be accompanied by a staging plan to ensure there is sufficient access, egress and services to the site, as required by the Fire Management Plan and servicing agencies.

LEGEND

 Outline Development Plan Boundary

Land Use:

-  Low Density Residential (R10)
-  Low Density Residential (R17.5)
-  Low Density Residential (R25)
-  Medium Density Residential (R30)
- Requires Detailed Area Plan
-  Residential
-  Rural Residential
-  Tourism
-  Mixed Use R30

 Village Centre (R40 - R60)
- Requires Detailed Area Plan and POS Calculation Review

 Primary School

 Public Open Space (Cash In Lieu at subdivision stage for those lots that do not provide 10% open space of land)

 Foreshore Reserve

 Future Foreshore Reserve


 Foreshore Node

 POS / Drainage

Infrastructure:

 Neighbourhood Connector

 Access Street

 Dual Use Path (2m wide) Indicative alignment only
- refer to Foreshore Management Plan

Other:

 South Coast Water Reserve
- Priority 2 Protection Area

 Existing Buildings / Houses


 Detailed Area Plan (DAP) for lots adjoining POS / Foreshore Reserve (permeable fencing, habitable room orientation etc)

 Fire Protection


 POS Identifier

 Drainage Identifier

 Development Plan Provision Identifier

 Existing Parks and Recreation Reserve Boundary (as shown on TPS maps)

 HSD
- Horizontal Setback Datum

 Physical Process and Foreshore Reserve Setback Required by the Department of Planning (M P Rogers / Coffey)

 Remnant Vegetation

OUTLINE DEVELOPMENT PLAN PROVISIONS

GENERAL

- Detailed Fire Management Plans shall be submitted with subdivision applications to the WAPC in accordance with 'Planning for Bushfire Protection - Edition 2'.
- To the extent the creation of any road shown on the ODP requires any easement or other interest in that land to be extinguished, the proponent must at its cost (including any compensation that may be payable) arrange for the interest to be extinguished.
- For areas identified as 'Low Density Residential (R25)' the average site area shall be 400m² rather than 350m² as per Section 9.3 of the Outline Development Plan Report.

(P1)

Should the owner of Lot 17 wish to develop their landholding for residential purposes a re-zoning from 'Motel' to 'Residential Development' zone prior to any residential subdivision or development would be required. Any rezoning requires separate approval by the Minister for Planning.

(P2)

A Detailed Area Plan is required for the Village Centre prior to development and shall be in accordance with the City of Albany Residential Design Code Policy with car parking in accordance with the City of Albany Scheme.

(P3)

Land identified as "Residential" to be retained for vegetation protection and added to one lot outside the Priority 2 Protection Area at the time of subdivision. Further subdivision, erection of a dwelling or waste disposal is prohibited.

(P4)

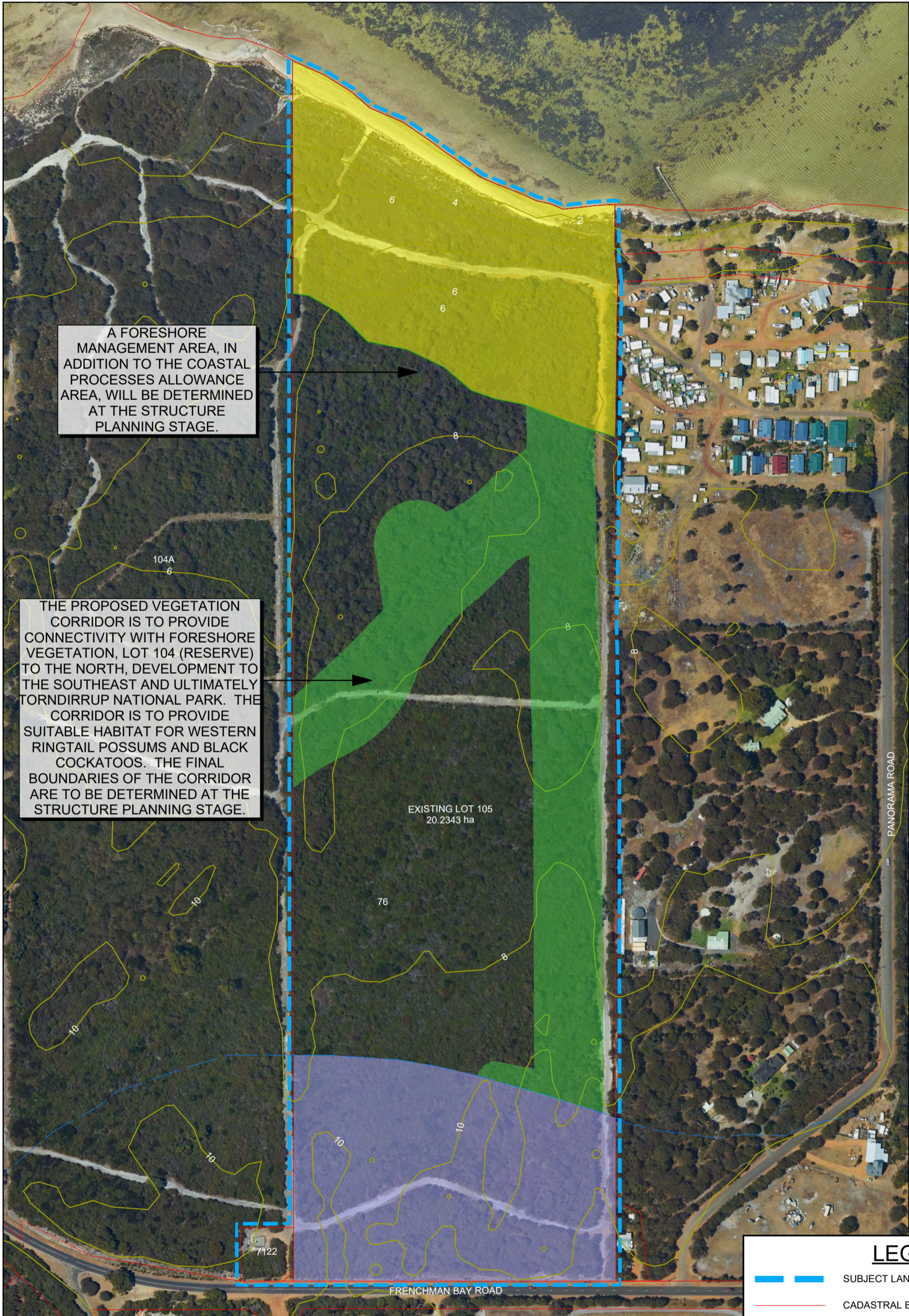
Should a need for widening of the Frenchman Bay Road reserve be identified, such widening will need to be accommodated north of Frenchman Bay Road (to meet the City requirements). Public Open Space schedule may require adjustment at subdivision stage.

(P5)

Frenchman Bay Road Intersection treatments to be designed in accordance with the Traffic Assessment Report at the subdivision stage.

APPENDIX 5 – CONSTRAINTS MAPPING

(Able Planning & Project Management, 2020)



A FORESHORE MANAGEMENT AREA, IN ADDITION TO THE COASTAL PROCESSES ALLOWANCE AREA, WILL BE DETERMINED AT THE STRUCTURE PLANNING STAGE.

THE PROPOSED VEGETATION CORRIDOR IS TO PROVIDE CONNECTIVITY WITH FORESHORE VEGETATION, LOT 104 (RESERVE) TO THE NORTH, DEVELOPMENT TO THE SOUTHEAST AND ULTIMATELY TORNDIRRUP NATIONAL PARK. THE CORRIDOR IS TO PROVIDE SUITABLE HABITAT FOR WESTERN RINGTAIL POSSUMS AND BLACK COCKATOOS. THE FINAL BOUNDARIES OF THE CORRIDOR ARE TO BE DETERMINED AT THE STRUCTURE PLANNING STAGE.

EXISTING LOT 105
20.2343 ha

LEGEND

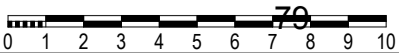
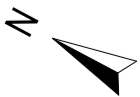
- SUBJECT LAND
- CADASTRAL BOUNDARY
- PUBLIC DRINKING WATER SOURCES SPECIAL CONTROL AREA LINE
- COASTAL PROCESS ALLOWANCE AREA
- INDICATIVE VEGETATION CORRIDOR
- PUBLIC DRINKING WATER SOURCES SPECIAL CONTROL AREA

Project: LOT 105 FRENCHMAN BAY ROAD, BIG GROVE

Drawing Title: CONSTRAINTS MAPPING

Principal: ROMAN CATHOLIC BISHOP OF BUNBURY

This drawing remains the property of Able Planning and Project Management and shall not be used without permission. This drawing shall be preliminary only and/or not for construction until signed approval.



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Date: 07/05/20 Scale: 1:3000
 Designed: AB Checked: AB
 Checked: TL
 Local Authority: City of Albany Sheet 1 Of 1
 Plan/Diagram Number: 230421
 CT Number: 2182-323
 Revision: V1 ORIGINAL: A3

APPENDIX 6 – BUSHFIRE MANAGEMENT PLAN

(Bushfire Prone Planning, 2018)

Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address:

Site visit: Yes No

Date of site visit (if applicable): Day Month Year

Report author or reviewer:

WA BPAD accreditation level (please circle):

Not accredited Level 1 BAL assessor Level 2 practitioner Level 3 practitioner

If accredited please provide the following.

BPAD accreditation number: Accreditation expiry: Month Year

Bushfire management plan version number:

Bushfire management plan date: Day Month Year

Client/business name:

	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the bushfire protection criteria elements)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Is the proposal any of the following (see [SPP 3.7 for definitions](#))?

	Yes	No
Unavoidable development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Strategic planning proposal (including rezoning applications)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
High risk land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Vulnerable land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>


None of the above

Note: Only if one (or more) of the above answers in the tables is yes should the decision maker (e.g. local government or the WAPC) refer the proposal to DFES for comment.

Why has it been given one of the above listed classifications (E.g. Considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

The information provided within this bushfire management plan to the best of my knowledge is true and correct:

Signature of report author or reviewer


81

Date



Bushfire Management Plan

Strategic Proposal (Local Planning Scheme Amendment)

Lot 105 Frenchman Bay Road, Albany

City of Albany

Job Number:	180294
Assessment Date:	2 May 2018
Report Date:	20 August 2018

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Disclaimer

The measures contained in this Bushfire Management Plan are considered to be minimum standards and they do not guarantee that a building will not be damaged in a bushfire, persons injured, or fatalities occur either on the subject site or off the site while evacuating. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions. Additionally, the correct implementation of the required bushfire protection measures (and any associated response/evacuation plan if applicable) will depend, among other things, on the actions of the landowners or occupiers over which Bushfire Prone Planning has no control.

All surveys, forecasts, projections and recommendations made in this report associated with the project are made in good faith based on information available to Bushfire Prone Planning at the time.

All maps included herein are indicative in nature and are not to be used for accurate calculations.

Notwithstanding anything contained therein, Bushfire Prone Planning will not, except as the law may require, be liable for any loss or other consequences whether or not due to the negligence of their consultants, their servants or agents – arising out of the services provided by their consultants.

Document Control



Version	Version Details	Date Submitted
1.0	Achievable BAL Report	11-May-18
Report Version	Amendment Record	Submitted Date
1.1	Updated report to align with revised draft structure plan	23-Jul-18
Report Version	Amendment Record	Submitted Date
1.2	Bushfire Management Plan	20-Aug-18
Author	Accreditation	Signature
Jason Benson	BPAD Level 1 - No. 37893	
Co-Author		
Mick Whitelaw	BPAD Level 2 - No. 37265	
Document Content Compliance Statement		
<p><i>This Bushfire Management Plan (the Plan) provides the required information to address State Planning Policy No. 3.7: Planning in Bushfire Prone Areas - December 2015 (SPP 3.7), the associated Guidelines for Planning in Bushfire Prone Areas - WAPC 2017 v1.3 (Guidelines), and any additional information as directed by the WA Planning Commission (WA Department of Planning, Lands and Heritage). It is fit for accompanying a planning application.</i></p>		
Structure Plan / Subdivision BMP Template v7.3		

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Executive Summary

This Bushfire Management Plan (the Plan) has been prepared to accompany the local planning scheme amendment for Lot 105 Frenchman Bay Road, Albany within the City of Albany. The development site of approximately 20.23 hectares (approximately 86 proposed lots) is within a designated bushfire prone area and the proposal requires the application of State Planning Policy No. 3.7: Planning in Bushfire Prone Areas (SPP 3.7).

The assessed bushfire risk is considered to be manageable and will be achieved by the identified stakeholders implementing and maintaining the bushfire risk management measures that are presented in this plan.

The Proposal, as set out in this Plan, has considered all applicable legislation, policy, standards and guidelines including the four elements of the Bushfire Protection Criteria of location, siting and design, vehicular access and firefighting water supply.

Indicative BAL ratings of BAL-29 or less can be achieved on all of the proposed lots. The proposed development is situated on Frenchman Bay Road which provides options to travel in two different directions. A reticulated water supply is available in the area.

1 The Proposal and Purpose of the Plan

1.1 Details

Proponent:	Able Planning & Project Management
Site Address:	Lot No. 105 Frenchman Bay Road, Albany
Local Government:	City of Albany
Development Area:	20.23 Ha
Planning Stage:	Strategic - Local Planning Scheme Amendment (Rezoning) - Indicative Lot Layout

Overview of the Proposal:

This Bushfire Management Plan (the Plan) has been prepared to accompany the Local Planning Scheme Amendment for Lot 105 Frenchman Bay Road, Albany within the City of Albany.

Bushfire Prone Planning Commissioned to Produce the Plan by:	Able Planning & Project Management
Purpose of the Plan:	To support a Strategic Planning Assessment
For Submission to:	City of Albany



LEGEND

	SUBJECT LAND		CLEARED AREA FOR OPEN SPACE
	EXISTING CONTOURS		BIO-RETENTION BASIN (INDICATIVE)
	PROPOSED BOUNDARIES		VEGETATION RETENTION IN WATER RESERVE
	PROPOSED FORESHORE RESERVE		BLACK ASPHALT
	PROPOSED VEGETATION CORRIDOR		RED ASPHALT
	SOUTH COAST WATER RESERVE		SHARED PATH (2.5m)
			FOOTPATH (2.0m)

1:1500 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

PROJECT LOT 105 / HOUSE 795 FRENCHMAN BAY ROAD, BIG GROVE
 DRAWING TITLE STRUCTURE PLAN
 PRINCIPAL ROMAN CATHOLIC BISHOP OF BUNBURY

ABLE PLANNING & PROJECT MANAGEMENT

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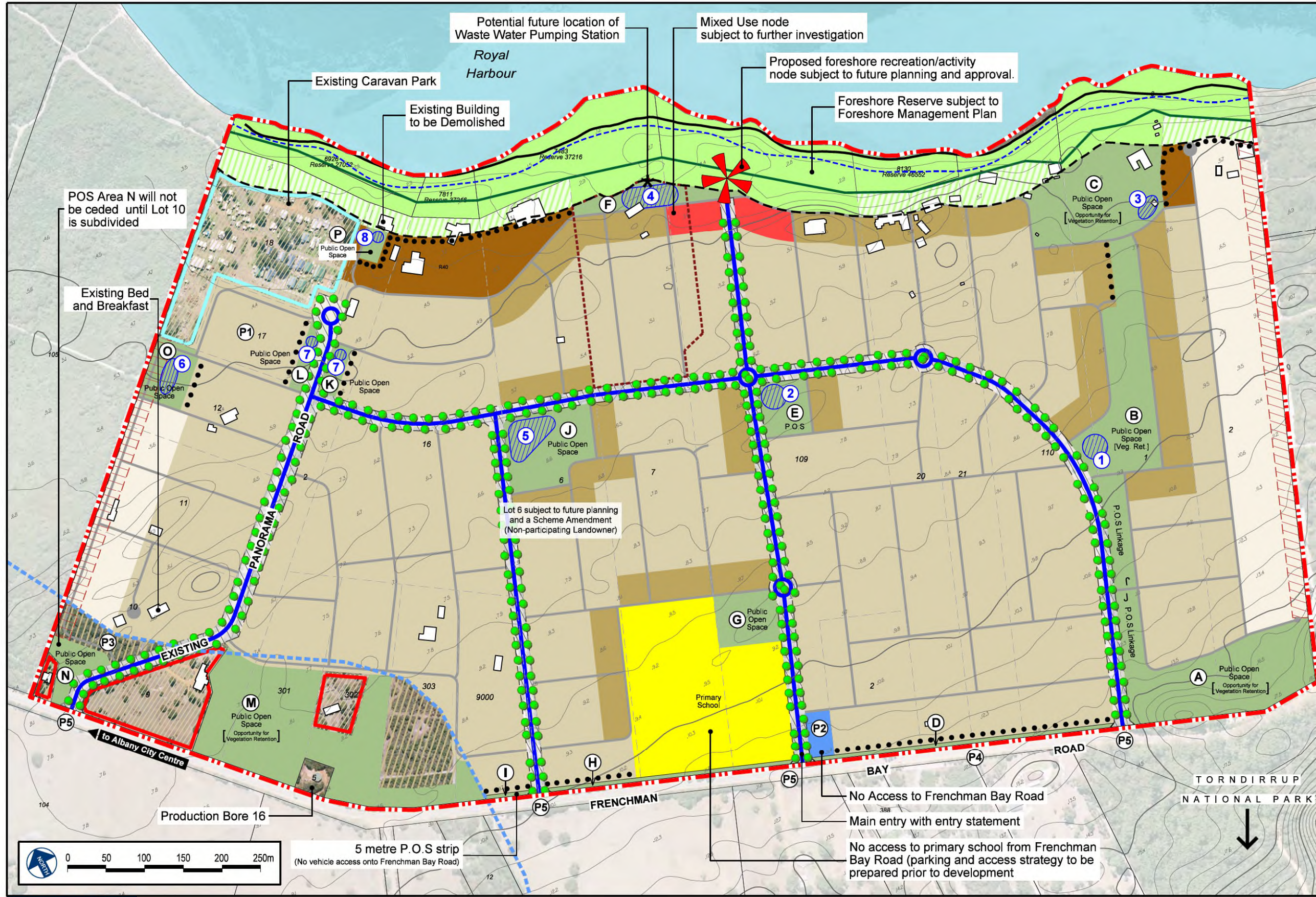
Date	28/05/18	Scale	1:1500
Designed	AB	Checked	AB
Drawn	DF	Approved	AB
Local Authority	City of Albany	Sheet	1 of 1
Plan/Diagram Number	CT Number	Revision	
230421	2182-323	B	
Survey Source			
Datum			
Projection			ORIGINAL A1

OUTLINE DEVELOPMENT PLAN PROVISIONS

GENERAL

- Detailed Fire Management Plans shall be submitted with subdivision applications to the WAPC in accordance with 'Planning for Bushfire Protection - Edition 2'.
- To the extent the creation of any road shown on the ODP requires any easement or other interest in that land to be extinguished, the proponent must at its cost (including any compensation that may be payable) arrange for the interest to be extinguished.
- For areas identified as 'Low Density Residential (R25)' the average site area shall be 400m² rather than 350m² as per Section 9.3 of the Outline Development Plan Report.

- (P1)** Should the owner of Lot 17 wish to develop their landholding for residential purposes a re-zoning from 'Motel' to 'Residential Development' zone prior to any residential subdivision or development would be required. Any rezoning requires separate approval by the Minister for Planning.
- (P2)** A Detailed Area Plan is required for the Village Centre prior to development and shall be in accordance with the City of Albany Residential Design Code Policy with car parking in accordance with the City of Albany Scheme.
- (P3)** Land identified as "Residential" to be retained for vegetation protection and added to one lot outside the Priority 2 Protection Area at the time of subdivision. Further subdivision, erection of a dwelling or waste disposal is prohibited.
- (P4)** Should a need for widening of the Frenchman Bay Road reserve be identified, such widening will need to be accommodated north of Frenchman Bay Road (to meet the City requirements). Public Open Space schedule may require adjustment at subdivision stage.
- (P5)** Frenchman Bay Road intersection treatments to be designed in accordance with the Traffic Assessment Report at the subdivision stage.



LEGEND

Outline Development Plan Boundary	Village Centre (R40 - R60) - Requires Detailed Area Plan and POS Calculation Review	Dual Use Path (2m wide) Indicative alignment only - refer to Foreshore Management Plan	HSD - Horizontal Setback Datum
Land Use:	Primary School	Other:	Physical Process and Foreshore Reserve Setback Required by the Department of Planning (M P Rogers / Coffey)
Low Density Residential (R10)	Public Open Space (Cash in Lieu at subdivision stage for those lots that do not provide 10% open space of land)	South Coast Water Reserve - Priority 2 Protection Area	Remnant Vegetation
Low Density Residential (R17.5)	Foreshore Reserve	Existing Buildings / Houses	Fire Protection
Low Density Residential (R25)	Future Foreshore Reserve	Detailed Area Plan (DAP) for lots adjoining POS / Foreshore Reserve (permeable fencing, habitable room orientation etc)	Foreshore Node
Medium Density Residential (R30) - Requires Detailed Area Plan	Foreshore Node	Fire Protection	POS / Drainage
Residential	POS / Drainage	POS Identifier	Development Plan Provision Identifier
Rural Residential	Infrastructure:	Drainage Identifier	Existing Parks and Recreation Reserve Boundary (as shown on TPS maps)
Tourism	Neighbourhood Connector	Development Plan Provision Identifier	
Mixed Use R30	Access Street		

**OUTLINE DEVELOPMENT PLAN (O.D.P.)
Big Grove, ALBANY**

Base data supplied by Harley Survey Group | Landgate
Aerial Photography Dated March 2007 (Latest available from Landgate)
Projection MGA Zone 50

Areas and dimensions shown are subject to final survey calculations. All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.

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Peet Tristate syndicate Ltd, P & B Corporation	CLIENT
1:5,000@A3 / 1:2,500@A1	SCALE
29 March 2012	DATE
3066-4-009r.dgn	PLAN No
	REVISION
	PLANNER
	DRAWN
	CHECKED

FIGURE 9



RPS Environment and Planning Pty Ltd
ACN 108 680 977
ABN 45 108 680 977
PO Box 465 Subiaco WA 6904
38 Station Street
Subiaco WA 6008
T +61 8 9211 1111
F +61 8 9211 1122
W rpsgroup.com.au

1.2 Existing Documentation Relevant to the Construction of this Plan

This section acknowledges any known reports or plans that have been prepared for previous planning stages, that refer to the subject area and that may or will impact upon the assessment of bushfire risk and/or the implementation of bushfire protection measures and will be referenced in this Bushfire Management Plan.

Relevant Documents		
Existing Document	Copy Provided by Client	Title
Draft Structure Plan	Yes	Structure Plan - Lot 105 Frenchman Bay Road
Endorsed Outline Development Plan (Map)	Yes	Pages from 3066 (2152) Big Grove ODP 100412 (Final with figures)SML
Achievable BAL Report	Yes	180294 - Lot 105 Frenchman Bay Road Albany (Achievable BAL)_v1.1

2 Environmental Considerations

2.1 Native Vegetation – Modification and Clearing

‘Guidelines’ s2.3: “Many bushfire prone areas also have high biodiversity values. SPP 3.7 policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values.”

Existing conservation areas that are potentially affected by the development proposal are required to be identified. This may result in vegetation removal/modification prohibition or limitations. These areas include National Parks, Nature Reserves, Wetlands and Bush Forever sites.

Environmental Protection Act 1986: “Clearing of native vegetation in Western Australia requires a clearing permit under Part V, Division 2 of the Act unless clearing is for an exempt purpose. Exemptions from requiring a clearing permit are contained in Schedule 6 of the Act or are prescribed in the Environmental Protection Regulations” (‘Guidelines’ s2.3).

The Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act): This Act administered by the Australian Government Department of Environment, provides a national scheme of environment and heritage protection and biodiversity conservation. Nationally threatened species and ecological communities are a specific matter of significance. Areas of vegetation can be classified as a Threatened Ecological Community (TEC) under the EPBC Act and consequently have removal restrictions imposed.

Vegetation Modification and Clearing Assessment

Will on-site clearing of native vegetation be required?	Yes
Does this have the potential to trigger environmental impact/referral requirements under State and Federal environmental legislation?	Yes
For the proposed development site, have any areas of native vegetation been identified as species that might result in the classification of the area as a Threatened Ecological Community (TEC)?	Yes
Potential TEC species identified:	N/A

The proponent has undertaken many technical flora and fauna studies on this site, all of which have been reviewed / assessed by the Department of Biodiversity, Conservation and Attractions (DBCA). While there remain several small points of contention, the DBCA has accepted the baseline information "... to be sufficient to allow the proponent for Lot 105 to progress a Scheme Amendment Request and subsequent planning stages." (Refer to Appendix 1. - DBCA Response 21 July 2015)

Development Design Options

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation Lots and/or Asset Protection Zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available design options to minimise the removal of native vegetation.

Minimising the Removal of Native Vegetation		
Design Option	Identified	Adopted
Cluster development	Yes	Yes
Modify Lot Layout	Yes	Yes
Reduce Lot Yield	Yes	Yes

Impact on Adjoining Land

Is this planning proposal able to implement the required bushfire measures within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes
---	-----

Bushfire management measures external to the site are not required as part of this proposal. Vegetation management within the boundaries of the land being developed is regulated via this bushfire management plan and the City of Albany annual Firebreak and Fuel Load Notice.

2.2 Re-vegetation / Retained Vegetation / Landscape Plans

Riparian zones, wetland/foreshore buffers, road verges and public open space may have plans to re-vegetate or retain vegetation as part of the Proposal. Vegetation corridors may join offsite vegetation and provide a route for fire to enter a development area. When applicable, any such area will be identified in this Bushfire Management Plan and their impact on the assessment and future management accounted for.

Is re-vegetation of riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	Yes
Is the requirement for ongoing maintenance of existing vegetation in riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	Yes

3 Potential Bushfire Impact Assessment

3.1 Assessment Input

3.1.1 Fire Danger Index (FDI) Applied

AS 3959-2009 specifies the fire danger index values to apply for different regions as per Table 2.1. The values used in the model calculations are for the Forest Fire Danger Index (FFDI) and for which equivalent representative values of the Grassland Fire Danger Index (GFDI) are applied as per Appendix B. The values can be refined if appropriately justified.

Table 3.1: Applied FDI Value

FDI Value			
Vegetation Area	As per AS 3959 - 2009 Table 2.1	As per DFES for the Location	Value Applied
1-7	80	N/A	80

3.1.2 Existing Vegetation Identification, Classification and Effective Slope

Vegetation identification and classification has been conducted in accordance with AS 3959-2009 s2.2.3 and the Visual Guide for Bushfire Risk Assessment in WA (DoP February 2016).

When more than one vegetation type is present, each type is identified separately with the worst-case scenario being applied as the classification. The predominant vegetation is not necessarily the worst-case scenario.

The vegetation structure has been assessed as it will be in its mature state (rather than what might be observed on the day). Areas of modified vegetation are assessed as they will be in their natural unmodified state (unless maintained in a permanently low threat, minimal fuel condition, satisfying AS 3959-2009 s2.2.3.2-f and asset protection zone standards). Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its revegetated mature state.

Effective Slope: Is the ground slope under the classified vegetation and is determined for each area of classified vegetation. It is the measured or determined slope which will most significantly influence the bushfire behaviour in that vegetation as it approaches a building or site. Where there is a significant change in effective ground slope under an area of classified vegetation that will cause a change in fire behaviour, separate vegetation areas will be identified, based on the change in effective slope, to enable the correct assessment.

Table 3.1.2: Vegetation identification and classification.

All Vegetation Within 150 metres of the Site			
Vegetation Area	Identified Types (AS3959) or Description if 'Excluded'	Applied Classification	Effective Slope Under Classified Vegetation (degrees)
1	Low Open Forest (A-04) - (Onsite)	Class A Forest	0
2	Low Open Forest (A-04) - (Onsite)	Class A Forest	0
3	Closed Scrub (D-13) - (Onsite)	Class D Scrub	0-5
4	Low Open Forest (A-04) <i>(Offsite)</i>	Class A Forest	0
5	Low Woodland (B-07) <i>(Offsite)</i>	Class B Woodland	0
6	Closed Scrub (D-13) <i>(Offsite)</i>	Class D Scrub	0-5
7	Sown Pasture (G-26) <i>(Offsite)</i>	Class G Grassland	0
8	Excluded - Managed areas, house, gardens and non-vegetated areas	Excluded AS3959-2009 2.2.3.2 (e)&(f)	-

Representative photos of each vegetation area, descriptions and classification justification, are presented on the following pages. The areas of classified vegetation are defined, and the photo locations identified on the topography and classified vegetation map, Figure 3.1.

Note¹: As per AS 3959-2009 Table 2.3 and Figures 2.3 and 2.4 a-g

Note²: As per AS 3959-2009 Table 2.3.

Vegetation Area 1

Classification Applied: Class A Forest

Assessment Comment: Low Eucalypt and Peppermint Forest, dense canopy with continuous Scrub understory.



Photo ID: 1a



Photo ID: 1b

Vegetation Area 2

Classification Applied: Class A Forest

Assessment Comment: Low Eucalypt and Peppermint Forest, dense canopy with continuous Scrub understory.



Photo ID: 2a



Photo ID: 2b

Vegetation Area 3

Classification Applied: Class D Scrub

Assessment Comment: Low closed Scrub <4m tall, mainly consisting of Peppermint trees and coastal species.



Photo ID: 3a



Photo ID: 3b

Vegetation Area 4

Classification Applied: Class A Forest

Assessment Comment: Low Eucalypt and Peppermint Forest, dense canopy with continuous Scrub understory.



Photo ID: 4a



Photo ID: 4b

Vegetation Area 5

Classification Applied: Class B Woodland

Assessment Comment: Peppermint Woodland, separated canopy with little or no understory.



Photo ID: 5a



Photo ID: 5b

Vegetation Area 6

Classification Applied: Class D Scrub

Assessment Comment: Low closed Scrub <4m tall, mainly consisting of Peppermint trees and coastal species.



Photo ID: 6a



Photo ID: 6b

Vegetation Area 7

Classification Applied: Class G Grassland

Assessment Comment: Paddock / Pasture.



Photo ID: 7a



Photo ID: 7b

Vegetation Area 8

Classification Applied: Excluded AS3959-2009 2.2.3.2 (e)(f)

Assessment Comment: Mix of managed and low threat vegetation and non-vegetated areas



Photo ID: 8a



Photo ID: 8b

Figure 3.1
Site Assessment Map

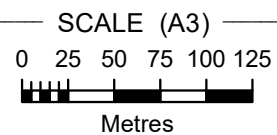
Lot 105 Frenchman Bay Road
Albany

LEGEND

- Lot 105
- Proposed Subdivision (v1.1)
- Proposed Road Network (v1.1)
- Area of Interest - 150m
- Other Lots
- Photo Locations
- Photo Locations

Classified Vegetation

- Class (A) Forest
- Class (B) Woodland
- Class (D) Scrub
- Class (G) Grassland
- Managed - Min. Fuel
- Existing Hydrant



Aerial Image: Landgate 2017



3.2 Assessment Output

3.2.1 Indicative BAL Results Presented as a BAL Contour Map

Interpretation of the Bushfire Attack Level (BAL) Contour Map

The contour map will present different coloured contour intervals constructed around the classified bushfire prone vegetation. These represent the different Bushfire Attack Levels that exist at varying distances away from the classified vegetation.

Each BAL represents a set range of radiant heat flux (as defined by AS 3959-2009) that can be generated by the bushfire in that vegetation at that location.

The width of each shaded contour (i.e. the distance interval) will vary and is determined by consideration of variables including vegetation type, fuel structure, ground slope, climatic conditions. They are unique to a site and can vary across a site. The width of each contour is a diagrammatic expression of the separation distances from the classified vegetation that apply for each BAL rating, for that site.

A building (or 'area') located within any given BAL contour will be subject to that BAL rating and potentially multiple BAL ratings of which the highest rating will be applied.

Separation Distances Calculated to Construct the BAL Contours

Table 3.2: Vegetation separation distances applied to construct the BAL contours.





Derived Vegetation Separation Distances								
Vegetation Area	Vegetation Classification	Effective Slope (degrees)	BAL Assessment Method Applied ¹	BAL Rating and Corresponding Separation Distance (metres)				
				BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5
1	Class A Forest	0	Method 1	<16	16-<21	21-<31	31-<42	42-<100
2	Class A Forest	0	Method 1	<16	16-<21	21-<31	31-<42	42-<100
3	Class D Scrub	0-5	Method 1	<11	11-<15	15-<22	22-<31	31-<100
4	Class A Forest	0	Method 1	<16	16-<21	21-<31	31-<42	42-<100
5	Class B Woodland	0	Method 1	<10	10-<14	14-<20	20-<29	29-<100
6	Class D Scrub	0-5	Method 1	<11	11-<15	15-<22	22-<31	31-<100
7	Class G Grassland	0	Method 1	<6	6-<8	8-<12	12-<17	17-<100

Method 1 as per AS 3959-2009 Table 2.4.3. The input variables applied, other than the calculation model defaults, are presented in Section 3.1 of this Plan.






Figure 3.2
Indicative BAL Contour Map

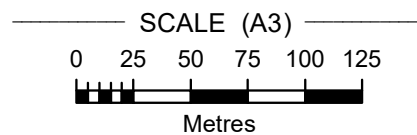
Lot 105 Frenchman Bay Road
Albany

LEGEND

-  Lot 105
-  Proposed Subdivision (v1.1)
-  Proposed Road Network (v1.1)
-  Other Lots


Bushfire Attack Levels (Method 1)

-  BAL FZ (Indicative only)
-  BAL 40 (Indicative only)
-  BAL 29 (Indicative only)
-  BAL 19 (Indicative only)
-  BAL 12.5 (Indicative only)



Aerial Image: Landgate 2017



 Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator
Map created on: 20/07/2018
Map compiled by: Mick Whitelaw

Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Prone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

3.2.2 Bushfire Attack Levels (BAL) Derived from the Contour Map

Deriving a BAL Rating for a Future Construction Site (Building) from the BAL Contour Map Data

Key Assumptions: The actual location of a building within a lot or envelope (an ‘area’) has not been determined at this stage of planning; and the BAL ratings represent the BAL of an ‘area’ not a building.

The BAL Rating is Assessed as Indicative

If the assessed BAL for the ‘area’ is stated as being ‘indicative’, it is because that ‘area’ is impacted by more than one BAL contour interval and/or classifiable vegetation remains on the lot, or on adjacent lots, that can influence a future building’s BAL rating (and this vegetation may have been omitted from being contoured for planning purposes e.g. Grassland or when the assumption is made that all onsite vegetation can be removed and/or modified).

In this report the indicative BAL is presented as either the highest BAL impacting the site or as a range of achievable BAL’s within the site – whichever is the most appropriate.

The BAL rating that will apply to any future building within that ‘area’ will be dependent on:

1. vegetation management onsite; and/or
2. vegetation remaining on adjacent lots; and/or
3. the actual location of the future building within that ‘area’.

Table 3.2.3: Indicative bushfire attack levels for the proposed lots.

Proposed Lot #	Highest Indicative BAL Impacting the Lot
3, 11-14, 19-22, 36-43, 74-82	BAL-12.5
2, 4-7, 10, 15, 18, 83	BAL-19
1, 8-9, 16-17, 23-35, 44-73, 84-86	BAL-29

3.2.3 Identification of Specific Issues Arising from BAL Contour Map

Onsite Vegetation

Vegetation onsite is within the control of the landowner and can therefore be removed or modified to lower the bushfire risk, subject to any approval being required by a local government, dependent on the lot’s specific situation with respect to identified environmental protection areas. The bushfire assessment and management strategies contained in the BMP, assume that environmental approval will be achieved or clearing permit exemptions will apply (as required). Vegetation Area 1 (currently Forest) is expected to be removed as development progresses. As a result, this area is excluded from BAL Contour Mapping as it is expected it will be maintained in a low threat state.

Offsite Vegetation

Vegetation offsite is not within the control of the subject site’s landowner and therefore the vegetation cannot be removed or modified.

4 Assessment Against the Bushfire Protection Criteria (BPC)

4.1 Bushfire Protection Criteria - Assessment Summary

Summarised Outcome of the Assessment Against the Bushfire Protection Criteria (BPC)					
Element	Basis for the Assessment of Achieving the Intent of the Element				
	Achieves compliance with the Element through meeting Acceptable Solutions		Achieves compliance with the Element by application of a Performance Based Solution		Minor or Unavoidable Development
	Meets all relevant acceptable solutions	One or more relevant Acceptable Solutions are not <u>fully</u> met. A <u>variation</u> of the solution is provided and justified.	One or more applicable Acceptable Solutions are not met. A solution is developed with the summary presented in this Plan in Section 5.5. The supporting document presenting Bushfire Prone Planning's detailed methodology is submitted separately to the decision makers.		The required supporting statements are presented in this Plan.
Location	✓				N/A
Siting and Design of Development	✓				
Vehicular Access	✓				
Water	✓				

The subject Proposal has been assessed against:

1. The requirements established in Appendix 4 of the Guidelines for Planning in Bushfire Prone Areas, WAPC 2017 v1.3 (the 'Guidelines'). The detail, including technical construction requirements, are found at <https://www.planning.wa.gov.au/8194.aspx>. A summary of relevant information is provided in the appendices of this Plan; and
2. Any endorsed variations to the Guideline's acceptable solutions and associated technical requirements that have been established by the relevant local government. If known and applicable these have been stated in Section 5.2 of this Plan with the detail included as an appendix if required by the relevant local government.

4.2 Bushfire Protection Criteria – Acceptable Solutions Assessment Detail

4.2.1 Element 1: Location

Bushfire Protection Criteria Element 1: Location			
Assessment Statements and Bushfire Protection Measures to be Applied			
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:	A1.1: Development Location	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution will be fully met in the future (at a later planning stage).

The proposed development achieves compliance by:

- By ensuring future building work on the lot/s can be located on an area that will be subject to potential radiant heat from a bushfire not exceeding 29 kW/m² (i.e. a BAL rating of BAL-29 or less will apply). This can be achieved by using positioning, design and appropriate vegetation removal/modification; and
- Managing the bushfire risk to an acceptable level by the existence/implementation and ongoing maintenance of all required bushfire protection measures, as identified within this Plan. These measures include the requirements for vegetation management, vehicular access and firefighting water supply.

4.2.2 Element 2: Siting and Design of Development

Bushfire Protection Criteria Element 2: Siting and Design of Development			
Assessment Statements and Bushfire Protection Measures to be Applied			
Intent: To ensure that the siting and design of development (note: not building/construction design) minimises the level of bushfire impact.			
Acceptable Solution:	A2.1: Asset Protection Zone	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution will be fully met in the future (at a later planning stage).

The proposed development achieves compliance by:

- Ensuring future building work on the lot/s can have established around it an APZ of the required dimensions - to ensure that the potential radiant heat from a bushfire to impact future building/s, does not exceed 29 kW/m² (i.e. a BAL rating of BAL-29 or less will apply to determine building construction standards);

4.2.3 Element 3: Vehicular Access

Bushfire Protection Criteria Element 3: Vehicular Access

Assessment Statements and Bushfire Protection Measures to be Applied

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

Acceptable Solution:	A3.1: Two access routes	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution can be fully met in the future (at a later planning stage).
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The proposed development is situated on Frenchman Bay Road which provides options to travel in two different directions.

Acceptable Solution:	A3.2 Public Road	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution will be fully met in the future (at a later planning stage).
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The construction technical requirements established by the Guidelines and/or the local government can and will be complied with.

Acceptable Solution:	A3.8 Firebreak Width	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution will be fully met in the future (at a later planning stage).
-----------------------------	---------------------------------	---	---

The proposed lots will comply with the requirements of the local government annual firebreak notice issued under s33 of the Bush Fires Act 1954.

4.2.4 Element 4: Water

Bushfire Protection Criteria Element 4: Water

Assessment Statements and Bushfire Protection Measures to be Applied

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

Acceptable Solution:	A4.1 Reticulated Areas	Method of achieving Element compliance and/or the Intent of the Element:	The acceptable solution will be fully met in the future (at a later planning stage).
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A reticulated water supply is available in the area of the subject site, the installation of hydrants will meet the technical requirements outlined in the guidelines.

5 Responsibilities for Implementation and Management of the Bushfire Protection Measures

Table 5.1: BMP Implementation responsibilities prior to the issue of titles for the Developer (Landowner).

DEVELOPER (LANDOWNER) - PRIOR TO ISSUE OF TITLES		
No.	Implementation Actions	
1	<p>Planning approval may be conditioned with the requirement to make appropriate notifications (on the certificates of title and the deposited plan), of the existence of this Bushfire Management Plan.</p> <p>The WAPC may condition approval with a requirement for the landowner / proponent to place a notification onto the certificate(s) of title and a notice of the notification onto the diagram or plan of survey (deposited plan). This will be done pursuant to Section 165 of the Planning and Development Act 2005 ('Hazard etc. affecting land, notating titles as to:') and applies to lots with a determined BAL rating of BAL-12.5 or above. The notification will be required to state:</p> <p><i>'This land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and may be subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land'.</i></p>	<input type="checkbox"/>
2	Construct the public roads to the standards stated in the BMP.	<input type="checkbox"/>
3	Install the reticulated water supply (hydrants) to the standards stated in the BMP.	<input type="checkbox"/>

Table 5.2: BMP Implementation responsibilities prior to lot sale, occupancy or building for the Landowner (Developer).

LANDOWNER (DEVELOPER) - PRIOR TO LOT SALE, OCCUPANCY OR BUILDING		
No.	Implementation Actions	
1	Prior to sale and post planning approval, the entity responsible for having the BMP prepared should ensure that anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information and informed that it contains their responsibilities. This includes the landowners/proponents (including future landowners where the Plan was prepared as part of a subdivision approval), local government and any other authorities or referral agencies ('Guidelines' s4.6.3).	
2	Prior to sale of the subject lots, each individual lot is to be compliant with the relevant local government's annual firebreak notice issued under s33 of the Bushfires Act 1954.	
3	Establish the Asset Protection Zone (APZ) on the lot to the dimensions and standard stated in the BMP. This is the responsibility of the developer.	

Table 5.3: Ongoing management responsibilities for the Landowner/Occupier.

LANDOWNER/OCCUPIER - ONGOING	
No.	Ongoing Management Actions
1	Maintain the Asset Protection Zone (APZ) to the dimensions and standard stated in the BMP.
2	Comply with the City of Albany Fire Management Notice issued under s33 of the Bush Fires Act 1954.
3	Maintain vehicular access routes within the lot to the required surface condition and clearances as stated in the BMP.

Table 5.4: Ongoing management responsibilities for the Local Government.

LOCAL GOVERNMENT - ONGOING	
No.	Ongoing Management Actions
1	Monitor landowner compliance with the Bushfire Management Plan and the annual City of Albany Fire Management Notice.
2	Where control of an area of vegetated land is vested in the control of the local government and that area of land has influenced the assessed BAL rating/s of the subject site/s – and the BAL rating has been correctly assessed - there is an obligation to consider the impact of any changes to future vegetation management and/or revegetation plans with respect to that area.



Your ref:
Our ref: 2011/002193
Enquiries: Deon Utber
Phone: (08) 9842 4500
Email: Deon.Utber@dpaw.wa.gov.au

Ms Kirsten Muir-Thompson
Principle Consultant
Accendo Australia
PO Box 5178
WEST BUSSELTON WA 6280

Dear Ms Muir-Thompson

Response to Comments on the Addendum to the Environmental Opportunities and Constraints Analysis for Lot 105 Frenchman Bay Road, Big Grove

Thank you for your letter received 10 June 2015 responding to Parks and Wildlife comments on the *Addendum to the Environmental Opportunities and Constraints Analysis for Lot 105 Frenchman Bay Road, Big Grove*.

With regards to the dot points listed in the conclusion of your letter:

- Parks and Wildlife supported the statement in the Addendum regarding 'significant habitat' for black cockatoo species and western ringtail possum with respect to EPBC Act Guidelines. Assessment and determination of significance under these guidelines is a matter for the Australian Government Department of Environment through an EPBC Act referral. Parks and Wildlife acknowledge that a referral assessment may determine the habitat as not significant;
- Sandiford and Barrett (2010) suggested there are possibly multiple threats impacting on the Priority Ecological Community ARVS 44 *Banksia littoralis* Woodland / *Melaleuca incana* Shrubland and there have not been any detailed studies to determine which of these threats are key drivers of decline. Therefore the PEC should not be discounted as an ecological constraint on hydrology alone. Parks and Wildlife considers that the PEC should be a consideration in the assessment of a Scheme Amendment Request; and
- Parks and Wildlife recommended dieback survey prior to construction which would occur after a scheme amendment request has been considered and approved. Therefore would not be required at this stage in the planning. However the term 'uninterpretable' refers to an area that does not have sufficient indicator species (due to vegetation type or impacts such as fire) and therefore it would not be accurate to use this term for Lot 105.

The department considers the advice provided previously and above to be sufficient to allow the proponent for Lot 105 to progress a Scheme Amendment Request and subsequent planning stages.

If you have any further queries please do not hesitate to contact Deon Utber at the Albany Parks and Wildlife Office on 9842 4500.

Yours sincerely

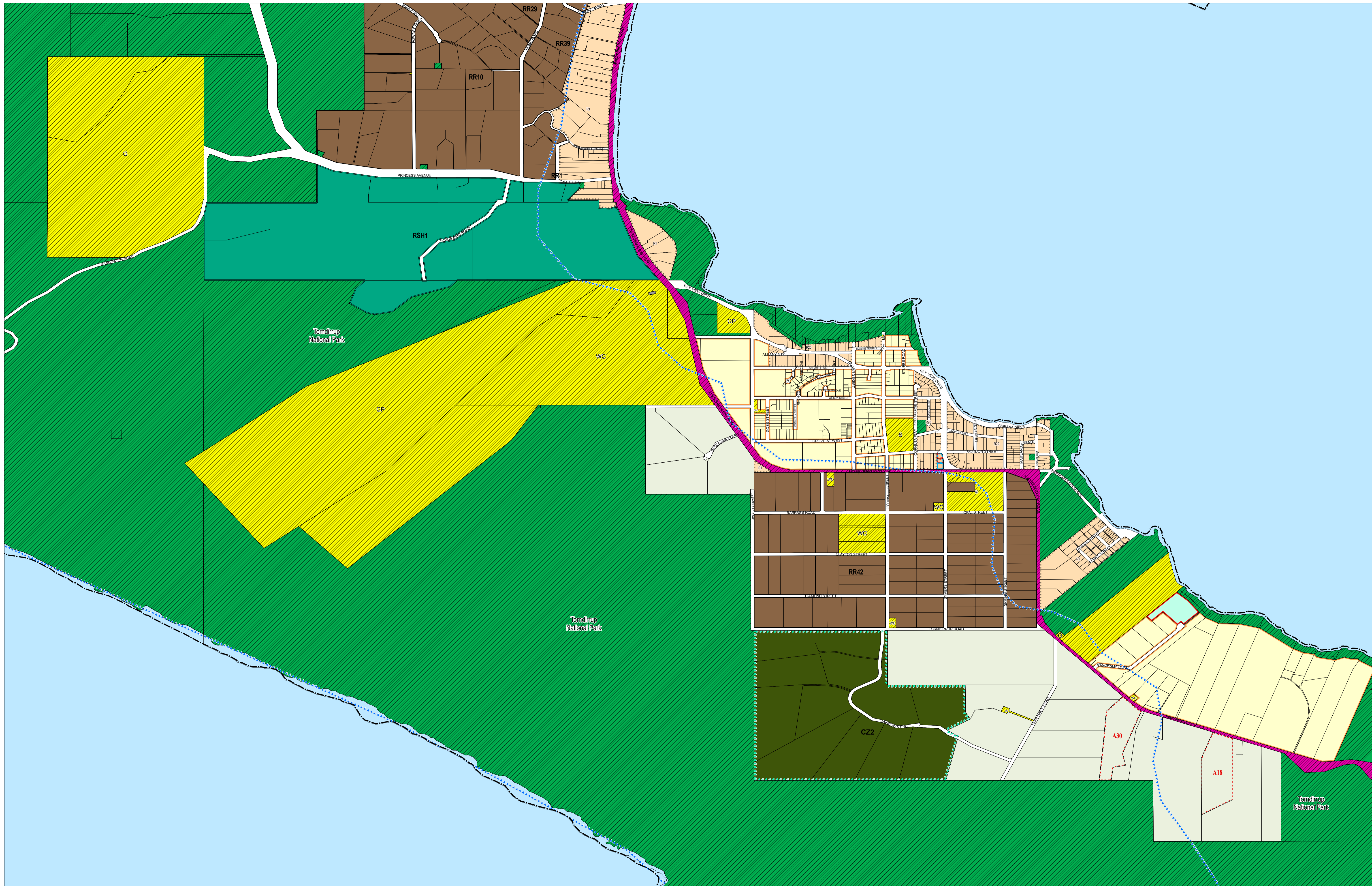
A handwritten signature in black ink, appearing to read 'Deon Utber', written in a cursive style.

Deon Utber
For Greg Mair
REGIONAL MANAGER

21 July 2015

APPENDIX 7 – LOCAL PLANNING SCHEME No. 1 MAP SHEET

(Department of Planning, Lands and Heritage, 2020)



LEGEND

LOCAL SCHEME RESERVES

	Local Road		Public Use : Government
	Major Road		Public Use : Hospital
	Parks and Recreation		Public Use : Museum
	Priority Road		Public Use : Public Utility
	Public Use		Public Use : Refuse
	Public Use : Airport		Public Use : School
	Public Use : Cemetery		Public Use : Technical College
	Public Use : Communication		Public Use : Water Corporation
	Public Use : Community Purpose		Rail
	Public Use : Conservation of Flora and Fauna		

LOCAL SCHEME ZONES

	Caravan and Camping		Priority Agriculture
	Clubs and Institutions		Regional Centre
	Conservation		Regional Centre Mixed Business
	Future Urban		Regional Centre Mixed Use
	General Agriculture		Residential
	General Industry		Rural Residential
	Highway Commercial		Rural Small Lot Holdings
	Hotel / Motel		Rural Village
	Light Industry		Special Residential
	Local Centre		Special Use
	Neighbourhood Centre		Tourist Residential
	Port Industry		Yakamia Creek

OTHER CATEGORIES

(see scheme text for additional information)

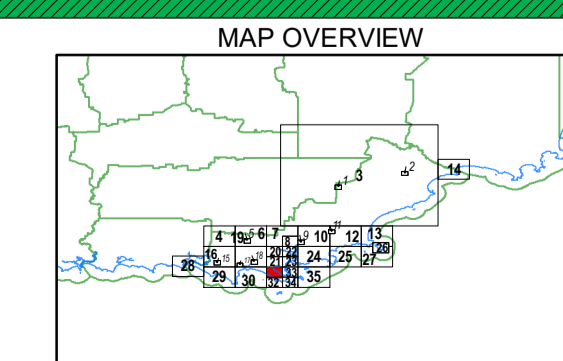
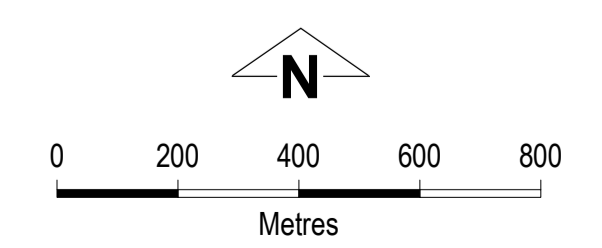
	Scheme Area Boundary
	Local Government Boundary
	R20 R Codes
	A1 Additional Uses
	R1 Restricted Uses
	RR1 Rural Residential Area
	RSH Rural Small Lot Holdings
	SR1 Special Residential Area
	RV1 Rural Village
	SU1 Special Use Area
	Albany Airport Special Control Area (see c.5.2)
	Albany Port Special Control Area (see c.5.4)
	Albany Speedway Noise Special Control Area (see c.5.5)
	CZ1 Conservation Zone Area
	DCA1 Development Contribution Area
	IA2 Industrial Area
	IA4BA Industrial Buffer Area
	Public Drinking Water Sources Special Control Areas (see c.5.3)
	Spencer Park Improvement Special Control Area (see c.5.7)
	Water Corporation Waste Water Treatment Plant Odour Buffer Special Control Area (see c.5.6)
	Places of Heritage Value - Buildings
	No Zone
	Waterbodies

VERSION No 1

Department of Planning, Lands and Heritage
 Whilst all care has been taken to accurately portray the current Scheme provisions, no responsibility shall be taken for any omission or errors in this documentation.
 Consultation with the respective Local Government should be made to view a legal version of the Scheme. Please advise the Department of Planning, Lands and Heritage of any omissions or errors in the document at Spatialdata@dph.wa.gov.au

Produced by GeoSpatial Planning Support, Department of Planning, Lands and Heritage.
 Base Information Supplied by the Western Australian Land Information Authority, SLIP 1096-2018-1

City of Albany
 Local Planning Scheme No. 1
 (District Scheme)



Authorised: T.Servaas
 Plot Date: 29 October 2019
 G.Gazette: Monday, 28 April 2014

Local Planning Scheme Map No. 31 of 35
 MAP: Robinson Locality

City of Albany
 Local Planning Scheme No. 1
 (District Scheme)

APPENDIX 8 – ALBANY LOCAL PLANNING STRATEGY MAP

(City of Albany, 2019)

Local Planning Strategy 2019

Figure 2: Urban



Legend

Designation					
	Rural		Commercial		Neighbourhood Centre
	Parks and Recreation		Industry		Future Neighbourhood Centre
	Rural Living		Public Use		Local Centre
	Urban		Regional Centre		Future Local Centre
	Existing Tourism Accommodation Sites		Urban Growth		Rural Enterprise

Strategic Direction/Action

4	Protect agricultural land from urban sprawl and inappropriate development	IA1	Investigation Area 1 - Centennial Park Urban Renewal Area
5	Direct urban settlement growth of Albany to areas designated as 'urban growth'	IA2	Investigation Area 2 - Wool Stores
6	Direct rural living settlement of Albany to areas designated as 'rural living'	IA3	Investigation Area 3 - Neighbourhood and Local Centres
7	Support the collaboration between the City and State government in the redevelopment of the Spencer Park Urban Renewal Area	IA4	Investigation Area 4 - Mirambeena Strategic Industrial Area
8	Identify localities or precincts in the City suitable to increase residential densities (infill development) based on accessibility to services and facilities, utility infrastructure, heritage, character and amenity, and land capability	IA5	Investigation Area 5 - Pendeen Expansion Area
9	Continue to protect the primacy of the regional centre, identify its unique identity and build upon this, facilitate new mixed-use commercial development, increase the density and diversification of housing within and surrounding the regional centre, protect and enhance the heritage character, improve public realm with universal access, improve public transport, walkability and bikeability, diversify users - residents (age and cultural diversity), workers and visitors that engage with the regional centre and attract the location of regional facilities	IA6	Investigation Area 6 - Proposed Ardess Estate Light Industrial Area
10	Identify education precincts in conjunction with activity centres and support diversification of housing and land uses to cater for accommodation, entertainment and shopping needs of students	IA7	Investigation Area 7 - Lot 2 Hanrahan Road (CSBP Fertiliser Depot)
11	Advocate for the completion of the Ring Road	IA8	Investigation Area 8 - Robinson Industrial Area
12	Facilitate the planning and construction of key link roads	IA9	Investigation Area 9 - Gledhow Industrial Area
13	Advocate for development of industry in Mirambeena	IA10	Investigation Area 10 - Mueller Road
		IA11	Investigation Area 11 - Protection of Yakamia Creek and Lake Seppings
		IA12	Investigation Area 12 - Implementation of the Emu Point to Middleton Beach Coastal Hazard Risk Management Adaptation Plan
		IA13	Investigation Area 13 - Potential Airport Business Area

Other					
	Rail		Indicative Rail Spur Extension		Macro-corridors
	Primary Road		Landscape Protection Areas		SCA PDWSA
	District Road		Housing Strategy		Education Precinct
	Significant waterway		Strategic Infrastructure		Investigation Area 12 - Emu Point to Middleton Beach CHRMAP
	Strategic Important Road Extensions				
	Investigation Area 4 - Mirambeena Strategic Industrial Area				

1 0.5 0 Kilometers

1:100,000

SCALE @ A3

This map has been produced by the City of Albany using data from a range of agencies. Landgate and West Australian Planning Commission information contained on this website is for personal and non-commercial use and is to be used as a guide only. Use for commercial advantage or monetary compensation is strictly prohibited and the City of Albany bears no responsibility as to the reliability, currency or accuracy of the data contained on this website or any output derived from the data. © Landgate (2019). Reproduced by permission of Western Australian Land Information Authority, Copyright Licence SLIP 1028-2017-1. www.landgate.wa.gov.au

APPENDIX 9 – COMMENTS ON ADDENDUM TO ENVIRONMENTAL OPPORTUNITIES AND CONSTRAINTS ANALYSIS

(Various Agencies, 2015)

Aaron Bell

From: Lukes, Christopher <Christopher.Lukes@planning.wa.gov.au>
Sent: Tuesday, 24 February 2015 2:08 PM
To: Aaron Bell
Cc: Petersen, Stephen
Subject: RE: Addendum to Opportunities and Constraints Analysis - Lot 105 on Deposited Plan 230421, Frenchman Bay Road, Big Grove (Certificate of Title 2182-323)

Hi Aaron

Thank you for your emails. Unfortunately, I am not the correct person for you to address your email and documentation.

I have passed your information on to Stephen Petersen, Planning Manager at the Department of Planning in Albany. His details are shown below:

Stephen Petersen
Planning Manager
Regional Planning And Strategy
Department of Planning
178 Stirling Terrace
Albany WA 6330
T (08) 98927300
E Stephen.Petersen@planning.wa.gov.au

Stephen has advised that he will contact you shortly.

Unfortunately, we Department of Planning web access prevents us accessing file transfer sites such as yours. Instead, please place your file at:

<http://online.planning.wa.gov.au/upload/>

Kind regards

Christopher

Christopher Lukes | Coastal Zone Management Coordinator | Infrastructure, Projects, Policy and Research
Department of Planning | 140 William Street | Perth WA 6000
T (08) 65519349 | F (08) 6551 9001
E Christopher.Lukes@planning.wa.gov.au | W www.planning.wa.gov.au



From: Aaron Bell [mailto:Aaron@ableplanning.com.au]
Sent: Tuesday, 24 February 2015 10:57 AM
To: Lukes, Christopher
Subject: Addendum to Opportunities and Constraints Analysis - Lot 105 on Deposited Plan 230421, Frenchman Bay Road, Big Grove (Certificate of Title 2182-323)

Hi Christopher

I act on behalf of the registered proprietor of the above lot.

On 15th March 2011 the City of Albany council resolved as follows in respect to the submitted scheme amendment request (SAR) for the land:

“THAT Council ADVISE the proponent that it is PREPARED to consider a formal scheme amendment to rezone Lot 105 Frenchman Bay Road, Big Grove from the ‘Public Purpose’ reserve to the ‘Residential Development’ zone, subject to the following matters being addressed and/or included as part of that formal amendment application:

- A. Studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation.***
- B. The identification of an appropriate foreshore reserve in accordance with the Western Australian Planning Commission Statement of Planning Policy 2.6.***
- C. The protection of the South Coast Water Reserve and the existing well-head on Reserve 931 to the satisfaction of the Department of Water and the Water Corporation.***
- D. The land required for vegetation protection, water resource protection, foreshore reserve and fauna habitat and corridor protection should be designated as ‘Parks and Recreation’ reserve.***
- E. The inclusion of a Local Water Management Strategy to the satisfaction of Council and the Department of Water.***
- F. The addressing of infrastructure provision and servicing requirements, inclusive of any associated buffers and easements to the satisfaction of the various servicing authorities.”***

The project team has spent the last few years undertaking further investigation and has now completed an Addendum to Opportunities and Constraints Analysis report covering items A – D of the above resolution. You will shortly receive a subsequent email from mailbigfile.com containing a link where this report can be downloaded.

With particular regard to items B and D of the council resolution, could you please review the report and provide written comment and / or an indication of acceptance on or before 24th March 2015?

If you have any questions or wish to discuss any aspect of the report, please contact the undersigned in the first instance.

Kind regards

Aaron Bell
Director



ABLE

PLANNING & PROJECT MANAGEMENT

"The subdivision experts in WA"

29 New River Ramble, West Busselton WA 6280

Mobile: 0438 521 419

Email: Aaron@ableplanning.com.au

ABN: 64 565 568 362

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Aaron Bell

From: Frank Kroll <Frank.Kroll@watercorporation.com.au>
Sent: Wednesday, 11 March 2015 8:40 AM
To: Aaron@ableplanning.com.au
Subject: FW: Lot 105 Frenchman Bay Road Big Grove Albany
Attachments: 201503101614.pdf; 201503101614.pdf

File: JT 2011 09903 V01

Hi Aaron

With respect to your email requesting information dated 24 February 2015. Refer also to Plan showing existing water and sewer networks.

Report - Environmental Opportunities and Constraints Analysis:

The only comment we have is that if you wish to extract groundwater, the matter should be referred to the Department of Water.

Wastewater:

Attached is plan of proposed system (Long Term Scheme Little Grove SD219). A new Little Grove Pump Station C will be required that will pump via a DN100 pressure main to an existing DN225 gravity sewer. This is a headworks item that would need to be scheduled by the Corporation once developer intentions were quantified. Should funds not be available when required by development, prefunding may be an option.

Water Supply:

The area is supplied from the Albany Mt Melville Tank that at the South Coast Headworks is a DN200, then into smaller diameter mains ending in DN100 at Little Grove. This supply is likely to be inadequate for the development of Lot 105. It is planned to augment supply via a new DN375 in the future. These works have not yet been scheduled, and will be constructed in stages based on development demand.

Funding:

All reticulation size mains (those under DN300) are to be funded by the developer. Prefunding of headworks (pipes DN300 and over and pump stations) may be required.

Should you have any further queries, please contact me.

Regards

Frank Kroll
Senior Development Planner
Development Services Branch

Water Corporation
Planning & Capability Group

629 Newcastle Street Leederville 6007

Telephone: (08)9420 2221

Fax: (08)9420 3193

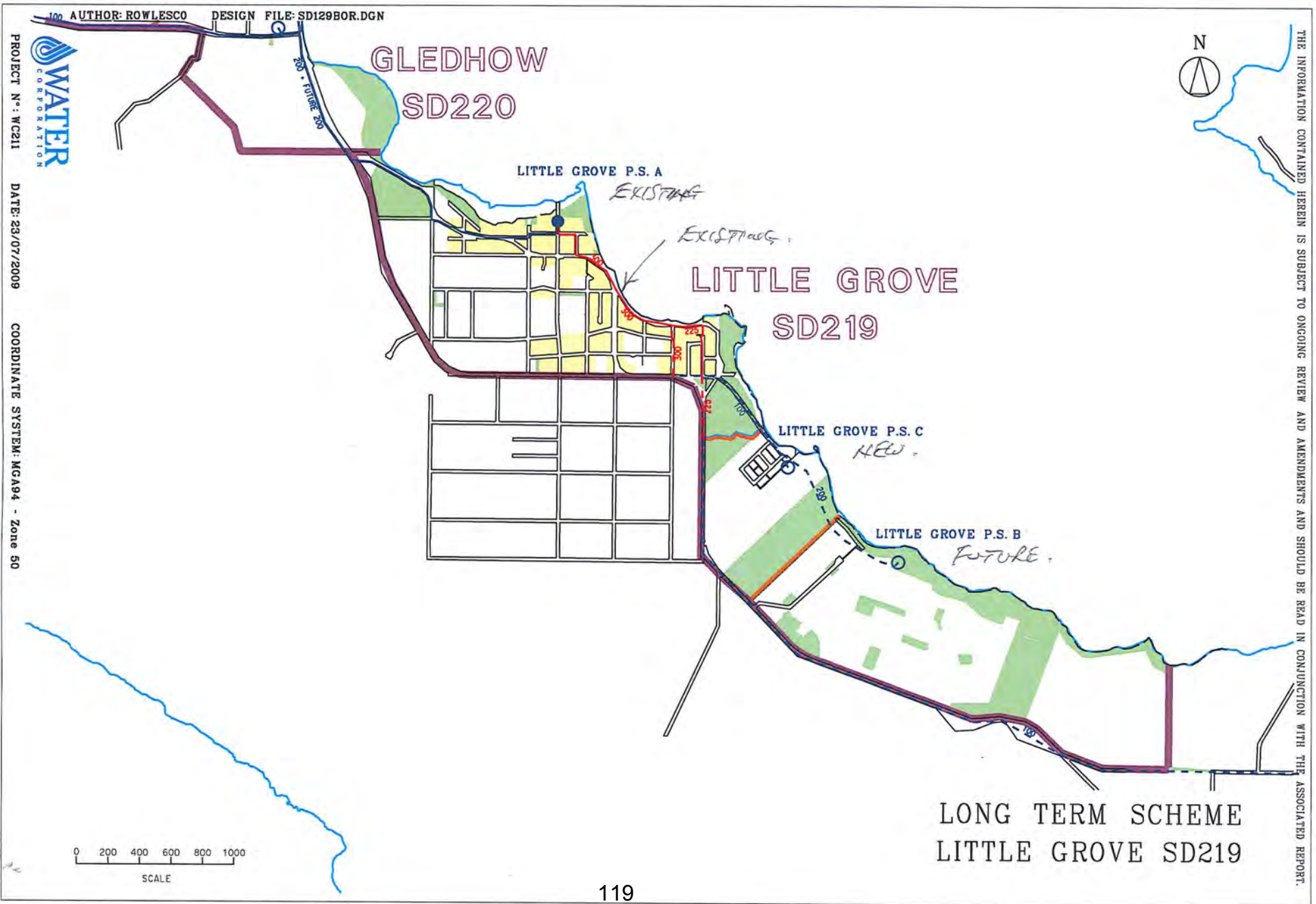
Email: frank.kroll@watercorporation.com.au

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This Electronic Mail Message and its attachments are confidential. If you are not the intended recipient, you may not disclose or use the information contained in it. If you have received this Electronic Mail Message in error, please advise the sender immediately by replying to this email and delete the message and any associated attachments. While every care is taken, it is recommended that you scan the attachments for viruses.

This message has been scanned for malware by Websense. www.websense.com

THE INFORMATION CONTAINED HEREIN IS SUBJECT TO ONGOING REVIEW AND AMENDMENTS AND SHOULD BE READ IN CONJUNCTION WITH THE ASSOCIATED REPORT.



GLEDHOW
SD220

LITTLE GROVE P.S. A
EXISTING

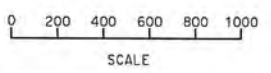
EXISTING

LITTLE GROVE
SD219

LITTLE GROVE P.S. C
NEW

LITTLE GROVE P.S. B
FUTURE

LONG TERM SCHEME
LITTLE GROVE SD219

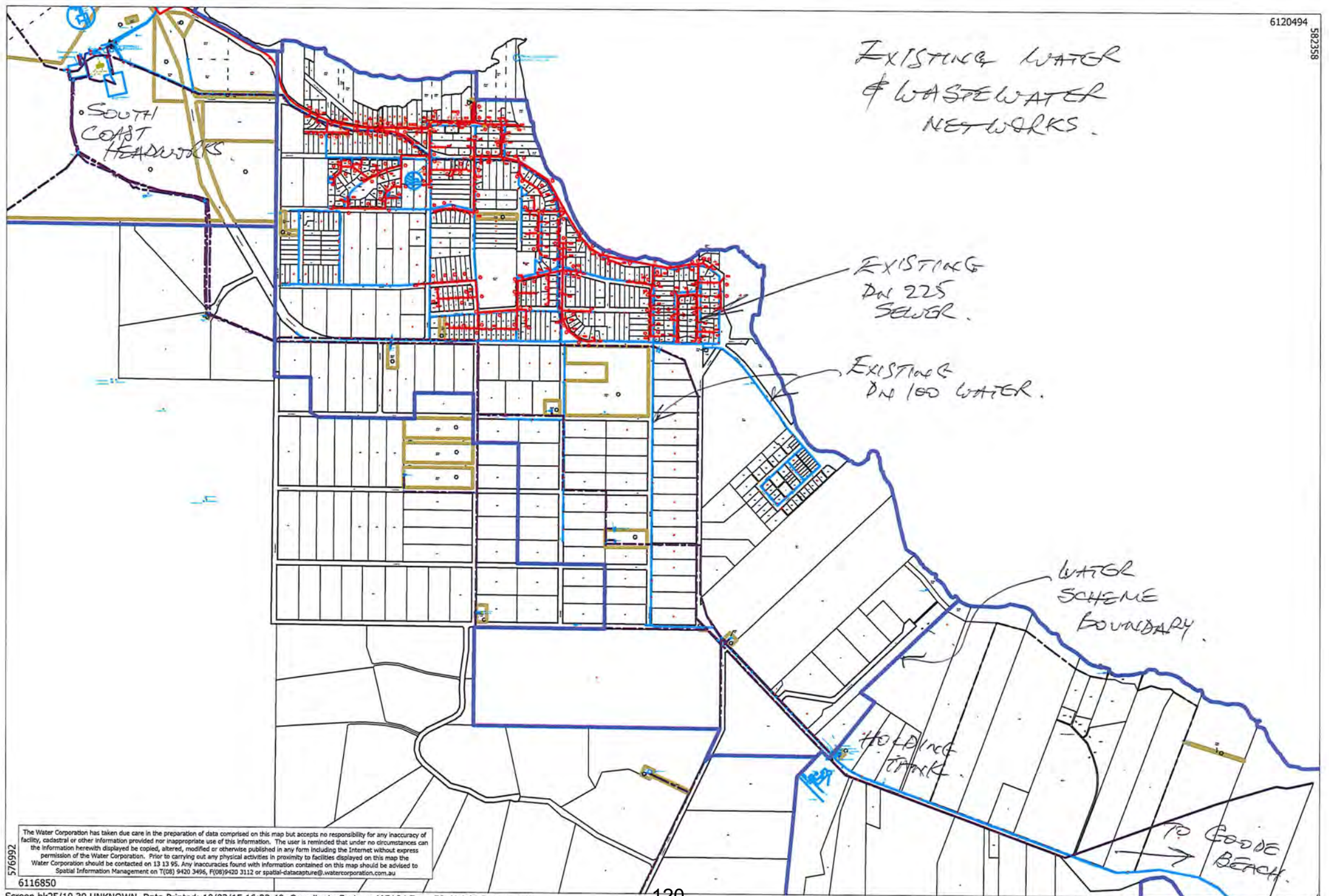


AUTHOR: ROWLESCO DESIGN FILE: SD129BOR.DGN



PROJECT N°: WC211 DATE: 23/07/2009 COORDINATE SYSTEM: MGA84 - Zone 50

EXISTING WATER & WASTEWATER NETWORKS



EXISTING DN 225 SEWER.

EXISTING DN 100 WATER.

WATER SCHEME BOUNDARY.

HOLDING TANK.

TO COODE BEACH.

SOUTH COAST HEADWORKS

The Water Corporation has taken due care in the preparation of data comprised on this map but accepts no responsibility for any inaccuracy of facility, cadastral or other information provided nor inappropriate use of this information. The user is reminded that under no circumstances can the information herewith displayed be copied, altered, modified or otherwise published in any form including the Internet without express permission of the Water Corporation. Prior to carrying out any physical activities in proximity to facilities displayed on this map the Water Corporation should be contacted on 13 13 95. Any inaccuracies found with information contained on this map should be advised to Spatial Information Management on T(08) 9420 3496, F(08)9420 3112 or spatial-datacapture@watercorporation.com.au

6116850



Aaron Bell
ABLE Planning and Project Management
29 New River Ramble
WEST BUSSELTON WA 6280

Dear Sir

Lot 105 Frenchman Bay Rd, Big Grove

Thank you for the opportunity to comment on the above proposal. The Department of Water (DoW) provides the following comments.

South Coast Water Reserve

A portion of Lot 105 is located within a priority one (P1) area of the South Coast Water Reserve. The DoW supports the proposal by the proponents to retain the existing native vegetation on the area of P1 land. To ensure the long-term protection of this land, it should be ceded to the crown to create a reserve for the purpose of water supply protection.

Foreshore Reserve

The DoW supports the connectivity between the proposed foreshore reserve and the adopted ODP over the adjoining property. However, the DoW topographic information does not match that provided on the map of the proposed reserve, so DoW queries whether sufficient vertical separation has been provided for future sea level rise. DoW requests that the on-site survey be conducted to clarify this situation. A foreshore management plan will be requested at subdivision stage, should the development proceed.

Please contact me if you have any further queries.

Yours sincerely

KAREN MCKEOUGH
A/PROGRAM MANAGER – WATER AND LAND USE
SOUTH COAST REGION

11 March 2015



Great Southern Region

Enquiries: Melinda Lyons (9892 7304)
Our Ref: TPS/1141

12 May 2015

Director
Able Planning & Project Management
29 New River Ramble
WEST BUSSELTON WA 6280

Dear Aaron

ADDENDUM TO ENVIRONMENTAL OPPORTUNITIES AND CONSTRAINTS ANALYSIS

The Department is aware that the City of Albany requested on 15 March 2011 that further studies on the biodiversity and conservation values be conducted within Lot 105 Frenchman Bay Road, Big Grove prior to consideration of an amendment to the scheme from 'Public Purpose' reserve to 'Residential Development' zone. These studies were to be to the satisfaction of the Department of Parks and Wildlife (formerly Department of Environment and Conservation).

We note that Opus has prepared an Addendum (2014) to complement the previously prepared Environmental Opportunities and Constraints Analysis (2008). We understood that the Addendum was prepared in order to record the results of a Level 2 Detailed Flora and Vegetation Survey and a Level 2 Fauna Survey as required by Department of Parks and Wildlife (DPaW).

The Department has the following comment to make:

- The Addendum highlights that the lot contains significant biodiversity and conservation values including:
 - vegetation units which are identified as significant habitat potential for Western Ringtail Possum and feeding and roosting habitat for Black Cockatoo species;
 - habitat for other mammal species including bandicoots, rats and kangaroos;
 - identification of vegetation units associated with coastal foreshores;
 - intersection by the South Coast Water Reserve; and
 - identification of conservation species of flora and a priority ecological community.
- Given the varying levels of protection within policy and legislation of these values, it appears the lot has a significant degree of environmental constraint and the level of development that would be supported will be minimal.
- The Department notes that DPaW have commented on the Addendum and made recommendations with regard to any anticipated development including:
 - the PEC is to be identified as a constraint to development;
 - a vegetation corridor is to be contiguous with adjoining Reserve 931;



Government of **Western Australia**
Department of **Planning**

- consideration is to be given to the minimisation of road intersections across vegetated areas;
- It is recommended that a draft development plan be prepared by the landholders, in consultation with DPaW, the City of Albany and our Department, which illustrates where anticipated development can be located without impacting identified values. A draft plan would need to include:
 - anticipated road network;
 - lot density;
 - landscape corridors (expand to include possum scat locations as per Ecological Aspects map of Appendix D- see attached markup);
 - POS location;
 - bushfire hazard assessment which identifies building envelope locations and BAL construction requirements; and
 - foreshore reserve treatments.
- Preparation of a draft plan will give a level of certainty to both to the landholder and to government agencies that concerns can be addressed, prior to a formal scheme amendment being adopted by the local government and subsequent referral of an amendment to the EPA .

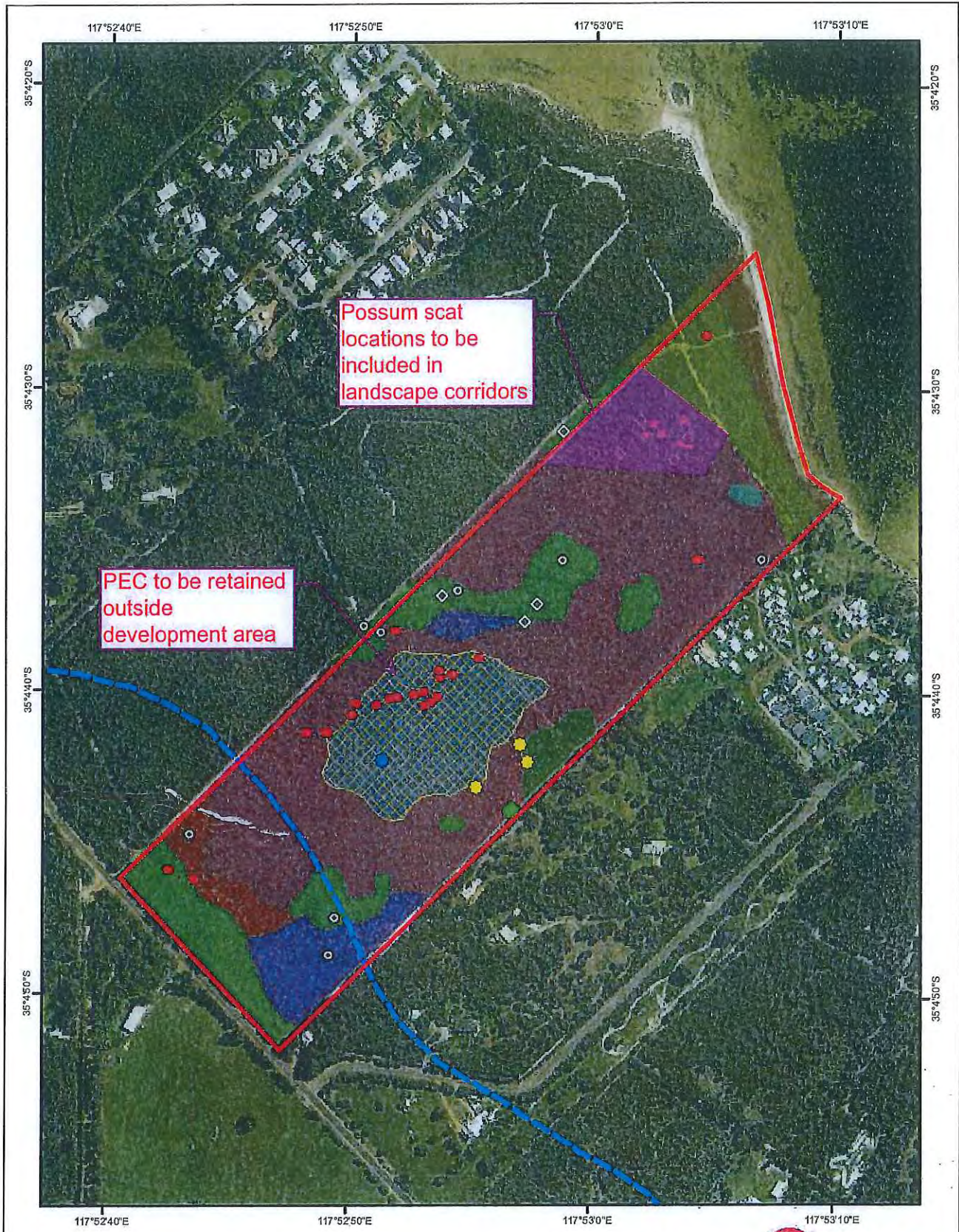
Should you wish to discuss this advice, please contact Melinda Lyons on 9892 7304.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'S. Petersen', with a long horizontal stroke extending to the right.

STEPHEN PETERSEN
REGIONAL MANAGER
GREAT SOUTHERN REGION
REGIONAL PLANNING & STRATEGY

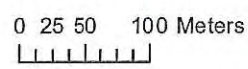
cc: City of Albany
Department of Parks & Wildlife



Possum scat locations to be included in landscape corridors

PEC to be retained outside development area

- Legend**
- Lot 105 Frenchman Bay Road
 - South Coast Water Reserve
 - Banksia surveyed 2012
 - ◇ 2012 Possum scats
 - 2012 Possum sighting
 - 2008 Possum scats
 - Amperea probrnsa P3
 - Adenanthos cunninghamii P4
 - PEC23 Priority 1
- ARVS Units**
- Coastal Banksia Ilicifolia/Peppermint Low Woodland
 - Coastal Limestone Heath
 - Coastal Yate Forest
 - Junctus kraussii Sedgeland
 - Mosaic Coastal Limestone Heath & Banksia Ilicifolia Woodland/Melaleuca Incana Scrubland
 - Mosaic Coastal Limestone Heath & Peppermint Low Woodland
 - Mosaic Coastal Limestone Heath & M Banksia Ilicifolia/Peppermint Low Woodland & Coastal Heath
 - Peppermint Low Woodland
 - affinis Coastal Banksia Ilicifolia/Peppermint Low Woodland & Coastal Heath



TITLE			
Lot 105 Frenchman Bay Road, Big Grove			
Ecological Aspects			
STATUS	FINAL	FILE	W-A1138.00/004AN
SCALE	1:5,000	PLOT DATE	29/05/14



Your ref:
Our ref: 2011/002193
Enquiries: Deon Utber
Phone: (08) 9842 4500
Email: Deon.Utber@dpaw.wa.gov.au

Ms Kirsten Muir-Thompson
Principle Consultant
Accendo Australia
PO Box 5178
WEST BUSSELTON WA 6280

Dear Ms Muir-Thompson

Response to Comments on the Addendum to the Environmental Opportunities and Constraints Analysis for Lot 105 Frenchman Bay Road, Big Grove

Thank you for your letter received 10 June 2015 responding to Parks and Wildlife comments on the *Addendum to the Environmental Opportunities and Constraints Analysis for Lot 105 Frenchman Bay Road, Big Grove*.

With regards to the dot points listed in the conclusion of your letter:

- Parks and Wildlife supported the statement in the Addendum regarding 'significant habitat' for black cockatoo species and western ringtail possum with respect to EPBC Act Guidelines. Assessment and determination of significance under these guidelines is a matter for the Australian Government Department of Environment through an EPBC Act referral. Parks and Wildlife acknowledge that a referral assessment may determine the habitat as not significant;
- Sandiford and Barrett (2010) suggested there are possibly multiple threats impacting on the Priority Ecological Community ARVS 44 *Banksia littoralis* Woodland / *Melaleuca incana* Shrubland and there have not been any detailed studies to determine which of these threats are key drivers of decline. Therefore the PEC should not be discounted as an ecological constraint on hydrology alone. Parks and Wildlife considers that the PEC should be a consideration in the assessment of a Scheme Amendment Request; and
- Parks and Wildlife recommended dieback survey prior to construction which would occur after a scheme amendment request has been considered and approved. Therefore would not be required at this stage in the planning. However the term 'uninterpretable' refers to an area that does not have sufficient indicator species (due to vegetation type or impacts such as fire) and therefore it would not be accurate to use this term for Lot 105.

The department considers the advice provided previously and above to be sufficient to allow the proponent for Lot 105 to progress a Scheme Amendment Request and subsequent planning stages.

If you have any further queries please do not hesitate to contact Deon Utber at the Albany Parks and Wildlife Office on 9842 4500.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Deon Utber', written in a cursive style.

Deon Utber
For Greg Mair
REGIONAL MANAGER

21 July 2015

APPENDIX 10 – COMMENTS ON LOCAL WATER MANAGEMENT STRATEGY

(Department of Water and Environmental Regulation, 2018)

Aaron Bell

From: Karen McKeough <karen.mckeough@dwer.wa.gov.au>
Sent: Thursday, 15 March 2018 3:21 PM
To: adriann@albany.wa.gov.au
Cc: alan.millar@albany.wa.gov.au; kirsten@accendoaustralia.com.au; Aaron Bell
Subject: RE: Lot 105 Frenchman Bay Rd, Big Grove - LWMS

Hi Adrian,

As discussed, there are some problems associated with the requirement for this development proposal to have an approved LWMS before the formal rezoning process takes place. The information provided in the Local Water Management Strategy (LWMS) identifies that there is sufficient separation to groundwater and that there are no water resources related constraints to the proposed development, unless the proposal becomes a low-density unsewered development, which DWER would be less supportive of.

I am advised by Aaron Bell that the structure plan is long way from being finalised. As it is necessary that the approved LWMS contains the final approved structure plan, DWER would be supportive for this document to be deferred to later in the planning process. The LWMS as submitted, reflected current DWER policy and principles, only lacking in some technical detail, which is best delivered when the urban form is finalised.

DWER recommends that the City of Albany defer the requirement for an LWMS until the formal rezoning process commences and a structure plan is finalised.

Regards,

Karen McKeough

Program Manager – Water and Land Use

South Coast Region

Department of Water and Environmental Regulation

5 Bevan Street, ALBANY WA 6330

PO Box 525, ALBANY WA 6330

T: (08) 9841 0128 | VOIP - 1528

E: karen.mckeough@dwer.wa.gov.au | www.dwer.wa.gov.au

Karen McKeough

From: Aaron Bell [mailto:Aaron@ableplanning.com.au]

Sent: Tuesday, 13 March 2018 9:27 AM

To: Karen McKeough <karen.mckeough@dwer.wa.gov.au>

Cc: alan.millar@albany.wa.gov.au; adriann@albany.wa.gov.au; kirsten@accendoaustralia.com.au

Subject: FW: Lot 105 Frenchman Bay Rd, Big Grove - LWMS

Karen

May you please call me at your earliest convenience following your email to Kirsten below?

Unfortunately, we are stuck with the City of Albany (CoA) council resolution that requires a LWMS before the rezoning of the land and structure planning phases. This decision was disputed at the time from which we (client group and project team) were advised that the LWMS could be of a broad nature, with the specific details firmed up later as part of the structure plan process (the proper stage at which the detail you are requesting should be provided).

For now, the LWMS should be considered precursory only, based on the concept plan the CoA approved on 12 December 2016 for the purposes of commencing water management discussions. If we need to expressly state

somewhere in the LWMS that it is to be expanded and finalised at the structure planning phase to incorporate the information you are requesting (amongst other things), then so be it. To do this work now would be putting the 'cart before the horse' and be out of sync with the process established under the *Better Urban Water Management* policy document; something I pointed out to the CoA many years ago.

Kind regards

Aaron Bell
Director
ABLE PLANNING & PROJECT MANAGEMENT

Mail: 29 New River Ramble, West Busselton WA 6280
Mobile: 0438 521 419
Email: Aaron@ableplanning.com.au

From: kirsten@accendoaustralia.com.au <kirsten@accendoaustralia.com.au>
Sent: Monday, 12 March 2018 12:50 PM
To: 'Aaron Bell' <Aaron@ableplanning.com.au>
Subject: FW: Lot 105 Frenchman Bay Rd, Big Grove - LWMS

Hi Aaron,

Please refer to Karen's email below. I will call to discuss further.

Thanks,

Kirsten Muir-Thompson **Principal Consultant**



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From: Karen McKeough <karen.mckeough@dwer.wa.gov.au>
Sent: Friday, 9 March 2018 10:54 AM
To: kirsten@accendoaustralia.com.au
Cc: alan.millar@albany.wa.gov.au
Subject: RE: Lot 105 Frenchman Bay Rd, Big Grove - LWMS

Dear Kirsten,

Thank you for your email of 23 January and I apologise for the delay in responding, however I was seeking comments from the City of Albany. Development engineer Alan Millar (alan.millar@albany.wa.gov.au , (08) 6820 3046) has provided the following comments in green, against my original comments (which you have already seen and responded to).

Page #	Section	comments
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General comment		<p>During the planning process, if the structure plan is amended prior to finalisation, the LWMS should be updated and resubmitted. Particularly as there are two development options, it is important that the LWMS reflects the final structure plan.</p> <p>Agreed. For this reason, the COA do not carry out a formal review until the Structure Plan application and Scheme Amendment Stages. Any comments at this stage are preliminary and subject to change.</p>
6	3. Proposed development	<p>DWER advises that the subject site is located in an area defined as “sewage sensitive”. Unsewered development in a sewage sensitive area is subject to meeting site requirements which includes a minimum lot size of 1 hectare. The sewer development option of 132 lots being considered on the site, however the structure plan shows only 90 lots. How will these additional lots impact on the water management planning and the other identified constraints on the site. The structure plan also notates R20 density over the plan, while the report makes reference to R15</p>
6	3. Proposed development – foreshore reserve	<p>The text indicates that no stormwater treatment or attenuation is to be undertaken in the foreshore reserve, however the structure plan shows notional stormwater infrastructure in the reserve</p>
7	4. Design criteria	<p>The design criteria principles are supported by DWER</p> <p>The City’s criteria is treatment of the first 15mm at source as much as practical, conveyance of the 20% AEP, flood routing of the 1% AEP.</p>
9	5.3 Rainwater tanks	<p>Why is the use of mandatory controls to enforce rainwater tank usage being dismissed? How will residents be encouraged to install rainwater tanks?</p> <p>The City encourage the use of rainwater tanks, however the City do not consider them as part of storage calculations.</p>
10	5.6 Groundwater bores	<p>DWER supports the proposal for restrictions on private bores as this will provide protection for the retained vegetation that has been identified as groundwater dependent ecosystems</p>
10	5.7 Wastewater management	<p>The LWMS offers two proposed development options 1. High density serviced by sewer or 2. Low density with on-site effluent disposal. DWER queries the viability of reticulated sewer servicing the site given that the sewer network is more than 1km from the site. Has there been any preliminary discussions with Water Corporation about the viability of a sewer connection to this site?</p> <p>Should the low density development with on-site effluent disposal option proceed, the land will be subject to the provisions of the new draft Government Sewerage Policy. Under this policy, the site is classified as a sewage sensitive area due to its proximity to Princess Royal Harbour. Minimum lot size in a sewage sensitive area is 1ha. Dwellings would require a secondary treatment system with nutrient removal.</p>
11	6.1 Stormwater management	<p>DWER supports the use of infiltration where appropriate and no lot connection to a piped drainage system, however the notion that no water will leave the lot is unrealistic. It is expected that run-off from driveways would leave the lot. The final calculations in the UWMP should allow for this run-off contribution .</p> <p>For no connect to a piped drainage system the lots would need to conform to the City’s <i>Infiltration Design Requirement Checklist</i> otherwise an overflow from to a piped system would be required. Swales are generally only supported along POS, and landscaped areas and not for urban lot frontages.</p> <p>There are no plans demonstrating the management of the different storm events (refer to examples from DOW guidelines). This is critical at the LWMS stage to demonstrate how the LWMS objectives and design criteria will be achieved.</p>

		The Structure Plan shows only shows indicative bio-retention basins, with no details.
17	7.1 Groundwater management	DWER acknowledges the inclusion of groundwater data into the LWMS which has now confirmed adequate separation to GW in the development area exists which allows for informed structure planning.
17	7.2 UWMP	At UWMP stage the development option (high density or low density) must be finalised and wastewater management options confirmed
21	9.2 Monitoring	DWER supports the proposed monitoring strategy. This is should be confirmed and detailed in the UWMP.
	Appendix B	What is the purple area? Not in legend.

My response to your table of comments:

- DWER stands by its comment (and is supported by the City of Albany) that the approved LWMS must be consistent with the approved structure plan. If the LWMS (as it is now, with a proposed structure plan of 90 residential lots), changes after it has been approved by DWER and City of Albany, then the LWMS will need to be resubmitted, and any subsequent UWMP is to consistent with the approved LWMS. Alternatively, the current LWMS can provide more details and plans of the low density option (that needs to be consistent with the Government Sewerage Policy).
- DWER previously indicated that it supported the design criteria and the methodology for managing stormwater, however more information is required to be provided that *demonstrates* (rather than just states) how different events will be managed, particularly the treatment of the 20% AEP that are only notated as bio-retention basins, with no further detail.

Please see link below to the DoW publication *Interim: Developing a local water management strategy*. Figures A3 8, 9 and 10 show examples of rainfall event plans that the City of Albany has requested to be included in the strategy.

http://www.water.wa.gov.au/_data/assets/pdf_file/0015/4218/83705.pdf

- DWER advises that it currently reviewing the boundary of the South Coast Water Reserve as part of the review of the South Coast Water Reserve Public Drinking Water Source Protection Plan, and there may be changes to the boundary over Lot 105. This review is not proposed to be completed until June 2019. Landowners will be advised of any boundary changes, and that may also necessitate changes to the structure plan and LWMS.
- DWER also requests that the bore logs for the monitoring bores established on the property be submitted to DWER for registration in our WIN database. This information will complement additional groundwater monitoring that DWER is undertaking in this area to measure impacts upon groundwater dependent ecosystems. Please see link to the form that can be completed and returned to me. Thanks.
http://www.water.wa.gov.au/_data/assets/pdf_file/0011/2630/Form-2.pdf

Please contact me if you wish to discuss any of these matters further. I look forward to receiving the updated LWMS. Please also send to Alan Millar at the City of Albany.

Regards,

Karen McKeough

Program Manager – Water and Land Use

South Coast Region

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APPENDIX 11 – COASTAL PROCESSES ALLOWANCE ASSESSMENT

(Seashore Engineering, 2020)

**LOT 105 FRENCHMAN BAY RD, BIG GROVE,
ALBANY.**

SPP2.6 ALLOWANCE FOR COASTAL PROCESSES



For Holy Family Catholic Parish, Albany

April 2020

FINAL Report

SE090-01 Rev1

Executive Summary

As part of the planning for development on Lot 105 in Big Grove, Albany, Able Planning have commissioned Seashore Engineering to conduct a Coastal Processes Allowance assessment of the lot under state Planning Policy (SPP) 2.6.

Big Grove is located on the southern shore of Princess Royal Harbour in Albany, Western Australia. The site is located on Lot 105 / house 795, Frenchman Bay Road, Big Grove. Seashore Engineering inspected the site on 29th August 2018. The beach at Big Grove is predominantly classified as a sandy coast, with an intertidal rock platform on the western edge of Lot105. The main foreshore features are the nearshore flats, sandy beach, foredune, foredune swale and primary dune.

Allowances for coastal processes have been assessed following guidance in the State Coastal Planning Policy No. 2.6. The HSD was defined as the 1mAHD contour based on the peak water level of the design storm, and represents the toe of the primary dune rather than the coastal vegetation line. Coastal process allowances are summarised below:

- S1 (Allowance for the Current Risk of Storm Erosion): The design storm required a site-specific assessment and was based on fetch limited wave coinciding with the 100yrARI ocean water level. This accounts for the relatively low lying foredune (<0.7mAHD) that is submerged during high tides and is susceptible to erosion during storms with strong northerly winds and high-water levels. Results of erosion modelling for two profiles suggest the maximum erosion during the 100yr ARI storm is 5m.
- S2 (Allowance for Historic Shoreline Movement Trends): Assessment of vegetation lines identified a relatively stable site with recent rates of erosion less than 0.1m/yr. However, higher rates of erosion have been observed in the past and the historic erosion rate for the length of available data (1961-2019) has been used to assess an maximum average erosion rate of 0.22m/yr, with the allowance for S2 being 22m.
- S3 (Allowance for Erosion Caused by Future Sea Level Rise): Whilst the response of the shoreline within Princess Royal Harbour to rising sea levels will be strongly influenced by localised rock controls and the variable shoreline and dune morphology, the Policy does not specifically allow a site specific assessment of the potential localised response of the shoreline to rising sea levels. An allowance of 90m has been included as required under the Policy.
- An additional allowance for uncertainty of 20m has been included as required under the Policy.
- Allowance for Coastal Storm Surge Inundation: The site is elevated with a large primary dune and a very low risk of coastal storm surge inundation. The current risk of storm inundation (S4) has been assessed as the 1.5mAHD contour, based on the maximum water level plus wave run-up resulting from running the SBEACH model under an assumed 500yr ARI peak steady water level. The allowance for inundation, including 0.9m sea level rise, is the 2.4mAHD contour, which is seaward of the allowance for coastal processes.

The total allowance for coastal processes at Lot 105 Frenchmans Bay Road, based on the methods outlined in Schedule 1 of SPP2.6, is 137m from the HSD.

Able Planning have noted that as the planning process progresses towards a 'structure plan' or subdivision stage, depending upon the timing, a refined assessment of the coastal process allowances may be required. Recommendations are provided for any future refined assessment of this allowance for coastal processes.

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Limitations of this Report

This report and the work undertaken for its preparation, is presented for the use of the client. The report may not contain sufficient or appropriate information to meet the purpose of other potential users. Shore Coastal does not accept any responsibility for the use of the information in the report by other parties.

Rev	Issues Description	By	Review	Date
A	Draft	HD/SB	SB	20 Sep 2019
B	Revised Draft following Able Planning review	HD/SB	SB	15 Nov 2019
0	Final Report following DoT review	HD/SB	SB	07 Feb 2020
1	Final Report with revised response DoT review	HD/SB	SB	30 April 2020

1. Introduction

1.1. Background

The locality of Big Grove is located on the south western sandy shoreline of Princess Royal Harbour in Albany, Western Australia. The proposed development site is Lot 105 Frenchman Bay Road, Big Grove (Figure 1.1). This site has an east facing sandy shoreline with a length of about 250m.

As part of the planning for development on Lot 105 in Big Grove, Albany, Able Planning have commissioned Seashore Engineering to conduct an assessment of the Allowance for Coastal Processes under State Planning Policy (SPP) 2.6 (1). This Policy applies to the coast throughout Western Australia, including the shoreline of Princess Royal Harbour which is identified as 'tidal reaches of inland waters'. Able Planning have noted this study accompanies a local planning scheme amendment (rezoning) and is not intended for a specific proposal (i.e. structure plan of subdivision application).

The site is located between existing developments to the south and north, however the lot to the immediate north is undeveloped. It has been assumed for the assessment of coastal processes that the proposal, at this stage, would not be considered as infill development.

In 2010 MP Rogers completed a coastal setback assessment of an adjacent landholding to the south at Big Grove under the 2003 State Coastal Planning Policy (SCPP) No. 2.6. However, in 2013, the policy was updated to with numerous variations to the method of assessing the coastal process allowance, in particular an increase in the allowance for sea level rise from 40m to 90m and revised interpretation of the Horizontal Setback Datum.

1.2. Scope of Works

The scope of works for the assessment of the Coastal Processes Allowance was to undertake the following:

- Site inspection.
- Source relevant metocean data and coastal vegetation line information.
- Review existing studies.
- Assess coastal processes allowances for the current site in accordance with the State Coastal Planning Policy 2013:
 - S1- Allowance for current risk of storm erosion: including assessment of storm event and erosion (SBEACH) modelling.
 - S2 - Allowance for historic shoreline movement trends: Mapping and assessment of shoreline movement.
 - S3 - Allowance for Erosion Caused by Future Sea Level Rise: Review of application of default 90m value for sandy coasts to tidal reaches of inland waters.
 - S4 - Allowance for Current Risk of Storm Surge Inundation: assessment of local tidal and flood data and land contours.
- Review data and provide technical report on coastal processes allowance.



Figure 1.1 Site Location (Opus)

2. Coastal Setting

2.1. Regional Geology

The geology of the Albany region is outlined in Figure 2.5 below. The locality of Big Grove is within Princess Royal Harbour, where three distinct geologic units are evident around the shoreline:

- Granite from the Nornalup Complex along the eastern and northern areas of Princess Royal Harbour (Pgp).
- Holocene quartz and calcaerous sand, mobile or in parts lithified beach and dune deposits, along a narrow section of the western shoreline and further east towards Denmark (Qhs).
- Pleistocene eolianite calcarenite and overlying residual quartz sand (Qpt). This is the geologic unit evident along the southwestern shore of Princess Royal Harbour, where the site is located.

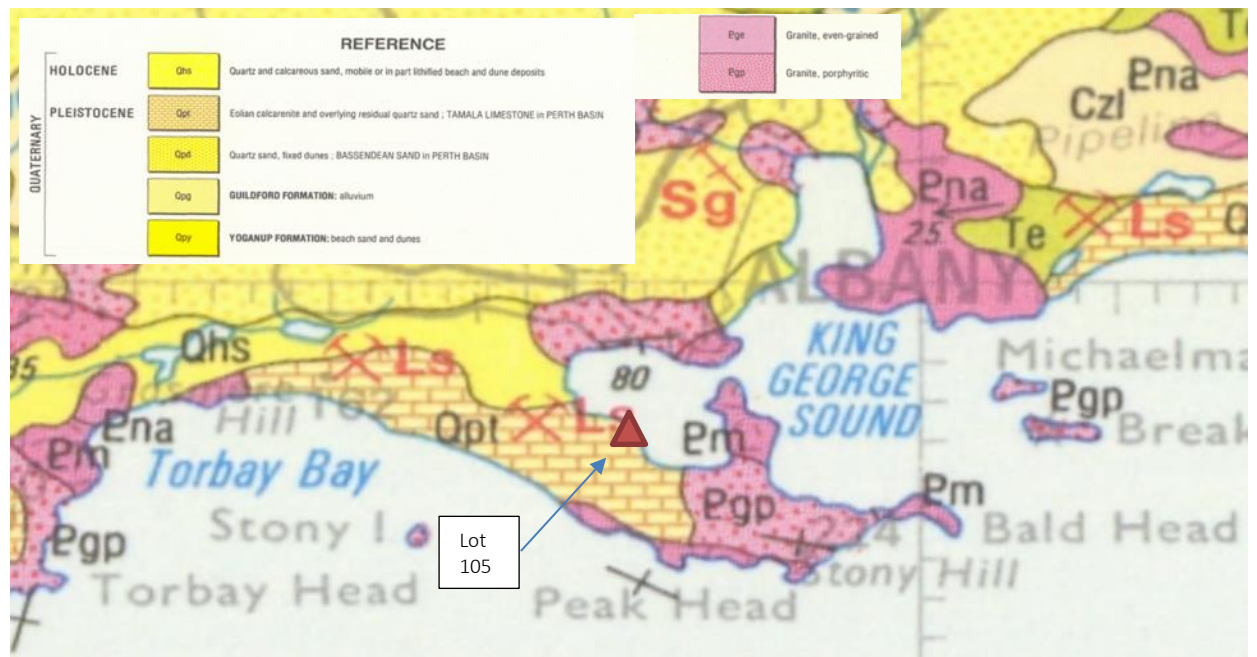


Figure 2.1 Geology of the Albany Region (2)

2.2. Coastal Geomorphology

The *South Coast* region is a combination of the prominent granite and gneiss outcrops of the ancient Yilgarn Craton, together with younger siltstones of the Bremer Basin. The coast faces into the prevailing high southwest waves and winds with higher energy beaches and extensive coastal dunes (3).

King George Sound is an 8 km wide, east-facing embayment bordered by Herald Point to the north and the Flinders Peninsula, terminating at Bald Head to the south. The sound has two major tributaries, Oyster Harbour in the north and Princess Royal Harbour in the west, with the city of Albany located along its north-western shores. The City is located on the protected shores of King George Sound, with the main anchorage inside the almost landlocked tributary Princess Royal Harbour (3).

Princess Royal Harbour is a large natural harbour with an 12m deep, 500m wide shipping channel to King George Sound in the east. The southern and western reaches of the harbour are relatively shallow with wide intertidal shoals, whilst there are deeper waters to the north near the Port of Albany (Figure 2.2).

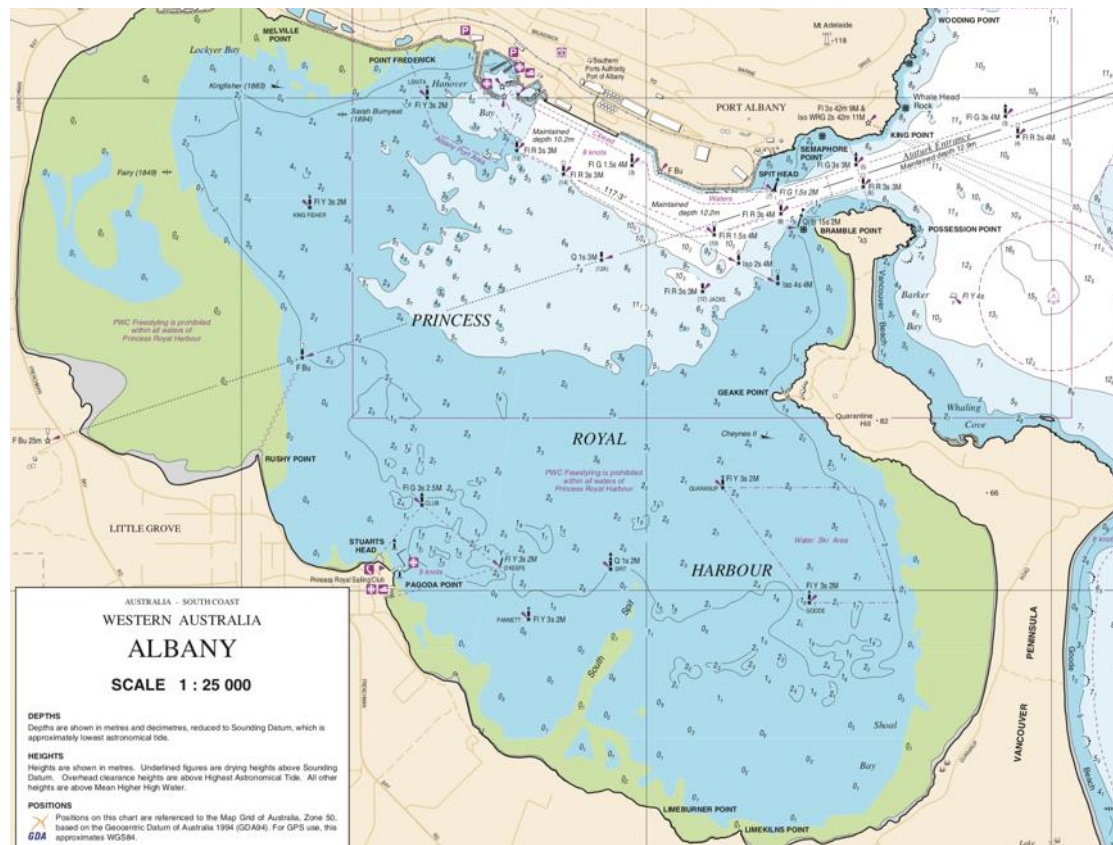


Figure 2.2 Marine Chart, Albany (4)

The locality of Big Grove is along the south western sandy shoreline of Princess Royal Harbour. This shoreline has an undulating planform and is highly sheltered from the offshore wave conditions that approach the exposed sections of Albany's coastline (Figure 2.3). The dominant waves that affect the southern side of the harbour are generated locally within the harbour by winds. As a result, the wave climate at Big Grove is a relatively low energy, fetch limited wave. Where beaches are evident, they are typically reflective beaches due to the low wave energy and microtidal climate.

The shoreline adjacent to Lot 105 Frenchmans Bay, Big Grove is a sandy coast (Figure 2.4), with an intertidal rock platform and creek outlet on the northern edge of Lot105 (Figure 2.5). The beach within the intertidal region has a relatively straight planform and slopes at approximately 1:15, before flattening out towards a shallow sand bank at -1m AHD that extends approximately 1.5km into Princess Royal Harbour. The topography landward of the dunes slopes up to an elevation of 8m AHD towards Frenchman Bay Road.



Figure 2.3 Big Grove Location in Albany, Western Australia (5).



Figure 2.4 Lot 405 Foreshore Morphology (August 2019)

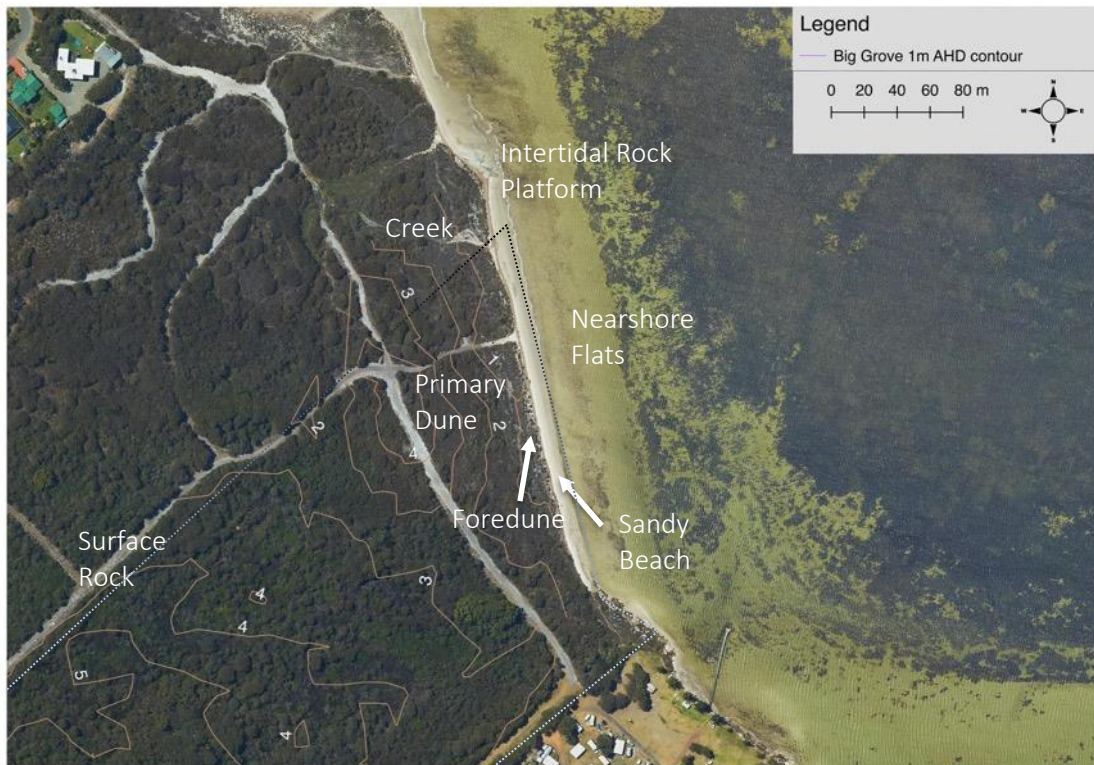


Figure 2.5 Site Features – January 2019 Aerial

3. Site Inspection

Seashore Engineering inspected the site on 29th August 2018. The inspection was undertaken on a mid-level falling tide. The main foreshore features are the nearshore flats, sandy beach, foredune and foredune swale. The following was noted in terms of the assessment of coastal processes (Figure 2.4, Figure 3.1).

Foreshore Morphology

- The site is on the south western shoreline of Princess Royal Harbour with exposure to fetch limited wind generated local waves from the north, extending around to the south east.
- There are sandy nearshore flats for some distance offshore.
- The shoreline is a sandy beach with medium/fine grain size but a relatively high shell content.
- The rock control at the northern end of the site was readily apparent on the falling tide, with the limestone intertidal platform at an elevation in the order of 0m AHD. This provides a local control to the planform of the sandy beach fronting Lot 105.
- The southern end of the beach transitions into foreshore vegetation fronting the adjacent Caravan Park.
- There is a low foredune typical of low energy inland waterways. Wrack was evident on the back face of the low foredune, with wash over expected to occur during high tidal levels with onshore winds.
- A low elevation foredune swale with spinifex species was evident behind the foredune and is expected to be subject to inundation during higher tides. Water was evident above the surface of the foredune swale in places.



Figure 3.1 Foreshore Features including a) Rock control at northern boundary to Lot 105, b) Foredune with wrack overwash at high tides, c) Foreshore vegetation at southern boundary and d) Inundated swale in foredune

Primary Dune

- There is a relatively high well vegetated primary dune fronting the site with an elevation in the order of 4mAHD.
- Coastal vegetation in the primary dune includes low coastal species and larger well-established peppermint and banksia trees.
- The primary dune is steeper and closer to the foreshore at the southern end of the site, with an older well-established banksia tree within about 2m of the shoreline.
- Limited probing suggested there is sand to at least 0.5m depth on the surface in the primary dunes.
- Limestone rock was evident at the surface immediately behind the primary dune and throughout the site. This surface rock was evident along Frenchmans Bay road at the western extent of the site through to within about 200m of the coast, at an elevation in the order of 4.0mAHD.



Figure 3.2 Primary Dune Features including a) views to east, b) views to north, c) coastal vegetation and at least 800m depth of sand in primary dune, d) exposed limestone on northern access track and e) exposed limestone on southern access track.

4. Allowance for Coastal Processes

Allowances for coastal processes have been assessed following guidance in the State Coastal Planning Policy (Schedule 1). SPP 2.6 notes that on a sandy coast such as Big Grove, the allowance for erosion should be measured from the HSD and calculated as the sum of the factors: S1 Erosion; S2 Erosion; and S3 Erosion plus 0.2 metres per year allowance for uncertainty.

This has required consideration of:

- Definition of the horizontal setback datum (HSD) for the Princess Royal Harbour foreshore.
- Acute storm erosion (S1)
- Historic and potential future shoreline changes at the site in the context of the coastal geomorphology outlined in this report (S2).
- Allowances for coastal response to future sea level rise (S3)
- Allowances for uncertainty.

These allowances have been considered over the 100-year planning timeframe.

4.1. HORIZONTAL SETBACK DATUM (HSD)

The Horizontal Setback Datum is a coastal planning construct defined as the “active limit of the shoreline under storm activity”. In the previous SPP2.6 (2003), this has been the coastal vegetation line (6). The 100-year ARI water level for Albany is 1.1m AHD, representing the peak steady water level during a 100yr ARI erosion event. Based on available survey data and the relatively steep primary dune, the HSD has been defined as the 1m AHD contour. Further detail on the selection of the “storm event” is outlined in section 4.2.

Due to the low-lying nature of the foredune fronting the site, this effectively means the HSD represents the toe of the primary dune, rather than the coastal vegetation line. This allows for the inundation of the foredune during the defined storm event. Note that the available survey data at the foredune has limited resulting and some interpolation between points has been required to define the foredune. It is also noted that the HSD for the adjacent development was identified as the 1.0m AHD contour.

4.2. ALLOWANCE FOR CURRENT RISK OF STORM EROSION (S1)

SPP 2.6 recommends the use of a credible sediment transport model such as SBEACH to model maximum cross shore storm erosion. The model is typically run for three successive storm events and the distance should be the “recession from the HSD to the land extent of the storm erosion as calculated by the model” (1).

4.2.1. *Definition of the Storm Event*

SPP2.6 notes “storm events will vary for each location and should be reviewed on a case-by-case basis” (1). The storm event for this site has been defined as fetch limited wave coinciding with the 100yr ARI water level.

The Department of Transport’s recent technical report for design event selection for erosion hazard assessment has been considered (7). However, the storm event for the South Coast (Albany) is identified the 6th June 1997 ‘mid latitude depression’. However, this is a storm with a large southwest swell direction, strong west north-westerly winds, a ‘mean water level’ of 0.3mAHD and peak water level in the order of 0.7mAHD. This swell direction would not penetrate Princess Royal Harbour substantially, wind direction is largely offshore along Big Grove shoreline (i.e. wave heights would be negligible), and peak water level is relatively low (in the order of Highest Astronomic Tide).

Wave hindcasting has been undertaken using the methods described in the Shore Protection Manual (8) for deep water propagation. The maximum exposed fetch is 6.5km from the N; the largest distance from the site extending across Princess Royal Harbour (Figure 4.1). We are not aware of any available wave records within Princess Royal Harbour to verify hindcast wave heights and anecdotal evidence of high wave heights is limited.



Figure 4.1 Maximum wind fetch.

Wind records from the nearest available Bureau of Meteorology station at Albany Airport from 1990 to 2017 were used to create extreme value distributions of hourly averaged wind speeds from a NNW to SE direction (other quadrants have limited to zero fetch). The resulting maximum observed wind speed (hourly average) is 70km/h (9) from the North, (Table 4.1).

Table 4.1 Maximum Wind Speeds at Albany Airport (1990 to 2017) (km/h)

Direction	N	NNE	NE	ENE	E	ESE	SE
Maximum 3hrly Wind Speed (km/hr)	72.4	48.2	40.7	46.4	50	53.6	53.6

Historical records from the Bureau of Meteorology were used to provide a longer timeframe of wind records and further assess extreme events. During Tropical Cyclone Alby in early April 1978, mean wind speeds of 90km/h were maintained for over two hours from the NW (10). TC Alby was included in an extreme wind speed analysis to provide an ARI analysis of the available data, providing a 100 year ARI for an hourly averaged wind speed of 70km/h (Figure 4.2).

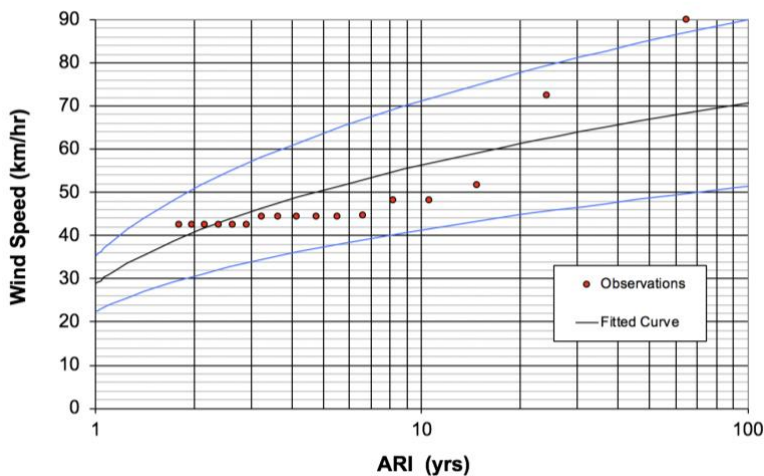


Figure 4.2 Albany airport ARI analysis for Northerly winds.

As a conservative approach, a fetch of 6.5km and maximum hourly averaged wind speed of 90km/h were adopted as the 100yr ARI extreme wind forcings. The resulting maximum developed (fetch limited) wave is 1.1m Hs with a period of 3 seconds. Note that this provides a conservative estimate due to the assumptions that the peak wind is directly onshore to the site and has the maximum fetch of 6.5km, assumes deep water propagation, and assumes unlimited duration (>1hr to developed seas).

The Department of Transport (DoT) undertook an extremes analysis on the water level data from Albany for the Augusta Boat Harbour project (11). Table 4.2 summarises the tidal planes and extreme water level distribution at Albany based on data from 1986 to 2012. A peak water level of 1.08 mAHD has been adopted for the 100 yr ARI.

Table 4.2 Tidal Planes and Extreme Water Level Event Analysis for Albany (11).

Water Level	Tidal Planes ¹					Extreme Event Analysis			
	LAT	MLLW	MSL	MHHW	HAT	1yr ARI	10yr ARI	25yr ARI	100yr ARI
Albany (m AHD)	-0.72	-0.31	0.0	0.33	0.67	0.87	1.02	1.05	1.08

The dominant force driving waves within the harbour is wind strength and direction. Since 1990, the strongest non cyclonic winds (hourly averaged) occurred during a northerly storm on the 10th June 2000, where peak winds were over 70km/h. The 100yr peak wind, wave and water level criteria determined for Big Grove in Albany were then used to scale a 24-hour period of the 10th June 2000 northerly storm to achieve the 100yr conditions. A timeseries of the storm scenario modelled is provided below (Table 4.3). The direction of the wind and waves was directly onshore to the beach at Lot 105.

¹ LAT: Lowest Astronomic Tide, MLLW: Mean Low Low Water, MSL: Mean Sea Level, MHHW: Mean High High Water, HAT: Highest Astronomic Tide, ARI: Average Return Interval.

Table 4.3 100 Year ARI Storm Event Time Series.

Hour	Hourly wind speed measured in km/h	Wave (m Hs)	Peak Period (s)	Water Level (m AHD)
0	34	0.37	2.16	0.61
3	28	0.29	1.98	0.45
6	37	0.4	2.21	0.35
9	46	0.52	2.41	0.19
12	46	0.52	2.41	0.19
15	60	0.71	2.67	0.67
18	69	0.84	2.82	1.09
21	90	1.14	3.15	0.83
24	42	0.46	2.32	0.55

4.2.2. Cross Shore Erosion Modelling

Two profiles were modelled as shown in the figure below using 1m contour survey data collected by Denada Surveys on the 26th of June 2019. The survey profiles were extended using publicly available survey data on WA Marine Maps (12).

Sediment samples were initially taken from the site during a site visit on the 30th August 2019. Visual observations suggested a medium sand onsite, however assessment of dried samples against sizing guides indicated a finer material (Figure 4.4).

The SBEACH modelling was initially undertaken using a conservative interpretation of this visual assessment of sediments from the site. However, following review of this modelling by Department of Transport, Seashore collected additional sediment samples in January 2020 from two sites along the foreshore, which were sent to a soil laboratory for PSD testing (Figure 4.5). The D50 of the samples at site 1 and 2 were 0.425mm and 0.35mm respectively (Attachment 3). The more conservative approach of adopting a grain size of 0.35mm was used in the modelling of both profiles.



Figure 4.3 SBEACH modelled profiles at Big Grove.



Figure 4.4 Beach and Foredune Sand During Site Inspection (Aug 2019)

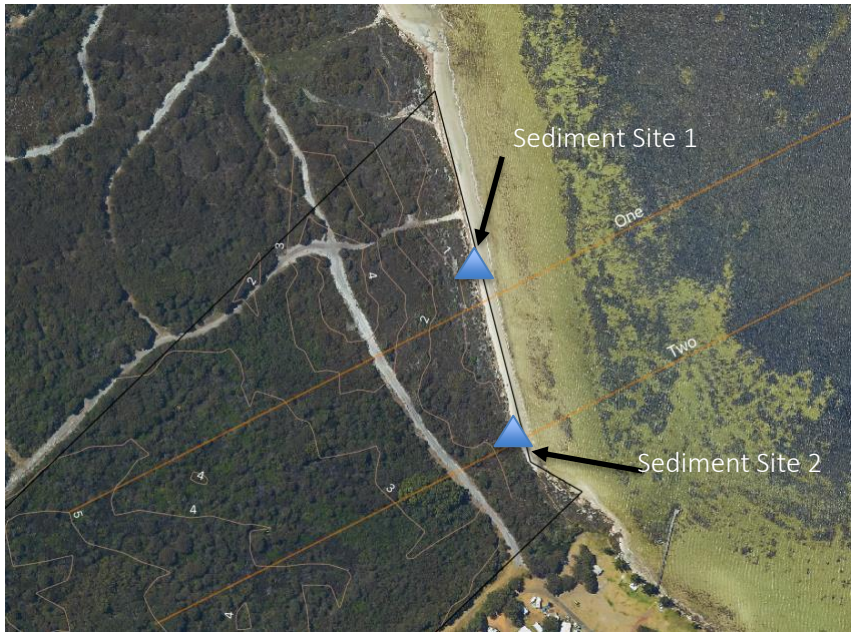


Figure 4.5 Sediment sample sites January 2020, and SBEACH Profiles (orange)

The effect of the 'storm event', scaled to meet 100yr ARI wind, wave and water levels was then simulated by running the storm for three successive times on each profile. The HSD as defined in SPP2.6 has been taken as the 'peak steady water level under storm activity' of 1m AHD. Results are summarised in Figure 4.6 and Table 4.4.

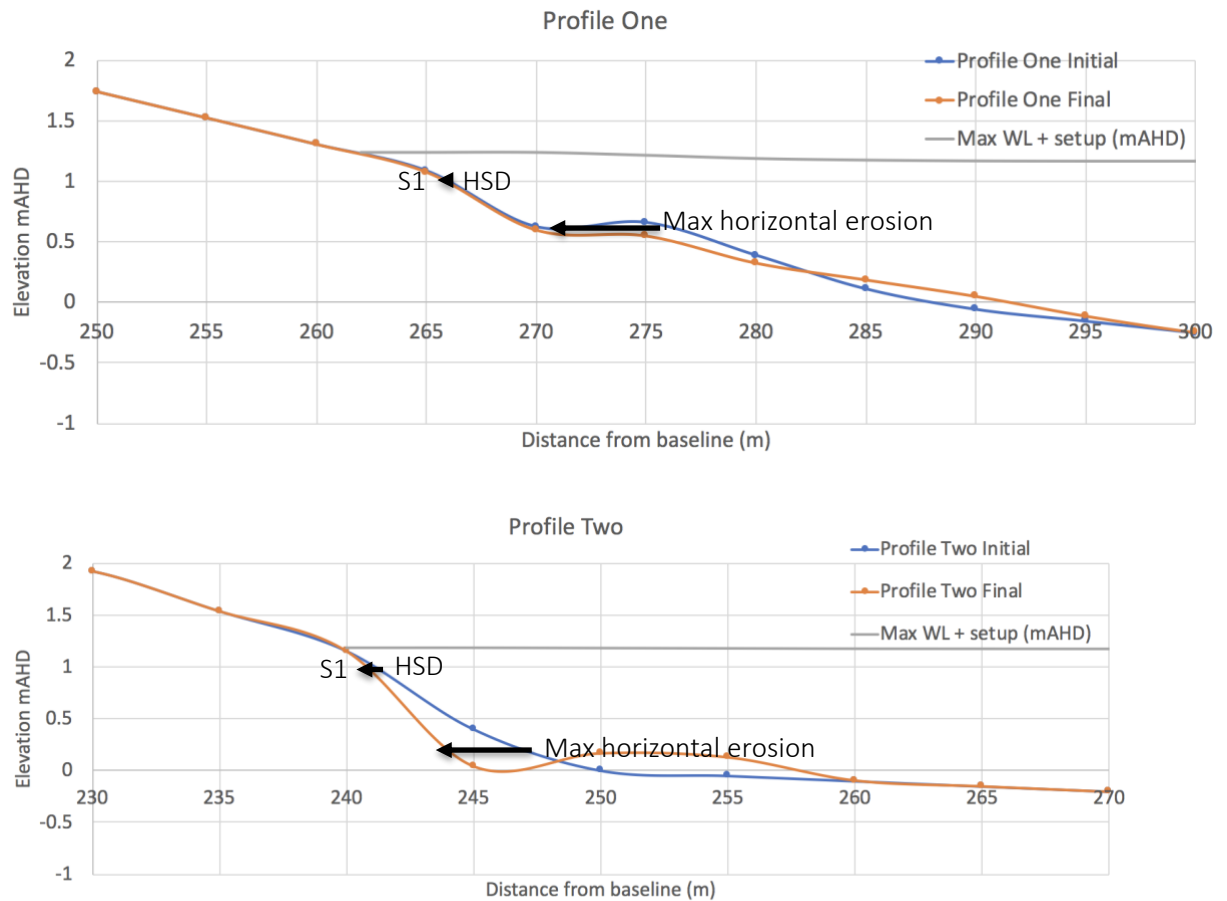


Figure 4.6 SBEACH results for profiles one and two

Table 4.4 Horizontal erosion results of storm erosion

Location	Erosion at 0mAHD	Erosion at 1mAHD	Erosion at 2mAHD	Landward extent of erosion from HSD	Maximum Horizontal Erosion
Profile One	0m	0.17m	0m	0.1m	5m
Profile Two	0m	0.33m	0m	1.0m	5m

The SPP2.6 notes that the value for the (S1) allowance should be the recession from the HSD to the land extent of the storm erosion as calculated by the model. The maximum recession from the HSD is negligible at both profiles. For conservatism, the maximum cross-shore storm erosion for S1 has been adopted as the maximum horizontal erosion observed, giving a value **5 metres** as the allowance for S1.

Whilst this assessment did not specifically consider longshore transport, and the SBEACH model does not have this capability, the storm erosion response for this foreshore is expected to be dominated by cross shore response to high water levels rather than alongshore transport.

4.3. ALLOWANCE FOR HISTORIC SHORELINE MOVEMENT TRENDS (S2)

As outlined in SPP2.6, the allowance for historic shoreline movement trends “should be based on the review of available shoreline records” (1). This is typically assessed with the use of historic aerial photography and/or vegetation lines to determine the historic position of the shoreline. The allowance for historic shoreline movement trends “should generally be calculated as 100 times the historic annual rate of erosion” (1).

Aerial photography from the years 1961, 1977, 1996, 2007, 2014, 2016 and 2019 were used to map vegetation lines at Big Grove, Albany. The shoreline changes since 1961 measured at 100m intervals beginning approximately 700m north of the site and extending 700m south along the shore (Figure 4.7). Within the site proximity at Lot 105, distances to the 1961 line were measured at 50m intervals.

In addition to the vegetation lines derived from available aerial imagery, vegetation lines available to the public from WA Marine Maps (14) were used to assess shoreline changes over the years 1965, 1997, 2007, 2014, and 2016. However, there were a number of quality issues with the data that reduced confidence in its application. Additional imagery available from Landgate was also reviewed but was not used for the assessment due to the accuracy of the imagery noted as being $\pm 8m$.

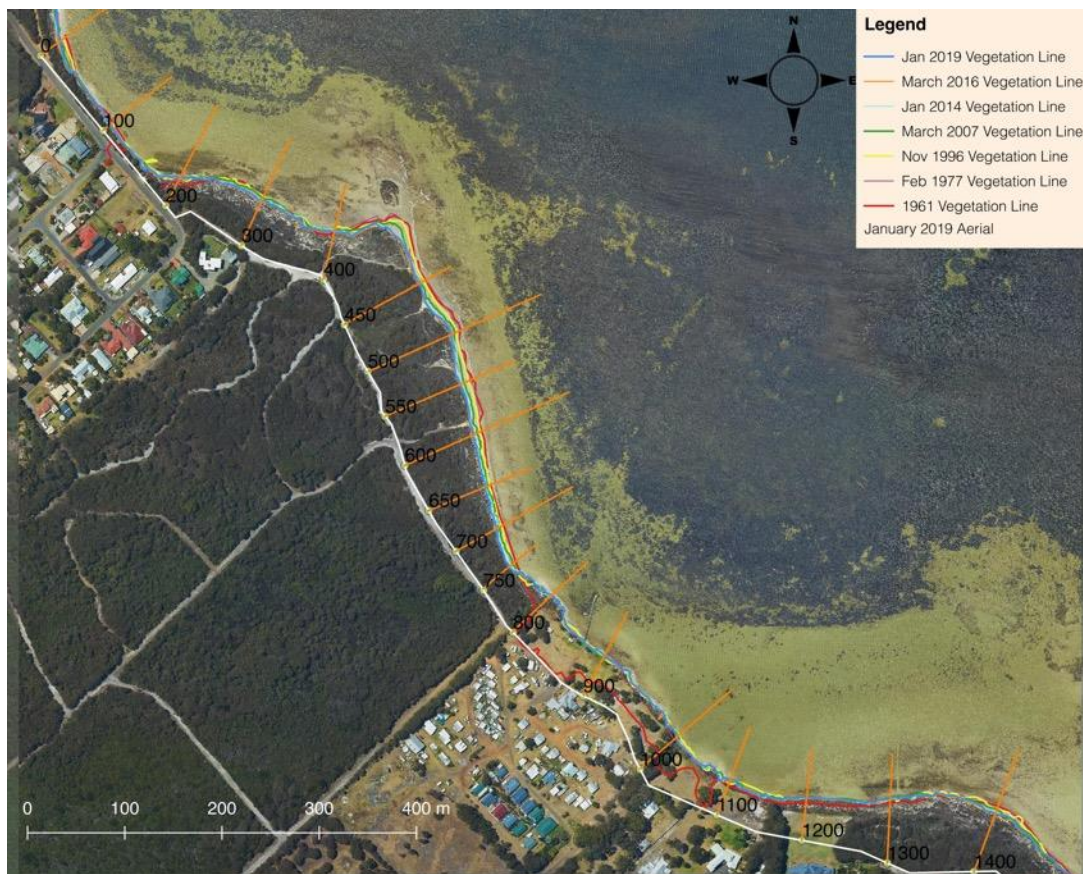


Figure 4.7 Vegetation Line Mapping.

Results of the vegetation line analysis suggest the shoreline at Big Grove has remained relatively stable with minor erosion since 1961. Some small variation along the shoreline can be observed in localised areas. To the north of the site, vegetation along the sandy point has shown some minor variability, with a localised section of retreat of the vegetation line on the tip of the sandy point (Chainage ~450, Figure 4.8).

There is a discrete section of accretion to the south of Lot 105 (at 800 to 1000 in Figure 4.7, Figure 4.8), where there has been 25 to 35m of shoreline advancement from 1961 to 2019. Since the 1970s, the shoreline has remained relatively stable in this area. The isolated advancement of the shoreline in this area has been attributed to artificial filling associated with the development (13).

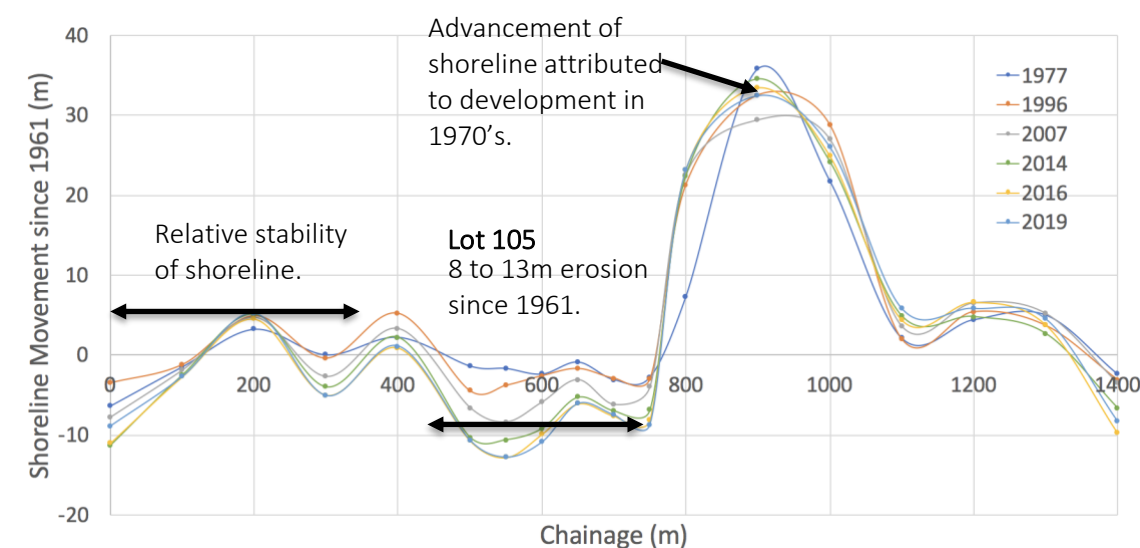


Figure 4.8 Shoreline Movement since 1961, Big Grove, Albany.

The vegetation lines of 1961, 1977, 1996, 2007, 2014, 2016 and 2019 were used to form a timeseries showing the shoreline at Lot 105 (Ch500 to 750, Figure 4.7), since 1961. Between 1961 and 1996, the rate of erosion is very slow, with an average of 0.1m/yr (Figure 4.9). The erosion rate then increased marginally between the period of 1996 to 2014, reaching a maximum of 0.3m/year. However, since 2016 the coastline has remained relatively stable, and erosion has reduced to below 0.1m/yr (Figure 4.9).

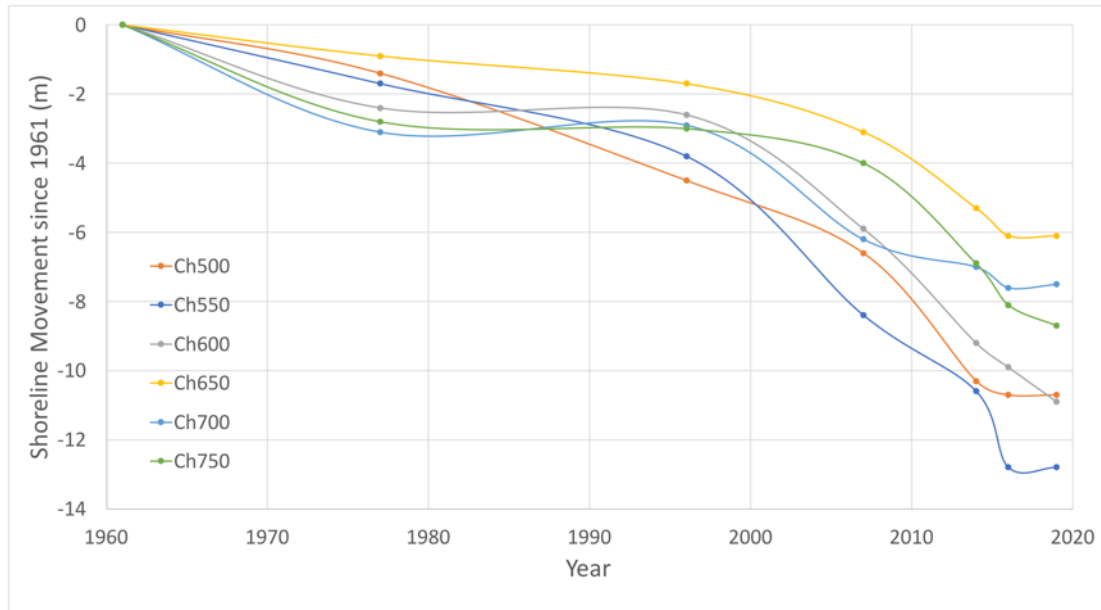


Figure 4.9 Shoreline Movement since 1961 at Lot 105, Big Grove (1961 to 2019).

The overall variation in erosion rates since 1961 is relatively minor (between 0.1 and 0.3m/yr), and an overall trend of slow erosion of the vegetation line is evident. The average erosion rate from chainage 500 to 750m is 1961 to 2019 is 0.16m/yr. The maximum overall erosion rate within Lot 105 occurs at chainage 550, with an average erosion rate of 0.22m/yr since 1961. This value has been adopted as the “historic rate of annual erosion” (as outlined in SPP2.6 (1)) at Lot 105, Big Grove, Albany. The resulting S2 allowance for the 100-year planning period at Big Grove is 100 times the maximum average erosion rate, or **22 metres**.

For context, a historical chart dated to the early 1800’s has also been used to qualitatively assess broad scale historic changes to the shoreline planform of Princess Royal Harbour. Many of the features apparent in recent aerial imagery are evident in the 1814 survey, in particular Casuarina Point, the undulating shoreline along Big Grove and the wide nearshore flats to the east. This suggests many of the major coastal landforms within Princess Royal Harbour have been relatively stable over the last 200 years.

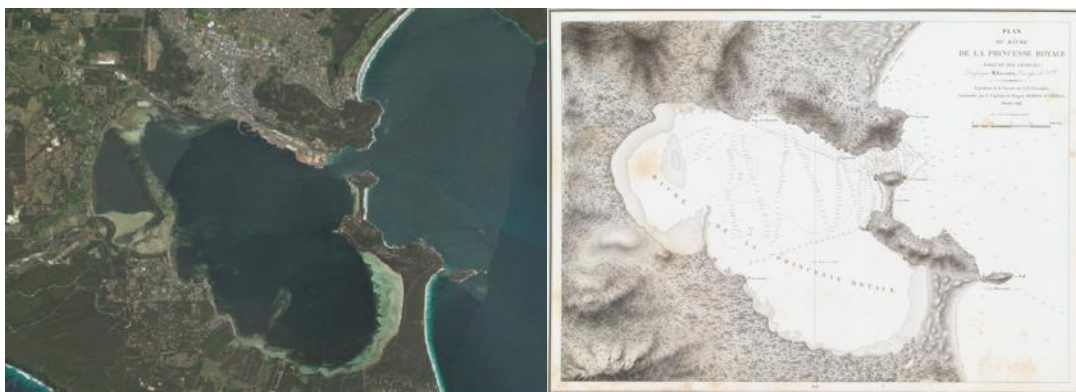


Figure 4.10 Comparisons of early 2000’s (left) and French chart of Princess Royal Harbour from early 1800’s from National Library of Australia (right).

4.4. ALLOWANCE FOR SEA LEVEL RISE (S3)

SPP2.6 (1) outlines the allowance for sea level rise should be based on a vertical sea level rise of 0.9 metres over a 100-year planning timeframe to 2110. The allowance for erosion caused by future sea level rise on sandy coast should be calculated as 100 times the adopted sea level rise value of 0.9m over a 100-year timeframe, or **90 metres**.

Whilst the response of the shoreline within Princess Royal Harbour to rising sea levels will be strongly influenced by localised rock controls and the variable shoreline and dune morphology, the Policy does not specifically allow a site-specific assessment of the potential localised response of the shoreline to rising sea levels.

4.5. ALLOWANCE FOR STORM SURGE INUNDATION

The proposed site has relatively steep primary dunes with modest elevation (4mAHD) and is not considered vulnerable to coastal inundation. As outlined in SPP2.6 (1) the allowance for the current risk of inundation should be the maximum extent of storm inundation. This has been defined as the peak steady water level plus wave run-up based on the storm event for storm surge inundation “based on ocean forces and coastal processes that have a 0.2 percent or one-in-five hundred probability of being equalled or exceeded in any given year over the planning time frame.”

The extreme water level values from the Department of Transport (DoT) extremes analysis for Albany for the Augusta Boat Harbour project (11) only extends to the 100yr ARI event (1.08m AHD). If the extreme water level analysis (using the available DoT tide gauge data at Albany; 1987 to 2016) is extrapolated, the 500 yr ARI water level is 1.2m AHD (Figure 4.13). Similarly, The 2017 Royal Haskoning DHV Albany Coastal Vulnerability Study and Hazard Mapping (15) recommends a 500yr ARI peak steady water level of 1.15m AHD (with no run up or set up).

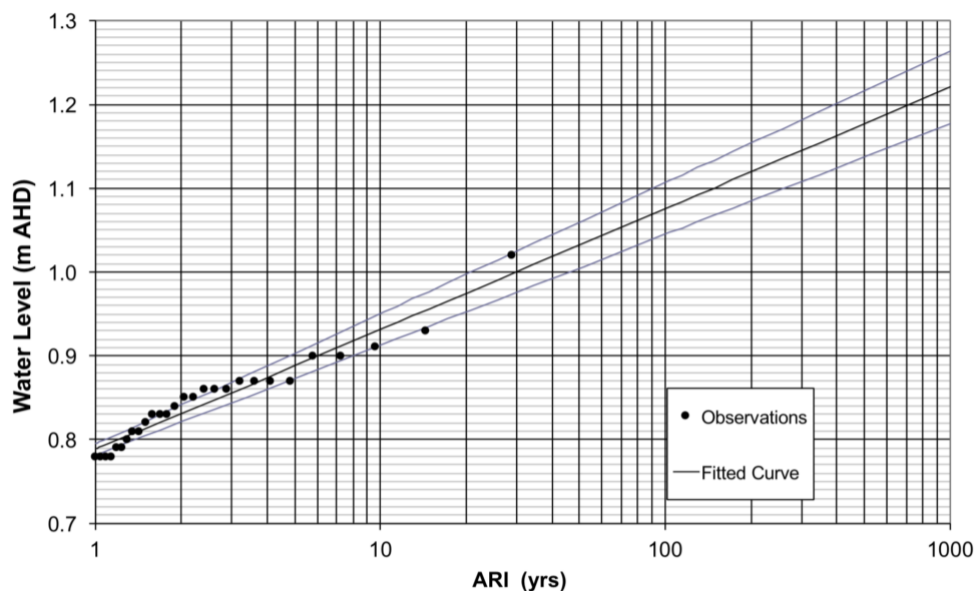


Figure 4.11 Albany Extreme Water levels (1987 – 2016).

The wave run up from the SBEACH modelling of the 100yr ARI wave event (refer section 4.2) reported a maximum estimated runup elevation of 1.39m AHD and 1.17 m AHD for Reach 1 and 2 respectively, resulting in a maximum wave run up of 0.31m above the 100yr ARI peak steady water level of 1.08m AHD for the two profiles.

The 100yr ARI peak steady water level of 1.08m AHD was scaled to peak at 1.2m AHD to represent the 500yr ARI peak steady water level event. The SBEACH model was then run for the two profiles with the 500yr ARI water level event by running the storm for three successive times on each profile. The maximum value for water elevation plus wave run up as reported from the model was 1.49m AHD and 1.30m AHD (respectively). The **1.5m AHD contour** has been adopted for the current risk of storm inundation.

The allowance for inundation as noted in SPP2.6 is based on the alignment of the 1.5m AHD contour (s4) plus an additional 0.9m allowance for sea level rise over a 100-year timeframe (i.e. the 2.4m AHD contour) (1). This is shown in Figure 4.12 and is seaward of the allowance for coastal processes. The dune buffer above 1.5m AHD within the allowance for coastal processes, typically exceeds 200m³/m. The site is elevated with a large primary dune and a very low risk of coastal inundation.



Figure 4.12 Allowance for Inundation (s4), Inundation (s4) and sea level rise (+0.9m over 100yr), and the allowances for coastal erosion processes (note contours interpolated from the 1m contours provided).

4.6. ALLOWANCE FOR COASTAL PROCESSES

The SPP2.6 notes that for a sandy coast the planning allowance for coastal processes should be measured from the HSD and calculated as the sum of the factors: S1 Erosion; S2 Erosion; and S3 Erosion plus 0.2 metres per year allowance for uncertainty. The total allowance for coastal processes is summarised in Table 4.5. Figure 4.13 shows the 137m allowance on Lot 105, Frenchman Bay Road. A drawing is also provided as an attachment.

Table 4.5 Planning allowances for coastal processes at Big Grove, Albany

Scenario	100-year timeframe
S1 Allowance	5 m
S2 Allowance	22 m
S3 Allowance	90 m
Uncertainty	20 m
Total	137 m



Figure 4.13 Allowance for Coastal Processes at Lot 105 Big Grove, Albany.

Note: 137m offset from HSD alignment is based on the NE/SW property boundary.

5. Conclusion

As part of the planning for development on Lot105 Frenchman's Bay Road in the locality of Big Grove, Albany, Able Planning commissioned Seashore Engineering to conduct a Coastal Processes Allowance assessment of the lot under State Planning Policy (SPP) 2.6.

The locality of Big Grove along the southern shoreline of Princess Royal Harbour is highly sheltered from offshore wave conditions and represents a low energy coastline. The methods outlined in SPP2.6 have been applied to Lot 105 Big Grove to determine a coastal set back allowance. In summary:

- The HSD was defined as the 1mAHD contour based on the peak water level of the design storm and represents the toe of the primary dune rather than the coastal vegetation line.
- S1 (Allowance for the Current Risk of Storm Erosion): The design storm required a site-specific assessment and was based on fetch limited wave coinciding with the 100yrARI ocean water level. This accounts for the relatively low lying foredune (<0.7mAHD) that is submerged during high tides and is susceptible to erosion during storms with strong northerly winds and high-water levels. Results of erosion modelling for two profiles suggest the maximum erosion during the 100yr ARI storm is 5m.
- S2 (Allowance for Historic Shoreline Movement Trends): Assessment of vegetation lines identified a relatively stable site with recent rates of erosion less than 0.1m/yr. However, higher rates of erosion have been observed in the past and the historic erosion rate for the length of available data (1961-2019) has been used to assess an maximum average erosion rate of 0.22m/yr, with the allowance for S2 being 22m.
- S3 (Allowance for Erosion Caused by Future Sea Level Rise): Whilst the response of the shoreline within Princess Royal Harbour to rising sea levels will be strongly influenced by localised rock controls and the variable shoreline and dune morphology, the Policy does not specifically allow a site specific assessment of the potential localised response of the shoreline to rising sea levels. An allowance of 90m has been included as required under the Policy.
- An additional allowance for uncertainty of 20m has been included as required under the Policy.
- Allowance for Storm Surge Inundation: The site is elevated with a large primary dune and a very low risk of coastal storm surge inundation. The current risk of storm inundation (S4) has been assessed as the 1.5mAHD contour, based on the maximum water level plus wave run-up resulting from running the SBEACH model under an assumed 500yr ARI peak steady water level. The allowance for inundation, including 0.9m sea level rise, is the 2.4mAHD contour, which is seaward of the allowance for coastal processes.

The total allowance for coastal processes at Lot 105 Frenchmans Bay Road, based on the methods outlined in Schedule 1 of SPP2.6, is 137m from the HSD.

Able Planning have noted that as the planning process progresses towards a 'structure plan' or subdivision stage, depending upon the timing, a refined assessment of the coastal process allowances may be required. It is recommended this refined assessment considers the following:

- Detailed Feature Survey: The investigations of this study have been based on the available feature survey (June 2019, 1.0m contours), supplied by Able Planning. The survey provided had limited resolution in the intertidal area that required some interpolation between hydrographic and land surveys. It is understood a detailed feature survey will be undertaken in subsequent stages at the structure plan and/or subdivision application stage, at which point the Coastal Process Allowances may be revised.
- Coastal Processes Allowance Offset: Due to the alignment of the property boundaries, extension of this detailed survey to adjacent properties may allow the Coastal Process Allowance to be offset 'perpendicular to the shore' rather than along the property boundary alignment as has been assumed for the current study.
- Geotechnical Investigation: A geotechnical investigation is recommended at the structure plan or subdivision application stage to determine the extent and depth any existing surface rock (such as the rock identified during the site inspection). There is rock evident across the site, which may reduce the recommended Coastal Process Allowance, depending upon the location, level and type of observed rock.
- Allowance for Erosion Caused by Sea Level Rise: The application of the 90m allowance for erosion caused by future sea level rise is assumed to be conservative at this site. Should future Policy revisions allow a site-specific application of the response of this shoreline to a 0.9m sea level rise at the structure plan stage, this could be considered by the Client.

6. References

1. Western Australian Planning Commission. Statement of Planning Policy No. 2.6: State Coastal Planning Policy. Government of Western Australia, Perth; 2012.
2. Hodgkin EP, Clark R. Estuaries of the Shire of Albany. Perth, Western Australia: Environmental Protection Authority; 1990.
3. Short AD. BEACHES OF THE WESTERN AUSTRALIAN COAST: EUCLA TO ROEBUCK BAY. Sydney University Press; 2006.
4. Department of Transport. Marine Chart, Albany. 2014.
5. Google. Google maps [Internet]. 2019 [cited 2019 Jul 18]. Available from: <https://www.google.com/maps/place/Big+Grove>
6. Western Australia Planning Commission. Statement of Planning Policy No. 2.6 – State Coastal Planning Policy. Western Australian Government, Perth; 2003.
7. MP Rogers & Associates. Design Event Selection for Erosion Hazard Assessments. 2018.
8. U. S. Army Corps of Engineers (USACE). Shore Protection Manual. 1984.
9. Seashore Engineering. Emu Point Boat Harbour – Wave Monitoring. 2017;
10. Bureau of Meteorology (Australian Government). Tropical Cyclone Alby 27/03/1978 to 04/04/1978. 2011.
11. Department of Transport: DOT. Augusta Boat Harbour Design Wave and Water Level Analysis. 2012.
12. Government of Western Australia. Wa Marine Map 3. 2019.
13. MP Rogers & Associates. Big Grove Albany Setback Assessment. 2010.
14. Government of Western Australia. MARINE MAPS 3. 2019.
15. Royal Haskoning DHV (RHDHV). Emu Point to Middleton Beach – Coastal Adaptation and Protection Strategy. Coastal Vulnerability Study and Hazard Mapping. Part 1: Coastal Processes and Hazard Mapping. 2017.
16. Seashore Engineering. Design Storms for Western Australian Coastal Planning: Tropical Cyclones. 2016.

Attachment 1: Lot 105 Coastal Processes Allowance

Attachment 2: SBEACH Reports

Report

Project: Big Grove Coastal Setback

Reach: Reach One

Storm: Big Grove 100yr variable

MODEL CONFIGURATION

INPUT UNITS (SI=1, AMERICAN CUST.=2): 1
NUMBER OF CALCULATION CELLS: 400
GRID TYPE (CONSTANT=0, VARIABLE=1): 1
NUMBER OF GRID CELL REGIONS: 2
NUMBER CELLS AND CELL WIDTH IN REGION 1: 200, 5.0
NUMBER CELLS AND CELL WIDTH IN REGION 2: 200, 10.0
NUMBER OF TIME STEPS AND VALUE OF TIME STEP IN MINUTES: 23,180.0
TIME STEP INTERVAL OF INTERMEDIATE OUTPUT: 20
NO COMPARISON WITH MEASURED PROFILE.
PROFILE ELEVATION CONTOUR 1: 0.00
PROFILE ELEVATION CONTOUR 2: 1.00
PROFILE ELEVATION CONTOUR 3: 2.00
PROFILE EROSION DEPTH 1: 0.50
PROFILE EROSION DEPTH 2: 1.00
PROFILE EROSION DEPTH 3: 1.50
REFERENCE ELEVATION: 0.00
TRANSPORT RATE COEFFICIENT (m⁴/N): 1.75E-6
COEFFICIENT FOR SLOPE DEPENDENT TERM (m²/s): 0.0020
TRANSPORT RATE DECAY COEFFICIENT MULTIPLIER: 0.50
WATER TEMPERATURE IN DEGREES C : 20.0

WAVE TYPE (MONOCHROMATIC=1, IRREGULAR=2): 2
WAVE HEIGHT AND PERIOD INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WAVE HEIGHT AND PERIOD INPUT IN MINUTES: 180.0
WAVE ANGLE INPUT (CONSTANT=0, VARIABLE=1): 0
CONSTANT WAVE ANGLE: 0.0
WATER DEPTH OF INPUT WAVES (DEEP WATER = 0.0): 0.0
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TOTAL WATER ELEVATION INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE TOTAL WATER ELEVATION INPUT IN MINUTES: 180.0
WIND SPEED AND ANGLE INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WIND SPEED AND ANGLE INPUT IN MINUTES: 180.0

TYPE OF INPUT PROFILE (ARBITRARY=1, SCHEMATIZED=2): 1
DEPTH CORRESPONDING TO LANDWARD END OF SURF ZONE: 0.30
EFFECTIVE GRAIN SIZE DIAMETER IN MILLIMETERS: 0.35
MAXIMUM PROFILE SLOPE PRIOR TO AVALANCHING IN DEGREES: 30.0

NO BEACH FILL IS PRESENT.

NO SEAWALL IS PRESENT.

NO HARD BOTTOM IS PRESENT.

COMPUTED RESULTS

DIFFERENCE IN TOTAL VOLUME BETWEEN FINAL AND INITIAL PROFILES:
0.0 m³/m

MAXIMUM VALUE OF WATER ELEVATION + SETUP FOR SIMULATION
1.24 m

TIME STEP AND POSITION ON PROFILE AT WHICH MAXIMUM VALUE
OF WATER ELEVATION + SETUP OCCURRED
7, 270.0 m

MAXIMUM ESTIMATED RUNUP ELEVATION: 1.39 m
(REFERENCED TO VERTICAL DATUM)

A 0.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.00 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

MAXIMUM RECESSION OF THE 0.00 m ELEVATION CONTOUR:
0.00 m

MAXIMUM RECESSION OF THE 1.00 m ELEVATION CONTOUR:
0.17 m

MAXIMUM RECESSION OF THE 2.00 m ELEVATION CONTOUR:
0.00 m

Report

Project: Big Grove Coastal Setback

Reach: Reach Two

Storm: Big Grove 100yr variable

MODEL CONFIGURATION

INPUT UNITS (SI=1, AMERICAN CUST.=2): 1
NUMBER OF CALCULATION CELLS: 400
GRID TYPE (CONSTANT=0, VARIABLE=1): 1
NUMBER OF GRID CELL REGIONS: 2
NUMBER CELLS AND CELL WIDTH IN REGION 1: 200, 5.0
NUMBER CELLS AND CELL WIDTH IN REGION 2: 200, 10.0
NUMBER OF TIME STEPS AND VALUE OF TIME STEP IN MINUTES: 23,180.0
TIME STEP INTERVAL OF INTERMEDIATE OUTPUT: 20
NO COMPARISON WITH MEASURED PROFILE.
PROFILE ELEVATION CONTOUR 1: 0.00
PROFILE ELEVATION CONTOUR 2: 1.00
PROFILE ELEVATION CONTOUR 3: 2.00
PROFILE EROSION DEPTH 1: 0.50
PROFILE EROSION DEPTH 2: 1.00
PROFILE EROSION DEPTH 3: 1.50
REFERENCE ELEVATION: 0.00
TRANSPORT RATE COEFFICIENT (m⁴/N): 1.75E-6
COEFFICIENT FOR SLOPE DEPENDENT TERM (m²/s): 0.0020
TRANSPORT RATE DECAY COEFFICIENT MULTIPLIER: 0.50
WATER TEMPERATURE IN DEGREES C : 20.0

WAVE TYPE (MONOCHROMATIC=1, IRREGULAR=2): 2
WAVE HEIGHT AND PERIOD INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WAVE HEIGHT AND PERIOD INPUT IN MINUTES: 180.0
WAVE ANGLE INPUT (CONSTANT=0, VARIABLE=1): 0
CONSTANT WAVE ANGLE: 0.0
WATER DEPTH OF INPUT WAVES (DEEP WATER = 0.0): 0.0
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TIME STEP OF VARIABLE TOTAL WATER ELEVATION INPUT IN MINUTES: 180.0
WIND SPEED AND ANGLE INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WIND SPEED AND ANGLE INPUT IN MINUTES: 180.0

TYPE OF INPUT PROFILE (ARBITRARY=1, SCHEMATIZED=2): 1
DEPTH CORRESPONDING TO LANDWARD END OF SURF ZONE: 0.30
EFFECTIVE GRAIN SIZE DIAMETER IN MILLIMETERS: 0.35
MAXIMUM PROFILE SLOPE PRIOR TO AVALANCHING IN DEGREES: 30.0

NO BEACH FILL IS PRESENT.

NO SEAWALL IS PRESENT.

NO HARD BOTTOM IS PRESENT.

COMPUTED RESULTS

DIFFERENCE IN TOTAL VOLUME BETWEEN FINAL AND INITIAL PROFILES:
0.0 m³/m

MAXIMUM VALUE OF WATER ELEVATION + SETUP FOR SIMULATION
1.18 m

TIME STEP AND POSITION ON PROFILE AT WHICH MAXIMUM VALUE
OF WATER ELEVATION + SETUP OCCURRED
7, 245.0 m

MAXIMUM ESTIMATED RUNUP ELEVATION: 1.17 m
(REFERENCED TO VERTICAL DATUM)

A 0.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.00 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

THE 0.00 m CONTOUR DID NOT RECEDE

MAXIMUM RECESSION OF THE 1.00 m ELEVATION CONTOUR:
0.33 m

MAXIMUM RECESSION OF THE 2.00 m ELEVATION CONTOUR:
0.00 m

Project: Big Grove Coastal Setback
Reach: Reach One
Storm: Big Grove 500yr

MODEL CONFIGURATION

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NUMBER CELLS AND CELL WIDTH IN REGION 2: 200, 10.0
NUMBER OF TIME STEPS AND VALUE OF TIME STEP IN MINUTES: 27,180.0
TIME STEP(S) OF INTERMEDIATE OUTPUT 1: 10
NO COMPARISON WITH MEASURED PROFILE.
PROFILE ELEVATION CONTOUR 1: 0.00
PROFILE ELEVATION CONTOUR 2: 1.00
PROFILE ELEVATION CONTOUR 3: 2.00
PROFILE EROSION DEPTH 1: 0.50
PROFILE EROSION DEPTH 2: 1.00
PROFILE EROSION DEPTH 3: 1.50
REFERENCE ELEVATION: 0.00
TRANSPORT RATE COEFFICIENT (m⁴/N): 1.75E-6
COEFFICIENT FOR SLOPE DEPENDENT TERM (m²/s): 0.0020
TRANSPORT RATE DECAY COEFFICIENT MULTIPLIER: 0.50
WATER TEMPERATURE IN DEGREES C : 20.0

WAVE TYPE (MONOCHROMATIC=1, IRREGULAR=2): 2
WAVE HEIGHT AND PERIOD INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WAVE HEIGHT AND PERIOD INPUT IN MINUTES: 180.0
WAVE ANGLE INPUT (CONSTANT=0, VARIABLE=1): 0
CONSTANT WAVE ANGLE: 0.0
WATER DEPTH OF INPUT WAVES (DEEP WATER = 0.0): 0.0
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TOTAL WATER ELEVATION INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE TOTAL WATER ELEVATION INPUT IN MINUTES: 180.0
WIND SPEED AND ANGLE INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WIND SPEED AND ANGLE INPUT IN MINUTES: 180.0

TYPE OF INPUT PROFILE (ARBITRARY=1, SCHEMATIZED=2): 1
DEPTH CORRESPONDING TO LANDWARD END OF SURF ZONE: 0.30
EFFECTIVE GRAIN SIZE DIAMETER IN MILLIMETERS: 0.35
MAXIMUM PROFILE SLOPE PRIOR TO AVALANCHING IN DEGREES: 30.0

NO BEACH FILL IS PRESENT.

NO SEAWALL IS PRESENT.

NO HARD BOTTOM IS PRESENT.

COMPUTED RESULTS

DIFFERENCE IN TOTAL VOLUME BETWEEN FINAL AND INITIAL PROFILES:
0.0 m³/m

MAXIMUM VALUE OF WATER ELEVATION + SETUP FOR SIMULATION
1.33 m

TIME STEP AND POSITION ON PROFILE AT WHICH MAXIMUM VALUE
OF WATER ELEVATION + SETUP OCCURRED
7, 270.0 m

MAXIMUM ESTIMATED RUNUP ELEVATION: 1.49 m
(REFERENCED TO VERTICAL DATUM)

A 0.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.00 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

MAXIMUM RECESSION OF THE 0.00 m ELEVATION CONTOUR:
0.00 m

MAXIMUM RECESSION OF THE 1.00 m ELEVATION CONTOUR:
0.41 m

MAXIMUM RECESSION OF THE 2.00 m ELEVATION CONTOUR:
0.00 m

Report

Project: Big Grove Coastal Setback

Reach: Reach Two

Storm: Big Grove 500yr

MODEL CONFIGURATION

INPUT UNITS (SI=1, AMERICAN CUST.=2): 1
NUMBER OF CALCULATION CELLS: 400
GRID TYPE (CONSTANT=0, VARIABLE=1): 1
NUMBER OF GRID CELL REGIONS: 2
NUMBER CELLS AND CELL WIDTH IN REGION 1: 200, 5.0
NUMBER CELLS AND CELL WIDTH IN REGION 2: 200, 10.0
NUMBER OF TIME STEPS AND VALUE OF TIME STEP IN MINUTES: 27,180.0
TIME STEP(S) OF INTERMEDIATE OUTPUT 1: 10
NO COMPARISON WITH MEASURED PROFILE.
PROFILE ELEVATION CONTOUR 1: 0.00
PROFILE ELEVATION CONTOUR 2: 1.00
PROFILE ELEVATION CONTOUR 3: 2.00
PROFILE EROSION DEPTH 1: 0.50
PROFILE EROSION DEPTH 2: 1.00
PROFILE EROSION DEPTH 3: 1.50
REFERENCE ELEVATION: 0.00
TRANSPORT RATE COEFFICIENT (m⁴/N): 1.75E-6
COEFFICIENT FOR SLOPE DEPENDENT TERM (m²/s): 0.0020
TRANSPORT RATE DECAY COEFFICIENT MULTIPLIER: 0.50
WATER TEMPERATURE IN DEGREES C : 20.0

WAVE TYPE (MONOCHROMATIC=1, IRREGULAR=2): 2
WAVE HEIGHT AND PERIOD INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WAVE HEIGHT AND PERIOD INPUT IN MINUTES: 180.0
WAVE ANGLE INPUT (CONSTANT=0, VARIABLE=1): 0
CONSTANT WAVE ANGLE: 0.0
WATER DEPTH OF INPUT WAVES (DEEP WATER = 0.0): 0.0
SEED VALUE FOR WAVE HEIGHT RANDOMIZER AND % VARIABILITY: 4567, 20.0
TOTAL WATER ELEVATION INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE TOTAL WATER ELEVATION INPUT IN MINUTES: 180.0
WIND SPEED AND ANGLE INPUT (CONSTANT=0, VARIABLE=1): 1
TIME STEP OF VARIABLE WIND SPEED AND ANGLE INPUT IN MINUTES: 180.0

TYPE OF INPUT PROFILE (ARBITRARY=1, SCHEMATIZED=2): 1
DEPTH CORRESPONDING TO LANDWARD END OF SURF ZONE: 0.30
EFFECTIVE GRAIN SIZE DIAMETER IN MILLIMETERS: 0.35
MAXIMUM PROFILE SLOPE PRIOR TO AVALANCHING IN DEGREES: 30.0

NO BEACH FILL IS PRESENT.

NO SEAWALL IS PRESENT.

NO HARD BOTTOM IS PRESENT.

COMPUTED RESULTS

DIFFERENCE IN TOTAL VOLUME BETWEEN FINAL AND INITIAL PROFILES:
0.0 m³/m

MAXIMUM VALUE OF WATER ELEVATION + SETUP FOR SIMULATION
1.34 m

TIME STEP AND POSITION ON PROFILE AT WHICH MAXIMUM VALUE
OF WATER ELEVATION + SETUP OCCURRED
25, 240.0 m

MAXIMUM ESTIMATED RUNUP ELEVATION: 1.30 m
(REFERENCED TO VERTICAL DATUM)

A 0.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.00 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

A 1.50 m EROSION DEPTH DID NOT OCCUR ANYWHERE ON THE PROFILE.

THE 0.00 m CONTOUR DID NOT RECEDE

MAXIMUM RECESSION OF THE 1.00 m ELEVATION CONTOUR:
2.81 m

MAXIMUM RECESSION OF THE 2.00 m ELEVATION CONTOUR:
0.00 m

Attachment 3 Sediment PSD Results



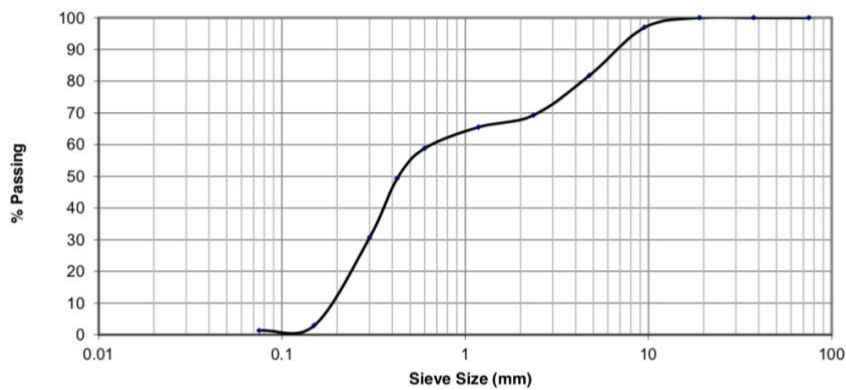
TEST REPORT

Page 1 of 1

CLIENT: Seashore Engineering	SAMPLE NO: P 27531
PROJECT: Big Grove	JOB NO: 96-1.2-1
LOCATION: Margaret River Big Grove Berm Track North (1)	FIELD DESCRIPTION: Sand
PROPOSED USE: Compliance	DATE PSD TESTED: 30-Jan-20
CLIENT REF: -	DATE PI TESTED: n/a
	DEPTH TESTED mm: Not Supplied

PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1



PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1				PLASTICITY INDEX & LINEAR SHRINKAGE		
Sieve Size	% Passing	Sieve Size	% Passing			
75.0 mm	100	1.18 mm	65	Liquid Limit	% AS 1289.3.1.2	n/a
37.5 mm	100	0.600 mm	59	Plastic Limit	% AS 1289.3.2.1	n/a
19.0 mm	100	0.425 mm	49	Plasticity Index	% AS 1289.3.3.1	n/a
9.5 mm	97	0.300 mm	31	Linear Shrinkage	% AS 1289.3.4.1	n/a
4.75 mm	82	0.150 mm	3	Length of Mould	mm	n/a
2.36 mm	69	0.075 mm	1	Sample history		n/a
				Sample Preparation Method		n/a
				Nature of Shrink		n/a

Notes:

Sample site selected by Client
Sampled by Client

Approved Signatory: W.Symonds

Date: 21-Jan-20

Report Number: P 27531 / 1



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Malaga WA 6090

TEST REPORT

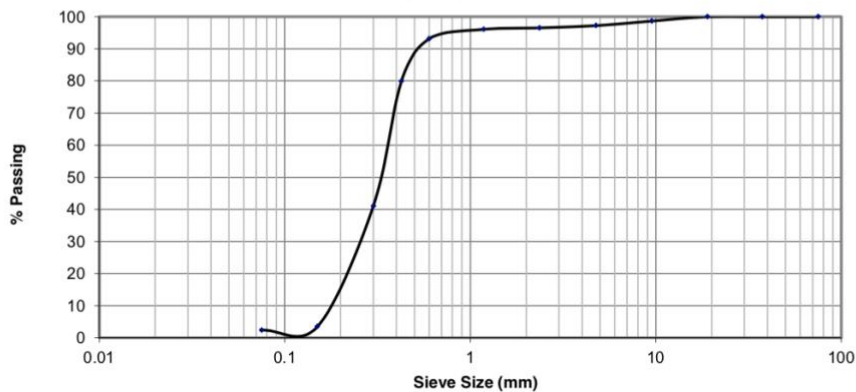
Page 1 of 1

CLIENT: Seashore Engineering
PROJECT: Big Grove
LOCATION: Margaret River
 Big Grove Beach South (2)
PROPOSED USE: Compliance
CLIENT REF: -

SAMPLE NO: P 27532
JOB NO: 96-1.2-1
FIELD DESCRIPTION: Sand
DATE PSD TESTED: 30-Jan-20
DATE PI TESTED: n/a
DEPTH TESTED mm: Not Supplied

PARTICLE SIZE DISTRIBUTION

AS 1289.3.6.1



PARTICLE SIZE DISTRIBUTION AS 1289.3.6.1				PLASTICITY INDEX & LINEAR SHRINKAGE		
Sieve Size	% Passing	Sieve Size	% Passing			
75.0 mm	100	1.18 mm	96	Liquid Limit	% AS 1289.3.1.2	n/a
37.5 mm	100	0.600 mm	93	Plastic Limit	% AS 1289.3.2.1	n/a
19.0 mm	100	0.425 mm	80	Plasticity Index	% AS 1289.3.3.1	n/a
9.5 mm	99	0.300 mm	41	Linear Shrinkage	% AS 1289.3.4.1	n/a
4.75 mm	97	0.150 mm	4	Length of Mould	mm	n/a
2.36 mm	97	0.075 mm	2	Sample history		n/a
				Sample Preparation Method		n/a
				Nature of Shrink		n/a

Notes:

Sample site selected by Client
 Sampled by Client

Approved Signatory: W.Symonds
Date: 21-Jan-20
Report Number: P 27532 / 1



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CITY OF ALBANY

LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

Lot 105 on Deposited Plan 230421,
House 795 Frenchman Bay Road,
Big Grove

(Certificate of Title 2182/323)

PART B – TECHNICAL APPENDICES

CITY OF ALBANY

LOCAL PLANNING SCHEME No. 1

AMENDMENT No. 34

Lot 105 on Deposited Plan 230421,
House 795 Frenchman Bay Road,
Big Grove

(Certificate of Title 2182/323)

MAY 2020 (Rev. 1)

PREPARED BY:



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TECHNICAL APPENDIX 1 – ADDENDUM TO ENVIRONMENTAL OPPORTUNITIES AND CONSTRAINTS ANALYSIS

(Opus International Consultants (PCA) Pty. Ltd., 2014)



Addendum to
Environmental Opportunities and
Constraints Analysis

Lot 105 Frenchman Bay Road
Big Grove, Albany


Prepared on behalf of the
Roman Catholic Bishop of Bunbury



Addendum to Environmental Opportunities and Constraints Analysis

Lot 105 Frenchman Bay Road
Big Grove, Albany

Prepared on behalf of the
Roman Catholic Bishop of Bunbury



Prepared by

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Operations Leader – Western
Australia

Date: June 2014
Status: FINAL
Reference: W-A1138.00/004AN



DOCUMENT HISTORY

REVISION / ISSUE RECORD

DATE	DESCRIPTION	REV	AUTHOR	VERIFIED
Sept 2008	Opportunities and Constraints Analysis (Opus Ref: WAENV095)	FINAL	Vicki Laurie	Scott Glassborrow
31 July 2012	Addendum (Opus Ref: W-A1138.00)	DRAFT	Vicki Davies	Evan Chadfield
4 June 2014	Addendum (Opus Ref: W-A1138.00/004AN)	FINAL	Vicki Davies	Mark Maund
		A		
		B		
		C		

DISTRIBUTION RECORD

RECIPIENT	REVISION / QUANTITY ISSUED				
	DRAFT	FINAL	A	B	C
Aaron Bell, BSO Development Consultants	1				
Aaron Bell, Able Planning		1			
John Ogilvie, Catholic Diocese of Bunbury	1	1			

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Appendix A – Site Map

Appendix B – Department of Environment and Conservation and Department of Parks and Wildlife Correspondence

Appendix C – Flora and Vegetation Report of Lot 105 Frenchman Bay Road, Big Grove – E.M. Sandiford

Appendix D – Level 2 Fauna Assessment of Lot 105 Frenchman Bay Road, Albany WA – Sandra Gilfillan and Sylvia Leighton (Fauna Consultants)

Appendix E – Ecological Aspects

– Constraints Mapping

– Proposed Foreshore Reserve and Contours

Appendix F – EPBC Act Threatened Species Categories

EPBC Act Significant Impact Criteria Assessment

1 Executive Summary

Opus International Consultants (PCA) Pty Ltd (Opus) have undertaken, on behalf of the Roman Catholic Bishop of Bunbury (RCBB), an addendum to the Environmental Opportunities and Constraints Analysis (Opus, 2008). The addendum involves further studies on the biodiversity and conservation values as for proposed future development to be undertaken at Lot 105 on Deposited Plan 230421 (House 795) Frenchman Bay Road, Big Grove, Albany.

Based on the findings of the Level 2 Flora and Vegetation and Level 2 Fauna Surveys undertaken for Lot 105, an ecological constraints analysis has been conducted to identify significant constraints to future development of the site.

It is considered that, subject to low impact development (type yet to be determined) and appropriate mitigation and management measures, it is likely that development of the site will be compatible with conservation of important habitat and vegetation units identified onsite for the following:

- Western Ringtail Possum habitat (refuge and feeding);
- Potential feeding and roosting habitat for Black Cockatoo species;
- Vegetation corridors across the site to provide connectivity with foreshore vegetation, Lot 104 to the north, 'Future Urban' lots to the south and ultimately to Torndirrup National Park;
- Retention of vegetation within the South Coast Water Reserve; and
- Retention of vegetation within the foreshore reserve.

It is recommended that the following is undertaken for any development of the site:

- Prior to any clearing of *Amperea protensa* P3 and *Adenanthos x cunninghamii* P4, local provenance plant material (seed, cuttings and transplants) is collected from individuals within Lot 105 for propagation and revegetation within the site;
- Propagated seedlings and other plants for landscaping should be supplied to industry standard and in soil free from weeds, insects and disease (e.g. *Phytophthora* dieback, *Armillaria*);
- Peppermint Low Woodland (ARVS 2) and Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) vegetation units should be considered for retention, where possible, as they provide significant habitat potential for Western Ringtail Possum and potential feeding opportunities for Black Cockatoo species;
- The Coastal Yate Forest and *Juncus kraussi* Sedgeland vegetation units be retained within the vegetation corridors across the site and foreshore reserve, respectively;
- Consideration should be made for the future lot configuration of the development with regard to minimisation of firebreaks and incorporation of previously cleared tracks and firebreaks to maintain as large as possible areas of intact native vegetation, thereby reducing fragmentation and enabling connectivity within the site and to vegetation offsite;
- It is the responsibility of the RCBB, as the site owner, to control Declared Pest weeds, Environmental Weeds and Weeds of National Significance (WONS) within the site;
- To reduce risk of pathogens such as *Phytophthora* dieback being introduced to the area, it is imperative that all machinery is cleaned from vegetation, soil and debris prior to commencing any works onsite;
- Any soil incoming to the site is clean and free from any pathogens. All topsoil shall be retained onsite for future use in the revegetation and rehabilitation of the site (where required);

- Where possible consideration should be made for areas for potential roosting (Bullich/Yate) and foraging (*Banksia* sp.) of Black Cockatoos should be retained within vegetation corridors across the site;
- The proposed development should be designed so as to mitigate significant impact as per Commonwealth referral guidelines for Black Cockatoo species and Western Ringtail Possums and thereby avoid need for referral to the Commonwealth Department of the Environment. However once the development footprint is known, if significant impact, as per the guidelines, cannot be avoided further assessment and referral to the Commonwealth Department of the Environment may be required;
- A fauna specialist to be onsite during any clearing activities to recover disorientated native fauna;
- Retention of vegetation within Lot 105 intersecting the South Coast Water Reserve;
- Ensure no chemical or fuels are stored within the South Coast Water Reserve area and a spill contingency procedure is in place via a Construction Environmental Management Plan for development of the site;
- Retain vegetation units *Juncus kraussii* Sedgeland (ARVS 66) and Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) within the proposed foreshore reserve;
- Confirmed by onsite survey that the proposed foreshore reserve area achieves 0.9 m separation to the high water level prior to development of the site;
- No development or stormwater treatment/ attenuation is to be undertaken within the proposed foreshore reserve;
- Access within the foreshore is formalised using materials sympathetic to the area (i.e. limestone paths and wooden steps) to restrict access to previously cleared areas of vegetation only;
- Proposed vegetation corridors to be retained to connect the South Coast Water Reserve area and foreshore reserve and vegetation within Lot 104 to the northwest and 'Future Urban' lots to the southeast to retain potential habitat for Western Ringtail Possums and Black Cockatoos;
- The boundary of the vegetation corridors is to be confirmed by onsite survey (spatial) prior to development.

2 Introduction

Opus have undertaken, on the behalf of the RCBB, further studies on the biodiversity and conservation values as an addendum to the Environmental Opportunities and Constraints Analysis (Opus, 2008) for proposed future development at Lot 105 on Deposited Plan 230421 (House 795) Frenchman Bay Road, Big Grove, Albany.

A Request to Amend the City of Albany Town Planning Scheme No 3 was submitted on 27 October 2010 to rezone the land from "Public Purposes" reserve to "Residential Development".

The application for the Scheme Amendment Request was considered at the Council's 15 March 2011 meeting where the following was resolved:

"THAT Council ADVISE the proponent that it is PREPARED to consider a formal scheme amendment to rezone Lot 105 Frenchman Bay Road, Big Grove from the "Public Purpose" reserve to the "Residential Development" zone, subject to the following matters being addressed and/or included as part of that formal amendment application:

- A. *Studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation (DEC)".*

Further clarification was formally requested (14 April 2011), from the then DEC (now Department of Parks and Wildlife), on the further studies required (Appendix B).

The correspondence (10 August 2011) indicated that the DEC response to the Environmental Opportunities and Constraints Analysis (Opus 2008) are still relevant, the following recommendations were made:

- Further seasonal investigation will be required to determine presence/ absence of the Main's Assassin Spider, *Austrarchaea mainae*, due to the presence of potential habitat on site and would be required prior to development of the site; and
- Further investigation including a Level 2 Detailed Vegetation and Flora survey.

Further studies required, as per the 10 August 2011 correspondence (Appendix B) included:

- *A Level 2 Survey, as per EPA guidance statements 20, 33, 51 and 56, including a comprehensive fauna and invertebrate survey, over more than one season.*
- *Flora and vegetation survey and units needs to be consistent with the Albany Regional Vegetation Survey, Sandiford and Barrett 2010 as identified in EPA Bulletin No 13 as a key information source to guide land use planning.*

This will include further field survey and validation of vegetation mapping to enable an assessment of regional significance.

*This survey particularly needs to give attention to vegetation unit 44 *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland which was mapped as occurring on the site during the survey.*

The Western Australian Threatened Ecological Communities Scientific Committee recommended that the "Banksia littoralis Woodland/ Melaleuca incana Shrubland" be ranked as Critically Endangered under Criteria B) iii), but ranked P1 in the interim; and

- *Survey and analysis should consider conservation and biodiversity values in total and not be restricted to significant species or communities. Connectivity, habitat value and minimisation of fragmentation are all issues of conservation significance that need to be addressed; the juxtaposition of the site with the Torndirrup National Park, the adjoining City of Albany Crown reserve to the north-west and connectivity along the foreshore reserve are all important in this regard;*

Further consultation with then DEC (Deon Utber, Regional Leader Nature Conservation, email 18 and 29 November 2011) indicated that the fauna survey could be undertaken in a secondary season to the fauna survey undertaken in 2008 for the purpose of the Opportunities and Constraints Analysis (Opus, 2008) (Appendix B).

2.1 Site Location

The subject site is located on Frenchman Bay Road in the suburb of Big Grove, approximately 10 kilometres south of the Albany City centre, via road (Figure 1). The subject site involves an area of 20.2343ha (Appendix A).



Figure 1 Location of Lot 105 Frenchman Bay Road, Big Grove, Albany

Under the City of Albany Local Planning Scheme No 1 Lot 105 is zoned as 'Public Use'. Lot 104 directly adjacent to the site to the northwest is zoned 'Parks and Recreation'. Lots to the southeast, between Frenchman Bay Road and Princess Royal Harbour, are zoned 'Future Urban'. Directly to the southeast of Frenchman Bay Road lots are zoned as 'General Agriculture' and further south and to the west lies Torndirrup National Park.

A portion of Lot 105 at the southern end of the site is intersected by the South Coast Water Reserve (Appendix E). This reserve extends beyond Frenchman Bay Road to the coast (DoW, 2008).

2.2 Development Proposal

The RCBB propose to rezone Lot 105 via local planning scheme amendment and structure plan submission. The ultimate intention is to rezone the lot to allow residential and/ or tourist development sensitive to the environmental aspects of the site. The exact nature and form of development and subdivision will be guided by the outcomes of these environmental investigations and planning assessment by the City of Albany and Western Australian Planning Commission following community consultation and liaison with government agencies.

2.3 Objectives

This report has been prepared to address further information required and in consultation with the, then, DEC the specific objectives for the studies on biodiversity and conservation included the following:

- Level 2 Flora and Vegetation Survey:
 - Desktop analysis (DRF/ conservation species, range limits, vegetation types as per ARVS, weeds, connectivity);
 - Field survey (record all vascular plants, vegetation boundaries, condition, location of conservation species, location of weeds, ARVS vegetation types).

Although DEC recommended that the Flora and Vegetation survey was to be undertaken in one additional season to the spring survey already undertaken, E.M. Sandiford, who was also one of the authors of the ARVS report, recommended that the most relevant information would be obtained in a spring survey. Therefore the site was resurveyed in spring to obtain relevant ARVS vegetation types followed by a short survey in autumn to search for any other flora species flowering at this time.

A previous Level 1 Fauna Survey at Lot 105 (Opus, 2008) produced the following outcomes:

- The full complement of ground mammals that could potentially occur on the site were recorded in the first survey (with the possible exception of *Sminthopsis* sp.);
- Western Ringtail Possums were recorded, but densities were not established;
- Potentially suitable habitat for the Mains Assassin Spider was located, but the species was not recorded with the level of survey carried out; and
- Use of the site by Carnaby's or Baudin's Cockatoos was not determined.

Therefore the Level 2 Fauna Survey, as per consultation with DEC, was a targeted survey in summer/ autumn and comprised the following:

- More intensive survey for Mains Assassin Spider, targeting all suitable habitat;
- Attempt to determine densities of Western Ringtail Possums; and
- Use of the site by Carnaby's or Baudin's Cockatoos.

The results of the Level 2 Fauna and Flora surveys have been compiled as an addendum to the Environmental Opportunities and Constraints Report (Opus, 2008).

2.4 Legislation Policy and Guidelines

This report has been prepared based on the following legislation, policy and guidelines:

- *Biosecurity and Agriculture Management Act 2007*;
- *Commonwealth Environmental and Protection and Biodiversity Conservation Act 1999*;
- *Environmental Protection Act 1986*;
- *Environmental Protection (Clearing Native Vegetation) Regulations section 51C*;
- *Wildlife Conservation Act 1950*.

- Department of the Environment, Water, Heritage and the Arts (2009) *Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia;
- Department of Sustainability, Environment, Water, Population and Communities (2012) *Environmental Protection and Biodiversity Conservation Act 1999 Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso**, Australian Government;
- Environmental Protection Authority (EPA) (2008) *Environmental Guidance for Planning and Development* Guidance Statement No 33;
- EPA (2009) *Guidance for the Assessment of Environmental Factors, Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia*, Guidance Statement No 20;
- EPA (2004) *Guidance for the Assessment of Environmental Factors, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Guidance Statement No 51;
- EPA (2004) *Guidance for the Assessment of Environmental Factors, Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia*, Guidance Statement No 56;
- 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.
- Western Australian Planning Commission (WAPC) 2013, State Planning Policy 2.6 State Coastal Planning Policy, Government Gazette WA, 30 July 2013.

3 Methodology

The methodology undertaken for the Level 2 Vegetation and Flora Survey is included in the Vegetation and Flora of Lot 15 Frenchman Bay Road, Big Grove report (Sandiford, 2012) (Appendix C).

The methodology of the Level 2 Fauna Survey is included in the Level 2 Assessment of Lot 105 Frenchman Bay Road, Albany WA report (Gilfillan and Leighton, 2012) (Appendix D).

3.1 Timing of Surveys

The Level 2 Vegetation and Flora Survey was undertaken in spring 2011 on 7, 11 and 15 November and a follow-up autumn flora survey conducted on 4 April 2012.

The Level 2 Fauna Survey comprised the results of the Level 1 Fauna Survey which was undertaken in spring 2008 and further, more detailed survey, in the summer 2011/ 2012 and autumn 2012 periods.

On the advice of the zoologist and in consultation with then DEC (Appendix B) the basis for the timing of the 2011/ 2012 survey period corresponded to the following:

- *Carnaby's Cockatoo is resident on the south coast;*
- *Baudin's Cockatoo is breeding within the south coast breeding areas;*
- *Mains Assassin Spider is restricted to areas where conditions remain moist throughout the drier summer months enabling easier identification of habitat;*
- *Timing of survey is not critical for Western Ringtail Possum as they are territorial species and females maintain their territories all year round; and*
- *It is also not critical for the Red-tailed Black Cockatoo as this species occur on the south coast all year round.*

Table 1 Survey Activities and Dates for 2011/ 2012 Fauna Survey.

Survey Dates	Time of Day	Survey Activities
2/12/11	Daytime	Attempt at transect set up, habitat searches, opportunistic observations of feeding and possum scats
5/1/12	Daytime	Habitat searches, opportunistic observations of cockatoo feeding and possum scats
24/2/12	Daytime	Opportunistic observations of cockatoo feeding and possum scats
2/3/12	Daytime	Opportunistic observations of cockatoo feeding and possum scats
9/3/12	Daytime	Opportunistic observations of cockatoo feeding and possum scats
7/3/12	Night time	Possum and roosting black cockatoo observations
12/3/12	Night time	Possum and roosting black cockatoo observations
21/3/12	Night time	Possum and roosting black cockatoo observations

4 Results

4.1 Vegetation and Flora Survey Results

4.1.1 Level 1 Vegetation and Flora Survey (2008)

The Opus (2008) Level 1 Vegetation and Flora Survey identified the following:

- The subject lies within the Jarrah Forest 2 (JF2 – Southern Jarrah Forest subregion) IBRA bioregion. This bioregion is comprised of “*duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Wandoo – Marri woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments Jarrah forests occur in a mosaic with a variety of species-rich shrublands*” (Hearn *et al.*, 2002).
- Although the dominant vegetation type has been classified as Low Woodland, *Agonis flexuosa* the following vegetation structures were identified:
 - 1) Sedgeland;
 - 2) Low woodland, *Agonis flexuosa* (peppermint);
 - 3) Closed shrubland; and
 - 4) Medium to tall woodland, *Agonis flexuosa* (peppermint) with *Eucalyptus megacarpa* (bullich).
- The vegetation located across the subject site was found to be considered in “Excellent” condition, with very little disturbance and weed invasion. The site has also not been burnt for an unknown number of years which has contributed to the presence of highly intact vegetation.

The following information from the Opus (2008) has been updated for the purpose of this report to provide the most up to date information regard to remaining extent of the pre-European Vegetation Association mapped within the site.

Lot 105 lies within the Torndirrup System Association in the Jarrah Forest IBRA Region (Thackway and Cresswell, 1995-). The Torndirrup 22 pre-European System Association is listed by Shepherd *et al.* (2002) as ‘Low Woodland, *Agonis flexuosa*’. This vegetation type is commonly found along coastal areas in the south coast region. The site is comprised primarily of native vegetation.

Table 1 Vegetation Representation (GoWA, 2013)

	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DPaW reserves
IBRA Region Jarrah Forest	4,506,660.26	2,457,731.55	54.54	40.66
Beard Vegetation Association Statewide				
22	3,450.55	2,973.42	86.17	50.45
Beard Vegetation Association in Jarrah Forest IBRA region				
22	116.76	76.59	65.60	20.63
Beard Vegetation Association in Local Government Authority City of Albany				
22	1,308.87	558.20	42.93	7.35

4.1.2 Level 2 Vegetation and Flora Survey

Further to the 2008 survey (Opus, 2008), a Level 2 Vegetation and Flora Survey (Sandiford, 2012) was undertaken and was consistent with the Albany Regional Vegetation Survey (ARVS) (Sandiford and Barrett, 2010). This survey identified the following aspects (Appendix C):

- 145 native species were recorded including 2 conservation species *Amperea protensa* P3 and *Adenanthos x cunninghamii* P4;
- 40 introduced species were recorded including one Weed on National Significance (WON), *Asparagus aethiopicus*, and one Declared Plant *Zantedeschia aethiopica*. Most weeds were restricted to tracks/firebreaks though the environmental weed *Acacia longifolia* was widespread throughout the survey area;
- Six vegetation units were recorded and mapped:
 - Coastal Yate Forest,
 - Peppermint Low Forest,
 - *Banksia ilicifolia*/Peppermint Low Woodland,
 - Coastal Limestone Heath,
 - *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland; and
 - *Juncus kraussi* Sedgeland.
- All of these units have previously been described in the Albany Regional Vegetation Survey (Sandiford and Barrett, 2010) though two units (Coastal Yate Forest and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland) were not previously mapped within the survey area;
- The most common units were:
 - Coastal Limestone Heath,
 - Peppermint Low Forest and
 - *Banksia ilicifolia*/Peppermint Low Woodland.
- The three above are well reserved on a regional and state scale and likely to have a high percentage of pre-clearing extent remaining. The remaining units have less than 25% reserved on a regional scale and their state wide reservation status and pre-clearing extent remains unclear though *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland is likely to have <30% pre-clearing extent remaining;
- One Priority Ecological Community (PEC) was recorded: *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland. This vegetation (a wetland unit) is currently a P1 PEC pending endorsement as a “Critically Endangered” Threatened Ecological Community. All occurrences within the survey area are modified, resulting from changing hydrology and all occurrences within the survey area are being invaded by upland species. The long term viability of this vegetation within the survey area is low;
- Two wetland units were recorded within the survey area *Juncus kraussii* Sedgeland and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, however the latter vegetation unit may no longer fall within the definitions of wetland vegetation due to the ongoing hydrological change and continuing invasion by upland species. The long term viability of this vegetation within the survey area is low;
- The overall vegetation condition is good to very good with invasion of *Acacia longifolia* and degradation of, and invasion of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, by upland species the major factors influencing condition rating; and

- The conservation values of the survey area are high and include a diversity of vegetation and flora which is typical of the region, presence of a Priority Ecological Community (PEC) pending endorsement as a “Critically Endangered” Threatened Ecological Community”, occurrence of two conservation species, wetland vegetation and occurrence in a corridor spanning the width of the Torndirrup Peninsula. These values are under threat from ongoing hydrological change that is impacting on the PEC (*Banksia littoralis* Woodland/*Melaleuca incana* Shrubland) and by the invasion of the environmental weed *Acacia longifolia*.

4.2 Fauna Survey

A Level 1 Fauna Survey was undertaken by zoologists Sylvia Leighton and Sandra Gilfillan on behalf of Opus, in October 2008 to determine the presence of native fauna on the subject site, specifically targeting the western ringtail possum, *Pseudocheirus occidentalis* and the Main’s assassin spider, *Austrarchaea mainae* habitat. The fauna survey involved the use of baited cages and Elliot box traps with some spotlighting for the survey of mammals.

Native mammal species that were either trapped or evidence of was observed on site included:

- Southern brown bandicoot, *Isodon obesulus*;
- Bush rat, *Rattus fuscipes*;
- Western grey kangaroo, *Macropus fuliginosus*; and
- Western Ringtail possum, *Pseudocheirus occidentalis*.

Non-native mammal species observed included fox and rabbits.

The fauna survey also identified the vegetation structure utilised by the Main’s assassin spider, *Austrarchaea mainae* however no specimens were collected during the investigation of the subject site. The habitat specifically required by this species was confirmed by DEC Regional Ecologist, Sarah Comer on site.

Further to the 2008 survey, then DEC requested a Level 2 detailed Fauna Survey be undertaken for the site. This has been undertaken by zoologists, Sandra Gilfillan and Sylvia Leighton, in summer 2011/2012 and autumn 2012 periods to compliment the 2008 spring survey.

The objectives of the 2012 survey included:

- A more intensive survey for Main’s Assassin Spider, involving a resampling of the 2008 sites plus the identification of additional potential habitat with additional sampling at these sites.
- An attempt to determine densities of Western Ringtail Possums. Potential to use distance sampling, a technique recently trialled on this species (deTores and Elscot 2010), which enables the determination of a robust estimate of Western Ringtail Possum abundance.
- The determination of the use of the site by Carnaby’s, Baudin’s, or Red-tailed Black Cockatoos for feeding, breeding or roosting.

The findings of the 2011/ 2012 survey indicated the following:

- Western Ringtail Possums are using the site for feeding and refuge, however due to the density of the vegetation estimates of numbers cannot be determined with current survey techniques;
- Mains Assassin Spider was not recorded, and the absence of moist microhabitat on the site, particularly after a dry summer suggests that the habitat is not suitable and that this species is unlikely to be present;

- *The site contains potentially suitable feeding habitat for Carnaby's and to a lesser extent Baudin's Black Cockatoo and possible roosting sites for all three Black Cockatoo species. Despite this none of the species were found to be using the site; and*
- *Based on EPBC Act guidelines the site should be considered significant habitat for Western Ringtail Possum and Carnaby's Black Cockatoo and it is recommended that this issue is addressed when considering any development of the site.*

5 Ecological Constraints Analysis

5.1 Flora and Vegetation

5.1.1 Conservation Flora

Two conservation species *Amperea protensa* P3 (2 plants) and *Adenanthos x cunninghamii* P4 (4 plants) were identified within Lot 105 (Sandiford, 2012).

Whilst Priority Flora species are not protected under the *Wildlife Conservation Act 1950* they are considered to contribute to biodiversity values. As such they are considered under Schedule 5 of the *Environmental Protection Act 1986* in the assessment against Clearing Principle (a) *Native vegetation should not be cleared if it comprises a high level of biological diversity.*

Sandiford (2012) reports that *Amperea protensa* P3 has been previously recorded on the coastal fringe from Scott River to near Cheynes Beach and one record near Perth. *Adenanthos x cunninghamii* P4 has been recorded from west of Albany to the Cheynes Beach locality. Both of these species have been previously recorded in nearby Torndirrup National Park as identified in then DEC Threatened (Declared Rare) Flora and WA Herbarium Specimen database search results (Opus, 2008).

Due to the low number of individuals identified onsite and representation within nearby Torndirrup National Park, it is considered that if these individuals are proposed to be cleared for the purpose of the development, propagation of the species within reserves and/ or Public Open Space (POS) onsite may assist to mitigate their loss and would not provide a significant constraint to development.

It is recommended that prior to any clearing, local provenance plant material (seed, cuttings and transplants) is collected from individuals within Lot 105 for propagation and revegetation within the site.

Propagated seedlings and other plants for landscaping should be supplied to industry standard and in soil free from weeds, insects and disease (e.g. *Phytophthora dieback*, *Armillaria*).

5.1.2 Priority Ecological Communities

During the Level 2 Flora and Vegetation Survey, Priority Ecological Community (PEC) 23: *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland (South Coast Region) was identified. This PEC generally occurs in winter wet depressions and drainage lines on dark grey sand/ sandy loam over limestone pavement (Sandiford and Barrett, 2010). Threats to this PEC include “fragmentation, dieback disease, hydrological change, too frequent fire and weed invasion” (DEC, 2013).

PEC 23 is a Groundwater Dependent Ecosystem (GDE) and is currently ranked Priority 1 PEC pending endorsement as a “Critically Endangered” Threatened Ecological Community by DPaW (pers comms Val English, Species and Communities Branch, DPaW, 2 May 2014).

Sandiford (2012) mapped this vegetation unit as a mosaic with Coastal Limestone Heath as “all occurrences of this vegetation were modified, indicated by the presence of invading upland species including *Spyridium globulosum*, *Acacia littoralis*, *Allocasuarina lehmanniana*, *Acacia cyclops* and **Acacia longifolia*, the presence of dead or dying *Banksia littoralis* (along with live plants), and the presence of the weed **Pelargonium capitatum*. Characteristic dampland species included *Melaleuca incana*, *Banksia littoralis*, *Gahnia trifida*, *Hakea varia* and *Lepdiosperma effusum* forma narrow.”

Sandiford (2012) reported that the *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland is currently considered “Degraded” (as per condition scale Keighery, 1994) within the site as a result of hydrological change and due to these changes this vegetation may no longer be considered a

wetland under the *Environmental Protection Act* (1986) and long term prognosis for this vegetation community is low.

Further consultation with the DPaW Species and Communities Branch indicated that DPaW “use a threshold of ‘Good’ condition to be the poorest condition to still be representative of a PEC, and for ‘Degraded’ to be no longer extant” (pers comms Val English, Species and Communities Branch, DPaW, 1 May 2014) (Appendix B).

However in contrast to the Sandiford (2012) findings, the DPaW also indicated:

“With regard to the *Banksia littoralis*/ *Melaleuca incana* condition on Lot 105 it appears to be difficult to determine why it is changing, potentially hydrology, but there may be disease also e.g. *Armillaria*. An assessment of ‘Degraded’ condition may not be warranted because we don’t appear to fully understand why it is changing and therefore can’t be certain that the changes are irreversible. The unit also may still be considered a GDE”.

In addition many locations of *Banksia littoralis* (dead and alive) and *Melaleuca incana* (dead and alive) were recorded during the survey outside the mapped mosaic of Coastal Limestone Heath *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland across Lot 105 (Figure 2). Their distribution, suggests that this unit was once more widespread within Lot 105 and has and is continuing to undergo contraction (Sandiford, 2012).

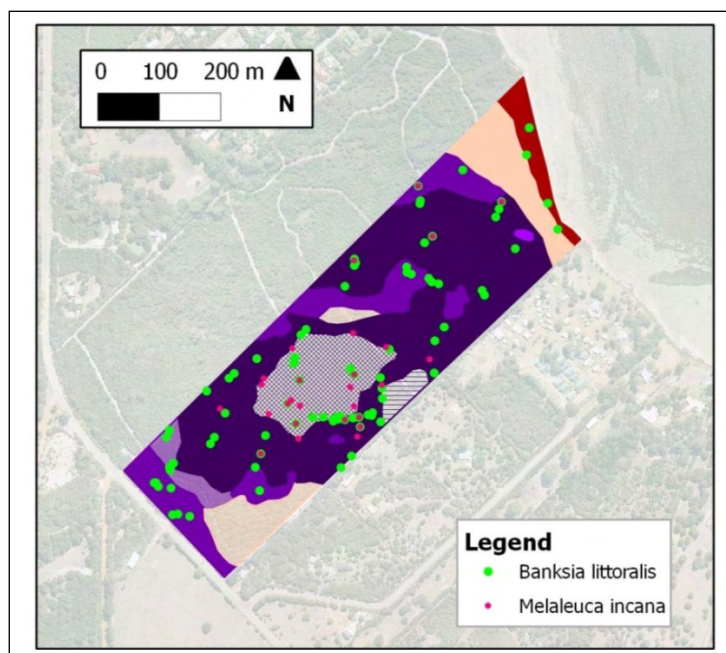


Figure 4 Distribution of *Banksia littoralis* and *Melaleuca incana* within the survey area (Both species are likely to be more frequent than indicated)

The ARVS (Sandiford and Barrett, 2010) also reports that at several locations around nearby Little Grove, dead and dying *Banksia littoralis* have been observed, possibly due to impact of hydrological change within the area. Of the 4 ha identified in the ARVS 23.4% is located within IUCN Reserve I-IV (Sandiford and Barrett, 2010).

Therefore based on DPaW assessment of PEC conditions, the “Degraded” condition of PEC 23 and its mosaic with the Coastal Limestone Heath (due to ongoing upland species invasion as a result of hydrologic change) would mean that this is not considered an extant representation of the Priority 1 PEC, and therefore not an ecological constraint within Lot 105.

5.1.3 Pre-European Extent of Vegetation (Regional and Local Scale)

EPA Position Statement No. 2 (EPA, 2000) with regard to clearing native vegetation states that:

- i) The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type;
- ii) A level of 10% of the original extent is regarded as being a level representing “endangered”.

The Torndirrup 22 System Association has approximately 42.93% of the pre-European extent remaining within the City of Albany local government area and therefore is above the “threshold level” (EPA, 2000).

The Beard pre-European vegetation association mapping is a very broad scale dataset. The Level 2 Vegetation and Flora Survey identified site specific vegetation units with regard to the ARVS vegetation mapping system (Sandiford and Barrett, 2010).

Coastal Limestone Heath (ARVS 5) was found to be the most common vegetation unit identified within the survey area and on a regional scale there are significant areas of this vegetation unit reserved within the West Cape Howe and Torndirrup National Parks and Two Peoples Bay Reserve (Sandiford, 2012). Analysis of the pre-clearing extent of this vegetation unit by Sandiford (2012) to comparable pre-European mapping (Shepard *et al.*, 2002) indicates that the remaining extent of Coastal Limestone Heath is greater than the EPA (2000) “threshold level” and is therefore considered that this vegetation unit is well represented both in a regional and local context.

Peppermint Low Woodland (ARVS 2) and Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) are also considered to be well reserved on a regional and local scale with a high percentage of pre-clearing extent remaining (>30%) (Sandiford, 2012). However, it is considered that these vegetation units should be considered for retention within the subject site, where possible, as they provide significant habitat potential for Western Ringtail Possum and potential feeding opportunities for Black Cockatoo species.

The Coastal Yate Forest, *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland and *Juncus kraussii* Sedgeland vegetation units are considered likely to have a level of <30% of the pre-European extent (Sandiford, 2012) and therefore may present a constraint to development Schedule 5 of the *Environmental Protection Act 1986* in the assessment against Clearing Principle (e) *Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.*

It is considered that the Coastal Yate Forest and *Juncus kraussii* Sedgeland vegetation units are a constraint to development and are recommended to be retained within the vegetation corridors across the site (Section 5.5) and foreshore reserve (Section 5.4) respectively.

However as the *Banksia littoralis* Woodland/ *Melaleuca incana* Shrubland vegetation unit is a mosaic with Coastal Limestone Heath and in a ‘Degraded’ condition due to upland species invasion it is considered that this vegetation unit would be difficult to delineate for retention and is not a constraint to development.

It is recommended that consideration is made for the future lot configuration of the development with regard to minimisation of firebreaks and incorporation of previously cleared tracks and firebreaks to maintain as large as possible areas of intact native vegetation, thereby reducing fragmentation and enabling connectivity within the site and to vegetation offsite.

5.1.4 Introduced Weed Species

Forty introduced weed species were recorded across the site however most weeds were restricted to tracks/firebreaks (Sandiford, 2012). The following weed species identified are of particular significance:

- Weed on National Significance (WONS) **Asparagus aethiopicus* (DoAFF, 2012);
- Declared Pest (s22) **Zantedeschia aethiopica* under the *Biosecurity and Agriculture Management Act 2007* (BAM Act); and
- Environmental weed **Acacia longifolia* which was widespread throughout the survey area.

It is not considered that the presence of these weed species will provide a constraint to development; however it is the responsibility of the RCBB, as the site owner, to control such weeds prior to, during and post development of the site.

5.1.5 Phytophthora Dieback and Other Plant Pathogens

Phytophthora cinnamomi (dieback) is a soil borne water mould which causes the slow death of vegetation. The pathogen is spread by the movement of spores in water, and by human activity that moves soil. A full *P. cinnamomi* survey or hygiene plan was not undertaken as a component of this assessment, however during the Level 2 Flora and Vegetation Survey, no obvious signs of dieback were observed (Sandiford, 2012).

It is not considered that dieback management will provide a constraint to development of the site however to reduce risk of pathogens such as *P. cinnamomi* (dieback) being introduced to the area, it is imperative that all machinery is cleaned from vegetation, soil and debris prior to commencing any works onsite.

It is recommended that any soil incoming to the site for the purpose of works is clean and free from any pathogens. All topsoil shall be retained onsite for future use in the revegetation and rehabilitation of the site (where required).

5.2 Fauna

5.2.1 EPBC Act Significant Impact Criteria Assessment

The fauna species identified onsite that are protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been assessed against the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DEWHA, 2009) (Appendix F). These species include:

- Western Ringtail Possum, *Pseudocheirus occidentalis* (Vulnerable);
- Carnaby's Black-Cockatoo, *Calyptorhynchus latirostris* (Endangered);
- Baudin's Black Cockatoo, *Calyptorhynchus baudinii* (Vulnerable); and
- Forest Red-tailed Black Cockatoo, *Calyptorhynchus banksii naso* (Vulnerable).

Gilfillan and Leighton (2012) have speculated that Black Cockatoo species may not have been observed utilising the site as summarised below:

- The food source onsite may not be dense enough to provide suitable feeding habitat;
- Large stands of more suitable feeding habitat are located in Torndirrup National Park less than 2km and 4-5km away; and
- Tall Karri are located approximately 2km to the south of the site and may provide more suitable roosting trees.

Although there was found to be no evidence of roosting or feeding by Black Cockatoo species during the survey period within Lot 105, based on the EPBC Act Referral Guidelines precautionary guidance (SEWPaC, 2012), areas for potential roosting (Bullich/ Yate) and foraging (Banksia sp.) are recommended to be retained in the vegetation corridors across the site (Section 5.5).

Subject to the proposed future development of the site if significant impact, as per the EPBC Act Referral Guidelines (SEWPaC, 2012), is mitigated it is considered that Black Cockatoos would not provide constraint to development of the site.

Based on the assessment against the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DEWHA, 2009) (Appendix F) it is considered that a low impact form of development is unlikely to impact on Western Ringtail Possums if suitable habitat is retained in vegetation corridors across the site providing connectivity to vegetation to the north and south of the site. If disturbance does occur it is likely to be at an individual scale rather than population scale.

It is recommended that the proposed development is designed so as to mitigate significant impact as per Commonwealth referral guidelines for Black Cockatoo species and Western Ringtail Possums and thereby avoid need for referral to the Commonwealth Department of the Environment. However once the development footprint is known, if significant impact, as per the guidelines, cannot be avoided referral to the Commonwealth Department of the Environment may be required.

A fauna specialist is recommended to be onsite during any clearing activities to recover disorientated native fauna.

As it is considered that the subject area is unlikely to support populations of the Main's Assassin Spider the presence of this species is not considered to be a constraint to development.

5.3 South Coast Water Reserve

A portion of Lot 105, at the south western end of the site, is intersected by the South Coast Water Reserve (Appendix E). This reserve extends beyond Frenchman Bay Road to the southern coast (DoW, 2008).

The South Coast Water Reserve is a Priority 1 (P1) Public Drinking Water Supply Areas (PDWSA) protected under the *Country Areas Water Supply Act 1947* (Water and Rivers Commission, 2001).

“Priority 1 (P1) classification areas are managed to ensure that there is no degradation of the drinking water source by preventing the development of potentially harmful activities in these areas. The guiding principle is risk avoidance. This is the most stringent priority classification for drinking water sources” (DoE, 2004).

The DoE (2004) guidance regarding Land Use Compatibility in PDWSA indicates that ‘Rural’, ‘Special Rural’ and ‘Urban’ subdivision is incompatible in a Priority 1 PDWSA.

Therefore it is considered that the area of vegetation within Lot 105 intersecting the South Coast Water Reserve is a constraint to development and will be required to be retained. As such the following vegetation units, which may provide potential habitat for Western Ringtail Possum

(Peppermint - refuge and feeding) and Black Cockatoo species (Bullich - potential roosting), will be retained within this area:

- Peppermint Low Woodland;
- Coastal Limestone Heath;
- Mosaic Coastal Limestone Heath & Peppermint Low Woodland;
- Affinities Coastal *Banksia ilicifolia*/Peppermint Low Woodland & Coastal Heath.

During any future development of the site consideration will also be required to ensure no chemical or fuels are stored onsite and a spill contingency procedure is in place via a Construction Environmental Management Plan.

5.4 Proposed Foreshore Reserve

The proposed foreshore reserve between the site and Princess Royal Harbour is comprised of two vegetation units and represent the whole mapped areas of these within Lot 105:

- The under-represented *Juncus kraussii* Sedgeland (ARVS 66); and
- Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) which may provide potential habitat for Western Ringtail Possum (refuge and feeding) and Black Cockatoo species (potential foraging).

The proposed reserve matches the approved foreshore boundary on the adjoining Outline Development Plan to the southeast and provides a significant connection to Lot 104 on the northwest boundary (Appendix E). The foreshore reserve has been proposed to fulfil the default setback requirements of the SPP 2.6 State Coastal Planning Policy (WAPC, 2013).

A vertical sea level rise of 0.9 m has been recommended to Local Government when considering the setback distance and elevation to allow for the impact of coastal processes over a 100 year planning timeframe (2010 to 2110) (Department of Transport, 2010). Therefore it is recommended that all new infrastructure is positioned at greater than 0.9 m above the existing high water level.

Based on 2m contours, estimated in the Department of Agriculture and Food WA dataset the high water level is approximately 2 mAHD. The inland boundary of the proposed foreshore reserve is at approximately 6 mAHD and therefore achieves a 0.9 m separation. However the contours are estimated from desktop assessment only and should be confirmed by onsite survey prior to development of the site.

It is recommended that no development or stormwater treatment and/ or attenuation is to be undertaken within the proposed foreshore reserve.

It is recommended that access within the foreshore is formalised using materials sympathetic to the area (i.e. limestone paths and steps) to restrict access to previously cleared areas vegetation only.

5.5 Proposed Vegetation Corridors

In addition to the vegetation proposed to be retained in the South Coast Water Reserve area and foreshore reserve it is recommended that vegetation corridors are retained within Lot 105 providing connectivity with native vegetation within adjacent lots and from the water reserve area to the foreshore reserve.

Such corridors provide shelter, protection and habitat for flora and fauna and reduce fragmentation of vegetation. They help enable fauna move from one area of vegetation to another to breed,

forage and avoid overcrowding. Ultimately vegetation corridors within Lot 105 would provide connectivity with Torndirrup National Park to Princess Royal Harbour.

A corridor is proposed from Lot 104 to the northwest and the 'Future Urban' lots to the southwest this provides ecological linkage and is comprised of the following mapped vegetation units (Appendix E):

- Coastal Limestone Heath;
- Affinities Coastal *Banksia ilicifolia*/Peppermint Low Woodland & Coastal Heathland; and
 - May provide habitat for Western Ringtail Possum (refuge and feeding).
 - May provide potential foraging habitat for Black Cockatoos.
- Peppermint Low Woodland.
 - May provide habitat for Western Ringtail Possum (refuge and feeding).
 - *Eucalyptus megacarpa* (Bullich) which is common in the Torndirrup and West Cape Howe National Parks (Sandiford, 2012). It is recommended that these trees are retained in vegetation corridors as potential roosting trees for Black Cockatoo species (Gilfillan and Leighton, 2012).

A vegetation corridor proposed to be retained to connect the South Coast Water Reserve area and foreshore reserve and is comprised of the following mapped vegetation units (Appendix E)

- Coastal Limestone Heath;
- Peppermint Low Woodland;
 - May provide habitat for Western Ringtail Possum (refuge and feeding).
 - *Eucalyptus megacarpa* (Bullich) which is common in the Torndirrup and West Cape Howe National Parks (Sandiford, 2012). It is recommended that these trees are retained in vegetation corridors as potential roosting trees for Black Cockatoo species (Gilfillan and Leighton, 2012).
- Coastal Yate Forest
 - This comprises the whole unit within Lot 105, is an underrepresented vegetation type within the local area and may provide potential roosting opportunities for Black Cockatoo species;
- Mosaic Coastal Limestone heath & aff *Banksia ilicifolia*/Peppermint Low Woodland & Coastal Heath (whole mapped mosaic within Lot 105);
 - May provide habitat for Western Ringtail Possum (refuge and feeding).
 - May provide potential foraging habitat for Black Cockatoos.
- Affinities Coastal *Banksia ilicifolia*/Peppermint Low Woodland & Coastal Heath;
- Locations of *Adenanthos x cunninghamii* P4.

Corridors of vegetation have been proposed based on a minimum of 50 m width (to encompass whole vegetation units where appropriate) and estimated from the latest aerial photography available for the Albany area (2012). Therefore it is recommended that the boundary of the vegetation corridors is confirmed by onsite survey (spatial) prior to development as clearing for firebreaks has not been uniform in the past.

6 Recommendations

It is considered that, subject to low impact development (type yet to be determined) and appropriate mitigation and management measures, it is likely that development of the site will be compatible with conservation of important habitat and vegetation units identified onsite for the following:

- Western Ringtail Possum habitat (refuge and feeding);
- Potential feeding and roosting habitat for Black Cockatoo species;
- Vegetation corridors across the site to provide connectivity with foreshore vegetation, Lot 104 to the north, 'Future Urban' lots to the south and ultimately to Torndirrup National Park;
- Retention of vegetation within the South Coast Water Reserve; and
- Retention of vegetation within the foreshore reserve.

It is recommended that the following is undertaken for any development of the site:

- Prior to any clearing of *Amperea protensa* P3 and *Adenanthos x cunninghamii* P4, local provenance plant material (seed, cuttings and transplants) is collected from individuals within Lot 105 for propagation and revegetation within the site;
- Propagated seedlings and other plants for landscaping should be supplied to industry standard and in soil free from weeds, insects and disease (e.g. *Phytophthora* dieback, *Armillaria*);
- Peppermint Low Woodland (ARVS 2) and Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) vegetation units should be considered for retention, where possible, as they provide significant habitat potential for Western Ringtail Possum and potential feeding opportunities for Black Cockatoo species;
- The Coastal Yate Forest and *Juncus kraussi* Sedgeland vegetation units be retained within the vegetation corridors across the site and foreshore reserve, respectively;
- Consideration is made for the future lot configuration of the development with regard to minimisation of firebreaks and incorporation of previously cleared tracks and firebreaks to maintain as large as possible areas of intact native vegetation, thereby reducing fragmentation and enabling connectivity within the site and to vegetation offsite;
- It is the responsibility of the RCBB, as the site owner, to control Declared Pest weeds, Environmental Weeds and WONS within the site;
- To reduce risk of pathogens such as *P. cinnamomi* (dieback) being introduced to the area, it is imperative that all machinery is cleaned from vegetation, soil and debris prior to commencing any works onsite;
- Any soil incoming to the site is clean and free from any pathogens. All topsoil shall be retained onsite for future use in the revegetation and rehabilitation of the site (where required);
- Where possible consideration should be made for areas for potential roosting (Bullich/Yate) and foraging (*Banksia* sp.) of Black Cockatoos are recommended to be retained within vegetation corridors across the site;
- The proposed development should be designed so as to mitigate significant impact as per Commonwealth referral guidelines for Black Cockatoo species and Western Ringtail Possums and thereby avoid need for referral to the Commonwealth Department of the Environment. However once the development footprint is known, if

significant impact, as per the guidelines, cannot be avoided further assessment and referral to the Commonwealth Department of the Environment may be required;

- A fauna specialist to be onsite during any clearing activities to recover disorientated native fauna;
- Retention of vegetation within Lot 105 intersecting the South Coast Water Reserve;
- Ensure no chemical or fuels are stored onsite within the South Coast Water Reserve area and a spill contingency procedure is in place via a Construction Environmental Management Plan for development of the site;
- Retain vegetation units *Juncus kraussii* Sedgeland (ARVS 66) and Coastal *Banksia ilicifolia*/ Peppermint Low Woodland (ARVS 4) within the proposed foreshore reserve;
- Confirmed by onsite survey that the proposed foreshore reserve area achieves 0.9 m separation to the high water level prior to development of the site;
- No development or stormwater treatment/ attenuation is to be undertaken within the proposed foreshore reserve;
- Access within the foreshore is formalised using materials sympathetic to the area (i.e. limestone paths and wooden steps) to restrict access to previously cleared areas of vegetation only;
- Proposed vegetation corridors to be retained to connect the South Coast Water Reserve area and foreshore reserve and vegetation within Lot 104 to the northwest and 'Future Urban' lots to the southeast to retain potential habitat for Western Ringtail Possums and Black Cockatoos;
- The boundary of the vegetation corridors is to be confirmed by onsite survey (spatial) prior to development as clearing for firebreaks has not been uniform in the past.

7 References

- Department of Agriculture, Fisheries and Forestry (DoAFF) (2012) *Weeds of National Significance*, Commonwealth of Australia.
- Department of Environment (DoE) (2004) *Land Use Compatibility in Public Drinking Water Source Areas*, Water Quality Protection Note No 25, Government of Western Australia, Perth.
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009) *Matters of National Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia.
- Department of Parks and Wildlife (DPaW) (2014) *Priority Ecological Communities for Western Australia Version 21*, Species and Communities Branch, 4 May 2014, DPaW, Perth.
- Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2012) *Environmental and Protection and Biodiversity Conservation Act 1999 Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) *Calyptorhynchus*, Baudin's cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest red-tailed black cockatoo (vulnerable) *Calyptorhynchus banksii naso**, Australian Government
- Department of Transport (2010) *Sea Level Change in Western Australia Application to Coastal Planning*, Department of Transport Coastal Infrastructure, Coastal Engineering Group.
- Department of Water (DoW) (2008) 1:250,000 Hydrogeology Map Series, Government of Western Australia.
- Environmental Protection Authority (EPA) (2000) *Environmental Protection of Native Vegetation in Western Australia Clearing of Native Vegetation, With Particular Reference to the Agricultural Area*, Position Statement No. 2, December 2000, Government of Western Australia.
- Gilfillan S. and Leighton S. (2012) *Level 2 Fauna Assessment of Lot 105 Frenchman Bay Road, Albany WA*. Unpublished, prepared on behalf of Opus International Consultants.
- Government of Western Australia (GoWA) (2013) *2013 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. Current as of June 2013. WA Department of Parks and Wildlife, Perth, Western Australia.
- Hearn, R., Williams, K., Comer, S. and Beecham, B. (2002) *Jarrah Forest 2 (JF2 – Southern Jarrah Forest subregion)*, A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, Department of Conservation and Land Management.
- Keighery, B. (1994) *Bushland Plant Survey A Guide to Community Survey for the Community*, Wildflower Society of WA, Perth.
- Opus International Consultants (2008) *Environmental Opportunities and Constraints Analysis – Lot 105 Frenchman Bay Road Big Grove, Albany*. Unpublished, prepared on behalf of the RBCC.
- 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.
- Sandiford, E. M. (2012) *Flora and Vegetation Report of Lot 105 Frenchman Bay road, Big Grove*. Unpublished, prepared on behalf of Opus International Consultants.
- Shepherd, D.P, Beeston, G.R. and Hopkins, A.J.M (2002) *Native Vegetation in Western Australia extent, type and status*. Department of Agriculture Government of Western Australia.
- Thackway, R and Cresswell, I. (1995-) *An Interim Biogeographic Regionalisation for Australia: A Framework for Setting Priorities in the National Reserves System (as amended)*. Australian Nature Conservation Agency, Canberra.

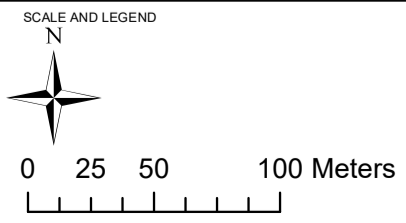
Water and Rivers Commission (2001) *South Coast Water Reserve and Limeburners Creek Catchment Area Water Source Protection Plan, Albany Water Supply*, Water and Rivers Commission Report WRP 44, Perth.

Western Australian Planning Commission (WAPC) (2013) *State Planning Policy 2.6 State Coastal Planning Policy*, Government Gazette WA, 30 July 2013, WAPC, Perth.

Appendices

Appendix A

Subject Site



Legend

Subject site

Albany Office
 PO Box 5236
 Albany, WA 6330, Australia
 Tel: +61 8 9842 6155
 Fax: +61 8 9842 6055

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TITLE	
Lot 105 Frenchman Bay Road, Big Grove	
Site Map	
STATUS	FILE
FINAL	W-A1138.00/0012A
SCALE	PLOT DATE
1:3,000	31/03/11

Appendix B

Department of Environment and Conservation and
Department of Parks and Wildlife Correspondence



Vicki Laurie
Opus International Consulting
Albany
PO Box 5236
ALBANY WA 6331

RECEIVED
15 AUG 2011

Dear Vicki

LOT 105 ON DEPOSITED PAN 230421, HOUSE 765 FRENCHMAN BAY ROAD, BIG GROVE

At the request of Aaron Bell, Planner and Project Coordinator for BSO Development Consultants, the Department of Environment and Conservation (DEC) is providing clarification on 'further studies required' to support the assessment of a Scheme Amendment Request to rezone Lot 105 Frenchman Bay Road, Big Grove from the 'Public Purpose' reserve to the 'Residential Development' zone.

As you are aware the City of Albany adopted the recommendation to consider a formal scheme amendment subject to "studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation".

DEC reviewed and provided comment (5 February 2009) on the level 1 survey data and information contained in the "Environmental Opportunities and Constraints Analysis" compiled by Opus International Consulting. As previously mentioned DEC considered this document to be relatively robust but provided comment on several significant issues regarding the interpretation and conclusions together with significant issues concerning future development options.

In March/April 2010 the Environmental Protection Authority formally assessed the City of Albany Local Planning Scheme No.1 and in its response to the City (3 May 2010) advised as follows with regard to the subject land:

" 3. Environmental Issues not assessed

Without limiting the EPA's discretion under section 5(e) of the EP Act to require the referral of proposals arising from the scheme amendment and your discretion, as the responsible authority, under section 481 of the EP Act to refer proposals arising from the scheme amendment, the EPA advises that the following environmental issues are not assessed for the areas designated below...

... All factors – relevant factors to be determined if required

Location 105, Little Grove: The EPA has set a level of assessment on LPS 1 on the basis that this fully vegetated lot is to be reserved as "Parks and Recreation". If there is any modification to this prior to gazettal of LPS 1, it will be of such significance as to warrant referral to the EPA, and potentially will attract the setting of a formal Level of Assessment."

The above advice and the findings of the Environmental Opportunities and Constraints Analysis clearly indicate that the site has environmental significance. DEC recommended in correspondence 11 January 2011 that, should Council be inclined to pursue rezoning of the site, more detailed information should be sought on the biodiversity and conservation values

South Coast Region 120 Albany Highway, Albany, Western Australia 6330

Phone: (08) 9842 4500 Fax: (08) 9841 7105

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wa.gov.au

of the site and the significance and extent of these, before further consideration of zoning changes and scheme amendment requests.

The issues raised by DEC in response to the 2009 Environmental Opportunities and Constraints Analysis are still current and now have greater relevance due to the potential Scheme Amendment Request, which would result in development of the site. DEC draws attention to those issues that will require further studies to be conducted to provide an appropriate level of information should the City of Albany decide to proceed with the Scheme Amendment Request and refer the request to the Environmental Protection Authority.

Specifically DEC considers the following will be required:

- A Level 2 survey, as per EPA guidance statements 20, 33, 51 and 56, including a comprehensive fauna and invertebrate survey, over more than one season;
- Flora and vegetation survey and units needs to be consistent with the Albany Regional Vegetation Survey, Sandiford and Barrett 2010 (<http://www.dec.wa.gov.au/content/view/6484/2368/>) as identified in EPA Bulletin No. 13 as a key information source to guide land use planning (http://edit.epa.wa.gov.au/Policies_guidelines/envprotectbulltn/Pages/default.aspx?cat=Environmental%20Protection%20Bulletins&url=Policies_guidelines/envprotectbulltn). This will include further field survey and validation of vegetation mapping to enable an assessment of regional significance. This survey particularly needs to give attention to vegetation unit 44 *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland which was mapped as occurring on the site during the survey. The Western Australian Threatened Ecological Communities Scientific Committee Scientific Committee recommended that the 'Banksia littoralis woodland / Melaleuca incana Shrubland' be ranked as Critically Endangered under criteria B) iii), but ranked P1 in the interim; and
- Survey and analysis should consider conservation and biodiversity values in total and not be restricted to significant species or communities. Connectivity, habitat value and minimisation of fragmentation are all issues of conservation significance that need to be addressed; the juxtaposition of the site with the Torndirrup National Park, the adjoining City of Albany Crown reserve to the north-west and connectivity along the foreshore reserve are all important in this regard;

If further planning is to proceed, consideration should be given to

- the use of planning instruments such as special land use lots or conservation lots of sufficient size to maximise the protection and consolidation of retained vegetation;
- the strategic positioning of building envelopes so as to minimise or negate additional impacts on vegetation through building protection zones and fire hazard separation zones;
- higher order levels of fire protection building standards under AS 3959 and
- maximising the area of contiguous vegetation between building envelopes and the adjacent City of Albany Crown reserve and the foreshore reserve.

If you wish to discuss survey requirement in further detail, please do not hesitate to contact Deon Utber.

Yours sincerely



Greg Mair
REGIONAL MANAGER

10 August 2011

Vicki Davies

From: Utber, Deon <Deon.Utber@dec.wa.gov.au>
Sent: Friday, 18 November 2011 3:46 p.m.
To: Vicki Davies
Cc: 'Aaron Bell'; Watson, John; Comer, Sarah
Subject: RE: Level 2 Fauna survey of Lot 105 Franchmans Bay Rd

Vicki,
DEC finds this acceptable.

Regards,
Deon Utber
Regional Leader Nature Conservation
South Coast Region
Department of Environment and Conservation

Ph: (08) 9842 4514
Fax: (08) 9841 7105
Mobile: 0429 080 243
Email: deon.utber@dec.wa.gov.au
Address: 120 Albany Highway, Albany WA 6330

From: Vicki Davies [mailto:vicki.davies@opus.com.au]
Sent: Friday, 18 November 2011 10:47 AM
To: Utber, Deon
Cc: 'Aaron Bell'
Subject: FW: Level 2 Fauna survey of Lot 105 Franchmans Bay Rd

Hi Deon

Further to the attached email, it is proposed to undertake fauna survey as below for Lot 105 Frenchman Bay Road. This was programmed to be undertaken in autumn 2012 to complete a level 2 fauna survey of the site (including original survey undertaken in spring 2008). However Sandra has suggested that summer survey for Carnaby's may be more appropriate. Would this be acceptable to DEC?

If you require further information please do not hesitate to contact me on 98426155.

Kind regards



Vicki Davies
Environmental Team Leader
Opus International Consultants (PCA) Pty Ltd
vicki.davies@opus.com.au
Tel +61 8 9842 6155, Mobile +61 427 915 726
<http://www.opus.com.au>

1st Flr Albany House, 125 York Street, PO Box 5236, Albany, Western Australia

From: sandra gilfillan [mailto:sandragilf@yahoo.com.au]
Sent: Thursday, 17 November 2011 12:20 PM
To: Vicki Davies
Cc: Sylvia Leighton
Subject: Level 2 Fauna survey of Lot 105 Franchmans Bay Rd

Hi Vicki,

Regarding the Level 2 fauna survey of Lot 105 Frenchman's Bay Rd I'm inquiring as if there is any reason why this survey needs to be carried out in Autumn. The survey is now not just a repeat of the original survey carried out in another season but a targeted approach comprising the following surveys:

1. An more intensive survey for Mains Assassin Spider, targeting all suitable habitat.
2. An attempt to determine densities of Western Ringtail Possums.
3. Use of the site by Carnaby's or Baudin's Cockatoos.

In order to obtain the best information on the presence or densities of these species the timing of these surveys does not need to be tied to Autumn. In fact for the Carnaby's Cockatoo a summer survey is most appropriate. Therefore would it be possible to commence this survey before autumn, with a finishing date in autumn 2012?

Cheers
Sandra

Sandra Gilfillan
P.O. Box 446
Albany WA 6331
Ph: 08 98425237
Mobile: 0447425237

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Vicki Davies

From: Utber, Deon <Deon.Utber@dec.wa.gov.au>
Sent: Tuesday, 29 November 2011 10:02 a.m.
To: Vicki Davies
Cc: 'Aaron Bell'
Subject: RE: Time of survey at Lot 105 Frenchmans Bay Rd.

Hi Vicki,
This is acceptable,

Regards,

Deon Utber

**Regional Leader Nature Conservation
South Coast Region
Department of Environment and Conservation**

Ph: (08) 9842 4514
Fax: (08) 9841 7105
Mobile: 0429 080 243
Email: deon.utber@dec.wa.gov.au
Address: 120 Albany Highway, Albany WA 6330

From: Vicki Davies [mailto:vicki.davies@opus.com.au]
Sent: Thursday, 24 November 2011 1:16 PM
To: Utber, Deon
Cc: 'Aaron Bell'
Subject: FW: Time of survey at Lot 105 Frenchmans Bay Rd.

Hi Deon

I have had a further suggestion from Sandra Gilfillan regarding the survey times at Lot 105 Frenchman Bay Road. Will the outline below be acceptable to DEC?

kind regards



Vicki Davies

Environmental Team Leader

Opus International Consultants (PCA) Pty Ltd

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<http://www.opus.com.au>

1st Flr Albany House, 125 York Street, PO Box 5236, Albany, Western Australia

From: sandra gilfillan [mailto:sandragilf@yahoo.com.au]
Sent: Thursday, 24 November 2011 12:16 PM
To: Vicki Davies
Subject: Time of survey at Lot 105 Frenchmans Bay Rd.

Hi Vicki,

Regarding the time of survey at Lot 105 Frenchmans Bay Rd., the Main's Assassin Spider survey, Micheal Rix from WAMuseum has suggested any time from now onwards would be suitable for survey (see below). Also, re Ringtail Possums, Autumn is probably the best time to survey as

more breeding occurs then then over summer, however survey transects will need to be set up and this can be done over summer, ready for an autumn survey.

Cheers
Sandra

Sandra Gilfillan
P.O. Box 446
Albany WA 6331
Ph: 08 98425237
Mobile: 0447425237

----- Forwarded Message -----

From: Michael Rix <michael.rix@museum.wa.gov.au>
To: Mark Harvey <Mark.Harvey@museum.wa.gov.au>
Cc: sandra gilfillan <sandragilf@yahoo.com.au>
Sent: Monday, 21 November 2011 3:10 PM
Subject: RE: Main's Assassin Spider

Dear Sandra,

Regarding your archaeid survey, I imagine anytime from now onwards would be good for surveying around Albany, as there are generally spiders around most of the year, and it may well be easier now before the vegetations starts to really dry up. We surveyed in Autumn as this is the start of the *A. mainae* breeding season (mostly April-June), and there were plenty of adults or sub-adults around at that time. However, juvenile specimens can be found throughout the hot summer months, even if it can be very hard to find the microhabitats in which they live. Having said that, a slightly drier environment can be helpful for finding the truly humid local refugia in which the spiders congregate; either weay November is probably a good time to find juveniles.

Sifting 'elevated' leaf litter with a metal sieve is far and away the best method for finding them, and Sarah Comer is certainly very well versed in this method if you want some additional pointers. The key is to get right up and under dense sedges and *Empodisma* curly-grass, and to seek out the most humid, shaded low vegetation. Rarely are the spiders truly abundant, but where they exist they are often not rare.

Please let me know if you require any further information, and good luck!

Best wishes,
Mike

Dr. Michael G. Rix
Terrestrial Zoology - Invertebrates
Western Australian Museum
49 Kew Street, Welshpool , WA 6106, Australia
Mail to: Locked Bag 49, Welshpool DC , WA 6986
Phone: +61 8 9212 3865
Email: michael.rix@museum.wa.gov.au

From: Mark Harvey
Sent: Monday, 21 November 2011 2:37 PM
To: Michael Rix
Cc: sandra gilfillan
Subject: RE: Main 's Assassin Spider

Hi Mike

Can you please deal with this query?

Many thank, M.

P.S. Hi Sandra! ☺

From: sandra gilfillan [mailto:sandragilf@yahoo.com.au]
Sent: Monday, 21 November 2011 2:25 PM
To: Mark Harvey
Subject: Main 's Assassin Spider

Hello Mark,

How are you? Its been awhile since we've had any contact...but I'm wondering if you can give me some advice on surveying for Main 's Assassin Spider. Myself and Sylvia Leighton are surveying a 20 ha area of remnant vegetation earmarked for development, on Frenchman's Bay Rd in Albany . We carried out a survey here in December 2008 for the spider as potentially suitable habitat exists here (confirmed by Sarah Comer), however had no luck. We are now doing a more intensive survey of the site, including another spider survey. I'm wondering if you can give any tips on surveying (we used sieves last time), particularly in relation to the time of survey. Your survey of the species was carried out from March to May- was there any particular reason for an autumn survey? Our last survey was the end of December so was quite hot and dry, I'm thinking if we do it now, while its still quite moist in the soil down here, this might head some better results?

Hope you can impart your knowledge on this one.

Cheers
Sandra

Sandra Gilfillan
P.O. Box 446
Albany WA 6331
Ph: 08 98425237
Mobile : 0447425237

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Vicki Davies

From: English, Val <Val.English@DPaW.wa.gov.au>
Sent: Friday, 2 May 2014 9:08 a.m.
To: Vicki Davies
Subject: Lot 105 Frenchman Bay Road Albany

Hi Vicki

The PEC remains as P1 pending consideration for TEC listing.

Groundwater Dependent Ecosystem – GDE

Cheers
Val

From: Vicki Davies [mailto:Vicki.Davies@opus.com.au]
Sent: Thursday, 1 May 2014 2:11 PM
To: English, Val
Subject: RE: Lot 105 Frenchman Bay Road Albany

Hi Val

Thanks for your reply and comments. Do you know what the status of this PEC is pending endorsement as a “Critically Endangered” Threatened Ecological Community.

Also just to avoid potential confusion could you please confirm the abbreviation GDE?

Kind regards



Vicki Davies | Environmental Team Leader | Opus International Consultants (PCA) Pty Ltd
Phone +61 8 9892 9615 | Mobile +61 427 915 726 | Fax +61 8 9842 6055 | Email vicki.davies@opus.com.au
Albany House, 125 York Street, Albany, Western Australia
PO Box 5236, Albany WA 6331, Australia

Visit us online: www.opus.com.au



From: English, Val [mailto:Val.English@DPaW.wa.gov.au]
Sent: Thursday, 1 May 2014 1:59 p.m.
To: Vicki Davies
Cc: Communities Data; Barrett, Sarah
Subject: RE: Lot 105 Frenchman Bay Road Albany

Hi Vicki

Wendy passed your email on to me.

We usually use a threshold of ‘Good’ condition to be the poorest condition to still be representative of a PEC, and for ‘degraded’ to be no longer extant.

I am not familiar with the site, but have consulted with regional staff.

With regard to the *B littoralis*/ *M incana* condition on Lot 105 it appears to be difficult to determine why it is changing, potentially hydrology, but there may be disease also eg *Armillaria*. An assessment of 'degraded' condition may not be warranted because we don't appear to fully understand why it is changing and therefore can't be certain that the changes are irreversible.

The unit also may still be considered a GDE.

Regards

Val

Appendix C

Flora and Vegetation Report of Lot 105 Frenchman Bay Road, Big Grove, E.M. Sandiford 2012

Vegetation and Flora of Lot 105 Frenchmans Bay Rd, Big Grove

Report produced for Opus International Consultants (PCA) Pty Ltd, Albany WA

By E.M.Sandiford B.Sc.(Hons)

May 2012

Disclaimer

Every effort has been made to ensure the accuracy of the information provided however the author does not accept responsibility for any omissions or errors or in how the information provided is used subsequently by others.

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SUMMARY

- The vegetation and flora survey of Lot 105 Frenchmans Bay Rd, Big Grove was conducted on 7, 11 & 15/11/2011 and 4/4/2012.
- 145 native species were recorded including 2 conservation species *Amperea protensa* P3 and *Adenanthos x cunninghamii* P4
- 40 introduced species were recorded including one Weed on National Significance (WON), **Asparagus aethiopicus*, and one Declared Plant **Zantedeschia aethiopica*. Most weeds were restricted to tracks/firebreaks though the environmental weed **Acacia longifolia* was widespread throughout the survey area. .
- Six vegetation units were recorded and mapped: Coastal Yate Forest, Peppermint Low Forest, *Banksia ilicifolia*/Peppermint Low Woodland, Coastal Limestone Heath, *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland and *Juncus kraussii* Sedgeland. All of these units have previously been described in the Albany Regional Vegetation Survey (Sandiford and Barrett 2101) though two units: Coastal Yate Forest and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland were not previously mapped within the survey area.
- The most common units were Limestone Heath, Peppermint Low Forest and *Banksia ilicifolia*/Peppermint Low Woodland all of which are well reserved on a regional and state scale and likely to have a high percentage of pre-clearing extent remaining. The remaining units have less than 25% reserved on a regional scale and their state wide reservation status and pre-clearing extent remains unclear though *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland is likely to have <30% pre-clearing extent remaining.
- One Priority Ecological Community (PEC) was recorded: *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland. This vegetation, naturally a wetland unit is currently a P1 PEC pending endorsement as a “Critically Endangered” Threatened Ecological Community. All occurrences within the survey area are modified, resulting from changing hydrology and all occurrences within the survey area are being invaded by upland species. The long term viability of this vegetation within the survey area is low.
- Two wetland units were recorded within the survey area *Juncus kraussii* Sedgeland and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, however the latter vegetation unit may no longer fall within the definitions of wetland vegetation due to the ongoing hydrological change and continuing invasion by upland species.
- The overall vegetation condition is good to very good with invasion of **Acacia longifolia* and degradation of, and invasion of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, by upland species the major factors influencing condition rating.
- The conservation values of the survey area are high and include a diversity of vegetation and flora which is typical of the region, presence of a Priority Ecological Community (PEC) pending endorsement as a “Critically Endangered” Threatened Ecological Community”, occurrence of two conservation species, wetland vegetation and occurrence in a corridor spanning the width of the Torndirrup Peninsula. These values are under threat from ongoing hydrological change that is impacting on the PEC (*Banksia littoralis* Woodland/*Melaleuca incana* Shrubland) and by the invasion of the environmental weed **Acacia longifolia*.

INTRODUCTION

Lot 105 Frenchmans Bay Rd, Big Grove, occurs on the Torndirrup Peninsula, abutting the southern shore of Princess Royal Harbour, 5.5 km south of Albany. It is surrounded by remnant bushland on the west/north west side, semi-rural and partially cleared properties to the south east, south and south west and by Princess Royal Harbour the north. The property forms part of a corridor spanning the width of the Torndirrup Peninsula from Princess Royal Harbour to the Southern Ocean.

This report documents the vegetation and flora of the property in accordance to EPA guidance statement 51 (EPA 2004) and EPA bulletin 13 (EPA2011).

METHODS

Desktop

A search of the Department of Environment and Conservation (DEC) Threatened and Priority Flora Database (TPFL), WA Herbarium data base (WAHerb) and Declared Rare and Priority Flora Species List was undertaken using the coordinates of 6128128/536529, 6128363/592920, 6111829/592930 and 6111762/536501 (Universal Transverse Mercator projection, Zone 50S). This area covers a 55km coastal strip from Denmark to Gull Rock National Park which includes the similar landforms, soils and habitats as those within the survey area. A search of the DEC Threatened Ecological Communities database was undertaken using the same search area.

Previous vegetation, geological and soils reports relevant to the area were reviewed.

Field Survey

Traverses were planned to cover the range of and previously mapped vegetation units, aerial patterns and soil/landform units, with distance between traverses approximately 40-80m. Vegetation boundaries were marked by hand held GPS and representative sites were sampled within each vegetation type using methods consistent with the Albany Regional Vegetation Survey (Sandiford and Barrett 2010). Sites (relevés) were selected to represent the range of floristic and structural differences with each vegetation type.

Each site consisted of an unmarked 10mx10m area centred on a GPS marked location, with the following data recorded for each site:

Structure: Vegetation structure was recorded according to the structural classification classes of Keighery (1994) (Appendix 1). Dominant or co-dominant species within each stratum were recorded, with structural and species data for the upper shrub and all tree strata recorded over a 20m x 20m area to enable more accurate description in areas of open to very open shrublands or woodlands.

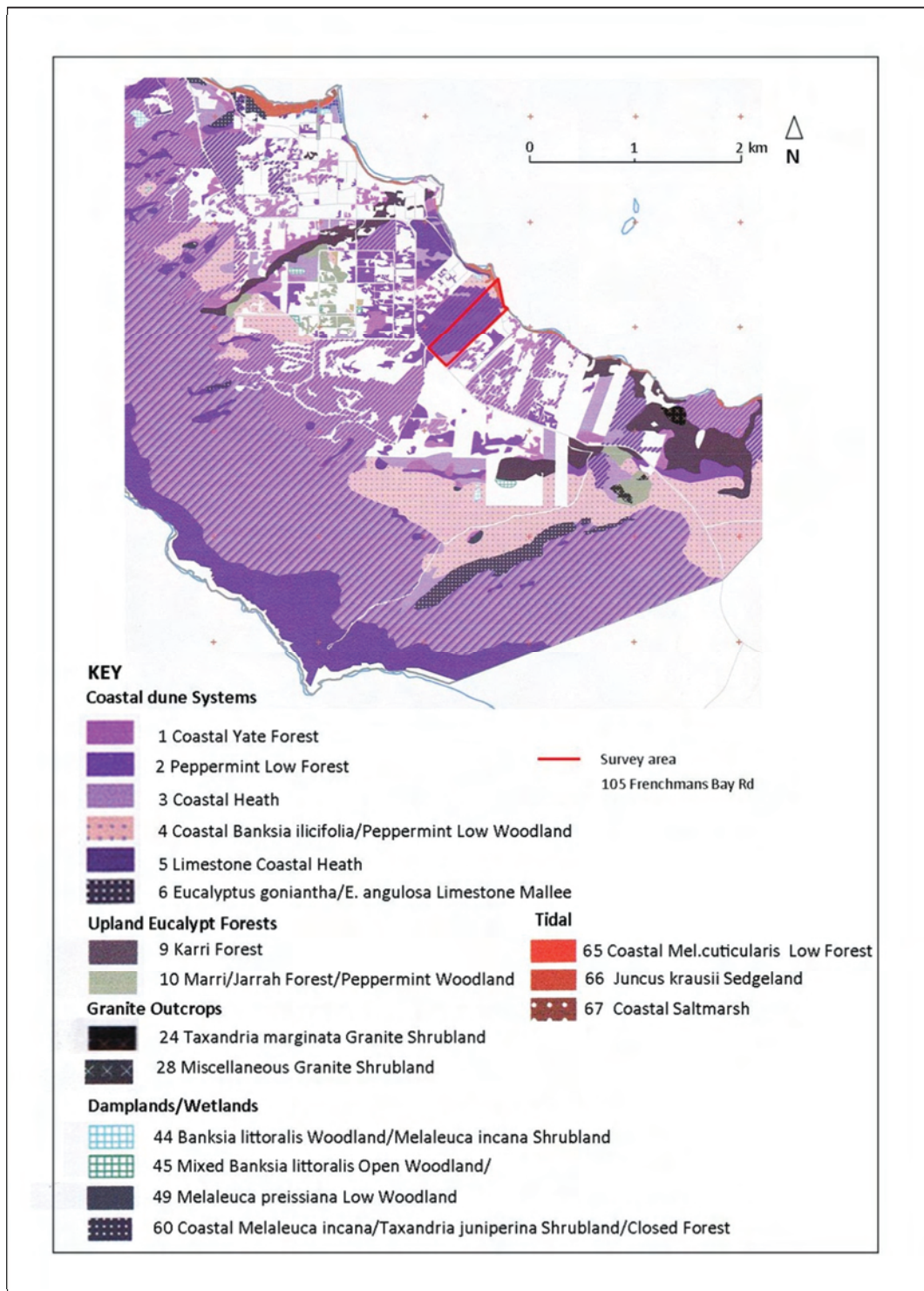
Floristics: All vascular plants were recorded where a minimum of 3 plants occurred or where species cover was > 5% within the site or for upper shrub and tree species within a 20m x 20m area. Species that could not be identified in the field were collected and identified later.

Site attributes. Visual assessment of soil colour and type, geology, percentage surface rock, landform, hydrology and drainage status were recorded, where known

Condition: Vegetation condition was recorded using both the National (Vegetation, Assets, States and Transition (VAST) scale (Thackway and Lesslie 2006) and condition categories of Keighery (1994), (Appendix 2a and 2b).

Additional notes were made where applicable and included health, age, other species of interest in the general area e.g. presence of conservation species, weeds.

Figure 1: Location of Lot 105 Frenchmans Bay Rd & Albany Regional Vegetation Survey units



Throughout the survey area additional notes on the structure and floristics of the vegetation were recorded. Introduced species were recorded with locations of Weeds of National Significance, Declared weeds recorded by hand held GPS. Locations of many **Acacia longifolia*, a major environmental weed in the Albany area, were recorded by hand held GPS to gauge distribution across the survey area.

Plants that could not be identified in the field were identified using relevant taxonomic texts, the Albany Regional Herbarium and the author's personal herbarium (checked against the Perth Herbarium). Nomenclature followed the current WA herbarium usage (DEC 2012a) with the exception of some *Lepidosperma* species which are currently undergoing revision. These species have been given phrase names as applied during the ARVS (Sandiford and Barrett 2010).

Mapping was undertaken using QGIS™ 1.7.1 software. Waypoint data was downloaded as a shape file and displayed over aerial photography of the survey area. Vegetation boundaries were drawn digitally using boundary waypoints, aerial pattern and field notes.

Comparisons with Albany Regional Vegetation Survey units, as required under EPA Bulletin No. 13 (EPA 2-011) were made by comparing floristics of sites and field notes with descriptions of ARVS units (Sandiford and Barrett 2010).

RESULTS and DISCUSSION

Desktop

Geology, landforms and soils

Geologically, the property has been mapped as quaternary estuarine and lagoonal deposits (Muhling and Brackel 1985). The soils have been described as the Meerup soil/landform unit with the survey area dominated by the "podzols on interdune" phase and interspersed with small areas of "podzols over calcareous sand" phase (Churchward *et al* 1988).

Biogeography and vegetation

The property lies at the eastern end of the Warren IBRA* biogeographic region (Thackway and Creswell 1995) which corresponds to the eastern end of the Warren Botanical sub districts (Beard 1979). It falls within the Torndirrup vegetation system described by Beard (1979) as "dominated by heath and scrub heath communities occurring on the consolidated sand of the coastal fringe with the climax community appearing to be *Agonis flexuosa* Low Woodland". Other less common communities within this system include Karri Forest, Banksia Low Forest (*B. littoralis*, misattributed as *B. verticillata*) and rocky outcrops (Beard 1979).

The property lies within the Albany Regional Vegetation Survey (ARVS) area (Sandiford and Barrett 2010). Most the property was mapped as a mosaic of Limestone Heath (ARVS unit 5) and Peppermint Low Forest (ARVS 20) with the northern fringe mapped as *Banksia illicifolia*/Peppermint Low Woodland (ARVS unit 4) on the dunes and *Juncus kraussii* Sedgeland (ARVS unit 66) on the harbour shore (Figure 1). A small area of Coastal Heath (ARVS unit 3) was mapped in south eastern corner of the property. The vegetation condition was mapped as residual on the national VAST scale (Appendix 2a, equating to Very Good to Excellent on the Keighery condition scale (Appendix 2b).

*IBRA= Interim Biogeographic Regionalization for Australia

Conservation Flora

No conservation flora species have previously been identified from the property. (See Appendix 3 for Conservation categories). The WAherb and TPFL searches recorded 81 conservation species within the search area though 14 of these are erroneous records related to old collections attributed to King George Sound, but not collected in the vicinity. Many additional records occur on landforms north of and differing from those on the coastal fringe, which encompasses the survey area and therefore not expected to occur within the survey area. Based on very broad vegetation landform data only 21 of the 81 conservation species listed have been recorded in similar vegetation and landforms to those known within the survey area, (Table 1.) Of these only 8 are likely to occur within the survey area given specific soil, landform and habitat preferences. No additional conservation species were recorded within similar landform or vegetation during the ARVS survey (author observations).

Table 1 Potential Conservation species

Conservation Species	Conservation status	Habitat &/or vegetation	Likely occurrence based on known habitat, distribution and vegetation
<i>Calectasia cyanea</i>	T CR	Base of coastal hills incl. Coastal Heath, <i>Banksia ilicifolia</i> /Peppermint Low Woodland	unlikely
<i>Caladenia evanescens</i>	P1	Coastal Heath	possible
<i>Selliera radicans</i>	P1	Saltmarsh, Wilson Inlet	unlikely
<i>Thomasia purpurea x solanacea</i>	P1	calcrete sand over limestone/above steep valley.	unlikely
<i>Austrostipa mundula</i>	P2	limestone. cliff top	unlikely
<i>Conospermum quadrupetalum</i>	P2	grey sandy soils include dampland within <i>B. ilicifolia</i> /Peppermint Woodland	possible
<i>Juncus meianthus</i>	P2	seepage/forshore	possible
<i>Schoenus</i> sp. Grassy (E. Gude & J. Harvey 250)	P2	damp flats, adjacent harbour	possible
<i>Gyrostemon thesioides</i>	P2	incl. Coastal and Limestone Heath	possible
<i>Amperea protensa</i>	P3	Dampland, heath and sedgeland including edge Princess Royal Harbour	possible
<i>Gahnia sclerioides</i>	P3	Base of coastal hills, Karri Forest	unlikely
<i>Melaleuca ringens</i>	P3	Cliff top, Limestone Heath	unlikely
<i>Sphaerolobium calcicola</i>	P3	Nullaki, Torndirrup Veg system	unknown
<i>Thomasia quercifolia</i>	P3	Shallow rocky limestone soils	unlikely
<i>Adenanthos x cunninghamii</i>	P4	Coastal fringe, incl. Coastal Heath	possible
<i>Corybas limpidus</i>	P4	Coastal fringe include Peppermint Thicket	possible
<i>Eucalyptus calcicola</i> subsp. <i>unita</i>	P4	Limestone ridge	unlikely
<i>Eucalyptus goniantha</i> subsp. <i>goniantha</i>	P4	Limestone ridge	unlikely
<i>Eucalyptus x missilis</i>	P4	Limestone ridge	unlikely
<i>Lepidium pseudotasmanicum</i>	P4	Hillslope - incl. Torndirrup Vegetation System with <i>Eucalyptus megacarpa</i>	unlikely
<i>Thomasia solanacea</i>	P4	Creek margin, Torndirrup Vegetation System	unlikely

Field survey

The main vegetation and flora survey was conducted in spring on 7, 11 & 15/11/2011, with a smaller autumn flora survey conducted on 4/4/2012. 25 sites were recorded during the spring survey (Figure 2 and Appendix 4 for full site data).

Flora

145 native species and 40 introduced species were recorded during the survey, with the majority of the introduced species found on or adjacent firebreaks/tracks (see Weeds & Appendix 5a & 5b for species lists). 73 native species and 3 introduced species were recorded within the 25 sites. Excluding introduced species the most diverse families were Proteaceae with 14 species, Fabaceae (13), Cyperaceae (12 plus an additional form), Poaceae (8), Ericaceae (8) and Asteraceae (8). The

most diverse genera were *Leucopogon*, *Hibbertia*, *Styliidium*, *Adenanthos*, *Banksia*, *Schoenus* and *Drosera* with 4 species each.

Conservation species

Two conservation species: *Amperea ericoides* P3 and *Adenanthos x cunninghamii* P4, were recorded during the survey (Figure 2). Threatened Flora Report Forms have been completed and forward to the Department of Environment and Conservation.

***Amperea protensa* P3**

Two plants were recorded in *Spyridium globulosum* Open Heath over *Melaleuca incana/Leucopogon parviflorus* Low Open Heath and *Lepidosperma gladiatum* Sedgeland. Other species present included *Ficinia nodosa*, *Desmocladius flexuosus*, *Gahnia trifida*, **Pelargonium capitatum* and *Poa porphyrocladus*. This vegetation is equivalent ARVS unit 44 *Banksia littoralis* Low Open Woodland/*Melaleuca incana* Shrubland with condition modified by the invasion of upland species.

This species has previously been found along the coastal/near coastal fringe from Scott River to near Cheynes Beach, with one record near Perth (DEC 2012a).

***Adenanthos x cunninghamii* P4**

Four plants were recorded near the central eastern boundary occurring in *Agonis flexuosa* Low Open Woodland over *Spyridium globulosum/Adenanthos sericeus* Tall Open Scrub and *Leucopogon obovatus* Shrubland. Other species present included *Banksia littoralis*, *Adenanthos cuneatus*, *Rhagodia baccata*, *Billardiera fusiformis*, *Acacia pulchella* and *Cyathochaeta equitans*. The presence of *Adenanthos cuneatus* and *Cyathochaeta equitans* are indicative acidic sands, whilst most other species occur on both alkaline and acidic sands.

This species has previously been found scattered along the coastal fringe from west of Albany to Cheynes Beach

Introduced species

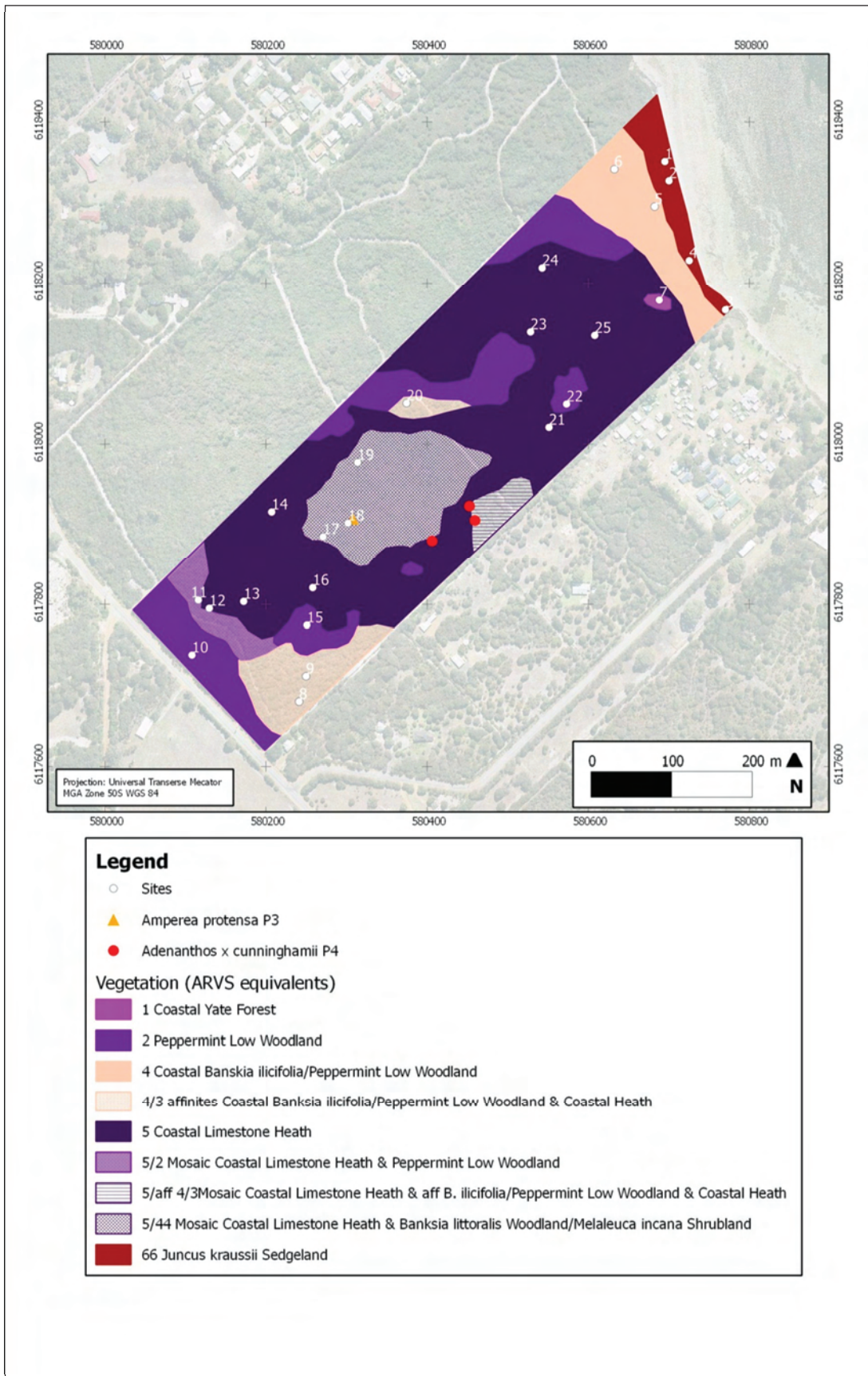
40 introduced species were recorded in the survey area with most occurring on or adjacent the tracks and firebreaks (Appendix 5b)

One seedling of **Asparagus aethiopicus*, a Weed of National Significance (declared 2012) was recorded in Site10 occurring in *Eucalyptus megacarpa* Open Forest over *Agonis flexuosa* Low Open Forest and *Spyridium globulosum* Tall Open Shrubland), Figure 3 (Weeds Aus 2012). This vegetation is equivalent to ARVS unit 2: Peppermint Low Forest. **Asparagus aethiopicus* species has been recorded in the Little Grove area over the last 5 years (author observations) and is likely to have been spread by birds from garden plants.

One Declared Plant **Zantedeschia aethiopica* (Arum Lily) was recorded in Peppermint (*Agonis flexuosa*) Low Woodland near the south western edge of survey area, adjacent Frenchmans Bay Rd, Figure 3,(DAFWA 2012). This species is a P1 and P4 designated declared plant in the Albany area thus "Introduction of the plant into, or movement of the plant within an area is prohibited" (P1) and "Spread of plant beyond where it currently occurs to be prevented" (P4). (Appendix 6 lists the Declared Plant categories).

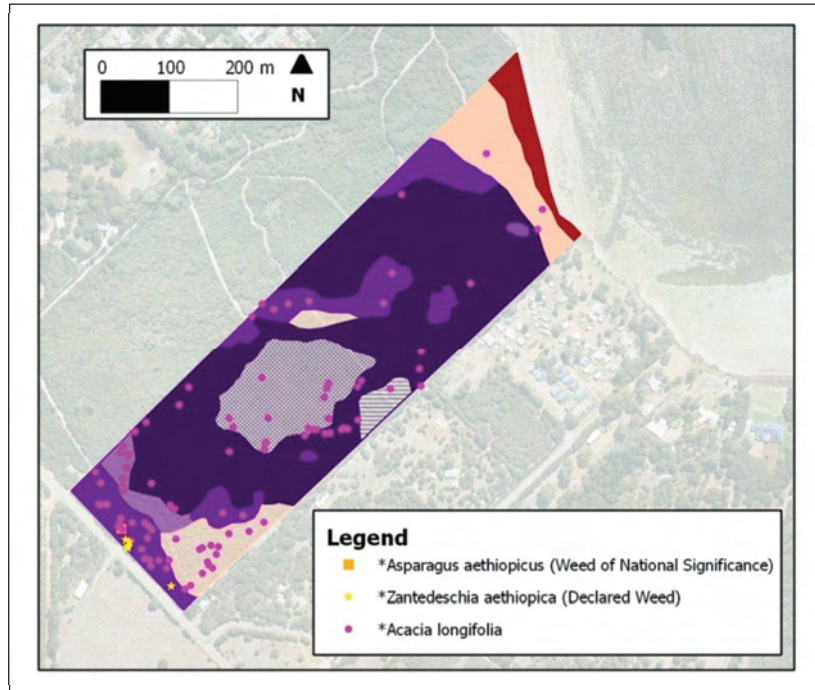
**Acacia longifolia* was the most widespread weed, found scattered throughout the survey area, Figure 3. This species was present as mature shrubs, saplings and seedlings and is recognized as a major environmental weed in the Albany area (CoA 2005, Peltzer 2007, Sandiford and Barrett 2010). This species has spread rapidly in the Albany region in the last decade and is a major environmental threat to remnant bushland due to its ability to germinate and establish in undisturbed bushland.

Figure 2 Vegetation map, conservation species and survey sites



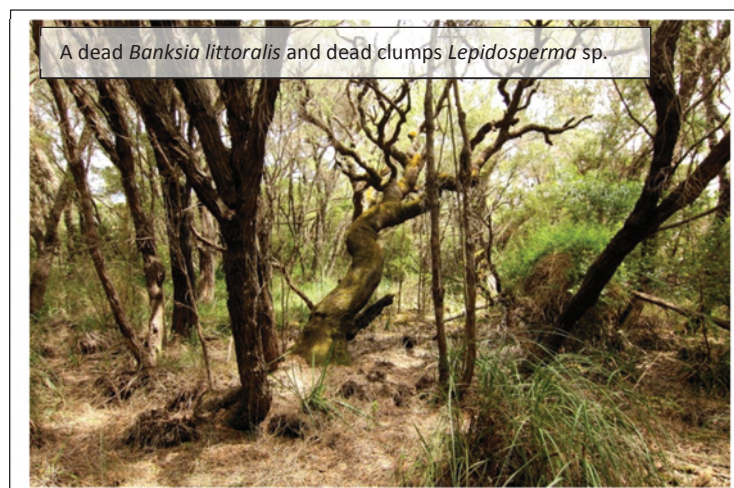
Another weed found scattered throughout the remnant bushland was **Pelargonium captiatum*. This species was found primarily in disturbed areas, notably within areas of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, Peppermint Low Forest and in burnt areas of Coastal *Banksia ilicifolia*/Peppermint Woodland.

Figure 3 Distribution Weeds of National Significance, Declared Weeds and **Acacia longifolia*
(NB Not all locations of **Acacia longifolia* were recorded)



Disease and Hydrology

No evidence of *Phytophthora* dieback was observed during this survey. The numerous dead *Banksia littoralis* trees observed appear to be associated with hydrological changes and attributed to falling water tables, probably a result of both water abstraction and declining rainfall (Sandiford and Barrett 2010). Invasion of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland vegetation by upland species and the presence of old basal stumps or dying clumps of *Lepidosperma* species and *Gahnia trifida* appear to be further evidence of changes within the survey area resulting from hydrological change occurring over past years.



Vegetation

Six vegetation units have been mapped with several areas mapped as mosaics (Figure 2). The units are:

- Coastal Yate Forest (ARVS 1)
- Peppermint Low Forest (ARVS 2)
- Coastal *Banksia ilicifolia*/Peppermint Woodland (ARVS 4)
- Coastal Limestone Heath (ARVS 5)
- Banksia littoralis* Woodland/*Melaleuca incana* Shrubland (ARVS 44)
- Juncus kraussi* Sedgeland (ARVS 66)

Several small areas on deep sand have been mapped as affinities with both Coastal *Banksia ilicifolia*/Peppermint Woodland (ARVS 4) and Coastal Heath (ARVS 3) as they do not clearly fall within either unit. These areas lack *Banksia ilicifolia* typical of the former unit but contain characteristic species that are either absent or rare in Coastal Heath including *Astroloma baxteri*, *Andersonia caerulea*, *Dasypogon bromeliifolius*, *Bossiaea praetermissa*, *Pultenaea reticulata* and *Petrophile rigida* whilst also containing *Allocasuarina humilis* which is characteristic of Coastal Heath but rare in *Banksia ilicifolia*/Peppermint Low Woodland. These two units form part of a continuum of vegetation on the coastal dune system with Peppermint Low Woodland recognized as a climax community and areas of intermediate species composition would not be unexpected (Beard 1979, Sandiford & Barrett 2010).

There is considerable overlap in species between many of these units and boundaries between these units were not always clear as indicated in Table 2, representing presence and absence data for the 25 survey sites. Variation in structure and floristics was also observed within units, particularly Coastal Limestone Heath, Table 2. Such variation has previously been recorded and associated with several factors including soil depth, rockiness, drainage, fire and age (Sandiford and Barrett 2010).

The distribution of vegetation within the survey area is similar to previous ARVS mapping though two additional units have been recorded as a result of more intensive survey and better aerial imagery. These units are Coastal Yate Forest which was limited to one small patch near the north east corner and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, Figure 2. The latter unit was recorded in the centre of the survey area occurring on shallow soils overlying a limestone pavement. All occurrences appear to be disturbed and have been mapped as a mosaic with Limestone Coastal Heath (see descriptions below). An area previously mapped as Coastal Heath appears to have floristic affinities with both *Banksia ilicifolia*/Peppermint Low Woodland and Coastal Heath. Comparison of floristic site data with ARVS data for the relevant and similar units is provided in Appendix 7.

Priority Ecological Communities (PEC)

One PEC occurs within the survey area: *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, (see vegetation descriptions for photo). This vegetation is currently listed as P1 PEC pending endorsement as a “Critically Endangered” Threatened Ecological Community (TEC) and it was nominated on the basis of limited range, rarity, fragmentation and threatening processes including changing hydrology, climate change, inappropriate fire regimes and weed invasion (S. Barrett, DEC, pers. comm.). (A Critically Endangered Ecological Community is defined as one “that has been adequately surveyed and found to have been subject to a major contraction in area and or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated” (see Appendix 8 for all TEC/PEC categories).

This vegetation, first described during the ARVS, has previously been recorded only from small patches along the coastal and near coastal flats adjacent Princess Royal Harbour though further occurrences may exist on the southern end of the Vancouver Peninsula, east of Princess Royal Harbour but outside the ARVS area (author observation). (See Vegetation Descriptions for floristic and structural characteristics).

Within the survey area this vegetation is modified and like most other occurrences recorded during the ARVS this wetland/dampland unit is being invaded by upland species including *Spyridium globulosum*, *Leucopogon parviflorus* and *Allocasuarina lehmanniana*. This invasion appears to be associated with long term reduction in the water table, the cause of which is unknown but likely to be due to a combination of abstraction and declining rainfall (Sandiford and Barrett 2010).

Vegetation Descriptions

Coastal Yate Forest (ARVS 1)

This unit was restricted to one small patch near the north east corner of the survey area. Floristically and structurally this vegetation consisted of a *Eucalyptus cornuta* Open Forest over *Agonis flexuosa* Low Open Woodland, *Spyridium globulosum* Tall Open Scrub, *Hibbertia furfuracea/Rhagodia baccata* Shrubland and *Desmocladius flexuosus/Lepidosperma effusum* forma narrow Very Open Sedgeland. Other species present include *Adenanthos sericeus*, *Leucopogon obovatus*, *Bossiaea linophylla*, *Opecularia hispidula* and *Clematis pubescens*.

Within the ARVS area this vegetation was primarily found scattered on the lower landward side of the coastal dune system or Meerup landform unit (Churchward *et al* 1988), with 21.4 % of the 419 ha occurring within conservation reserves ,(i.e. IUCN* I-IV reserves). Based on floristics, it is likely this vegetation reaches its eastern limit just east of the ARVS area (approx. 35 km NE of the survey area), and extending westwards along the coastal fringe in the Warren Botanical District, (Beard 1979, Sandiford and Barrett 2010).



Peppermint Low Woodland (ARVS 2)

This vegetation was found along the minor drainage channels and in the southern parts of the survey area. Typically it is *Agonis flexuosa* (peppermint Low Open Forest over *Spyridium globulosum* Tall Shrubland and Very Open Sedgeland of various species. In wetter areas and drainage lines

*International Union for Conservation of Nature

Eucalyptus megacarpa occurs as a co- dominant or as a Open Forest strata above *Agonis flexuosa*. Other common species include *Adenanthos sericeus*, *Bossiaea linophylla*, *Hibbertia cuneiformis*, *Leucopogon obovatus*, *Lepidosperma densiflorus*, *Desmocladus flexuosa* and *Lepidosperma gladiatum*.

Both ARVS subunits 2a and 2b, the latter dominated by *E. megacarpa*, occur within the survey area. This unit is common along the coastal dune systems and considered a climax community of Coastal Heath (Beard 1979). Within the ARVS area 2.8% of the 1232 ha was recorded as reserved within conservation reserves, though the percentage reserved on a regional scale is likely to be far higher as this vegetation is common in Torndirrup and West Cape Howe National Park in areas outside the ARVS area.

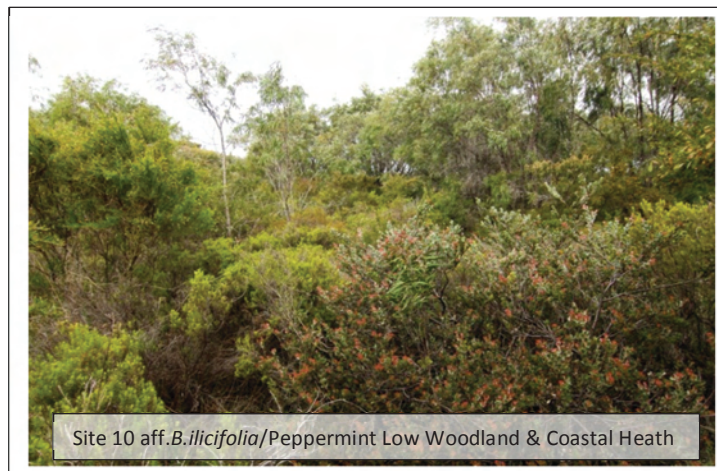
All occurrences of **Zantedeschia aethiopica* (Declared Plant) and **Asparagus aethiopicus* (WON) occurred within this vegetation.



***Banksia ilicifolia*/Peppermint Low Woodland (ARVS 4)**

This unit was restricted to the deeper sands within the survey area, and distinguished by an Open Woodland of *Banksia ilicifolia*/*Agonis flexuosa* over a Mixed Open Shrubland or Heath and Mixed Sedgeland. Common understorey species included *Adenanthos cuneatus*, *Bossiaea linophylla*, *Melaleuca thymoides*, *Lysinema pentapetalum*, *Acacia pulchella*, *Andersonia caerulea*, *Astroloma baxteri*, *Jacksonia horrida*, *Adenanthos obovatus*, *Amperea ericoides*, *Bossiaea praetermissa*, *Anarthria prolifera*, *Cyathochaeta equitans*, *Lyginia barbata*, *Schonus caespitius*, *Hibbertia racemosa* and *Lepidosperma densiflora*. Most areas along the northern boundary are regenerating from a recent fire. As mentioned previously several small areas have been mapped as affinities with both *Banksia ilicifolia*/Peppermint Low Woodland (ARVS 4) and Coast Heath (ARVS 3) as they appear intermediate between these units and do not clearly fit either unit.

Within the ARVS area this unit was restricted to coastal or near coastal areas, primarily on the Meerup landform unit, with 1.1% found within conservation reserves (IUCN I-IV reserves). On a regional scale this figure will be higher as there significant occurrences in West Cape Howe and Torndirrup National Parks outside the ARVS area. The distribution of this unit outside the ARVS area is unclear though it is likely to reach its eastern limit within the ARVS area.



Limestone Heath (ARVS 5)

This vegetation was the most common unit within the survey area and the most varied in terms of structure and floristic composition with age, soil depth, and possible fire history likely factors in determining species composition and structure. Typically this vegetation was dominated by one shrub strata over a very open sedgeland though an *Agonis flexuosa* Low Open Woodland or Open Woodland was present in some areas. Common structural variations included:

Spyridium globulosum Closed Tall Shrubland

Adenanthos sericeus Closed Tall Shrubland

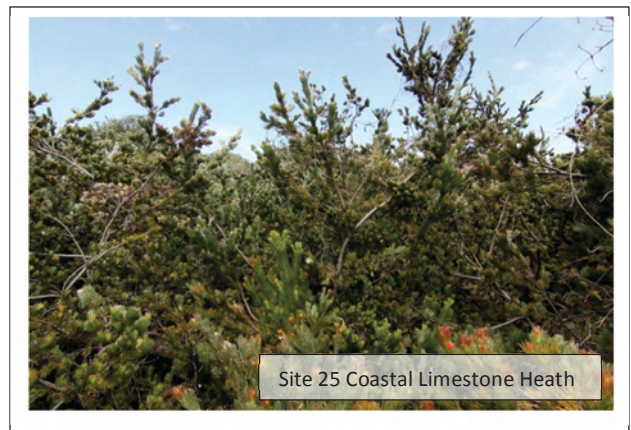
Spyridium globulosum/*Adenanthos sericeus* Tall Open Scrub

Mixed Open Heath

Agonis flexuosa Open Low Woodland over *Spyridium globulosum*/*Adenanthos sericeus* Tall Open Scrub

Other common species included *Allocasuarina lehmanniana*, *Acacia littorea*, *Leucopogon parviflorus*, *Rhagodia baccata*, *Leucopogon obovatus*, *Desmocladus flexuosus*, *Lepidosperma densiflora* and *Lepidosperma gladiatum*.

This vegetation is a heterogeneous unit widespread on the alkaline soils of the coastal dunes (Meerup landform unit), (Sandiford and Barrett 2010). Within the ARVS area 4.2% of the 1849 ha occurred within conservation reserves (IUCN 1-1V reserves). On a regional scale this reservation status will be higher as significant areas occur within the West Cape Howe and Torndirrup National Parks and Two Peoples Bay Reserve.



***Banksia littoralis* Woodland/*Melaleuca incana* Shrubland (ARVS 44)**

This unit was restricted to the middle of the survey area, occurring on shallow sands over a limestone pavement. Most areas were a *Melaleuca incana*+/*Spyridium globulosum* Open Heath over *Gahnia trifida*/*Hypolaena pubescens* Open Sedgeland. An emergent *Banksia littoralis* stratum was present in some areas. All occurrences of this vegetation were modified, indicated by the presence of invading upland species including *Spyridium globulosum*, *Acacia littoralis*, *Allocasuarina lehmanniana*, *Acacia cyclops* and *Acacia longifolia*, the presence of dead or dying *Banksia littoralis* (along with live plants), and the presence of the weed *Pelargonium capitatum*. Characteristic dampland species included *Melaleuca incana*, *Banksia littoralis*, *Gahnia trifida*, *Hakea varia* and *Lepidosperma effusum* forma narrow.

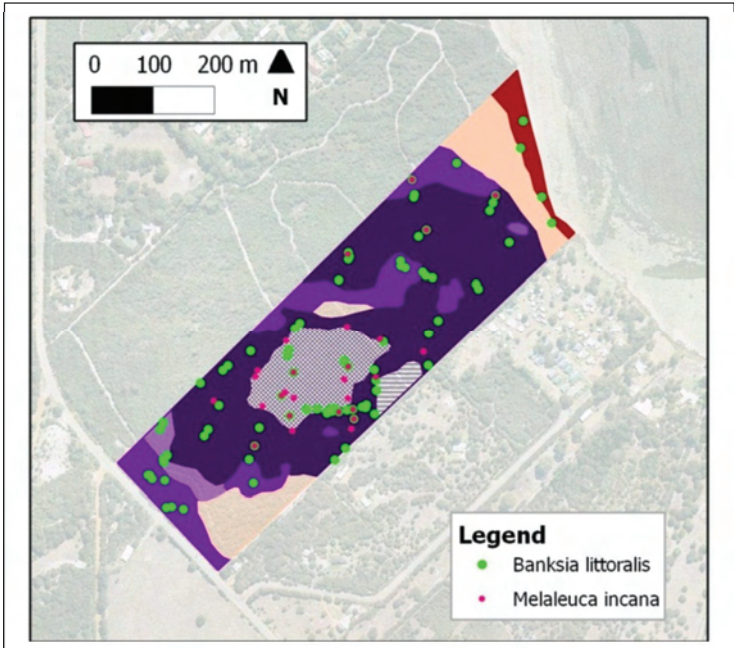
As a consequence of upland species invasion, delineation of this unit was not easy and all areas have been mapped as a mosaic with Coastal Limestone Heath. Many locations of *Banksia littoralis* (dead and alive) and *Melaleuca incana* (dead and alive) were recorded during the survey (Figure 4). Their distribution, particularly where this coincides with shallow soils over a limestone pavement (corresponding roughly to the distribution of the Coastal Limestone Heath, dark purple in Figure 4), suggests that this unit was once more widespread and is undergoing contraction as has been previously noted (Sandiford and Barrett 2010).

This unit is a Priority Ecological Community (pending endorsement as a “Critically Endangered” Threatened Ecological Community) and it is restricted to shallow soils occurring over limestone pavements on the southern shores of Princess Royal Harbour. It may also occur on the southern end of Vancouver Peninsula (author observations). Within the ARVS area <23.4% of the 4 ha were found

within conservation reserves (IUCN 1-1V reserves). Possible occurrences on the Vancouver Peninsula are outside the ARVS area and are not within conservation reserves.



Figure 4 Distribution of *Banksia littoralis* and *Melaleuca incana* within the survey area
(Both species are likely to be more frequent than indicated)



***Juncus kraussii* Sedgeland (ARVS 66)**

This unit was restricted to the shoreline of Princess Royal Harbour. It was dominated by dense stands of *Juncus kraussii* with *Gahnia trifida* and *Baumea juncea* co- or sub-dominant in some areas. A low herb stratum including *Sarcocornia quinqueflora*, *Samolus repens* and *Wilsonia backhousei* was occasionally present and a band of *Banksia littoralis* was present at the landward margin of this unit suggesting the presence of a freshwater seep.

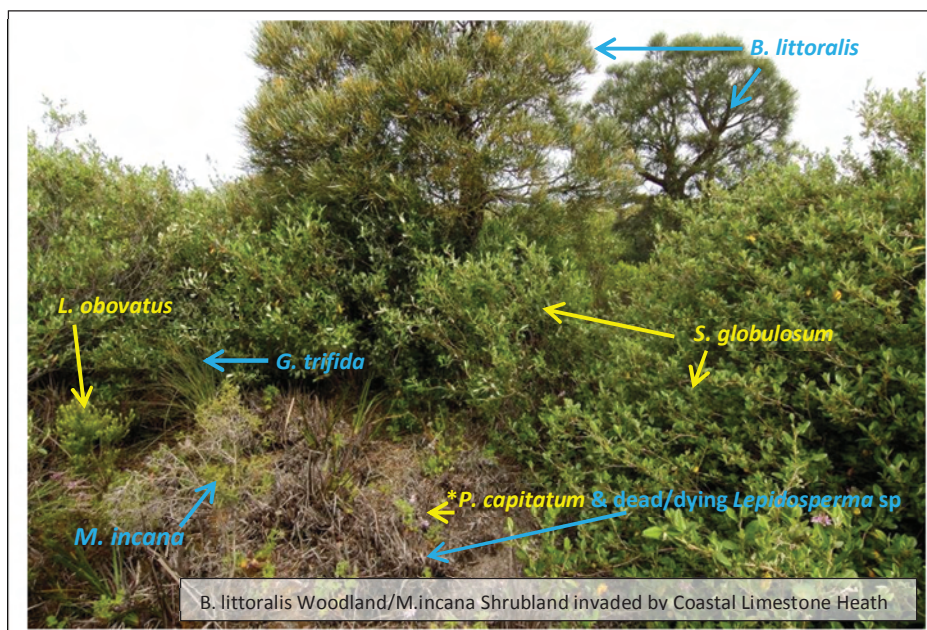
Within the ARVS area this unit is common along the edges of Princess Royal Harbour, Oyster Harbour and lower King and Kalgan Rivers with 2.4% of the 70ha recorded in conservation reserves (IUCN I-IV reserves). It has also been recorded on the margins of other estuaries in southern Western Australia and Southern Australia (Pen 1996, Pen *et al* 2000, Adam 2002, Sandiford and Barrett 2010).



Condition

Whilst many of the individual sites were rated as excellent on the Keighery (1994) scale (Appendix 4), the overall condition of the survey area would best be described as good or good/very good on the basis of widespread occurrence of **Acacia longifolia*, and degradation of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland. Some areas including *Juncus kraussii* Sedgeland would be rated excellent. On the national VAST scale the survey area would be rated modified/residual (Appendix 2a & 2b).

Application of condition categories is difficult in relation to *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland areas due to the dynamic and changing state of this unit and its invasion by upland species which will ultimately result in its conversion to Coastal Limestone Heath. Currently the application of “degraded” would best fit this vegetation as it is unlikely that ongoing trend of invasion can be halted, unless the water table rises, thus the vegetation does not have the ability to “retain basic vegetation structure or ability to regenerate it” (definition of Good, Keighery scale, Appendix 2b). Ironically once this vegetation is converted to Coastal Limestone Heath the condition rating improves as the new vegetation will have the ability to regenerate.



Conservation values

The survey area contains a high diversity of vegetation which is typical of the region (Sandiford and Barrett 2010). Six vegetation units were identified including one Priority 1 Ecological Community (pending endorsement as a “Critically Endangered” Threatened Ecological Community) = *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, and one wetland *Juncus kraussii* Sedgeland, as defined under the Environmental Protections Act 1986 Schedule 5 where “wetland means an area of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary”(EPA Act 1986). The *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland is currently being degraded as a result of hydrological change and due to these changes this vegetation may no longer be considered a wetland under the EPA Act (1986). The long term prognosis for this vegetation is low.

The most common vegetation units within the survey area, Coastal Limestone Heath, Peppermint Low Woodland and *Banksia ilicifolia* Peppermint Low Woodland are well reserved on a regional scale with extensive areas occurring within Torndirrup and West Cape Howe and/or Two Peoples Bay Nature Reserve (Table 3). The other units are less well reserved on a regional scale with Coast Yate Forest and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland having 20-25% reserved within conservation reserves and *Juncus kraussii* Sedgeland having <3% within conservation reserves in the ARVS area..

From a purely biodiversity perspective the EPA recognizes 30% pre-clearing extent the threshold level below which species loss appears to accelerate exponentially at an ecosystem level, and 10% of pre-clearing extent as representing endangered (EPA 2000). The extent to which the vegetation units found within the survey area have been cleared on a state scale is less clear due to absence of comparable data however the more common units: Coastal Limestone Heath, Peppermint Low Woodland and *Banksia ilicifolia* Peppermint Low Woodland, are likely to have a high percentage remaining due to the high number of coastal reserves occurring on the Meerup landform unit to which these units are restricted. In accordance with EPA Bulletin 13, pre-clearing extents and reservation status are provided where possible in Table 3 using the closest equivalent vegetation unit to the broad scale state mapping of Beard (DAFWA 2005, Shepherd et al 2002). This data is based on

1995-1999 aerial photography (Shepherd *et al* 2002) and it is noted that little correlation was found between Beard digitized units upon which this data is based and ARVS units and that significant errors in the digitizing process occurred e.g. no “Samphires” which include the *Juncus kraussii* Sedgeland were not mapped, though Beard clearly mapped areas in the vicinity of the King River (Beard 1979, Sandiford and Barrett 2010). The current extent of Coastal Yate Forest is likely to be much less than the 65.8 % indicated based on the known distribution in the Albany where most its occurrence is in semi –rural areas that have undergone significant clearing (Sandiford and Barrett 2010). It is likely <30% of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland exists (PEC nomination form, S. Barrett pers. comm.) whilst the current extent of *Juncus kraussii* Sedgeland is unclear with some occurrences of this unit not mapped due to scale and others were overlooked during digitizing.

Table 3 Reservation status and pre-clearing extent of vegetation units

Vegetation unit	ARVS unit	ARVS area (ha)	ARVS % IUCN I-IV	Beard unit	Beard Remaining*	Beard % IUCN I-IV*
Coastal Yate Forest	1	419	21.4	included in 22	65.8	45.7
Peppermint Low Woodland	2	1232	23 [†]	22	65.8	45.7
<i>Banksia ilicifolia</i> /Peppermint Low Woodland	4	506	39.9 [†]	22 & 423	65.8/62.6	45.7/45.2
Coastal Limestone Heath	5	1849	40.1 [†]	423 & 49	62.6/40.4	45.2/45.5
<i>Banksia littoralis</i> Woodland/ <i>Melaleuca incana</i> Shrubland (PEC)	44	4	23.4	no equivalent	?	?
<i>Juncus kraussii</i> Sedgeland	66	70	2.4	not digitized	?	?

*based on 1995-99 aerial photography (Shepherd *et al* 2002)

[†] On a regional scale more occurs within IUCN I-IV reserves in Torndirrup & West Cape Howe NP and/or Two Peoples Bay Natue Reserve, outside the ARVS area

The survey area has high species diversity, typical of and reflecting the range of vegetation types present and includes two conservation species: *Amperea protensa* P3 and *Adenanthos x cunninghamii* P4. Whilst the survey area contains a high number of weeds most of these are restricted to firebreaks/tracks. The one seedling Weed of National Significance **Asparagus aethiopicus* and occurrences of the Declared Plant **Zantedeschia aethiopicus*, were restricted to a very small area. The major environmental weed *Acacia longifolia* was found throughout the survey area and it has the potential to impact negatively on the biodiversity of the survey area.

The survey area forms part of a corridor that spans the width of the Torndirrup Peninsula from Princess Royal Harbour to the Southern Ocean.

In summary the presence of a diversity of vegetation and flora including a Priority Ecological Community (pending endorsement as a “Critically Endangered” Threatened Ecological Community), 2 conservation species, wetland vegetation and occurrence within a corridor of vegetation indicates the area has conservation values. However these values will diminish if the current changes in vegetation composition occurring within the PEC (*Banksia littoralis* Woodland/*Melaleuca incana* Shrubland) continue and further expansion of **Acacia longifolia* occurs.

REFERENCES

- Adam, P. (2002), Saltmarshes in a time of change. *Environmental conservation* 29 (1) 39-81
- Beard, J.S. (1979), *The Vegetation of the Albany and Mt Barker Areas, Western Australia*. Map and
- Churchward, H.M., McArthur, W.M., Sewell, P.L. and Bartle, G.A. (1988), *Landforms and Soils of the South Coast and Hinterland, Western Australia, Northcliffe to manypeaks*, Divisional Report 88/1, City of Albany 2005 (Environmental /weeds Strategy for City of Albany Reserves (including /declared and Pest plants 2005-2010, Work &services City of Albany June 2005
- C of A (City of Albany) (2005), *Environmental Weeds Strategy for the City of Albany reserves (including Declared and Pest plants) 2005-1010*
- DAFWA (2005), *Digitised Beard Vegetation map, Vegetation Survey of Western Australia*, Department of Agriculture and Food.
- DAFWA (2012), *Declared Plants Agriculture and Related Resources Protection Act 1976*, Jan 2011, http://www.agric.wa.gov.au/objtwr/imported_assets/content/pw/weed/decp/dec_plants_list.pdf
- DEC (2012a), *Florabase Western Australian Herbarium. The Western Australian Flora*, Department of Environment and Conservation, <http://florabase.dec.wa.gov.au>
- DEC (2012b), *Definitions, categories and criteria for Threatened and Ecological Communities (PDF)*. <http://www.dec.wa.gov.au/content/view/849/2017/>
- EPA (2000), *Position Statement No 2 – Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with particular Reference to the Agricultural Area*, Environmental Protection Authority, Perth.
- EPA (2004), *Guidance for Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986) Terrestrial Vegetation and Flora Surveys for Environmental Impact Assessment in Western Australia No. 51* Environmental Protection Authority
- EPA (2011), *Environmental Protection Bulletin No 13 Guidance for the use of the Albany Regional Vegetation Survey in Environmental Impact Assessment*, Environmental Protection Authority.
- Keighery, B. (1994), *Bushland Plant Survey. A guide to Plant Community Survey for the Community*. Wildflower Society of Western Australia (Inc.), Nedlands, Western Australia.
- Muhling, P. C. and Brakel, A.T. (1985), *1:250,000 Geological Series – Explanatory Notes, Mount Barker – Albany, Western Australia*. Geological Survey of Western Australia, Perth, Western Australia.
- Peltzer, S. (2007), *List of Priority Environmental Weeds for the South Coast NRM Region and Threat Abatement Plans, Methodology of prioritisation*, Department of Agriculture and Food, south Coast natural Resource Management.

References cont.

- Pen. L (1996), The Fringing vegetation of the Wilson Inlet Delta, 1946-1994. Report to the Wilson Inlet Management Authority. Water and Rivers Commission, Technical Series, Report no WTT6.
- Pen. L, Semeniuk, V. and Semeniuk, C.A (2000), Peripheral wetland habitats and vegetation of the Leschenault Inlet Estuary, *Journal of Royal Society of Western Australia*, 83. 293 -316.
- Sandiford and Barrett (2010), Albany Regional Vegetation Survey, Extent, Type and Status. Unpublished report. Department of Environment and Conservation Western Australia.
- Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2002) Native Vegetation in Western Australia: Extent, types and status, Department of Agriculture, Western Australia.
- Thackway, R. and Lesslie, R. (2006), Reporting vegetation condition using the Vegetation Assets States and Transitions (VAST) framework. *Ecological Management & Restoration*. 7, Suppl. 1 S53-62.
- Thackway, R. and Cresswell, I.D. Eds, (1995), An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves Version 4.0 Australian nature Conservation Agency Canberra
- Weeds Australia (2012), List of Weeds of National Significance, <http://www.weeds.org.au/WONS/>

Appendix 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

Appendix 2a National Vegetation Assets States Transition (VAST) condition scale (Thackway & Lesslie 2006)

Vegetation Cover Class Criteria	Type 0 Naturally bare Areas where native vegetation does not naturally persist	Native Vegetation cover Type I Residual Native vegetation community structure, composition, and regenerative capacity intact – no significant perturbation form landuse/land management practice	Type II Modified Native vegetation community structure, composition and regenerative capacity intact – perturbed by land use /land management practice	Type III Transformed Native vegetation community structure, composition and regenerative capacity significantly altered by land use/land management practice	Non-native vegetation cover Type IV Replaced Adventive Native vegetation replacement – species alien to the locality and spontaneous in occurrence	Type V Replaced managed Native vegetation replacement with cultivated vegetation	Type VI Removed Vegetation removal
Diagnostic criteria	Natural regenerative capacity unmodified	unmodified, structural and compositional integrity of native vegetation is very high	Natural regeneration tolerates/endures under past &/or present current land management practices. Structure is predominantly altered but intact e.g. a layer and/growth form and or age classes removed. Composition of vegetation is altered but intact	Natural regenerative capacity is limited/at risk under past &/or current land use or land management practices. Rehabilitation and restoration possible through modified land management practice. Dominant structuring species of native vegetation significantly altered e.g. a layer frequently and repeatedly removed	Regeneration of native vegetation has been suppressed by ongoing disturbances of the natural regenerative capacity Limited potential for restoration. Dominant structuring species of native vegetation removed or predominantly cleared or extremely degraded.	Regeneration of native vegetation community lost or suppressed by intensive land management. Limited potential for restoration. Dominant structuring species of native vegetation community removed	Nil or minimal Vegetation absent or ornamental
Corresponding Keighery (1994) Condition Scale Appendix 2b		Very good excellent, Pristine	Good to very good	Very degraded to degraded/good	Completely degraded	Completely degraded	

Appendix 2b Vegetation condition scales (Keighery 1994)

1 Pristine

Pristine or nearly so, no obvious signs of disturbance

2 Excellent

Vegetation structure intact disturbance affecting individual species and weeds are non-aggressive species. For example damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.

3. Very Good

Vegetation structure altered, obvious signs of disturbance

For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging or grazing.

4 Good

Vegetation structure significantly altered by very obvious signs of multiple disturbances.

Retains basic vegetation structure or ability to regenerate it. For example disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback or grazing.

5. Degraded

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

6 Completely Degraded

The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora composed of weed or crop species with isolated native trees or shrubs.

Appendix 3 Conservation Categories

T: Threatened Flora (Declared Rare Flora_Extant)

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the Wildlife Conservation Act 1950).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria.:

- CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN: Endangered – considered to be facing a very high risk of extinction in the wild
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild.
- T: Threatened Flora (Declared Rare Flora_Extant)

X: Presumed Extinct Flora (Declared Rare Flora – Extinct).

Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the Wildlife Conservation Act 1950).

1: Priority One: Poorly-known taxa

Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

2: Priority Two: Poorly-known taxa

Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

3: Priority Three: Poorly-known taxa

Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

4 Priority Four: Rare, near Threatened and other taxa in need of monitoring

1. **Rare.** Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
2. **Near Threatened.** Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
3. Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5 Priority Five: Conservation Dependent taxa

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

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 1 **Date** 7/11/11 **Lat/Long** -, -35.0744, 117.8851 **Northing /Easting** 6118351.0/580695.1

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Juncus kraussii/Gahnia trifida Sedgeland

ARVS unit Juncus kraussii Sedgeland

Soil Dark grey silty sand **Landform** shore edge **Slope** - **Aspect** -

Rock - **Hydrology** Permanently wet **Condition** Excellent

Notes

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	-	Banksia littoralis
Shrub <0.5m		Atriplex hypoleuca
Sedge	30-70	Gahnia trifida Juncus karussii Chaetanthus aristatus Baumea juncea
Herb	10-30	Suaeda australis Samolus repens Wilsonia backhousei Sarcocornia quinqueflora
Grass	-	Sporobolus virginicus

Site 2 **Date** 7/11/11 **Lat/Long** -35.0746/117.8852, **Northing /Easting** 6118327.2/580700.3

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Juncus kraussii Sedgeland

ARVS unit Juncus kraussii Sedgeland

Soil Grey sand with shell grit **Landform** shore edge **Slope** - **Aspect** -

Rock - **Hydrology** Permanently wet 0- 5cm **Condition** Excellent

Notes

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Sedge	30-70	Juncus karussii Baumea juncea

Site 3 **Date** 7/11/11 **Lat/Long** -35.0760/117.8859-, **Northing /Easting** 6118166.5/580770.2

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Juncus kraussii Closed Sedgeland over Samolus repens Very Open Herbland

ARVS unit Juncus kraussii Sedgeland

Soil Dark grey silty sand **Landform** shore edge **Slope** - **Aspect** -

Rock - **Hydrology** Permanently wet, +/- tidal **Condition** Excellent

Notes

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Sedge	>70	Juncus karussii
Herb	<10	Samolus repens Suaeda australis
Grass	-	Sporobolus virginicus

Appendix 4 cont. Site data (species in **bold** = dominant within stratum)

Site 4 **Date** 7/11/11 **Lat/Long** -35.0755/117.8854, **Northing /Easting** 6118228.2/580725.3
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Juncus krausii Sedgeland over Mixed Open Herbland
ARVS unit Juncus krausii Sedgeland
Soil Light grey sand **Landform** shore edge **Slope** - **Aspect** -
Rock - **Hydrology** Permanently wet, damp-inundated **Condition** Excellent

Notes		
VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	emergent	Banksia littoralis
Shrub <0.5m		Atriplex hypoleuca
Sedge	30-70	Juncus karussii Gahnia trifida Ficinia juncea Baumea juncea
Herb	10-30	Suaeda australis Samolus repens Sarcocornia quinqueflora Patersonia occidentalis
Grass	<10	Sporobolus virginicus

Site 5 **Date** 7/11/11 **Lat/Long** -35.0749/117.8850 **Northing /Easting** 6118295.2/580682.4
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Banksia ilicifolia/Agonis flexuosa Low Open Woodland over Mixed Low Shrubland, Anarthria prolifera/Lepidosperma densiflora Open Sedgeland and Opercularia hispidula Very Open Herbland
ARVS unit Banksia ilicifolia/Agonis flexuosa Low Woodland
Soil Dark grey loamy sand **Landform** dune **Slope** - **Aspect** -
Rock - **Hydrology** well drained **Condition** Excellent
Notes, regrowth from fire

Notes , regrowth from fire		
VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	<10	Agonis flexuosa Banksia ilicifolia
Shrub 0.5-1m	10-30	Adenanthos cuneatus Jacksonia horrida Melaleuca thymoides Bossiaea linophylla
Shrub <0.5m	<10	Amperea ericoides Hibbertia racemosa Sphenotoma gracilis Bossiaea praetermissa Andersonia caerulea Acacia pulchella Hibbertia furfuracea Adenanthos obovatus
Sedge	10-30	Anarthria prolifera Lepidosperma densiflora Baumea jucea Lyginia barbaa Hypolaena exsulca
Herb	<10	Opercularia hispidula Stylidium hirsutum Stylidium violaceum Patersonia occidentalis Burchardia congesta

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 6 **Date** 7/11/11 **Lat/Long** -35.0745/117.8844 **Northing /Easting** 6118341.5/580632.4
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Agonis flexuosa Low Woodland over Bossiaea linophylla Tall Open Shrubland, Melaleuca thymoides Open Heath and Mixed Open Sedgeland
ARVS unit Banksia ilicifolia/Agonis flexuosa Low Woodland
Soil Light grey sand **Landform** dune **Slope** gentle **Aspect** N
Rock - **Hydrology** well drained **Condition** Excellent
Notes, regrowth

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	Agonis flexuosa Banksia ilicifolia
Shrub >2m	<10	Bossiaea linophylla Spyridium globulosum
Shrub 1-2m	30-70	Melaleuca thymoides Adenanthos cuneatus Jacksonia horrida Hibbertia furfuracea Pultenaea reticulata
Shrub <0.5m	-	Adenanthos obovatus Andersonia caerulea Astroloma baxteri Lysinema pentapetalum
Sedge	10-30	Anarthria prolifera Lepidosperma densiflora Schoenus caespititius Hypolaena exsulca
Herb	-	Isotoma hypercraetiformis

Site 7 **Date** 7/11/11 **Lat/Long** --35.0759/117.8850 **Northing /Easting** 6118178.5/580688.2
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Eucalyptus cornuta Open forest over Agonis flexuosa Low Open Woodland, Spyridium globulosum Tall Open Scrub, Hibbertia furfuracea/Rhagodia baccata Shrubland and Desmocladus flexuosus/Lepidosperma effusum forma narrow Very Open Sedgeland
ARVS unit Coastal Yate Forest
Soil Grey sandy loam **Landform** flat **Slope** - **Aspect** -
Rock - - **Hydrology** well drained **Condition** Excellent
Notes Ivy seedling (removed)

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree >10m	30-70	Eucalyptus cornuta
Tree <10m	<10	Agonis flexuosa
Shrub >2m	30-70	Spyridium globulosum Bossiaea linophylla Adenanthos sericeus Hibbertia cueniformis
Shrub 1-2m	10-30	Hibbertia furfuracea Rhagodia baccata Leucopogon obovatus
Sedge	<10%	Desmocladus flexuosus Lepidosperma effusum forma narrow Lepidosperma densiflora
Herb		Opercularia hispidula Clematis pubescens

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 8 **Date** 7/11/11 **Lat/Long** --35.0805/117.8802 **Northing /Easting** 6117679.7/580241.1

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation *Agonis flexuosa* Low Woodland over *Leucopogon obovatus* Open Heath, *Adenanthos cuneatus*/*Astroloma baxteri* Low Open Shrubland and *Cyathochaeta equitans* Open Sedgeland

ARVS unit affinites Coastal Heath/*Banksia ilicifolia*/Peppermint Low Woodland

Soil grey sand **Landform** low dune **Slope** - **Aspect** -

Rock - **Hydrology** well drained **Condition** Very good

Notes some seedling **Acacia longifolia*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	Agonis flexuosa
Shrub >2m	-	<i>Spyridium globulosum</i> * <i>Acacia longifolia</i>
Shrub 1-2m	30-70	Leucopogon obovatus
Shrub 0.5-1m	<10	Adenanthos cuneatus
Shrub <0.5	<10	Astroloma baxteri <i>Lysinema pentapetalum</i>
Sedge	10-30	Cyathochaeta equitans <i>Lyginia barbata</i> <i>Lepidosperma densiflora</i> <i>Schoenus caespititius</i>
Herb	-	<i>Dasyogon bromeliifolius</i> <i>Billardiera fusiformis</i> <i>Cassytha racemosa</i> * <i>Pelargonium capitatum</i>

Site 9 **Date** 7/11/11 **Lat/Long** --35.0802/117.8803 **Northing /Easting** 6117711.2/580249.7

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation *Agonis flexuosa* Low Open Woodland over *Leucopogon obovatus* Open Heath, *Astroloma baxteri* Low Open Shrubland and Mixed Open Sedgeland

ARVS unit affinites Coastal Heath/*Banksia ilicifolia*/Peppermint Low Woodland

Soil grey sand **Landform** dune **Slope** - **Aspect** -

Rock - **Hydrology** well drained **Condition** Very good

Notes *Acacia longifolia* present

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	<10	Agonis flexuosa
Shrub >2m	-	<i>Spyridium globulosum</i>
Shrub 1-2m	30-70	Leucopogon obovatus <i>Hakea ruscifolia</i>
Shrub <0.5m	<10	Astroloma baxteri <i>Acacia pulchella</i> <i>Hibbertia racemosa</i> <i>Lysinema pentapetalum</i> <i>Bossiaea praetermissa</i> <i>Allocasuarina humilis</i>
Sedge	10-30	Cyathochaeta equitans Lepidosperma densiflora Loxocarya cinerea <i>Hypolaena exsulca</i>
Herb	-	<i>Cassytha racemosa</i> <i>Billardiera fusiformis</i>

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 10 **Date** 7/11/11 **Lat/Long** --35.0800/117.8787 **Northing /Easting** 6117737.4/580108.1

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Eucalyptus megacarpa Open Forest over Agonis flexuosa Low Open Forest, Spyridium globulosum Tall Shrubland and Lepidosperma gladiatum/Lepidosperma densiflora Sedgeland.

ARVS unit Peppermint Low Forest

Soil grey loamy sand **Landform** flat **Slope** **Aspect**

Rock **Hydrology** well drained **Condition** Excellent

Notes long unburnt, dense leaf litter, one seedling *Asparagus aethiopicus (WON),

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree >10m	30-70	Eucalyptus megacarpa
Tree <10m	30-70	Agonis flexuosa
Shrub >2m	10-30	Spyridium globulosum
Shrub 1-2m	-	Bossiaea linophylla Leucopogon obovatus
Sedge	<10	Lepidosperma gladiatum Lepidosperma densiflora

Site 11 **Date** 7/11/11 **Lat/Long** --35.0793/117.8788 **Northing /Easting** 6117805.2/580116.0

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Agonis flexuosa Low Open Woodland over Spyridium globulosum/Allocasuarina lehmanniana Open Heath over Leucopogon obovatus Shrubland and Lepidosperma gladiatum Sedgeland

ARVS unit Coastal Limestone Heath

Soil Dark grey sand **Landform** flat **Slope** - **Aspect** -

Rock - **Hydrology** well drained **Condition** Excellent

Notes 1 *Acacia longifolia

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	<10	Agonis flexuosa
Shrub 1-2m	30-70	Spyridium globulosum Allocasuarina lehmanniana Banksia littoralis
Shrub 0.5-1m	10-30	Leucopogon obovatus Acacia pulchella
Sedge	<10	Lepidosperma gladiatum Desmocladius flexuosus
	<10	Lepidosperma densiflora
Herb	-	Cassytha racemosa

Site 12 **Date** 7/11/11 **Lat/Long** --35.0794/117.8790 **Northing /Easting** 6117795.0/580129.6

Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Spyridium globulosum Closed Tall Scrub over Lepidosperma densiflora Very Open Sedgeland

ARVS unit Coastal Limestone Heath

Soil Dark grey sand **Landform** flat **Slope** - **Aspect** -

Rock - **Hydrology** well drained **Condition** Excellent

Notes

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	emergent	Agonis flexuosa
Shrub >2m	>70	Spyridium globulosum Adenanthos sericeus
Sedge	<10%	Lepidosperma densiflora
Herb	-	Billardiera fusiformis

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 13 **Date** 7/11/11 **Lat/Long** --35.0794/117.8794 **Northing /Easting** 6117803.5/580172.3
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Spyridium globulosum Closed Tall Scrub
ARVS unit Coastal Limestone Heath
Soil Grey loam **Landform** flat **Slope** - **Aspect** -
Rock - **Hydrology** well drained **Condition** Excellent
Notes Seedling Agonis flexuosa present

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	>70	Spyridium globulosum Adenanthos sericeus
Shrub 1-2m	-	Leucopogon obovatus Leucopogon parviflorus
Sedge	-	Lepidosperma effusum forma narrow

Site 14 **Date** 7/11/11 **Lat/Long** --35.0783/117.8798 **Northing /Easting** 6117916.3/580207.0
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Lepidospermna gladiatum Sedgeland
ARVS unit ecotone Coastal Limnesotne Heath& Banksia littoralis Woodland/Melaleuca incana Shrubland
Soil Dark grey loamy sand **Landform** flat **Slope** **Aspect**
Rock **Hydrology** unknown **Condition** Good
Notes Area disturbed, weeds include *Pelargonium capitatum and 1*Senecio elegans

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub 1-2m	emergent	Banksia littoralis
Shrub <0.5m	-	Rhagodia baccata Spyridium globulosum Leucopogon obovatus
Sedge	30-70	Lepidosperma gladiatum Ficinia nodosa
Herb	<10%	*Pelargonium capitatum Senecio glomeratus Ixiolaena viscosa

Site 15 **Date** 11/11/11 **Lat/Long** --35.0796/117.8803, **Northing /Easting** 6117774.3/580250.8
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Eucalyptus megacarpa Woodland over Agonis flexuosa Low Open Forest, Spyridium globulosum Tall Shrubland
ARVS unit Peppermint Low Forest
Soil grey sand **Landform** flat **Slope** **Aspect**
Rock **Hydrology** well drained **Condition** Excellent
Notes Lots of logs

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree >10m	10-30	Eucalyptus megacarpa
Tree <10m	30-70	Agonis flexuosa
Shrub >2m	10-30	Spyridium globulosum
Shrub 1-2m		Adenanthos sericeus
Sedge	<10	Lepidosperma densiflora

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 16 **Date** 11/11/11 **Lat/Long** --35.0792/117.8804 **Northing /Easting** 6117820.6/580258.0
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Spyridium globulosum/Adenanthos sericeus Closed Tall Shrubland over Lepidosperma densiflora forma prolifera Open Sedgeland
ARVS unit Coastal Limestone Heath
Soil Grey loamy sand **Landform** flat **Slope** - **Aspect** -
Rock - **Hydrology** well drained **Condition** Excellent
Notes Agonis flexuosus = seedlings

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	>70	Spyridium globulosum Adenanthos sericeus
Shrub 1-2m	-	Leucopogon obovatus Allocasuarina lehmanniana Melaleuca incana
Shrub <0.5m	-	Agonis flexuosus
Sedge	10-30	Lepidosperma densiflora forma prolifera Desmocladus flexuosus

Site 17 **Date** 11/11/11 **Lat/Long** --35.0786/117.8805 **Northing /Easting** 6117885.3/580270.8
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Melaleuca incana/Spyridium globulosum Open Heath over Gahnia trifida/Hypolaena pubescens Open Sedgeland
ARVS unit Banksia littoralis Woodland/Melaleuca incana Shrubland
Soil Dark grey sandy loam **Landform** flat **Slope** **Aspect**
Rock **Hydrology** ?poor drained **Condition** Very good
Notes Area drying out and Spy glo/All leh etc invading

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	emergent	Acacia cyclops *Acacia longifolia
Shrub 1-2m	30-70	Melaleuca incana Spyridium globulosum
	-	Leucopogon parviflorus Allocasuarina lehmanniana
Sedge	10-30	Gahnia trifida Hypolaena pubescens
Herb	-	Billardiera fusiformis
Grass	-	Rytidosperma setaceum

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 18 **Date** 11/11/11 **Lat/Long** --35.0784/117.8808 **Northing /Easting** 6117902.3/580301.8
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Melaleuca incana Open Heath over Gahnia trifida/Hypolaena pubescens Sedgeland
ARVS unit Banksia littoralis Woodland/Melaleuca incana Shrubland
Soil Dark grey sandy loam **Landform** flat **Slope** - **Aspect** -
Rock - **Hydrology** poor drained **Condition** Very good
Notes Area drying out and Spy glo/All leh etc invading. Some weeds present

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub 1-2m	30-70	Melaleuca incana Spyridium globulosum Leucopogon parviflorus Allocasuarina lehmanniana Boronia crenulata
Sedge	30-70	Gahnia trifida Hypolaena pubescens Baumea juncea Ficinia nodosa
Herb	-	*Pelargonium capitatum *Parentucellia viscosa Drosera enodes

Site 19 **Date** 11/11/11 **Lat/Long** -35.0778/117.8810, **Northing /Easting** 6117977.2/580313.7
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation ecotone Coastal Limnesotne Heath& Banksia littoralis Woodland/Melaleuca incana Shrubland
Soil Grey loamy sand **Landform** flat **Slope** **Aspect**
Rock - **Hydrology** unknown **Condition** Good
Notes weed *Pelargonium capitatum present, 1 Sphenotoma gracilis indicative of winter wet, present

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	<10	Banksia littoralis
Shrub 1-2m	30-7-	Spyridium globulosum Allocasuarina lehmanniana Acacia littorea Bossiaea linophylla Leucopogon parviflorus
Shrub 0.5-1m	10-30	Leucopogon obovatus
Sedge	<10	Gahnia trifida Lepidosperma effusum forma narrow Lepidosperma densiflora Desmocladus flexuosus
Herb	<10%	* Pelargonium capitatum Cassytha racemosa Billardiera fusiformis

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 20 **Date** 11/11/11 **Lat/Long** --35.0771/117.88316 **Northing /Easting** 6118051.0/580374.5
Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Agonis flexuosa Low Woodland over Bossiaea linophylla Tall Open Shrubland, Leucopogon obovatus/Adenanthos cuneatus Open Heath and Mixed Sedgeland

ARVS unit affinites Coastal Heath/Bankia ilicifolia/Peppermint Low Woodland

Soil Light grey sand **Landform** low dune **Slope** **Aspect**

Rock **Hydrology** well drained **Condition** Very good

Notes some seedling *Acacia longifolia*

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	Agonis flexuosa
Shrub >2m	<10	Bossiaea linophylla
Shrub 1-2m	30-70	Leucopogon obovatus Adenanthos cuneatus Melaleuca thymoides Hakea ruscifolia
Shrub <0.5	-	Andersonia caerulea Hibbertia racemosa
Sedge	30-70	Cyathochaeta equitans Lepidosperma densiflora Schoenus caespititius
Herb	-	Billardiera fusiformis

Site 21 **Date** 1/11/11 **Lat/Long** -35.0774/117.88336 **Northing /Easting** 6118020.9/580551.3
Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Spyridium globulosum/Adenanthos sericeus Closed Tall Shrubland

ARVS unit Coastal Limestone Heath

Soil Grey sand **Landform** flat **Slope** - **Aspect** -

Rock over Limestone **Hydrology** well drained **Condition** Excellent

Notes 10cm humus

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	>70	Spyridium globulosum Adenanthos sericeus

Site 22 **Date** 11/11/11 **Lat/Long** --35.0771/117.8838 **Northing /Easting** 6118049.9/580573.1
Location Lot 105 Frenchmans Bay Rd, Little Grove

Vegetation Eucalyptus megacarpa Open Forest over Agonis flexuosa Low Woodland, Spyridium globulosum Tall Shrubland and Desmodcladus flexuosus Very Open Sedgeland.

ARVS unit Peppermint Low Forest

Soil Grey loamy sand **Landform** flat **Slope** **Aspect**

Rock **Hydrology** well drained **Condition** Excellent

Notes

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree >10m	30-70	Eucalyptus megacarpa
Tree <10m	10-30	Agonis flexuosa
Shrub >2m	10-30	Spyridium globulosum
Shrub 1-2m		Adenanthos sericeus Hibbertia cuneiformis Leucopogon obovatus
Sedge	<10%	Desmodcladus flexuosus Cyathochaeta equitans Lepidosperma densiflora forma proliferous
Herb	-	Opercularia hispidula

Appendix 4 Site data (species in **bold** = dominant within stratum)

Site 23 **Date** 1/11/11 **Lat/Long** --35.0763/117.8833 **Northing /Easting** 6118138.9/580528.4
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Agonis flexuosa Woodland over Adenanthos sericeus Tall Open Shrub and Mixed Very Open Sedgeland
ARVS unit Ecotone Peppermint Low Forest & Coastal Limestone Heath
Soil Grey brown loamy sand **Landform** flat **Slope** - **Aspect** -
Rock over Limestone **Hydrology** well drained **Condition** Excellent
Notes Ecotonal area

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Tree <10m	10-30	Agonis flexuosa
Shrub >2m	30-70	Adenanthos sericeus Spyridium globulosum
Sedge	<10	Gahnia trifida Desmocladius flexuosus Ficinia nodosa Lepidosperma gladiatum
Herb	-	Clematis pubescens

Site 24 **Date** 11/11/11 **Lat/Long** --35.0756/117.8834 **Northing /Easting** 6118219.1/580542.8
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Adenanthos sericeus Closed Tall Shrubland over Desmocladius flexuosus/Lepidosperma gladiatum Open Sedgeland
ARVS unit Coastal Limestone Heath
Soil grey loamy sand **Landform** flat **Slope** - **Aspect** -
Rock - **Hydrology** well drained **Condition** Excellent
Notes long unburnt, Very large/old Adenanthos sericeus

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	>70	Adenanthos sericeus Spyridium globulosum Hibbertia cuneiformis
Shrub <0.5m	-	Rhagodia baccata
Sedge	10-30	Desmocladius flexuosus Lepidosperma gladiatum
Herb	-	Billardiera fusiformis

Site 25 **Date** 15/11/11 **Lat/Long** --35.0763/117.8842 **Northing /Easting** 6118134.6/580608.1
Location Lot 105 Frenchmans Bay Rd, Little Grove
Vegetation Adenanthos sericeus Closed Tall Shrubland
ARVS unit Coastal Limestone Heath
Soil Dark grey sandy loam **Landform** flat **Slope** - **Aspect** -
Rock - **Hydrology** well drained **Condition** Excellent
Notes Very large/old Adenanthos sericeus

VEG LAYER	% COVER	SPECIES (Bold =dominant)
Shrub >2m	>70	Adenanthos sericeus Spyridium globulosum Hibbertia cuneiformis
Sedge	-	Lepidosperma densiflora forma prolifera
Herb	-	Clematis pubescens

Appendix 5a Native Species list

Family	Species	Family	Species
Anarthriaceae	<i>Lyginia barbata</i>	Fabaceae cont.	<i>Gompholobium tomentosum</i>
	<i>Anarthria prolifera</i>		<i>Hardenbergia comptoniana</i>
Apiaceae	<i>Apium prostratum</i>		<i>Jacksonia horrida</i>
	<i>Centella asiatica</i>		<i>Kennedia coccinea</i> subsp. <i>esotera</i>
	<i>Daucus glochidiatus</i>		<i>Pultenaea reticulata</i>
	<i>Xanthosia huegelii</i>		<i>Sphaerolobium vimineum</i>
Araliaceae	<i>Hydrocotyle puberula</i>		<i>Templetonia retusa</i>
	<i>Trachymene pilosa</i>	Goodeniaceae	<i>Dampiera leptoclada</i>
Asparagaceae	<i>Lomandra pauciflora</i>		<i>Velleia trinervis</i>
	<i>Thysanotus gracilis</i>	Haemodoraceae	<i>Conostylis aculeata</i> subsp. <i>aculeata</i>
	<i>Thysanotus sparteus</i>		<i>Anigozanthos flavidus</i>
	<i>Thysanotus multiflorus</i>	Iridaceae	<i>Patersonia limbata</i>
Asteraceae	<i>Rhodanthe citrina</i>		<i>Patersonia occidentalis</i>
	<i>Euchiton sphaericus</i>	Juncaceae	<i>Juncus kraussii</i>
	<i>Isolaena viscosa</i>	Lauraceae	<i>Cassytha racemosa</i>
	<i>Senecio glomeratus</i>	Loganiaceae	<i>Logania serpyllifolia</i>
	<i>Senecio hispidulus</i>		<i>Logania vaginalis</i>
	<i>Senecio ramosissimus</i>		<i>Phyllangium divergens</i>
	<i>Siloxerus humifusus</i>		<i>Phyllangium paradoxum</i>
	<i>Sonchus hydrophilus</i>	Menyanthaceae	<i>Omduffia parrassifolia</i>
Campanulaceae	<i>Isotoma hypocateriformis</i>	Myrtaceae	<i>Agonis flexuosa</i> var. <i>flexuosa</i>
	<i>Lobelia anceps</i>		<i>Eucalyptus comuta</i>
	<i>Wahlenbergia gracilentia</i>		<i>Eucalyptus megacarpa</i>
Casuarinaceae	<i>Allocasuarina humilis</i>		<i>Melaleuca incana</i>
	<i>Allocasuarina lehmanniana</i>		<i>Melaleuca thymoides</i>
Celastraceae	<i>Stackhousia monogyna</i>	Olacaceae	<i>Olax phyllanthi</i>
Centrolepidaceae	<i>Centrolepis drummondiana</i>	Orchidaceae	<i>Corybas</i> sp.
	<i>Centrolepis strigosa</i>		<i>Thelymitra</i> sp.
Chenopodiaceae	<i>Atriplex hypoleuca</i>	Pittosporaceae	<i>Billardiera fusiformis</i>
	<i>Rhagodia baccata</i> subsp. <i>baccata</i>	Pittosporaceae	<i>Marianthus candidus</i>
	<i>Sarcocornia quinqueflora</i>	Poaceae	<i>Amphipogon laguroides</i>
	<i>Suaeda australis</i>		<i>Austrostipa compressa</i>
Colchicaceae	<i>Burchardia congesta</i>		<i>Austrostipa exilis</i>
Convolvulaceae	<i>Wilsonia backhousei</i>		<i>Poa drummondiana</i>
Crassulaceae	<i>Crassula exserta</i>		<i>Poa porphyroclados</i>
Cyperaceae	<i>Baumea juncea</i>		<i>Polypogon tenellus</i>
	<i>Baumea rubiginosa</i>		<i>Rytidosperma setaceum</i>
	<i>Cyathochaeta equitans</i>		<i>Sporobolus virginicus</i>
	<i>Ficinia nodosa</i>	Polygalaceae	<i>Comesperma calymega</i>
	<i>Gahnia trifida</i>		<i>Comesperma confertum</i>
	<i>Lepidosperma densiflora</i>	Polygonaceae	<i>Muehlenbeckia adpressa</i>
	<i>Lepidosperma densiflora</i> forma <i>proliferous</i>	Primulaceae	<i>Samolus repens</i>
	<i>Lepidosperma effusum</i> forma <i>narrow</i>	Proteaceae	<i>Adenanthos cuneatus</i>
	<i>Lepidosperma gladiatum</i>		<i>Adenanthos obovatus</i>
	<i>Schoenus asperocarpus</i>		<i>Adenanthos sericeus</i>
	<i>Schoenus caespitius</i>		<i>Adenanthos x cunninghamii</i> P4
	<i>Schoenus curvifolius</i>		<i>Banksia dallaneyi</i>
	<i>Schoenus sublatralis</i>		<i>Banksia grandis</i>
Dasyopogonaceae	<i>Dasyopogon bromeliifolius</i>		<i>Banksia ilicifolia</i>
Dilleniaceae	<i>Hibbertia cuneiformis</i>		<i>Banksia littoralis</i>
	<i>Hibbertia cunninghamii</i>		<i>Hakea ceratophylla</i>
	<i>Hibbertia furfuracea</i>		<i>Hakea ruscifolia</i>
	<i>Hibbertia racemosa</i>		<i>Hakea varia</i>
Droseraceae	<i>Drosera erythrorhiza</i>		<i>Isopogon femosus</i>
	<i>Drosera menziesii</i>		<i>Petrophile rigida</i>
	<i>Drosera paleacea</i>		<i>Petrophile squamata</i>
	<i>Drosera pallida</i>	Ranunculaceae	<i>Clematis pubescens</i>
Ericaceae	<i>Andersonia caerulea</i>	Restionaceae	<i>Chaetanthus aristatus</i>
	<i>Astroloma baxteri</i>		<i>Desmocladus flexuosus</i>
	<i>Leucopogon distans</i>		<i>Hypolaena exsulca</i>
	<i>Leucopogon obovatus</i>		<i>Hypolaena pubescens</i>
	<i>Leucopogon parviflorus</i>		<i>Loxocarya cinerea</i>
	<i>Leucopogon reflexus</i>	Rhamnaceae	<i>Spyridium globulosum</i>
	<i>Lysinema pentapetalum</i>	Rubiaceae	<i>Opercularia hispidula</i>
	<i>Sphenotoma gracilis</i>	Rutaceae	<i>Boronia crenulata</i>
Euphorbiaceae	<i>Amperea ericoides</i>	Stylidiaceae	<i>Stylidium diversifolium</i>
	<i>Amperea protensa</i> P3		<i>Stylidium hirsutum</i>
Fabaceae	<i>Acacia cyclops</i>		<i>Stylidium junceum</i>
	<i>Acacia littorea</i>		<i>Stylidium violaceum</i>
	<i>Acacia pulchella</i>		<i>Levenhookia pusilla</i>
	<i>Bossiaea linophylla</i>	Thymelaeaceae	<i>Pimelea hispida</i>
	<i>Bossiaea praetermissa</i>		<i>Pimelea rosea</i> subsp. <i>rosea</i>
	<i>Gompholobium confertum</i>		

Appendix 5b Introduced Species list

(WON= Weed of National Significance)

Family	Species	Status
Aizoaceae	*Aptenia cordifolia	
Araceae	*Zantedeschia aethiopica	Declared weed
Araliaceae	*Hedera helix	
Asparagaceae	*Asparagus aethiopicus	WON
Asteraceae	*Cirsium vulgare	
	*Gamochaeta calviceps	
	*Hypochaeris radicata	
	*Leontodon saxatilis	
	*Senecio angulatus	
	*Senecio elegans	
	*Sonchus asper	
Caprifoliaceae	*Centranthus ruber	
Caryophyllaceae	*Petrohragia dubia	
	*Polycarpon tetraphyllum	
	*Silene gallica var. quinquevulnera	
Cyperaceae	*Isolepis marginata	
Euphorbiaceae	*Euphorbia peplus	
Fabaceae	*Acacia longifolia	
	*Dipogon lignosus	
	*Lotus angustissimus	
	*Melilotus indicus	
	*Ornithopus pinnatus	
Geraniaceae	*Pelargonium capitatum	
Iridaceae	*Gladiolus undulatus	
Juncaceae	*Junus bufonis	
Orobanchaceae	*Parentucellia viscosa	
Phytolaccaeeae	*Phytolacca octandra	
Poaceae	*Anthoxanthum odoratum	
	*Avena barbata	
	*Aira caryophyllea	
	*Aira praecox	
	*Bromus diandrus	
	*Cynodon dactylon	
	*Lagurus ovatus	
	*Lolium perenne	
	*Pennistum clandestinum	
	*Vulpia myuros	
Primulaceae	*Lysimachia arvensis	
Ranunculaceae	*Ranunculus muricatus	
Scrophulariaceae	*Dischisma arenarium	

Appendix 6 Declaration categories for Plants under the Agriculture and Related Resources Protection Act 1976

P1 – Introduction of the plant into, or movement of the plant within, an area is prohibited;

P2 – Plant to be eradicated in the area.

P3 - Plant to be controlled by reduction in number or distribution of the plant or both.

P4 – Spread of plant beyond where it currently occurs to be prevented.

P5 – Particular action to be taken on public land or land under the control of a local government.

Appendix 7 cont. Comparison of modified species/site data with ARVS units (singletons have been removed, Red = 105 Frenchmans Bay Rd)
 (The first six species entries have been repeated from the previous page)

Species	ARVS Vegetation Unit												
	1	2	3	4	5	6	7	8	9	10	11	12	
Relévé	L443	L216	D012	L070	L213	L308	L192	L214	L214	L214	L214	L214	L214
<i>Logania zeyherifolia</i>													
<i>Pimelia rosea</i> subsp. <i>rosea</i>													
<i>Amperea ericoides</i>													
<i>Allocasuarina humilis</i>													
<i>Schoenus curtifolius</i>													
<i>Billardiera fasciformis</i>													
<i>Platyaceae compressa</i>													
<i>Banania zeyherii</i>													
<i>Acacia littorea</i>													
<i>Acrotriche cordata</i>													
<i>Acacia cochlearis</i>													
<i>Conostylis scaberrima</i>													
<i>Phyllanthus calycinus</i>													
<i>Leucopogon parviflorus</i>													
<i>Allocasuarina lehmanniana</i>													
<i>Poa poliformis</i>													
<i>Pimelia ferruginea</i>													
<i>Opercularia vaginata</i>													
<i>Gahnia</i> sp. <i>headband</i>													
<i>Schoenus bananus</i>													
<i>Choricema ilicifolium</i>													
<i>Scaevola thicketoides</i>													
<i>Tetraria capillaris</i> forma <i>limestone</i>													
<i>Banksia praemorsa</i>													
<i>Pultenaea heterochilla</i>													
<i>Spyridium majoranifolium</i>													
<i>Melaleuca pentagona</i>													
<i>Logania fasciculata</i>													
<i>Dioclea enodes</i>													
<i>Chaetanthus aristatus</i>													
<i>Amperea protensa</i>													
<i>Halca varia</i>													
<i>Lepidoperna effusum</i> forma <i>small</i>													
<i>Peltargonium capitatum</i>													
<i>Hypoburnia pubescens</i>													
<i>Acacia cyclops</i>													
<i>Melaleuca incana</i>													
<i>Banksia littoralis</i>													
<i>Gahnia trifida</i>													
<i>Baumea jancea</i>													
<i>Juncus karauitii</i>													
<i>Samolus repens</i>													
<i>Sarcocornia quinquestris</i>													
<i>Suaeda australis</i>													
<i>Sporobolus virginicus</i>													
<i>Atriplex hypoleuca</i>													
<i>Triglochin striata</i>													
<i>Wilsonia backhousei</i>													
<i>Wilsonia humilis</i>													
<i>Hibbertia grossularifolia</i>													
<i>Stylidium violaceum</i>													
<i>Sphenotoma gracilis</i>													
<i>Leucopogon gibbellus</i>													
<i>Hypocalymma strictum</i>													
<i>Compholobium scabrum</i>													
<i>Pterostichum limbatum</i>													

Appendix 7 cont. Comparison of modified species/site data with ARVS units (singletons have been removed, Red = 105 Frenchmans Bay Rd)

Species	1		4		3		5		66		67	
	L149	L154	L151	L157	L159	L161	L162	L163	L164	L165	L166	L167
<i>Gompholobium tomentosum</i>												
<i>Chorizanthe glycinifolia</i>												
<i>Stylidium hirsutum</i>												
<i>Olearia axillaris</i>												
<i>Gyrostemon sheathii</i>												
<i>Andersonia sprengeloides</i>												
<i>Vallis trimeris</i>												
<i>Leucopogon rubricaulis</i>												
<i>Tringulum ledifolium</i>												
<i>Eucalyptus angulosa</i>												
<i>Haakea prostrata</i>												
<i>Lomandra nigricans</i>												
<i>Acacia leioderma</i>												
<i>Stylidium spatulatum</i>												
<i>Conostylis serrulata</i>												
<i>Patersonia occidentalis</i>												
<i>Pteridium esculentum</i>												
<i>Lepidosperma effusum</i>												
<i>Billardiera boxiflora</i>												
<i>Lechenaultia tubiflora</i>												
<i>Dampiera leptoclada</i>												
<i>Poa porphyroclados</i>												
<i>Pyridosperma stracca</i>												
<i>Stylidium schoenoides</i>												
<i>Acacia longifolia</i>												

Appendix 8 Categories of Threatened and Priority Ecological Communities (DEC 2012b)

Threatened Ecological Communities

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

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

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

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

Priority Ecological Communities

Priority One: Poorly-known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening process across their range.

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

Priority Three: poorly known ecological communities.

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

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

Priority Five: Conservation Dependent ecological communities; Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix D

Level 2 Fauna Assessment of Lot 105 Frenchman Bay
Road, Albany WA, Sandra Gilfillan and Sylvia Leighton,
2012

Level 2 Fauna Assessment of Lot 105 Frenchman's Bay Rd., Albany WA.



May 2012
by
Sandra Gilfillan and Sylvia Leighton
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SUMMARY

A Level 2 targeted Fauna Assessment was carried out at Lot 105 Frenchman's Bay Rd., Albany in order to determine the presence of five threatened fauna species or the likelihood of their presence based on an assessment of suitable habitat. Surveys were carried out for Western Ringtail Possum (*Pseudocheirus occidentalis*), Main's Assassin Spider (*Austrarchaea mainae*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*).

Results of the survey indicate that:

1. Western Ringtail Possums are using the site for feeding and refuge, however due to the density of the vegetation estimates of numbers cannot be determined with current survey techniques.
2. Mains Assassin Spider was not recorded, and the absence of moist microhabitat on the site, particularly after a dry summer suggests that the habitat is not suitable and that this species is unlikely to be present.
3. The site contains potentially suitable feeding habitat for Carnaby's and to a lesser extent Baudin's Black Cockatoo and possible roosting sites for all three Black Cockatoo species. Despite this none of the species were found to be using the site.

Based on EPBC Act guidelines the site should be considered significant habitat for Western Ringtail Possum and Carnaby's Black Cockatoo and it is recommended that this issue is addressed when considering any development of the site.

1. Introduction

1.1 Background

In October 2008, *OPUS International Consultants* requested a fauna survey to determine the presence of native fauna on the property of Lot 105 Frenchman's Bay Road. This comprised a general trapping survey using Elliot and cage traps to determine the presence of terrestrial, ground-dwelling vertebrates plus specifically targeted surveys for two threatened fauna species; the Western Ringtail Possum (*Pseudocheirus occidentalis*) and the Main's Assassin Spider (*Austrarchaea mainae*).

The results of this survey are outlined in Leighton and Gilfillan (2008). In summary, almost the whole compliment of terrestrial ground dwelling mammal fauna that would be expected to occur on the site, based on the presence of suitable habitat, were recorded. With regard to the 2008 targeted survey for threatened species:

- Western Ringtail Possums were observed to be present by sign only (dreys and scats). Spotlighting was only carried out for one night and no possums were seen hence no measure or estimate of abundance was determined.
- Potentially suitable habitat for the Main's Assassin Spider was located, but the species was not recorded with the level of survey carried out.
- The site was not assessed for use by three threatened species of black cockatoos that could potentially be using the site for feeding, roosting or possibly breeding; the Forest Red-tailed Black Cockatoo

(*Calyptorhynchus banksii naso*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*).

1.2 Objectives of the 2012 survey

As a follow up to the 2008 survey, the Department of Conservation and Environment requested a further survey of this site with the following objectives:

1. A more intensive survey for Main's Assassin Spider, involving a resampling of the 2008 sites plus the identification of additional potential habitat with additional sampling at these sites.
2. An attempt to determine densities of Western Ringtail Possums. Potential to use distance sampling, a technique recently trialed on this species (deTores and Elscot 2010), which enables the determination of a robust estimate of Western Ringtail Possum abundance.
3. The determination of the use of the site by Carnaby's, Baudin's, or Red-tailed Black Cockatoos for feeding, breeding or roosting.

1.3 Legislative Context

The conservation status of fauna species is assessed under State (*Western Australian Wildlife Conservation Act 1950*) and Commonwealth (*Environmental Protection and Biodiversity Conservation (EPBC) Act 1999*).

The Western Ringtail Possum is currently listed as VU under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and currently listed in Western Australia under the *Wildlife Conservation Act 1950* under Schedule 1 species ('fauna that is rare or likely to become extinct'), and currently ranked as Vulnerable.

The Mains Assassin Spider is currently listed in Western Australia under the *Wildlife Conservation Act 1950* under Schedule 1 species ('fauna that is rare or likely to become extinct'), and ranked as Vulnerable. It is not listed under the EPBC Act.

All three cockatoo species are listed under the *Wildlife Conservation Act 1950*, Carnaby's and Baudin's Black Cockatoo ranked as endangered and the Forest Red-tailed Black Cockatoo as vulnerable. All three species are also listed under EPBC Act, Carnaby's ranked as Endangered and Baudin's and the Forest Red-tailed Black Cockatoo as vulnerable.

Listings and rankings for DEC's threatened fauna list are current at 17th August 2010.

The survey was carried out under DEC Licence number SF00 8398

1.4 Level 2 Fauna Assessment

This survey follows the requirements of a Level 2 Fauna Survey as outlined in the Environment Protection Authority (EPA)'s latest Guidance Note for the Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (Guidance Statement 56) (EPA 2010a) and Technical Guide- Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, September 2010 (EPA 2010b).

It comprises a targeted survey of the selected species listed above.

2. Site Description

Lot 105 on Frenchmans Bay Road is located on the south coast of Western Australia in the City of Albany on the southern side of Princess Royal Harbour (Figure 1).

The area has a Mediterranean climate with mild summers and cool, wet winters. July is the wettest month, with a long-term average of 144.0 mm and driest month is February with a mean of about 22.8 mm. The site falls at the very eastern edge of the Warren IBRA subregion, an area characterised by Karri (*Eucalyptus diversicolor*) forest occurring on deep loam, Jarrah (*Eucalyptus marginata*)/ Marri (*Corymbia calophylla*) medium forest on poorer, lateritic soils. Peppermint (*Agonis flexuosa*) woodlands or scrub occur on Holocene marine dunes (Thackway and Cresswell 1995).

The Lot is 20.55 ha in size with its northern boundary adjoining the Princess Royal Harbour shoreline. The foredunes on the northern boundary reach a height of about eight metres above sea level and the rest of the block is gently undulating ranging between 8 to 10 metres with deep to shallow grey podsolic soils and outcropping calcareous limestone (Leighton and Gilfillan 2008).



Figure 1: Lot 105 Frenchman's Bay Rd., Albany survey area (red)

2.1 Fauna Habitats

The predominant fauna habitats broadly correspond to the broad vegetation communities on the remnant and include; (ARVS codes refer to those in Sandiford and Barrett 2010).

1.) *Banksia littoralis* / *Spyridium globulosum* thicket (yellow shaded area on maps).

This habitat dominates most of the inner areas of the block, and is almost impenetrable in the northeastern half where the *Agonis flexuosa* is taller on deeper sand immediately behind the foredune system (represented on the map by the yellow line separating the two areas). It represents both a mosaic and an area which is being invaded predominately by *Spyridium globulosum* as well as *Agonis flexuosa* and *Adenanthos sericeus* – originally these would have been *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland (ARVS 44) and by one of many variations of Coastal Limestone Heath (ARVS 5) (Libby Sandiford , pers. com.).

The understorey includes sedges such as *Lepidosperma gladiatum*, *Gahnia trifida* (in wetter areas) *Hypolaena pubescens* and *Desmocladius flexuosus*. Mid storey species include *Acacia littorea*, *Allocasuarina lehmanniana*, *Hakea varia* (in wetter areas) and *Leucopogon parviflorus* (Libby Sandiford , pers. com.).

2.) *Agonis flexuosa* open woodland (green shaded areas on maps).

This habitat occurs in two pockets. It has 'typical' coastal heath understorey species like *Leucopogon obovatus* and *Acacia alata*, although the understorey varies depending on whether it occurs over calcareous or more acidic soils (Libby Sandiford , pers. com.).

3.) *Eucalyptus megacarpa* open woodland (orange shaded area on maps).

This habitat comprises tall *Eucalyptus megacarpa* (Bulluich) with a moderately dense understorey of sedges (*Lepidosperma gladiatum*), and a less dense mid storey of *Spyridium globulosum*, *Adenanthos sericeus*, and *Leucopogon obovatus*. Occasional very ancient large *B. littoralis* occurred amongst the Bullich. This vegetation type is part of the ARVS Peppermint Thicket group (Libby Sandiford , pers. com.).

There were occasional very ancient, large *B. littoralis* in amongst the Bullich in these sites.

4.) *Banksia illicifolia* / *Agonis flexuosa* open woodland (blue shaded area on maps).

This habitat occurred along the foreshore dune. There is a low understorey including *Adenanthos cuneatus*, *Jacksonia horrida*, *Melaleuca thymoides*, *Amperea ericoides*, *Astroloma baxteri*, *Hibbertia furfuracea*, *Andersonia caerulea*, *Lysinema pentapetalum*, *Cyathochaeta equitans*, *Anarthria prolifera*, and sedges; *Schoenus caespitius* and *Lepidosperma* spp.

5.) *Eucalyptus cornuta* tall woodland (pink shaded area on maps).

A small clump of up *Eucalyptus cornuta* (Yate) occurs at the southern end of the track closest to the shoreline. Other species include *Hibbertia furfuracea*, , *Spyridium globulosum*, and sedges (*Lepidosperma* spp., *Desmocladius flexuosus*).

Since the last survey in 2008 a fire has burnt the area between the shoreline and the first inland track, within the *Banksia illicifolia* / *Agonis flexuosa* open woodland. A small strip of about 50m west of the track was burnt in the same fire.

1.) *Banksia littoralis* / *Spyridium globulosum* thicket dominate across the centre of the property where the soil profile is very shallow.



2.) Open *Agonis flexuosa* woodland. with a coastal heath understory



3.) *Eucalyptus megacarpa* woodland occurs intermittently across the property.



4.) *Banksia illicifolia* / *Agonis flexuosa* open woodland.



5.) *Eucalyptus cornuta* tall woodland.



Figure 2: The main fauna habitats on the site

3. Targeted fauna species information

Western Ring-tail Possum (*Pseudocheirus occidentalis*)

The Western Ringtail Possum, *Pseudocheirus occidentalis*, is endemic to the south-west of Western Australia. Its abundance and range has declined dramatically since that beginning of the 20th Century and abundance is continuing to decline. The factors contributing to this decline are complex and interactive, their significance varying between localities and scales (Richardson 2005). This highlights the importance of identifying population specific issues relating to the species throughout its range (Gilfillan 2008). One of the highest density populations occurs around Albany, from West Cape Howe in the west to Mt Manypeaks in the east (Richardson 2005).

Preferred habitat: Habitats used in this south coast population include peppermint (*Agonis flexuosa*) woodlands and thickets, myrtaceous heaths and shrublands, Bullich (*Eucalyptus megacarpa*) dominated riparian zones, Karri (*E. diversicolor*) forest and Marri (*Corymbia calophylla*)/jarrah (*E. marginata*) woodlands (Gilfillan 2008). It feeds almost exclusively of myrtaceous plants: peppermint, marri and jarrah (Jones *et al.*, 1994). In urban areas possums feed on introduced garden species (Richardson 2005). Refuge sites include dreys (self-built nests), platforms, tree hollows, vegetation, fallen hollow logs, grasstree (*Xanthorrhoea* spp.) skirts, on the ground under sedges and at the base of grasstrees and disused rabbit warrens.

Key Threats: Habitat loss and fragmentation, urbanisation, fox and cat predation, inappropriate fire regimes (Richardson 2005).

Main's Assassin Spider (*Austrarchaea mainae*)

The Main's Assassin Spider was first described in 1983 from an area approximately 8 km to the north-west of Lot 105 Frenchman Bay Rd. (Harvey and Rix 2008). Recent surveys for the Main's Assassin Spider carried out by DEC Officer's have located populations further north than the original Western Australian Museum study identified, including near the Albany Racecourse and in the Robinson Estate area of Albany .

Preferred habitat: The preferred habitat of Mains's Assassin Spider comprises long unburnt condition of the peppermint woodland over a humid, shaded low vegetation created by thick leaf litter accumulating on top of the understorey of *Leptospermum*, Restionaceae and *Empodisma* curly-grass plant species. As leaves and twigs fall into the crowns of these grasses and sedges over time, a complex, elevated and interconnected 'matrix' of debris forms above the ground, providing habitat for many small invertebrates, including assassin spiders and the other small spiders on which they feed. With the exception of a single record from Mount Hallowell, all specimens of Main's Assassin Spider have been found within long-unburnt groves of Peppermint Trees (*Agonis* spp.), especially the dark, thickly-vegetated groves which develop in valleys, gullies and depressions in the landscape. Long-unburnt groves of coastal Peppermint Trees provide excellent habitat for Main's Assassin Spider in that they: (A) form protected, shaded habitats for the spiders in an otherwise exposed landscape; (B) drop copious numbers of leaves for the formation of an elevated leaf litter understorey; and (C) are conducive to the growth of understorey sedges and grasses (Harvey and Rix 2008).

Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

The Forest Red-tailed Black Cockatoo distribution largely follows the distribution of Marri (*Corymbia calophylla*), its primary food species (Johnstone and Kirkby 1999), in areas receiving more than 600 mm of annual average rainfall (Chapman 2008). Although the generalised distribution of the Forest Red-tailed Black Cockatoo is known, detailed information on the current distribution and habitat that is critical to survival and important populations is unknown (Chapman 2008). Habitat critical to survival of this species comprises all Marri *Corymbia calophylla*, Karri *Eucalyptus diversicolor* and Jarrah *Eucalyptus marginata* forests, woodlands and remnants in the south-west of Western Australia receiving more than 600 mm of annual average rainfall (Chapman 2008).

Breeding habitat: The species has been recorded nesting in standing Jarrah (*Eucalyptus marginata*), Marri, Karri (*E. diversicolor*) (Johnstone and Storr 1998), and Bullich (*E. megacarpa*) (SEWPaC 2012). The species may only breed in years when Marri is fruiting in abundance (Johnstone and Kirkby (1999).

Hollows used by FRTBC occur in trees with a diameter, measured 1.3 m above ground, of 60 cm or larger. Nest hollows in Marri have been recorded to range from 8-14 m above ground, with the entrance size 12-41 cm and depth of hollow 1-5 m (Johnstone & Storr 1998). The breeding period spans from September to April, with eggs typically laid in October/November (Johnson & Storr 1998), or March/April in years with good autumn rains

Feeding habitat: Around 90% of the subspecies' diet is made up of the seeds from Marri and Jarrah fruits (Johnstone & Kirkby 1999). Other south coast species consumed include Albany Blackbutt (*E. staeri*) and Snottygobble (*Persoonia longifolia*) and Sheoak *Allocasuarina fraseriana* (Johnstone & Kirkby 1999; Johnstone & Storr 1998).

Roosting habitat: Forest Red-tailed Black Cockatoos mainly roost in tallest Jarrah and Marri trees in an area within or on the edges of forests and (SEWPaC 2012). The Forest Red-tailed Black Cockatoo roosts in Jarrah-Marri-Blackbutt habitat on road-sides, paddocks or forest blocks (Johnstone and Kirkby 1999), in close proximity to fresh water. Flocks leave the roost at sunrise and feed in small family groups of up to 10 birds, usually within one to 4km of the roost (Johnstone and Kirkby 1999).

Key threats include: Habitat loss, nest hollow shortage and competition for available nest hollows from other species, and injury or death from the European Honeybee (*Apis mellifera*), illegal shooting and fire. Climate change is an additional threat that is likely to exacerbate other threats (SEWPaC 2012).

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*)

Baudin's Cockatoo is endemic to the south-west of WA and occurs in the high rainfall forests and woodlands of Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*). They occur less frequently in woodlands of Wandoo, Blackbutt (*Eucalyptus patens*), Flooded Gum (*Eucalyptus rudis*), Yate (*Eucalyptus cornuta*), partly cleared farmlands and urban areas including roadside trees and house gardens (Johnson and Kirby 2008). Habitat critical to survival of this species thus comprises all forests, woodlands and remnants in the south-west of Western Australia comprising these forest species and receiving more than 600 mm of annual average rainfall (Chapman 2008).

Breeding habitat: Nests, which comprise a layer of wood-chips, are built in large hollows in tall eucalypts, especially mature Marri and Karri and Jarrah (Johnstone & Storr 1998), and Wandoo (*E. wandoo*) (Jonstone & Kirkby 2008). The range of the species during the non-breeding season is largely determined by the distribution of Marri. The breeding requirements of this species are still poorly known. Breeding has been recorded as far east as Albany (and possibly further east to about Waychinicup). Breeding occurs in late winter and spring, from August to November or December. The species favours top entry hollows with entrances ranging between from 15 and 48cm in diameter (Johnstone & Storr 1998).

Feeding habitat: The seeds of Marri form the staple diet of this species. It also consumes the seeds of the Proteaceous species (eg. *Banksia grandis*, *B. littoralis*, *B. ilicifolia*, *Hakea undulata*, *H. prostrata*, *H. trifurcata*) as well as *Erodium botrys*, Jarrah and insect larvae, and apple and pear seeds in orchards (Chapman 2008). This species forages at all levels of the forest from the canopy to the ground, often feeding in the understorey on proteaceous trees and shrubs, especially *Banksia* (Jonstone & Kirkby 2008).

Roosting habitat: Baudin's Cockatoo roosts in flocks of up to 900 in areas with a dense canopy close to permanent sources of water, that provide the birds with protection from weather conditions. Most roost sites are in tall emergent eucalypts often near watercourses and in sheltered gullies. Trees used for roosting need to be a certain height, have a canopy with enough leaves to shield the cockatoos from the elements and possibly help them retain body heat. Roosting has been recorded in Blackbutt (*Eucalyptus patens*), Flooded Gum (*E. rudis*), Wandoo, Marri, Bullich and smooth-barked exotic eucalypts (Jonstone & Kirkby 2008).

Key threats include: Habitat loss, killing by illegal shooting, feral honeybees (*Apis mellifera*), nest shortage and competition for available nest hollows (SEWPaC 2012).

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Black Cockatoo is distributed across the south-west of Western Australia in Eucalyptus woodland and shrubland or kwongan heath. The species breeds largely in the Wheatbelt region of Western Australia from August to January, with large flocks moving to the higher rainfall coastal heathlands and woodlands to forage after the breeding season from January to July. Birds migrating to the south coast arrive from breeding areas in the wheatbelt to the north (Cale 2002).

Breeding habitat: Breeding activity has historically been restricted to eucalypt woodlands mainly in the semiarid and subhumid interior (records from Three Springs District south to the Stirling Range, west to Cockleshell Gully and east to Manmanning). However, this species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain (SEWPaC 2012).

Feeding habitat: While resident in coastal heathlands and woodlands they feed predominantly on seeds from a wide variety of proteaceous (eg. *Banksia* spp. *Hakea* spp.) and myrtaceous species (Jarrah and Marri) (a full list of species consumed by Carnaby's Cockatoo on the south coast is shown in Appendix 1). In addition, insects and nectar are also consumed (Saunders 1980, Mawson 1995).

Pine (*Pinus spp.*) cones form an important part of the diet, at least for part of the year. The energy content of pine seeds are only slightly less than the most energy rich *Banksia* seed, however the overall importance of this food source is still unknown (Weirheim 2008).

Roosting habitat:

Carnaby's Cockatoo roost sites are generally within 2km of freshwater (Tamara Kabat BirdLife Australia *pers. com.*) This water source can include farm dams and troughs so, being in a rural area, it is likely that watering sites are within 2 km of this site.

Key threats include: Loss of both breeding and feeding habitat; illegal harvesting of nestlings for cage-bird trade; competition for nesting hollows with other cockatoo species and feral Honeybees (*Apis mellifera*) (SEWPaC 2012).

4. Field Survey

4.1 Methodology

A Level 2 Survey provides information on the project area through one or more visit/s in each season appropriate to the bioregion and the faunal group being surveyed. Surveys should be conducted during the season of maximum activity of the targeted faunal group (EPA 2010b).

Timing of survey

The timing of this survey corresponded to the time when:

1. Carnaby's Cockatoo is resident on the south coast.
2. Baudin's Cockatoo is breeding within the south coast breeding areas.
3. Mains Assassin Spider is restricted to areas where conditions remain moist throughout the drier summer months enabling easier identification of habitat.

Timing of survey is not critical for Western Ringtail Possum as they are territorial species and females maintain their territories all year round. It is also not critical for the Red-tailed Black Cockatoo as this species occur on the south coast all year round.

Survey design

A recent critique of survey techniques for Western Ringtail Possums (deTores and Elscot 2010) argued that standard techniques currently used for surveying this species i.e. non-invasive spotlighting, faecal pellet (scat) searches and searching for dreys (nests) (DEC 2007), while enabling an assessment of the presence of possums at a site, all have inherent problems for determining accurate estimates of abundance and hence densities of animals. Capture and removal of resident Western Ringtail Possum populations, before clearing and development, has indicated these estimates have consistently underestimated the population size. Often only the presence of possums, or unquantified, non-robust

estimates of density (eg. minimum number of animals present at any given sampling session or drey counts) can be determined. DeTores and Escot (2010) argue that these measures can be misleading for managers as they provide no indication of the level of uncertainty and/or variability associated with the estimates.

DeTores and Escot (2010) suggest surveying for Western Ringtail Possums using *distance sampling* which involves setting up random or stratified random transects, and deriving estimates of abundance from data collected on the distances from the transect to where an animal is seen. The technique is based on deriving a detection function (giving an average probability of detection) and an encounter rate (the number of observations per unit effort (Buckland *et al.* 2001, 2004).

However, for small remnants, and for areas where possum densities are low (where maybe only one or two possums are seen at each sampling period) employing more rigorous non-invasive techniques is problematic (eg. requirement of employing random or stratified random sampling, which would not likely return any sightings).

With this in mind the *intention* for survey methodology was to set up systematically placed (random) transects through the remnant and to use these transects to:

1. Spotlight for possums, and use the method of distance analysis to determine a robust estimate of abundance.
2. Search for spider habitat and sample within these habitats.
3. Search for suitable feeding habitat for black cockatoos and search for signs of feeding within these habitats.

However, the impenetrable nature of almost half of the area of the remnant (*Banksia littoralis* / *Spyridium globulosum* thickets) meant that this method had to be revised, as it was not possible to put the whole transects in place due to time constraints (it took 3hrs to attempt to set up one) and the non-random nature of the route taken (ie. always having to take the least impenetrable one).

Therefore, the following methods were employed for each target group:

Western Ringtail Possum

As it had already been determined that this species is *present* on the site (Leighton and Gilfillan 2008), barring the distance sampling technique, the most useful methods for obtaining any estimate of abundance (minimum numbers present only) for this species is via spotlighting. It is not known how counts of scats and dreys relate to abundance and observations of these only confirm the presence of the species and an indication of which areas/habitats within the remnant that are being used. Due to thick nature of the vegetation dreys were very difficult to see, therefore the observation of scats only was carried out opportunistically while in the process of carrying out other components of the survey.

Spotlighting does have many limitations: possums may go undetected at low densities using spotlighting (de Tores and Rosier 1997), and spotlighting is influenced by such factors as season, weather, density of vegetation and observer bias (Wayne *et al.* 2005).

In low density populations it is recommended that spotlighting be carried out over at least two, preferably three nights in order to gain a reasonable probability of detection. Spotlighting was therefore conducted over three nights.

To minimise biased sampling, the same route was followed each night (along each edge of the remnant and through the centre in two locations, following tracks), and at least one observation was consistent over the three nights.

Spotlighting was conducted on foot with a head-torch, held at head height giving a direct beam of light from the observer's eyes to the animal's eyes, enabling eyeshine to be easily picked up. The vegetation was swept by the beam from top to bottom as the observer walked and every 20m or so the observer turned backwards and performed another sweep looking back.

Spotlighting was carried out along the vehicle tracks that traversed around the outside edge of the site, plus along the track that bisected the centre of the site.

It was fully dark before spotlighting commenced.

Mains Assassin Spider

Autumn is the start of the *A. mainae* breeding season (April-June) when adults and sub-adults can be found. The advantage of sampling in late summer is that within a slightly drier environment it can be easier to find the truly humid local refugia in which the spiders congregate. The spiders are not abundant, but where they exist they are often not rare (Dr. Michael Rix, *Terrestrial Zoology – Invertebrates*, Western Australian Museum, *pers. com.*). They therefore should be relatively easy to detect in suitable habitat.

The survey involved sampling a number of sites within suitable habitat. Suitable habitats were determined from those sampled in 2008, and by searching all accessible areas for additional suitable habitat. A subset of the sites sampled in 2008 was re-sampled (4 sites) and an additional 12 sites were sampled for the first time. The fire at the eastern edge of the block has resulted in the potential Main's Assassin Spider habitat sampled within this area in 2008 (3 samples) being currently unsuitable. These 2008 sites were therefore not re-sampled.

At each site leaf litter was removed from dense sedges and *Empodisma* curly-grass in shaded low vegetation. The leaf litter was sieved through a 1cm sieve into a white plastic tray. This allowed the spider (approximately 5mm in length) to fall through the sieve and large leaf litter to remain, allowing easy visibility of the spider. The tray was searched with a magnifying glass for the presence of the spider.

Black Cockatoos

The survey area falls within the general breeding and feeding range of the Red-tailed Black Cockatoo and Baudin's Cockatoo and the feeding range of Carnaby's Cockatoo. Roosting of all three species may occur in this area (Table 1).

Table 1: Summary of surveys for Black Cockatoos

	Forest Red-tail	Baudin's	Carnaby's
Feeding survey	No suitable feeding habitat present.	Suitable feeding habitat present.	Suitable feeding habitat present.
Roosting survey	Possible roost trees- Bullich / Yate	Possible roost trees- Bullich / Yate	Possible roost trees- Bullich / Yate
Breeding survey	Within breeding range but no suitable breeding habitat present	Within breeding range but no suitable breeding habitat present	Not within breeding range

Targeted survey methods for these three species are outlined below:

Feeding Survey

None of the major food trees of Forest Red-tailed Black Cockatoo (Jarrah and Marri) and Baudin's Black Cockatoo (Marri) are present on the site. The site does support significant numbers of proteaceous species to be considered a potential feeding site for Carnaby's and Baudin's Black Cockatoo .

The feeding survey therefore consisted of:

1. The presence of these species on the site via observation (calling or sighting) on each of the site visits. This comprised five visits between November and March.
2. The inspection of 27 *Banksia littoralis* and 1 *Banksia illicifolia* trees for evidence of feeding by Baudins or Carnaby's Cockatoos, plus any opportunistic observations of feeding signs on other suitable proteaceous species. Feeding can be determined by the presence of characteristic chew marks, cockatoo droppings and feathers (including the identification of bite patterns to indicate which black cockatoo species fed there). This can be assessed at any time of year, as cones and nuts can remain on the ground for many months.

Roosting Survey

All three species of Black Cockatoos could potentially be roosting on the site, Carnaby's Cockatoo within the non-breeding season and the other two species at any time of year.

1. Inspection of tall Yate and Bullich trees for evidence of roosting (black cockatoo dropping and feathers). An assessment of the proximity to water and foraging habitat of these trees was also made.
2. On the three nights of spotlighting for Western Ringtail Possums (March- see Table 2) we arrived at dusk to listen for Cockatoos coming in to roost and inspected tall Bullich and Yate trees with a headtorch for the presence of roosting birds.

Breeding Survey

The site is not within the current known breeding range of Carnaby's Cockatoo. Although within the breeding range of Baudin's Black Cockatoo the site does not contain any suitable breeding trees for this species. Red-tailed Black Cockatoos have been recorded as breeding in Bullich (*Eucalyptus megacarpa*)

(SEWPac 2012), however these need to be over 500mm in diameter for them to contain suitable hollows. The largest Bullich on the site was approximately 300mm.

For these reasons, no breeding survey was carried out.

Table 2: Survey Dates

Daytime searches	2/12/11	5/1/12	24/2/12	2/3/12	9/3/12
	Attempt at transect set up, habitat searches, opportunistic observations of feeding and possum scats	habitat searches, opportunistic observations of cockatoo feeding and possum scats	opportunistic observations of cockatoo feeding and possum scats	opportunistic observations of cockatoo feeding and possum scats	opportunistic observations of cockatoo feeding and possum scats
Spider samples			020, 554	026, 004_2008, 005_2008	005, 006, 032,034, 036,038, 548, 577, 007_2008, 009_2008
Cockatoo feeding observations	550, 562, 564-5,572-3		001-018	023-026	036
Nighttime searches	7/3/12	12/3/12	21/3/12		
Conditions	7-9pm near full moon clear v.sl. breeze mild	7-9pm no moon part cloud mod breeze mild	7-9pm new moon part cloud mod breeze slight drizzle mild		
	Possum and roosting black cockatoo observations	Possum and roosting black cockatoo observations	Possum and roosting black cockatoo observations		

5. Targeted Fauna Survey Results

Western Ring-tail Possum

Scat search:

Scats were observed at a number of locations, throughout the major habitat types, except for the *Banksia littoralis* / *Spyridium globulosum* thicket. Due to the impenetrable nature of this habitat type it is under-represented in the samples. However all the samples in this community were negative for possum scats, suggesting this species does not use the habitat. Although this vegetation type does contain *Agonis flexuosa*, it is low and does not form a continuous canopy and therefore not preferred habitat for this species.

Map A - east



MapB- west



Figure 3: Locations of Western Ringtail possum scats (2008 (circles) and 2012 (squares) survey) and sightings during spotlighting (star) (2012 survey only). Yellow squares indicate areas searched but no scats found.

Spotlighting:

Only one possum was observed on one occasion during the three nights of spotlighting (2012 survey). This animal was observed on the edge of the survey area, adjacent to the caravan park. It was approximately 5m up an 8m tall *Agonis flexuosa*. This is a confirmation of the presence of this species on the site which was only determined by indirect sign (presence of scats and dreys) in the 2008 survey.

Until further techniques and survey guidelines are developed for the south coast Western Ringtail possum populations, the techniques employed in this survey provide only a confirmation of the presence of possums on the sites, and a simple count of the number of possums seen (minimum number known to be present). As detection rates for possums using the techniques employed have not been calculated for south coast populations, the relationship between the numbers of possums seen and the total number present, or a valid estimate of relative abundance and hence density, cannot be made.

Until more robust methods of determining possum abundance within south coast vegetation types are developed it can only be concluded that the site is currently being used by possums. Although only one possum was observed it is highly likely that more individuals are using the site based on the following:

1. The remnant is large (20.55 ha) in comparison with estimates of home range for the species (5 ha – Jones *et al.* 1994) suggesting the site could support anything from four possums upwards (home ranges often overlap) (It should be noted that there is limited data on home range estimates for the Albany population).
2. Sightings always underestimate numbers due to incomplete detection (Aubry *et al.* 2012, deTores and Elscot 2010). The dense nature of the vegetation on this site and the fact that we were only able to spotlight along edges would greatly increase this discrepancy between animals detected and actual numbers present.

The distribution of scats indicates that the habitats predominantly being used are the *Agonis flexuosa* open woodland and the taller, denser *Banksia littoralis* / *Spyridium globulosum* thicket. The one possum sighted was adjacent to the *Banksia littoralis* / *Spyridium globulosum* thicket, in tall *Agonis flexuosa* on the other side of the track.

Main's Assassin Spider

Of the total of 16 sites sampled for Main's Assassin Spider none resulted in a positive record of this species. Potentially suitable habitat occurred predominantly in the *Agonis flexuosa* open woodland and taller *Banksia littoralis* / *Spyridium globulosum* thicket, where samples were taken under *Agonis flexuosa* trees where litter had accumulated on the top of sedges. Small areas of potentially suitable habitat occurred in the lower, less dense *Banksia littoralis* / *Spyridium globulosum* thicket and two samples were taken here, under *Banksia littoralis* trees where the *Banksia* leaf litter had accumulated on top of sedges (*Lepidopserma gladiatum*).

None of the sites sampled maintained significant levels of moisture at the end of a very dry summer and early autumn in Albany (records for Little Grove: *Jan*: 15.2mm (mean 26.4mm), *Feb*: 13.2mm (mean 21.7mm) and *Mar*: 16.2mm (mean 32.8)), a habitat feature crucial for the persistence of this species. This site has undergone some drying in the recent past indicated by changes in vegetation types (Libby Sandiford *pers. com*). It is possible that further potentially suitable habitat exists in the areas that were

not sampled due to impenetrable nature, however considering the above two facts this is unlikely and therefore it is unlikely that this site support populations of this species.

Map A - east



MapA-West



Figure 4: Locations of Main's Assassin Spider sampling sites (2008 (squares) and 2012 (circles)).

Black Cockatoos

Over the duration of the survey period no Black Cockatoos of any species were observed using the site for roosting or feeding. In addition no indirect signs of roosting or feeding were observed. Carnaby's or Baudin's were heard on one occasion flying overhead.

It can only be speculated as to why this remnant is not being used by black cockatoos. The density of Banksias within the *Banksia littoralis* / *Spyridium globulosum* thicket habitat was quite high suggesting that this should potentially be a good food source for Carnaby's and possibly Baudin's Cockatoos. However, as seen in Table 3, although many plants had reasonable number of cones and flowers, the food resource is possibly not of sufficient density for it to be viable for feeding (it has been calculated that Carnaby's Cockatoo needs to eat 11 *Banksia attenuata* cones per day to meet field energy requirements (Cooper *et al.* 2002).

Large stands of potentially suitable feeding habitat in the form of coastal heath occurs within Torndirrup NP occurs less than 2km away and therefore may provide more suitable food resources in terms of density and extent of proteaceous species.

Extensive stands of suitable feeding habitat for Red-tailed Black Cockatoos (Marri and Jarrah) occur further afield (4-5km) and therefore this site may not be within the preferred distance between feeding and roosting sites.

Although no large bodies of freshwater occur within 4 kms of the site, the area is within a rural zone and therefore the presence of water troughs and dams would be expected in close proximity, suggesting the site is in a suitable location for roosting trees. The tall Bullich and Yate trees on the site were the some of the tallest in the immediate area- although Karri, a taller tree, occurs approximately 2km to the south and may prove a more suitable roosting tree.

Table 3: Plants inspected for evidence of Black Cockatoo feeding.

Species	Number on Map	Feeding evidence	Comments
<i>Banksia littoralis</i>	001	None	2m tall
<i>Banksia littoralis</i>	002	None	4m tall
<i>Banksia littoralis</i>	003	None	3m tall, no cones or flowers
<i>Banksia littoralis</i>	004	None	4m tall, few cones
<i>Banksia littoralis</i>	005	None	3m tall, 3 cones
<i>Banksia littoralis</i>	006	None	4m tall, > 10 flowers and cones
<i>Banksia littoralis</i>	007	None	3m tall, few cones and old flowers
<i>Banksia littoralis</i>	009	None	4m tall many cones and old flowers, fungal growth
<i>Banksia littoralis</i>	010	None	4m tall many cones and old flowers, fungal growth
<i>Banksia littoralis</i>	011	None	4m tall, old cones and flowers
<i>Banksia littoralis</i>	012	None	Flowers and a few cones
<i>Banksia littoralis</i>	013	None	3m tall, 2 plants, flowers and cones
<i>Banksia littoralis</i>	014	None	3m tall, many cones
<i>Banksia littoralis</i>	015	None	1m tall, profuse flowering
<i>Banksia littoralis</i>	016	None	4m tall, few cones
<i>Banksia littoralis</i>	017	None	8m tall, > 10 flowers
<i>Banksia ilicifolia</i>	018	None	5m tall, very old, flowers and cones
<i>Banksia littoralis</i>	023	None	3m tall, cones and old flowers
<i>Banksia littoralis</i>	024	None	4m tall, profuse cones and old flowers
<i>Banksia littoralis</i>	025	None	5m tall, cones and old flowers
<i>Banksia littoralis</i>	026	None	2 plants, very old, 50 cm diam, lopped off top and reshooting, cones
<i>Banksia littoralis</i>	036	None	10m tall, 80cm diam, very old, many cones and flowers on the ground (9 within 3x2m plot) and still on tree
<i>Banksia littoralis</i>	550	None	1-1.5 m tall
<i>Banksia littoralis</i>	555	None	3m tall
<i>Banksia littoralis</i>	559	None	In burnt area, 3 m tall resprouting after fire
<i>Banksia littoralis</i>	562	None	5-m tall, 80cm diam
<i>Banksia littoralis</i>	563	None	Very old
<i>Banksia littoralis</i>	564	None	
<i>Banksia littoralis</i>	565	None	Grove of very old senescing trees, cones and flowers
<i>Banksia littoralis</i>	572	None	
<i>Banksia littoralis</i>	573	None	Young, spindly –few flowers

Map A – east



Map B – west



Figure 5: Banksia plants inspected for evidence of feeding by Carnaby's or Baudin's Cockatoo.

6. Assessment of Fauna Issues

6.1 General

The site is a large intact remnant with a low degree of disturbance (low weed invasion, minimal tracks crossing the remnant) and supports a wide array of fauna (Leighton and Gilfillan 2008). It is directly adjacent to remnant of similar size, essentially forming a refuge of over 40 ha. This is significant in terms of area of this particular broad vegetation type (coastal Peppermint) within in the immediate area, and also forms a link in the coastal corridor linking Torndirrup NP and protected areas east of Albany.

6.2 Significance of the site for the targeted species.

Western Ring-tail Possum

The Albany population of Western Ringtail Possums is considered an *important population* as defined under the EPBC Act Significant Impact Guidelines (SEWPaC 2012b), due to its location at the far edge of the species range. Under these guidelines *important populations* require particular consideration when assessing significant impacts. Significant impact guidelines exist for Western Ringtail Possums within the Swan Coastal Plain. Under these guidelines *Core Habitat*, *Primary Corridors* and *Supporting Habitat* have been identified, and deemed necessary for the persistence and recovery of this species (SEWPaC 2012b). Such habitats have yet to be determined for the Albany population, therefore, using the precautionary principle, any habitat occupied by this species should be considered significant habitat.

The site is a large remnant within the area and also forms a link along the coastal corridor from Torndirrup NP to areas occupied by possums further east, Little Grove, Robinson, Albany townsite so it can be speculated this site is significance habitat for Western Ringtail Possums.

Main's Assassin Spider

It has been concluded that this species is unlikely to occur on the site (Section 5) and therefore the significance to this species is not discussed.

Black Cockatoos

According to the EPBC Act Referral Guidelines for Black Cockatoos “any area within the range of the black cockatoos that contains known food or nesting plant species is considered to be habitat for the species”. It states that within targeted present absence surveys lack of detection should not be taken to mean that black cockatoos do not use the site.

In this sense the site should be considered potential feeding habitat for Carnaby's Cockatoo and to a lesser extent Baudin's Cockatoo.

6.3 Potential Fauna Impacts

Assessment of the scale and nature of impacts of the proposed works on fauna can be made using the guidelines outlined in the EPA's latest Guidance Note for the Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (Guidance Statement 56), Appendix 2). The onsite impacts outlined below should be assessed in the context of these guidelines.

The main impacts of disturbance of the site on the targeted fauna present are:

Death or injury to fauna species: Development of the sites has the potential to cause death or injury to individual Western Ringtail Possums as even relatively mobile animals may become confused when disturbed. As possums are territorial species individuals may not be able to move into adjacent undisturbed habitat if it is occupied by other individuals.

Increased predation: Immediate loss of shelter or refuge sites during clearing will increase the chance of predation of individuals by birds of prey, foxes and cats .

Habitat loss and damage: Development of the site will cause a loss of fauna habitat for as follows:

- the loss or damage of Peppermint (*Agonis flexuosa*) trees will result in the loss of feeding and refuge trees for the Western Ringtail Possum;
- the loss of potential feeding habitat for Carnaby's and to a lesser extent Baudin's Cockatoo and potential roosting habitat for all three Black Cockatoo species.

Weed introduction and invasion: Disturbance from the clearing has the potential to introduce and/or spread weeds to the area directly impacted by, and adjacent to, the clearing. Herbaceous weeds may alter the suitability of habitat for ground-dwelling species (eg. Quenda- loss of sedges and thick understorey), and woody weeds (eg. *Acacia longifolia*) may alter the tree layer, rendering sites unsuitable for Western Ringtail Possum.

7. References

Aubry, P., Pontier, D., Aubineau, J., Berger, F., Léonard, Y., Mauvy, B., & Marchandeu, S. (2012). Monitoring population size of mammals using a spotlight-count-based abundance index: How to relate the number of counts to the precision? *Ecological Indicators*, 18: 599-607

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. (2001). 'Introduction to Distance Sampling. Estimating Abundance of Biological Populations.' (Oxford University Press: Oxford, UK.)

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. (2004). 'Advanced Distance Sampling. Estimating Abundance of Biological Populations.' (Oxford University Press: Oxford, UK.)

Cale, B., 2002. *Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) Recovery Plan 2002-2012*. [Online]. Department of Conservation and Land Management, Perth. Available from:

http://www.dec.wa.gov.au/pdf/plants_animals/threatened_species/frps/Carnaby_WA_Rec_Plan_2003.pdf.

Chapman, T. (2008). *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Redtailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan*. [Online]. Western Australia: Department of Environment and Conservation. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/wa-forest-black-cockatoos.html>.

Cooper, C.E., Withers, P.C., Mawson, P.R., Bradshaw, S.D., Prince, J. and Robertson, H. (2002) Metabolic ecology of cockatoos in the south-west of Western Australia. *Australian Journal of Zoology*, **50**, 67-76.

de Tores, P. & S.R. Rosier (1997). *Harvey Basin allocation plan: Western Ringtail Possum survey*. Perth: Unpublished report prepared for the Waters and Rivers Commission.

de Tores, P.J. and Elscot, S. (2010). [Estimating the population size of a threatened arboreal marsupial: use of distance sampling to dispense with ad hoc survey techniques](#). *Wildlife Research* **37**, pp. 512–523

EPA (Environment Protection Authority) (2010a). Guidance Note for the Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (Guidance Statement 56).

EPA (Environment Protection Authority) (2010b). Technical Guide- Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment, September 2010 .

Gilfillan, S. (2008). Western Ringtail Possum (*Pseudocheirus occidentalis*) Survey and Data Collation in the Greater Albany Area. Final Report Phase 1. Unpublished Report, Dept. of Environment and Conservation, South Coast Region.

Harvey, M.S. & Rix, M.G. 2008: *A Survey of Populations of Main's Assassin Spider (Austrarchaea mainae) near Albany, Preliminary Report to Verve Energy and the Water Corporation*, Western Australian Museum.

Johnstone, R.E. and Kirkby, T. (1999). Food of the forest red-tailed black cockatoo, *Calyptorhynchus banksii naso*, in south-west Western Australia. *The Western Australian Naturalist* **22**(3):167-177.

Johnstone, R. E. & Storr, G. M. (1998). *Handbook of Western Australian Birds. Volume 1. Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth.

Johnstone, R.E, C. Johnstone & T. Kirkby (2008). Carnaby's Cockatoo (*Calyptorhynchus latirostris*) on the northern Swan Coastal Plain (Lancelin-Perth). *Report to the Department of the Environment, Water, Heritage and the Arts*.

Jones, B.A., How, R.A. and Kitchener, D.J.(1994). A Field Study of *Pseudocheirus occidentalis* (Marsupialia :Petauridae). II. Population Studies. *Wildlife Research* **21**; 189-201.

Leighton, S. and Gilfillan, S. (2008). Fauna Survey Report for Lot 105 Frenchman Bay Road, Albany.

Mawson, P.R. (1995). Observations of nectar feeding by Carnaby's Cockatoo *Calyptorhynchus latirostris*. *Western Australian Naturalist*. 20:93-96.

Richardson, J. (2005). DRAFT Western Ringtail Possum *Pseudocheirus occidentalis* Recovery Plan, July 2005-June 2010. Version 4. Department of Conservation and Land Management (now Department of Environment and Conservation).

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 Resource Management Inc. and the City of Albany for the Department of Environment and Conservation. Unpublished Report. Department of Environment and Conservation, Western Australia.

Saunders, D.A. (1980). Food and movements of the short-billed form of the White-tailed Black Cockatoo. *Australian Wildlife Research*. 7:257--269.

SEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012a) Species Profile and Threats Database, Australian Government, Canberra.
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

SEWPaC (Department of Sustainability, Environment, Water, Population and Communities) (2012b). Matters of National Environmental Significance, Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999*.

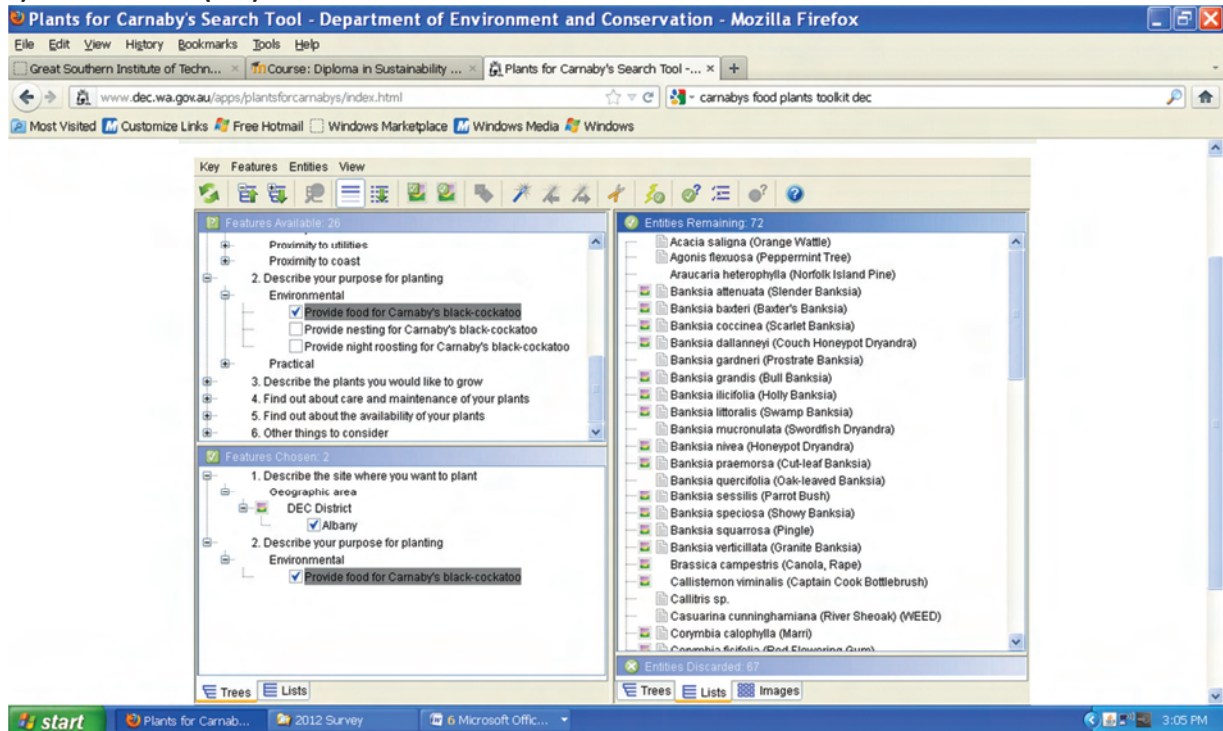
Thackway, R and I D Cresswell (1995) *An interim biogeographic regionalisation for Australia : a framework for setting priorities in the National Reserves System Cooperative Program* Version 4.0 Canberra : Australian Nature Conservation Agency, Reserve Systems Unit, 1995.

Wayne, A.F., Cowling, A., Rooney, J.F., Ward, C.G., Wheeler, B.I., Lindenmayer, D.B., Donnelly, C.F (2005) Factors affecting the detection of possums by spotlighting in Western Australia. *Wildlife Research* 32; 689-700.

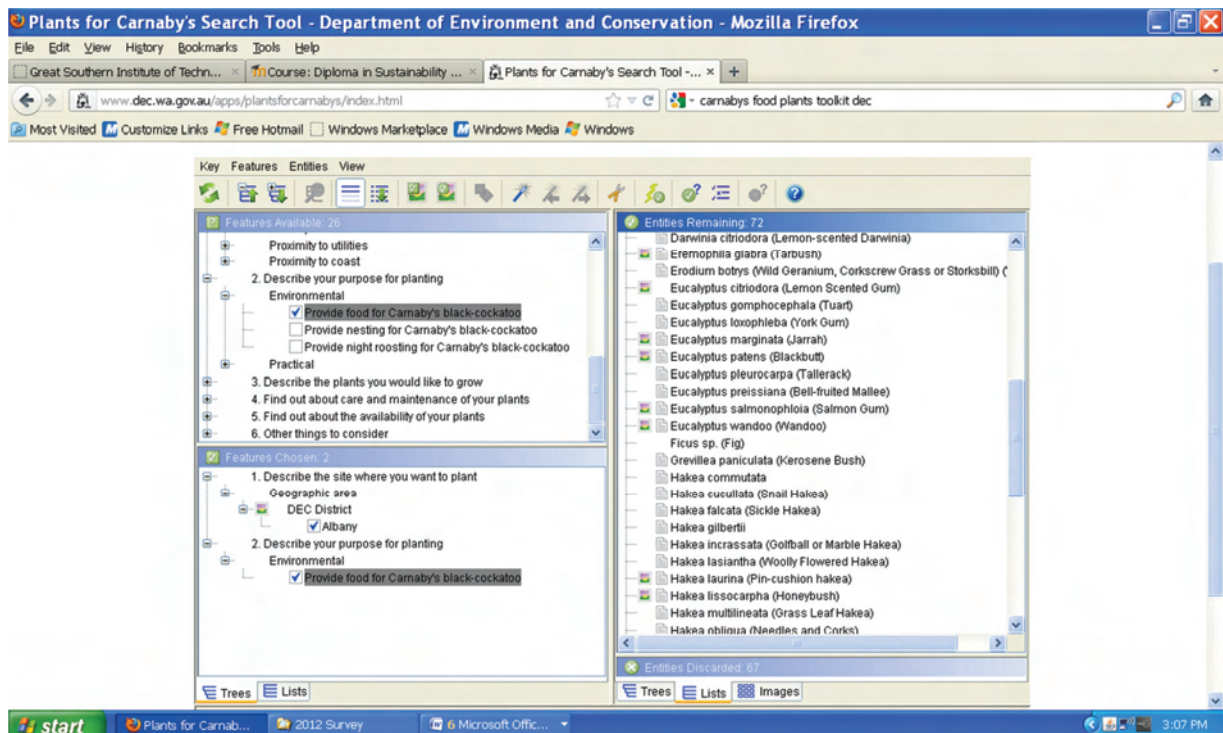
Weirheim, M.S (2008). Distribution patterns and habitat use of black cockatoos (*Calyptorhynchus* spp.) in modified landscapes in the south-west of Western Australia. MSc Thesis, School of Natural Sciences, Edith Cowan University.

Appendix 1: Food plants consumed by Carnaby's Cockatoo on the in south coast region (DEC Albany district) <http://www.dec.wa.gov.au/content/view/5983/1556/>

1) Genera name (A-C)



Genera name (D-H)



Genera name (H-X)

The screenshot shows a web browser window titled "Plants for Carnaby's Search Tool - Department of Environment and Conservation - Mozilla Firefox". The address bar shows the URL: www.dec.wa.gov.au/apps/plantsforcarnabys/index.html. The application interface includes a menu bar (File, Edit, View, History, Bookmarks, Tools, Help) and a toolbar with various icons. The main content area is divided into several sections:

- Key Features:** A list of features with checkboxes. Under "2. Describe your purpose for planting", the "Environmental" section has "Provide food for Carnaby's black-cockatoo" checked. Under "3. Describe the plants you would like to grow", the "Practical" section has "Provide nesting for Carnaby's black-cockatoo" and "Provide night roosting for Carnaby's black-cockatoo" checked.
- Features Available:** 26 features listed.
- Features Chosen:** 2 features listed, including "Provide food for Carnaby's black-cockatoo" under the "Environmental" section.
- Entities Remaining:** 72 plant genera listed, including *Pinus trauianica* (Grass Leaf Hakea), *Hakea obliqua* (Needle and Corio), *Hakea oleifolia* (Dungyn or Olive-leaved Hakea), *Hakea pandanica* subsp. *crassifolia* (Thick Leaved Hakea), *Hakea preissii* (Needle Tree), *Hakea prostrata* (Harsh Hakea), *Hakea ruscifolia* (Candle Hakea), *Hakea scoparia* (Kangaroo Bush), *Hakea smilacifolia*, *Hakea stenocarpa* (Narrow-fruited Hakea), *Hakea sulcata* (Furrowed Hakea), *Hakea trifurcata* (Two-leaved Hakea), *Hakea undulata* (Wavy-leaved Hakea), *Hakea varia* (Variable-leaved Hakea), *Hibiscus* sp. (Hibiscus), *Jacaranda mimosifolia* (Jacaranda), *Jacksonia furcellata* (Grey Stinkwood), *Lambertia inermis* (Chittick), *Lambertia multiflora* (Many-flowered Honeysuckle), *Liquidamber styraciflua* (Liquid Amber), *Malus domestica* (Apple), *Mesomeleana* sp., *Pinus radiata* (Radiata Pine), *Raphanus raphanistrum* (Wild Radish) (WEED), and *Xanthorrhoea preissii* (Grass Tree).
- Entities Discarded:** 67 entities listed.

The bottom of the browser window shows the Windows taskbar with the Start button, several open applications (Plants for Carnab..., 2012 Survey, Microsoft Offic...), and the system clock showing 3:08 PM.

Appendix E

Ecological Aspects Constraints Mapping Proposed Foreshore Reserve and Contours

117°52'40"E

117°52'50"E

117°53'0"E

117°53'10"E

35°42'0"S

35°42'0"S

35°43'0"S

35°43'0"S

35°44'0"S

35°44'0"S

35°45'0"S

35°45'0"S




117°52'40"E

117°52'50"E









117°53'0"E

117°53'10"E

Legend

-  Lot 105 Frenchman Bay Road
-  South Coast Water Reserve
-  Banksia surveyed 2012
-  2012 Possum scats
-  2012 Possum sighting
-  2008 Possum scats
-  Amperea prolensa P3
-  Aderanthes cuminghamii P4
- PEC 23 Priority 1

ARVS Units

-  Coastal Banksia ilicifolia/Peppermint Low Woodland
-  Coastal Limestone Heath
-  Coastal Yate Forest
-  Juncus kraussii Sedgeland
-  Mosaic Coastal Limestone Heath & Banksia littoralis Woodland/Melaleuca incana Shrubland
-  Mosaic Coastal Limestone Heath & Peppermint Low Woodland
-  Mosaic Coastal Limestone Heath & aff Banksia ilicifolia/Peppermint Low Woodland & Coastal Heath
-  Peppermint Low Woodland
- affinites Coastal Banksia ilicifolia/Peppermint Low Woodland & Coastal Heath



0 25 50 100 Meters



TITLE		
Lot 105 Frenchman Bay Road, Big Grove		
Ecological Aspects		
STATUS	FINAL	FILE
		W-A1138.00/004AN
SCALE	1:5,000	PLOT DATE
		29/05/14

117°52'40"E

117°52'50"E

117°53'0"E

117°53'10"E

35°42'0"S

35°42'0"S

35°43'0"S

35°43'0"S

35°44'0"S

35°44'0"S

35°45'0"S

35°45'0"S








117°52'40"E

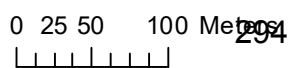
117°52'50"E

117°53'0"E

117°53'10"E

Legend

-  Lot 105 Frenchman Bay Road
-  Proposed Foreshore Reserve
-  Proposed Vegetation Corridor
-  South Coast Water Reserve
-  Vegetation Retention in Water Reserve



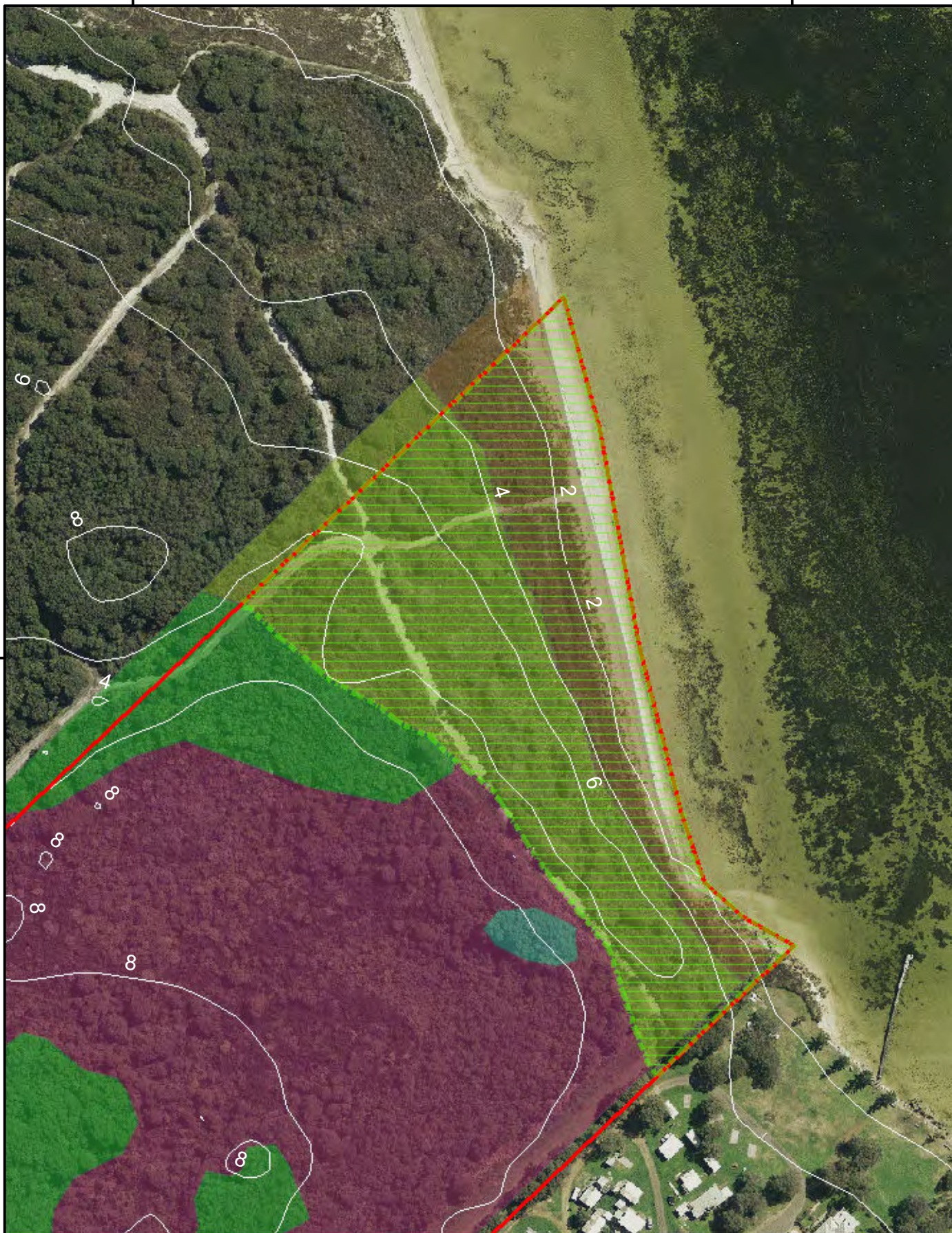
TITLE		
Lot 105 Frenchman Bay Road, Big Grove		
Constraints Mapping		
STATUS	FINAL	FILE W-A1138.00/004AN
SCALE	1:5,000	PLOT DATE 29/05/14

117°53'0"E

117°53'10"E

35°43'0"S

35°43'0"S




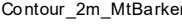

117°53'0"E

117°53'10"E






0 12.5 25 50 Meters



Legend

-  Lot 105 Frenchman Bay Road
-  Contour_2m_MtBarker
-  Proposed Foreshore Reserve

ARVS Units

-  Coastal Banksia ilicifolia/Peppermint Low Woodland
-  Coastal Limestone Heath
-  Coastal Yate Forest
-  Juncus kraussii Sedgeland
-  Peppermint Low Woodland



TITLE		Lot 105 Frenchman Bay Road, Big Grove	
		Proposed Foreshore Reserve & Contours (2m)	
STATUS	FINAL	FILE	W-A1138.00/004AN
SCALE	1:2,000	PLOT DATE	29/05/14

Appendix F

EPBC Act Threatened Species Categories EPBC Act Significant Impact Criteria Assessment

Categories of Threatened Species (Commonwealth)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the [Environment Protection and Biodiversity Conservation Act 1999](#) (EPBC Act):

Section 179 Categories of threatened species

(1) A native species is eligible to be included in the **extinct** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

(2) A native species is eligible to be included in the **extinct in the wild** category at a particular time if, at that time:

(a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or

(b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

(3) A native species is eligible to be included in the **critically endangered** category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

(4) A native species is eligible to be included in the **endangered category** at a particular time if, at that time:

(a) it is not critically endangered; and

(b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

(5) A native species is eligible to be included in the **vulnerable category** at a particular time if, at that time:

(a) it is not critically endangered or endangered; and

(b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.

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

(a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or

(b) the following subparagraphs are satisfied:

(i) the species is a species of fish;

(ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;

(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory;

(iv) cessation of the plan of management would adversely affect the conservation status of the species.

(7) In subsection (6):

fish includes all species of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals or marine reptiles.

Species listed as 'conservation dependent' and 'extinct' are not matters of national environmental significance and therefore do not trigger the EPBC Act.

Environmental Protection and Biodiversity Conservation Act 1999 Significant Impact Criteria

The fauna species identified onsite that are protected under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been assessed against the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DEWHA, 2009).

EPBC Act Criteria	Species Protected Under the EPBC Act			
	Western Ringtail Possum (Vulnerable)	Carnaby's Black-Cockatoo (Endangered)	Baudin's Black Cockatoo (Vulnerable)	Forest Red-tailed Black Cockatoo (Vulnerable)
<i>Lead to a long-term decrease in the size of a population or an important population of a species</i>	Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors If disturbance does occur it is likely to be at an individual scale rather than population scale	Unlikely to occur		
		Not within breeding range Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present No suitable feeding habitat present
<i>Reduce the area of occupancy of the species or of an important population</i>	Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors If disturbance does occur it is likely to be at an individual scale rather than population scale	Unlikely to occur		
		Not within breeding range Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present No suitable feeding habitat present

EPBC Act Criteria	Species Protected Under the EPBC Act					
	Western Ringtail Possum (Vulnerable)	Carnaby's Black-Cockatoo (Endangered)	Baudin's Black Cockatoo (Vulnerable)	Forest Red-tailed Black Cockatoo (Vulnerable)		
<i>Fragment an existing population or important population into two or more populations</i>	<p>Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors to reduce barriers to movement</p> <p>If disturbance does occur it is likely to be at an individual scale rather than population scale</p>	Unlikely to occur as there is not considered to be any barrier to movement				
<i>Adversely affect habitat critical to the survival of a species</i>	<p>Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors</p> <p>If disturbance does occur it is likely to be at an individual scale rather than population scale</p>	Unlikely to occur				
		Not within breeding range Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present Suitable feeding habitat present however no foraging observed onsite	Within breeding range but no suitable breeding habitat present No suitable feeding habitat present		
<i>Disrupt the breeding cycle of a population</i>	<p>Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors</p> <p>If disturbance does occur it is likely to be at an individual scale rather than population scale</p>	Unlikely to occur				
		Not within breeding range	Within breeding range but no suitable breeding habitat present	Within breeding range but no suitable breeding habitat present		
<i>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	<p>Unlikely to occur – Habitat areas within the site are proposed to be maintained as habitat corridors</p>	Unlikely to occur				
		If possible roost trees (Bullich/ Yate) are recommended to be maintained as habitat corridors				

EPBC Act Criteria	Species Protected Under the EPBC Act					
	Western Ringtail Possum (Vulnerable)	Carnaby's Black-Cockatoo (Endangered)	Baudin's Black Cockatoo (Vulnerable)	Forest Red-tailed Black Cockatoo (Vulnerable)		
<i>Result in invasive species that are harmful to a critically endangered, endangered or vulnerable species' habitat</i>	Unlikely to occur – Feral predators such as foxes and cats have already been identified as present on site.	Unlikely to occur European honeybees are likely to be present within the local area and competition for nest hollows within European honeybees and invading bird species is not considered to be an impact as the site is either not located within breeding range or does not have suitable breeding habitat present.				
	It is recommended that all works on site are undertaken as per best practice measures for weed control.					
<i>Introduce disease that may cause the species to decline</i>	It is recommended that all works on site are undertaken as per best practice hygiene management techniques.					
<i>Interfere with the recovery of the species</i>	No known recovery measures are currently undertaken within the site.					

TECHNICAL APPENDIX 2 – LOCAL WATER MANAGEMENT STRATEGY

(Accendo Australia, 2018)

LOCAL WATER MANAGEMENT STRATEGY



LOT 105 FRENCHMAN BAY ROAD, BIG GROVE

JANUARY 2018



Document Control

Version	Date	Author	Reviewer
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EXECUTIVE SUMMARY

This Local Water Management Strategy (LWMS) has been prepared by Accendo Australia in consultation with WML Consultants on behalf of the Roman Catholic Bishop of Bunbury to support development of Lot 105 Frenchman Bay Road, Big Grove (herein referred to as the subject site). The subject site is located in the municipality of the City of Albany within Western Australia and is approximately 5.5 km southwest of Albany.

The subject site is approximately 20.5 hectares (ha) in size with its northern boundary adjoining the Princess Royal Harbour shoreline. Pursuant to the City of Albany's Local Planning Scheme No. 1, the subject site is zoned 'Public Purpose'. The proponent is seeking to rezone the subject site from 'Public Purpose' to 'Residential Development' to enable residential subdivision of the subject site.

This LWMS provides an integrated total water cycle management approach for the development of the subject site. This includes an assessment of the pre-development environment, development of water use sustainability initiatives and a stormwater and groundwater management strategy.

The overall aim of total water cycle management includes the sustainable consumption of potable water and consideration of all water sources. On this basis, the use of water within the development will be minimised wherever possible. This will be achieved through considered landscaping of the Public Open Space (POS) to minimise areas requiring irrigation. Water efficient appliances and water efficient gardens will be promoted at the lot scale. This will encourage the development to meet the net use of water within household's target of 100m³/person/year (Government of Western Australia 2007).

The proposed stormwater management system for the development has been designed in accordance with the *Stormwater Management Manual for Western Australia* (DoW 2004-2007). Stormwater management for the subject site will be designed using the following key principles and objectives:

- All lots will infiltrate or retain stormwater on-site either through infiltration and/or through the collection of rainwater in tanks;
- All roads will be designed to provide a flood route for events greater than 1-in-1 year ARI and up to 1-in-100 year ARI event;
- Roads will incorporate the following treatments depending on the road reserve width and slope of the area in question:
 - Flush kerbing and swales; or
 - Mountable kerbing and collection (side entry) pits.
- POS areas will only be used for drainage for events where the collection pits cannot retain and infiltrate the entire event (i.e. 1-in-100 year events); and
- Piping and similar infrastructure will be minimised within the subject site.

The overall objectives for groundwater management are to minimise any changes to the underlying groundwater level and quality as a result of development.

Further investigations will be completed prior to subdivision, including detailed drainage design and public open space landscaping planning. An Urban Water Management Plan will be prepared at subdivision stage, with the implementation of the plan to commence during development stages. Stormwater management considerations and strategies outlined in this report are likely to be refined as more detailed environmental and geotechnical information becomes available and the subdivision design is finalised.

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1 INTRODUCTION

1.1 Background

This Local Water Management Strategy (LWMS) has been prepared by Accendo Australia in consultation with WML Consultants on behalf of the Roman Catholic Bishop of Bunbury (RCBB) to support development of Lot 105 Frenchman Bay Road, Big Grove (herein referred to as the subject site). The subject site is located in the municipality of the City of Albany within Western Australia and is approximately 5.5 km southwest of Albany (refer to **Figure 1** and **Figure 2**).

The subject site is approximately 20.5 hectares (ha) in size with its northern boundary adjoining the Princess Royal Harbour shoreline. Pursuant to the *City of Albany's Local Planning Scheme No. 1*, the subject site is zoned 'Public Purpose'. The RCBB is seeking to rezone the subject site from 'Public Purpose' to 'Residential Development' to enable residential subdivision of the subject site.

This LWMS provides an integrated total water cycle management approach for the development of the subject site. This includes an assessment of the pre-development environment, development of water use sustainability initiatives and a stormwater and groundwater management strategy.

1.2 Key Reference Documents

This LWMS has been developed with reference to the following guidance documents:

- *Better Urban Water Management* (WAPC 2008);
- *Decision Process for Stormwater Management in Western Australia* (DoW 2009);
- *Interim: Developing a Local Water Management Strategy* (DoW 2008);
- *Stormwater Management Manual for Western Australia* (DoW 2007);
- *City of Albany Development and Subdivision Guidelines* (City of Albany 2009) and
- *National Water Quality Management Strategy* (ANZECC 2000).

1.3 Design Objectives

The LWMS will detail the integrated water management strategies to facilitate future urban water management planning. The LWMS will achieve Water Sensitive Urban Design (WSUD) through the following design objectives:

- Decrease nutrient, sediment and contaminant discharge to the environment by the application of Sensitive Urban Design for drainage;
- Protection and enhancement of local biodiversity values by implementing a native plant Landscape and Waterwise Plan for lot gardens, public open space and proposed bio-filter areas on existing drainage systems and wetland areas;
- Manage run-off and peak flows from urban developments by using local detention measures and minimising impervious areas;
- Protection of groundwater quality and quantity;
- Protection of wetlands from urban development runoff; and
- Value adding while minimising development costs where practicable.

2 PRE-DEVELOPMENT ENVIRONMENT

2.1 Existing Land Use

The subject site is predominately vegetated and is devoid of any dwellings or associated infrastructure. It is surrounded by remnant bushland on the west/north west side, semi-rural and partially cleared properties to the south east, south and south west and by Princess Royal Harbour to the north. The property forms part of a corridor spanning the width of the Torndirrup Peninsula from Princess Royal Harbour to the Southern Ocean.

2.2 Topography

Within the subject site the foreshore on the northern boundary has an approximate elevation of 2.0 m Australian Height Datum (AHD). The foredunes reach a height of about 8 m AHD and the rest of the subject site is gently undulating ranging between 8 to 10 m AHD, with deep to shallow grey podsolic soils and outcropping calcareous limestone (Leighton and Gilfillan 2008).

2.3 Geotechnical

2.3.1 Surface Geology

Pursuant to the Geological Survey of Western Australia's (1978) mapping, the subject site is located on the Scott Coastal Plain and consists of the Meerup soil landscape system which can be described as *'coastal dunefields, on the southern edge of the Albany Sandplain Zone, with calcareous sand (mostly deep) and pale deep sand'* (Churchwood and McArthur 1978).

The Department of Agriculture and Food's (DAF's) Shared Land Information Portal (SLIP) maps the soil-landform units contained within the subject site as follows:

- Meerup podzols on interdune plains Phase (242MeMRf): Podzols on interdunal plains. This unit is mapped across the majority of the subject site (approximately 17 ha); and
- Meerup podzols over calcareous sand Phase (242MeMRp): Podzols over calcareous sand. This unit is associated with the foreshore area and contains approximately 3 ha of the subject site.

Subject to the DAF's Land Capability Assessment, the Meerup podzols on interdune plains Phase has a moderate capability to support onsite effluent disposal. The key limiting factors are phosphorus loss and water repellence.

2.3.2 Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. They have become a potential issue in land development projects on the Swan Coastal Plain when the naturally anaerobic conditions in which they are situated are disturbed and they are exposed to aerobic conditions and subsequently oxidise. When oxidised, ASS produce sulfuric acid, which can result in a range of impacts to the surrounding environment. ASS that has oxidised and resulted in the creation of acidic conditions are termed "Actual ASS" (AASS), and those that have acid generating potential but remain in their naturally anaerobic conditions are termed "Potential ASS" (PASS).

Based on the desktop analysis of ASS risk within the locality, the risk of ASS occurring generally at depths of less than 3 m below ground level was found to be low, based on the following:

- Published geology of the site (Gozzard 1989);
- An ASS study for the adjacent Lot 109 Frenchman Bay Road by Golder Associates (2006); and

- Geotechnical investigations also conducted by Golder Associates (2007), for Lots 20, 21, and 110 Frenchman Bay Road.

2.3.3 Contaminated Sites

A search of the Department of Environment and Regulation's (DER's) Contaminated Sites database indicates that there are no known contaminated sites within or adjacent to the subject site. Given that the subject site is undeveloped the risk of contamination is considered low.

2.4 Hydrology

2.4.1 Surface Water

The subject site does not contain any significant surface water features or defined drainage lines. Occasional swales have been observed across the subject site whereby winter water tables are close to the surface (Leighton and Gilfillan 2008).

Limeburners Creek, located approximately 1 km southeast of the subject site, is the closest surface water feature to the subject site. It is a major creekline draining from Torndirrup National Park to Princess Royal Harbour.

2.4.2 Groundwater

The site occurs within the South Coast Water Reserve (SCWR) and in close proximity to the Limeburners Creek Catchment, both of which are the subject of a Water Source Protection Plan prepared by the Water and Rivers Commission (WRC 2001). The SCWR is proclaimed pursuant to the *Country Areas Water Supply Act 1947* in order to limit the risk of groundwater contamination from human activities. In the SCWR, groundwater is hosted by the upper unconfined coastal limestone aquifer in addition to a deeper sandstone aquifer which is confined beneath an impermeable clay layer. The sandstone aquifer is utilised for public water supply, whereas most private wells utilise the water in the unconfined limestone aquifer.

The western portion of the subject site is classified as a Priority 1 area within the SCWR (refer to **Figure 3**). Priority 1 areas are defined to ensure that no degradation of the public drinking water source occurs. These areas are managed in accordance with the principle of risk avoidance whereby land development is generally not permitted. On this basis, it is unlikely that development of the western portion of the subject site will be acceptable. Nonetheless, retention of vegetation within this area will provide a noise and visual buffer from the road for any future residential development.

Groundwater in the SCWR flows radially out from a groundwater mound and flows into the Grasmere Valley to the north, Princess Royal Harbour to the east, and the Southern Ocean to the south. Groundwater in the unconfined superficial formations is also influenced by the local topography, which at the site slopes gently downwards towards Princess Royal Harbour. Consequently it is interpreted that the shallow groundwater at the site flows towards the northeast (Coffey 2010).

Three groundwater monitoring bores were installed within the subject site on the 5th April 2017. Groundwater level monitoring was conducted at each of the three bores monthly from April to November in 2017 (refer to **Appendix A**). For the monitoring bores within the proposed development footprint a separation distance between the Maximum Groundwater Level (MGL) and building floor level of 2.6m AHD is achieved. Monitoring bore MW3 is located within the proposed foreshore reserve and recorded a separation distance of 0.8m AHD, which can be attributed to its location immediately adjacent to the foreshore. Based on these results and in consideration of the proposed Structure Plan, it is likely that adequate separation exists between static groundwater level and the ground surface. Maximum

groundwater levels appear to be closest to the surface within the proposed foreshore reserve, where no development will occur.

Coffey (2010) undertook groundwater monitoring on properties to the south of the subject whereby the groundwater elevation was found to vary from 8.7m AHD at the southern portion of the site to 0.8m AHD along the foreshore, which is consistent with the monitoring results from the subject site. Over the available monitoring period, the range of groundwater fluctuations at the site was approximately 1 m.

Groundwater quality sampling has also been undertaken in proximity to the subject site. Overall, the results indicate the following (Coffey 2010):

- The groundwater pH is close to neutral, tending alkaline in winter, with a range of between 7.0 and 8.7;
- Total nitrogen concentrations are generally close to 1mg/L or less; and
- Total phosphorus concentrations are generally between the laboratory limit of reporting (0.01 mg/L) and 0.43 mg/L.

2.5 Wetlands

Areas of wetlands have been mapped previously by Semenuik (1995) across the entire Swan Coastal Plain. This mapping has been converted into a digital dataset that is maintained by the Department of Parks and Wildlife (DPaW) and is referred to as the '*Geomorphic Wetland of the Swan Coastal Plain*' dataset. This dataset contains information on geomorphic wetland types and assigns management categories that guide the recommended management approach for each wetland area. The *Geomorphic Wetlands of the Swan Coastal Plain* dataset does not extend to the subject site.

Environmental Protection Policy (EPP) wetlands are prepared by the Environmental Protection Authority (EPA) and approved by the Minister under Part 3 of the *Environmental Protection Act 1986* (EP Act). The subject site does not contain an EPP wetland.

While no wetlands have been mapped within the subject site by the DPaW or the EPA, it is noted that during the flora and vegetation survey (Sandiford 2012) two wetland units were recorded within the survey area, including *Juncus kraussii* Sedgeland and *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland. Nonetheless, the latter vegetation unit may no longer fall within the definition of wetland vegetation due to the ongoing hydrological change and continuing invasion by upland species (Sandiford 2012).

2.6 Flora and Vegetation

2.6.1 Flora

A Level 2 flora and vegetation survey has been undertaken within the subject site which comprised a spring and autumn survey conducted in November 2011 and April 2012, respectively (Sandiford 2012). The surveys resulted in the identification of 145 native species, including two conservation species *Amperea protensa* (Priority 3) and *Adenanthos x cunninghamii* (Priority 4). A total of 40 introduced species were recorded including one Weed on National Significance (WON), *Asparagus aethiopicus*, and one Declared Plant, *Zantedeschia aethiopica*. Most weeds were restricted to tracks/firebreaks though the environmental weed, *Acacia longifolia*, was widespread throughout the survey area.

The two Priority flora species identified during the Level 2 flora survey are unlikely to pose a significant constraint to development. Furthermore, if required, the six plants can be translocated to reserves or future Public Open Space (POS) within the subject site. It is noted that *Adenanthos x cunninghamii* is

readily propagated from cuttings and seed denoting its suitability for incorporation within revegetation programs.

2.6.2 Vegetation

During the Level 2 flora and vegetation survey, six vegetation units were recorded and mapped. This included (Sandilands 2012):

- Coastal Yate Forest;
- Peppermint Low Forest;
- *Banksia ilicifolia*/Peppermint Low Woodland;
- Coastal Limestone Heath;
- *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland; and
- *Juncus kraussi* Sedgeland.

The most common units are the Limestone Heath, Peppermint Low Forest and *Banksia ilicifolia*/Peppermint Low Woodland, all of which are well reserved on a regional and state scale and are likely to have a high percentage of pre-clearing extent remaining. The remaining units have less than 25% reserved on a regional scale and their state wide reservation status and pre-clearing extent remains unclear, though *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland is likely to have <30% pre-clearing extent remaining (Sandilands 2012).

One Priority Ecological Community (PEC) was recorded within the subject site, the *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland. This vegetation community, naturally a wetland unit, is currently a Priority 1 PEC pending endorsement as “Critically Endangered” Threatened Ecological Community (TEC). All occurrences of the PEC within the survey area are modified, resulting from changing hydrology and invasion by upland species. The long term viability of this PEC within the subject site is low.

The overall vegetation condition within the subject site is good to very good with invasion of **Acacia longifolia* and degradation of, and invasion of *Banksia littoralis* Woodland/*Melaleuca incana* Shrubland, by upland species the major factors influencing condition rating.

3 PROPOSED DEVELOPMENT

The proposed development will provide a residential subdivision in the satellite suburb to Albany, Big Grove. Currently, two options for development are being considered which include:

- A high density residential subdivision resulting in sewered lots; or
- A low density residential subdivision comprised of approximately 44 un-sewered lots with a minimum size of 1,800m².

Detailed environmental investigations (Opus 2014) have been conducted over the subject site resulting in the identification of constraints to development (refer to **Appendix B**). These include the following:

- South Coast Water Reserve: 3.6 ha;
- Vegetation Corridor: 4.7 ha; and
- Foreshore Reserve: 2.1 ha.

This has resulted in an approximate developable area (including roads and lots) of 9.2 ha.

The proposed Foreshore Reserve (refer to **Appendix B**) between the site and Princess Royal Harbour correlates with the approved foreshore boundary on the adjoining Outline Development Plan to the southeast. The Foreshore Reserve has been proposed to fulfill the default setback requirements of the *State Planning Policy 2.6 State Coastal Planning Policy* (WAPC 2003). While it is been recommended that no development or stormwater treatment and/ or attenuation is to be undertaken within the proposed Foreshore Reserve (Opus 2014), *State Planning Policy No. 2.6 State Coastal Planning Policy* and its associated guidelines do not preclude drainage infrastructure within foreshore reserve areas. Section 3.3 of the *State Coastal Planning Policy Guidelines* only precludes piped drainage outlets being constructed through foreshore areas directly onto the beach. The concept plan shows indicative bio-retention basins in the foreshore reserve which will rely on infiltration to dispose of treated stormwater. Any significant storm outlet for this basin will be developed in accordance with the eventual UWMP as directed by Section 3.3 of *State Coastal Planning Policy Guidelines* and *Better Urban Water Management Policy*.

4 DESIGN OBJECTIVES AND CRITERIA

4.1 Water Conservation

The overall intention of the proposed development is to achieve the sustainable management of all aspects of the water cycle within the development and with minimal drinking water use outside the home. Specifically, the objectives for integrated urban water management for the development are:

- Achieve the Western Australian State Water Plan (Government of Western Australia 2007) target of reducing unrestricted annual water consumption to 100 kL/person, including not more than 40 – 60 kL/person/year of scheme water.
- Substitute drinking quality water with fit-for-purpose water for non-drinking water uses. The State Water Strategy (Government of Western Australia 2003) sets a target of 20% reuse by 2012. This development aims to reduce the use of scheme (drinking) water by providing an alternative fit for purpose water supply for non-drinking use. It is expected that recycled water will meet approximately 58% of total demand.

4.2 Water Quantity Management

The post-development annual stormwater discharge volumes and peak flows are to be maintained relative to pre-development conditions. The following criteria will be applied:

- Ecological protection - For the critical 1-year average recurrence interval (ARI) event, the post-development discharge volume and peak flow rates shall be maintained relative to pre-development conditions in all parts of the catchment.
- Serviceability – Manage 5-year ARI rainfall events so that post-development flows do not exceed predevelopment peak discharges and are conveyed within the proposed stormwater system.
- Flood management - Manage the catchment run-off for up to the 100-year ARI event in the development area to pre-development peak flows (unless otherwise indicated in an approved strategy or as negotiated with the City of Albany).
- Groundwater – Abstraction from the aquifer will be managed so as not to reduce long-term groundwater levels within the existing townsite. Minimise the use of groundwater within the development by prohibiting private or public bores.
- Retain and restore existing elements of the natural drainage system, including waterway, wetland and groundwater features, regimes and processes, and integrate these elements into the urban landscape, possibly through a multiple use corridor.

4.3 Water Quality Management

Stormwater will be managed to maintain surface and groundwater quality at pre-development levels and, if possible, to improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located. The following criteria will be applied:

- Ensure that all runoff contained in the drainage infrastructure network receives treatment prior to discharge to a receiving environment consistent with the Stormwater Management Manual.
- Protect groundwater as a resource. The site has highly permeable soils and a deep watertable, the development of the area must protect the water quality of the unconfined aquifers.
- Minimise pollutant inputs through implementation of appropriate non-structural source controls (such as town planning controls, strategic planning controls, pollution prevention procedures,

education and participation programs and regulatory controls) and structural controls (that manage the quantity and quality of stormwater runoff and prevent or treat stormwater pollution).

- With regard to stormwater quality – apply water sensitive urban development to achieve a reduction in pollution transported to receiving waterways when compared with conventional urban development. This reduction is in the order of:
 - At least 80 per cent reduction of total suspended solids;
 - At least 60 per cent reduction of total phosphorus;
 - At least 45 per cent reduction of total nitrogen; and
 - At least 70 per cent reduction of gross pollutants.

5 WATER CONSERVATION STRATEGY

The State Water Plan of 2007 has set a target for water usage in Western Australia to 100 kilolitres per person a year. This target has been adopted for the development area. With an average occupancy of 2.4 people (Albany average household according to 2011 Census) the target water usage per household, for use inside and outside, is averaged to 240L per annum. The Water Corporation's *Perth Residential Water Use Study 2008/09* (2010) found that the average Perth household (2.4 people) water use was 255KL per annum. To achieve further conservation of water resources within the development the following initiatives will be undertaken.

5.1 Water Supply

Reticulated water will be supplied to all lots. The Water Corporation manage both distribution and reticulation pipe network infrastructure within the Shire.

5.2 Waterwise Appliances

Simple water conservation techniques, such as installing waterwise appliances and rainwater tanks in the home can have a significant impact on reducing water consumption. **Table 1** below summarises the savings in potable water consumption through the installation of waterwise appliances and rainwater tanks (based on 2.4 people per household).

Table 1. Reduction in water consumption from water efficient appliances.

Appliance Type	Potential Savings (kL/house/year)	Potential Savings (kL/person/yr)
3-star rated shower head	23	7
7 minute shower	44	13
Rainwater tanks	40	12
4-star rated washing machine	35	10
Dual-flush toilets	33	10
4 – star dishwasher	9	3

5.3 Rainwater Tanks

Residents will be encouraged to install rainwater tanks to reduce the quantity of water consumption from the reticulated water supply. Owners will be encouraged to install fittings to ensure the captured rainwater can service indoor and outdoor purposes. Encouraging the installation of a 3,000 L rainwater tank could potentially capture approximately 29 kL per annum for each household's usage. The *Stormwater Management Manual of WA* (DoW 2007) formula was used to calculate maximum volumes of water that can be collected from a roof.

The City of Albany is able to enforce the installation of rainwater tanks through the building approvals process however, this will be dependent on the nature of the development and available future connection to the scheme water network.

5.4 Waterwise Landscaping

The Water Corporation estimates that garden watering (irrigation) accounts for an estimated 39% of Perth's domestic scheme water usage. This is a particularly low value use for what is a high quality resource (drinking water). Consequently, a significant reduction in potable water use can be achieved by

minimising water use outside homes. Based on this, the following initiatives will be implemented to reduce water usage at the development:

- Xeriscaping;
- Waterwise POS designs that feature areas of un-irrigated landscaping;
- Reduced areas of lawn/gardens that require substantial volumes of watering;
- Garden and lawn care education; and
- Encouraging use of rainwater tanks by residents for garden use.

Information regarding waterwise landscaping will be provided by the developer to land owners to achieve the following:

- Minimise the extent of water consumption planting;
- Maximise the use of water conserving elements and techniques; and
- Apply the basic principle of grouping plants on the basis of similar water requirements.

Lot titles will not however, be covenanted with notifications or memorials in regard to waterwise landscaping.

The development will utilise the following general design principles regarding planting:

- Maximise the use of non-planting treatments to retain water such as mulches;
- Planted areas should be dense and consolidated; and
- Lawn areas are to be kept to a minimum to be consistent with functional and aesthetic requirements. Avoid planting lawn on slopes, in narrow decks or pathways, which are difficult to water efficiently and maintain.

To further reduce water use within the POS areas and manage erosion issues, the following measures will be implemented:

- Use mulches and other groundcovers within landscaping areas;
- Installation of footpaths; and
- Installation of stormwater management infrastructure (i.e. detention basins).

5.5 Grey Water Use

The use of grey water is possible but will need to be undertaken by individual lot owners. Grey water could provide most of the water wise garden needs and save from 80-120kL per year being allocated to sewage. The use of grey water will require approval from the City of Albany and the Department of Health.

5.6 Groundwater/Bore

Domestic bores may be expensive to develop and the water resource may not be available in quality and quantity. Shallow groundwater within the subject site is recharged by annual rainfall and with the installation of over 44 localised bores, severe stress on the shallow water resources may result.

5.7 Wastewater Management

Servicing the development will necessitate the construction of a wastewater pump station, pumping (pressure) mains and gravity sewers. This will be required for the high density development option (refer to **Appendix C** for maps and correspondence from the Water Corporation regarding wastewater infrastructure).

The alternative low density development option will involve the installation of onsite effluent disposal systems and will need to consider the provisions of the draft Government Sewerage Policy. Under this policy, the site is classified as a sewage sensitive area due to its proximity to the Princess Royal Harbour, denoting that a minimum lot size of 1ha will be required.

The City of Albany and the Department of Health have regulations and recommendations for the installation, operation and maintenance of onsite effluent disposal systems which will need to be considered for the low density development option.

6 STORMWATER MANAGEMENT

Post-development annual discharge volume and peak flow is to be maintained relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments, as follows:

- Ecological protection – For the critical 1-year Average Recurrence Interval (ARI) event, the post-development discharge volume and peak flow rates shall be maintained relative to predevelopment conditions in all parts of the catchment.
- Flood management – Manage the catchment runoff for up to the 1-in-100 year ARI event within the development area to pre-development peak flows unless otherwise indicated in an approved water management strategy.

Stormwater peak flows from the pre-development area will be maintained through the use of compensation and retention structures including lot storage systems, rain gardens and a dry detention basin designed to maintain the pre-developed discharge peaks of events up to the 1-in-100 year ARI.

6.1 Stormwater Management

6.1.1 Key Design Criteria

In consideration of the subject site's pre-development characteristics and subject to acceptance by the City of Albany and Department of Water and Environmental Regulation (DWER), it is proposed that the stormwater drainage system complies with the following design criteria:

- All lots will infiltrate or retain stormwater on-site (as far as practicable) either through infiltration and/or through the collection of rainwater in tanks (3,000 L). Landowners will demonstrate retention through the building approval process. Lots will not require connection to a district piped system;
- It is expected that run-off from driveways will leave the lot. The final calculations in the UWMP will allow for this run-off contribution;
- All roads are designed to provide a flood route for events greater than 1-in-1 year ARI and up to 1-in-100 year ARI event;
- Roads will incorporate the following treatments depending on the road reserve width and slope of the area in question:
 - Flush kerbing and swales to temporarily store and infiltrate the 1-in-1 year ARI post event, and convey the ARI events larger than this; or
 - Mountable kerbing and collection (side entry) pits. Collection pits will have soakwells to infiltrate stormwater. While it is unlikely that the 1-in-1 year ARI event will be entirely stored in the soakwells, the aim will be to maximise the storage capacity.
- POS areas will only be used for drainage for events where the collection pits cannot retain and infiltrate the entire event. This will occur during larger storms, including 1-in-100 year events.
- Piping and similar infrastructure will be minimised within the subject site. Water will be diffused over a wider surface area to prevent erosion, particularly at POS and the Foreshore Reserve interfaces. Structures to prevent erosion will be determined at the detailed design stage, but will include swales and rock pitching (or similar approaches) to prevent erosion and scouring at key points.

Stormwater management strategies are dependent on groundwater levels and soil type. Measures outlined above assume that the maximum groundwater level will be at least 1m below the base of

infiltration devices across the subject site. They are also based on the premise that the soils are granular and free-draining.

6.1.2 Surface Water Flows

In consideration of the available surface water data, pre-development peak flows for the catchment areas have been estimated. The flows have been calculated in accordance with the *Australian Rainfall & Runoff Volume 1* (Pilgrim 1987). The following parameters were used to determine the pre- and post-development stormwater flows for the subject site.

- Developable area of 9.2 ha:
 - High density = 132 lots (runoff coefficient = 0.8)
 - Low density = 44 lots (runoff coefficient = 0.5)
- Pre-development internal catchments are defined as follows (refer to **Plate 1**):
 - Catchment A
 - Catchment B
 - Catchment C
 - Catchment D
- Post-development internal catchments are defined as follows (refer to **Plate 2**):
 - Catchment A
 - Catchment B1
 - Catchment B2
 - Catchment C1
 - Catchment C2
 - Catchment D
- External Catchments are defined as follows (refer to **Plate 3**):
 - Catchment 1
 - Catchment 2
 - Catchment 3

Runoff flow rates for the 1.5, 5 and 100 year events were calculated using the Rational Method as for the pre and post development flows are provided below.

Table 2. Pre-development flow calculation - internal catchments.

Catchment	Area (ha)	Time of Concentration (tc) min	Runoff Coefficient (C)	Design Flow (m ³ /s)						
				Q1	Q2	Q5	Q10	Q20	Q50	Q100
Catchment A	3.6	23.0	0.3	0.07	0.10	0.13	0.15	0.18	0.22	0.26
Catchment B	8.9	37.5	0.3	0.14	0.18	0.23	0.26	0.31	0.38	0.44
Catchment C	5.0	27.5	0.3	0.09	0.12	0.16	0.18	0.22	0.27	0.31
Catchment D	2.1	17.2	0.3	0.05	0.07	0.09	0.10	0.13	0.16	0.18
Sub-Total	19.6	-	-	0.35	0.47	0.61	0.69	0.84	1.03	1.19

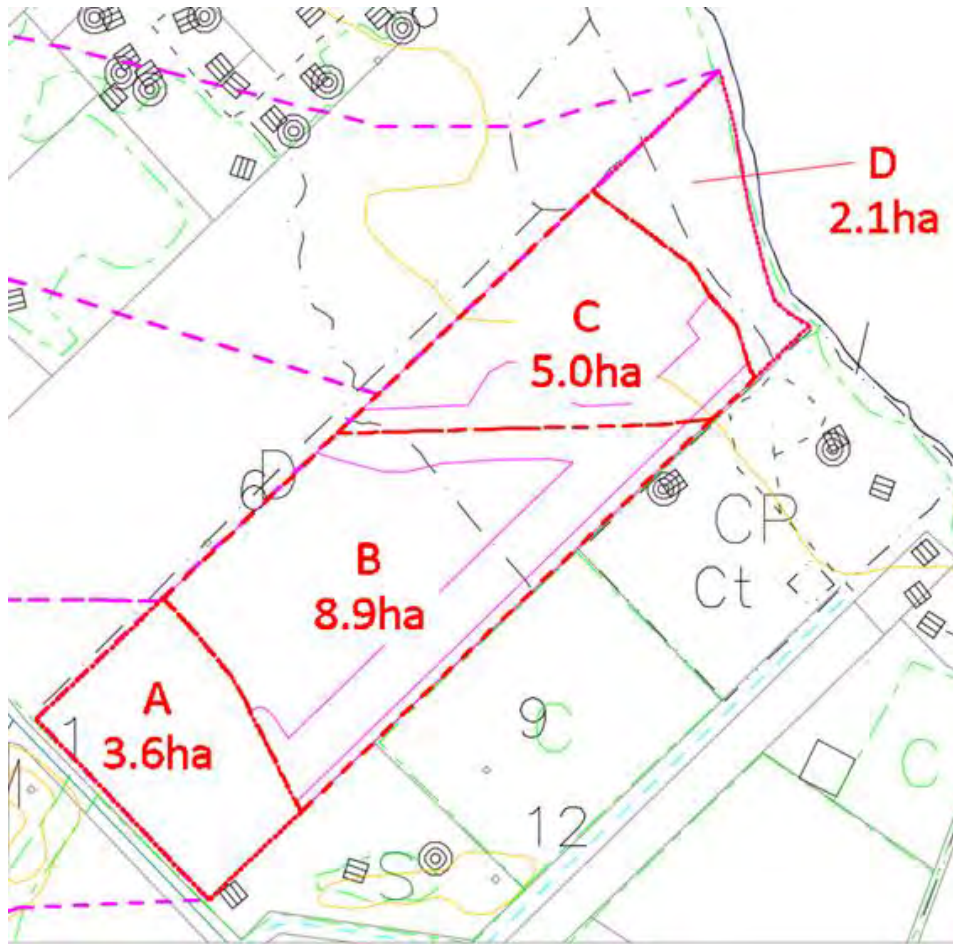


Plate 1. Pre-development internal catchment area.

Post development flow calculations have been provided for the for the high and low density development options as discussed within Section 3.

Table 3. Post-development flow calculation for high density development – Internal catchments.

Catchment	Area (ha)	Time of Concentration (tc) min	Runoff Coefficient (C)	Design Flow (m ³ /s)						
				Q1	Q2	Q5	Q10	Q20	Q50	Q100
Catchment A	3.6	23.0	0.3	0.07	0.10	0.13	0.15	0.18	0.22	0.26
Catchment B1	5.0	10.0	0.8	0.42	0.57	0.77	0.92	1.11	1.41	1.67
Catchment B2	3.9	24.0	0.3	0.08	0.10	0.13	0.16	0.19	0.23	0.27
Catchment C1	3.4	7.5	0.8	0.33	0.44	0.61	0.72	0.89	1.13	1.34
Catchment C2	1.6	14.9	0.3	0.04	0.06	0.07	0.09	0.11	0.13	0.16
Catchment D	2.1	17.2	0.3	0.05	0.07	0.09	0.10	0.13	0.16	0.18
Sub-Total	19.6	-	-	0.99	1.34	1.80	2.14	2.61	3.28	3.88

Table 4. Post-development flow calculation for low density development – Internal catchments.

Catchment	Area (ha)	Time of Concentration (tc) min	Runoff Coefficient (C)	Design Flow (m ³ /s)						
				Q1	Q2	Q5	Q10	Q20	Q50	Q100
Catchment A	3.6	23.0	0.3	0.07	0.10	0.13	0.15	0.18	0.22	0.26
Catchment B1	5.0	15.0	0.5	0.22	0.29	0.38	0.45	0.55	0.68	0.80
Catchment B2	3.9	24.0	0.3	0.08	0.10	0.13	0.16	0.19	0.23	0.27
Catchment C1	3.4	10.0	0.5	0.33	0.44	0.61	0.72	0.89	1.13	1.34
Catchment C2	1.6	14.9	0.3	0.04	0.06	0.07	0.09	0.11	0.13	0.16
Catchment D	2.1	17.2	0.3	0.05	0.07	0.09	0.10	0.13	0.16	0.18
Sub-Total	19.6	-	-	0.79	1.06	1.41	1.67	2.05	2.55	3.01

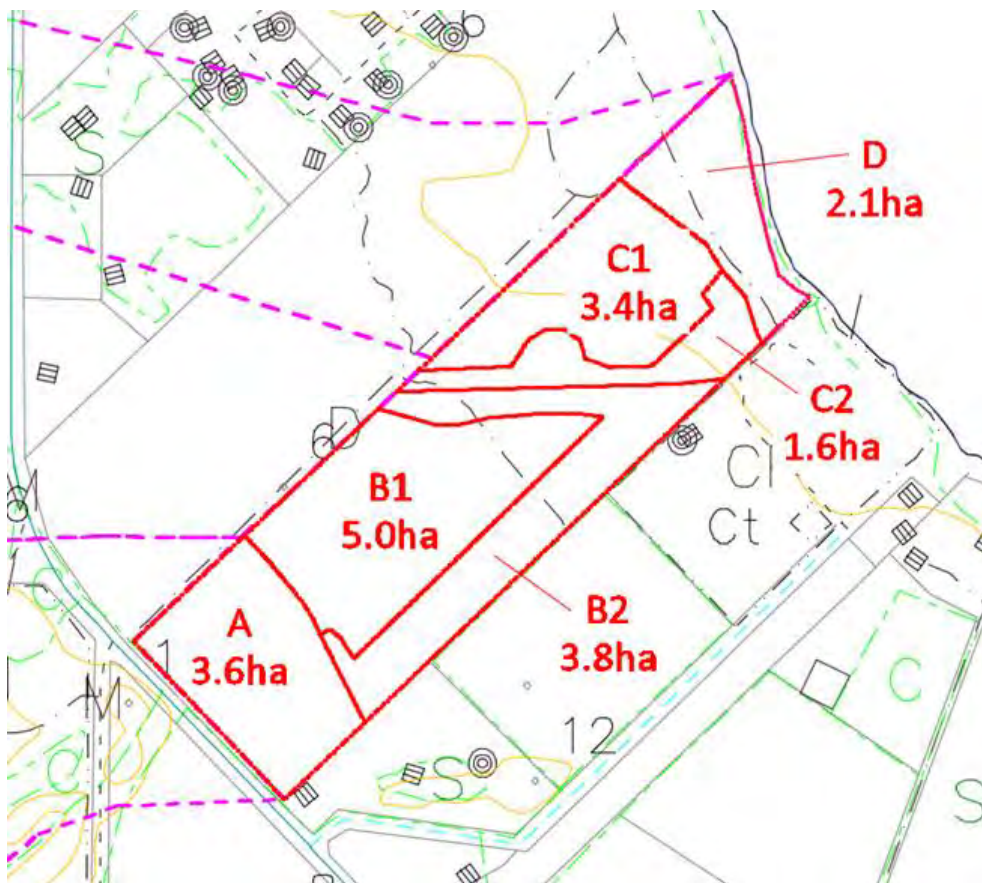


Plate 2. Post-development internal catchments.

A summary of the pre and post development internal surface water flows is provided below in **Table 5**. Based on these calculations, the approximate stormwater detention requirement for the high density development option is as follows:

- Catchment B1 – 210m³ detention pond; and
- Catchment C1 – 120m³ detention pond.

Table 5. Summary of pre and post development internal flows.

Description	Design Flow (m ³ /s)						
	Q1	Q2	Q5	Q10	Q20	Q50	Q100
Total Pre-development internal flow	0.35	0.47	0.61	0.69	0.84	1.03	1.19
Total Post-development internal flow - high density	0.99	1.34	1.80	2.14	2.61	3.28	3.88
Total Post-development internal flow - low density	0.79	1.06	1.41	1.67	2.05	2.55	3.01
Additional flow for high density development	+0.64	+0.87	+1.19	+1.45	+1.77	+2.25	+2.69
Additional flow for low density development	+0.44	+0.59	+0.80	+0.98	+1.21	+1.52	+1.82

Surface water flow calculations for external catchments (refer to **Table 6**) indicate that open channels and gully crossings associated with the catchments illustrated in Plate 3 shall be constructed to accommodate the following Q100 peak flows.

Table 6. Surface water flow calculations for external catchments.

Catchment	Area (ha)	Time of Concentration (tc) min	Runoff Coefficient (C)	Design Flow (m ³ /s)						
				Q1	Q2	Q5	Q10	Q20	Q50	Q100
Catchment 1	46.7	92	0.35	0.5	0.6	0.8	0.9	1.0	1.2	1.4
Catchment 2	278.3	241	0.45	2.1	2.7	3.3	3.8	4.4	5.3	6.0
Catchment 3	185.5	193	0.35	1.2	1.6	2.0	2.2	2.6	3.1	3.6



Plate 3. External catchments.

6.2 Flood Management

Flooding up to and including the 1:100 year ARI event will sheet across lots and be intercepted by road reserves. Within the road reserve boundary the flows will be managed within the swale network and road design. The protection of private property from inundation and detaining outflow rates into receiving water bodies are the primary objectives of these flood events.

At the detailed design stage consideration will be given to the finished levels of the roads relative to the lot levels on the lower side of the road to ensure adequate protection from the 1:100 year ARI flood levels. The swale profiles and culvert sizes for lot crossovers and intersections will be designed to mitigate the flows and protect private lots from flood levels down the road reserves.

6.3 Water Quality Management

The principle of improving water quality in comparison to existing water quality will be adopted. To achieve this objective it is proposed to focus on implementing current known best management practice as detailed in the *Stormwater Management Manual for Western Australia* (DoW 2007) and *Australian Runoff Quality* (Engineers Australia 2006).

The LWMS proposes the use of a treatment train approach including source control techniques. The proposed water quality management approach includes:

- Where practicable, installation and connection to a reticulated sewer system;
- Non-structural controls including:
 - Planning practices (POS locations and configuration)
 - Construction practices (construction management, soil amendment, use of native plantings)
 - Maintenance practices (street sweeping, stormwater system, POS areas)
 - Educational and participatory practices (community education)
- Structural controls including:
 - Retention and infiltration of frequent events where possible (soakwells, swales, bottomless manholes)
 - Creation of ephemeral retention/detention areas within POS areas

7 GROUNDWATER MANAGEMENT

7.1 Groundwater Management

Based on available groundwater data (refer to **Appendix A**), an adequate separation exists between static groundwater level and the ground surface. Maximum groundwater levels are closest to the surface within the proposed Foreshore Reserve, where no development will occur. Sand fill is not expected to be required to provide adequate clearance to the underlying groundwater table.

Maintenance of groundwater quality and levels can be achieved by the following:

- Maintain a minimum separation of 1.2m between buildings and the MGL (to be addressed in the Urban Water Management Strategy (UWMP)).
- Where the MGL is at or within 1.2m of the surface, the importation of fill will be required to ensure that adequate separation of building floor slabs from groundwater is achieved.
- The bio-retention system and drainage inverts are set at or above the MGL.
- Limit the use of private wells and bores for Lots in accessing the shallow groundwater table.

Soil permeability, winter seepage flows and compaction will be determined by a geotechnical assessment of the proposed building sites on the lots when proposed building applications are presented.

7.2 Matters to be addressed in the UWMP

The UWMP will include:

- A finalised Structure Plan;
- Design and location of any proposed subsoil drainage;
- Finished lot levels; and
- Detailed monitoring strategy.

8 WATER QUALITY MANAGEMENT

Stormwater should be treated through a system of rain gardens and vegetated basins or swales to reduce nutrient loads leaving the site which will target achievement of the design parameters discussed in **Section 4.3**.

8.1 Nutrients

Water quality management refers to the quality of both the stormwater and groundwater within the subject site. The most important factor in both stormwater and groundwater quality is the level of nitrogen and phosphorus nutrients, which can cause algal blooms and eutrophication in rivers and lakes.

Potential sources of nutrients into the drainage system and waterways of the subject site come from both onsite and off-site, due to surrounding catchments discharging into the area, as well as groundwater inflows from off-site. These sources are discussed in detail below.

As a result of the effective retention of stormwater flows up to and including the 1 year ARI design event, it is not anticipated that the use of Gross Pollutant Traps (GPTs) or their variants will be required within the residential sections of the subject site. Within the residential areas, the expected pollutants can be effectively retained using the following measures:

- Discharge and subsequent settlement of runoff from all minor events the designated flood storage basins prior to release into the groundwater / surface water channels;
- Use of vegetated swales where possible to convey stormwater runoff into the flood storage basins;
- Appropriate use of soils with a higher Phosphorus Retention Index (PRI) in areas such as gardens and POS areas to enhance the ability of vegetated areas to retain soluble pollutants;
- Use of trash racks for situations where stormwater is piped directly into a flood storage basin, and where overflow volumes from large storm events are discharged into the POS area; and
- Routing overflows from the drainage system through vegetated watercourses and dams to provide final polishing of low-level overflows and to achieve detention, settling and filtering of major flows.

8.2 Fertiliser

The need for fertiliser application within the subject site is minimal and only slow release fertilisers will be used. This is in keeping with the *Guidelines for Fertiliser Use on the Swan Coastal Plain of Western Australia* (SRT 2000). The application of fertilisers will not be required within the POS area as endemic species will be used for revegetation.

Post-construction it is assumed that fertilisers will be applied by landholders on private lots to establish gardens and lawns. However, information relating to waterwise gardening practices (including information about nutrient application) will be provided in the land sales office for prospective land purchasers.

Information relating to efficient fertiliser application practices will be provided to prospective purchasers at the land sales office during the sales period.

8.3 Sediments

Sediments affect water quality in numerous ways affecting the health of aquatic organisms, in stream processes and aesthetics. Pollutants such as heavy metals and phosphates enter waterways through

being attached to clay particles. Development works on the site with the potential to disturb soils include site remediation and bulk earthworks associated with construction.

It is recommended that earthworks at the site should commence during the summer months, when the locality does not experience significant rainfall thereby minimising risks associated with runoff occurring from the subject site.

Due to the promotion of at source treatments within the development, the amount of sediment entering receiving environments post-construction is expected to be minimal.

Street sweeping will be carried out quarterly through the urban development to remove particulate build-up from the road surface. Riparian vegetation will be planted in the treatment system to maximise the amount of fine sediments removed from surface water.

8.4 Hydrocarbons

Hydrocarbons including petrol, oil and grease are considered toxic in aquatic environments. The extent of hydrocarbons in the stormwater run-off generated from the development is expected to be minimal due to the scale of the development and the low traffic volumes. For these reasons, oil and grease traps are not proposed.

The laying of bitumen during the construction of roadways has the potential to affect water quality. Where practicable, these activities should be undertaken in the summer when rainfall is less likely.

8.5 Pesticides and Herbicides

Pesticides and herbicides can have toxic effects on aquatic ecosystems especially on aquatic plants and insects. These organisms are crucial to maintaining healthy aquatic systems as they cycle nutrients, and provide food habitat and oxygen.

Weed control will be undertaken in accordance with an appropriate Management Plan which will involve the use of specialised chemicals in riparian/aquatic environments.

8.6 Structural Best Management Practices

Within the development a number of WSUD elements will be implemented to satisfy the structural best management practice (BMP) requirements. These are summarised in **Table 7** below and are discussed in further detail in the following Sections.

Table 7. WSUD elements for structural BMPs.

Level	Responsibility	BMP
Lot/group housing	Lot Owner	<ul style="list-style-type: none"> • Infiltration • Amended topsoils • Mulch and other groundcover
Street	Local Authority	<ul style="list-style-type: none"> • Street sweeping • Infiltration • Sedimentation traps
Estate	Local Authority	<ul style="list-style-type: none"> • Retention / detention areas • Vegetated swales • Groundwater re-use

8.6.1 Lot / Group Housing Level Structural BMPs

Infiltration of stormwater is common practice in Western Australian land development projects and is considered an appropriate at source control measure that can significantly reduce the magnitude and volume of stormwater runoff generated from the site.

Rainwater generated from roof areas can be infiltrated into the groundwater without the need for pre-treatment, on the basis that the roof areas generate significantly lower nutrient loads. Runoff from residential buildings can be directed to the road stormwater infrastructure. Alternatively, if soakwells are required, soakwells could be installed on the down slope edges of building fill pads with a minimum constructed fill height of 1.2m. If used, soakwells should also be designed to consider adequate clearance from buildings and foundations.

8.6.2 Street Level Structural BMPs

Road design for amenity should be separated from road design for flood protection based on the stormwater infrastructure requirements as a function of road hierarchy. Three types of design criteria are applicable:

- Pollution control – low level of requirement;
- Convenience and nuisance control – medium level of requirement; and
- Flood control – high / main level of requirement.

Road design will include a series of side-entry pits and pipes to convey stormwater runoff to the rain gardens, swales and/or basins. The road design will be discussed in further detail in the UWMP.

8.6.3 Estate Level Structural BMPs

It is recommended that a series of vegetated swales and retention / detention system be used as estate-level structural BMPs.

Vegetated swales can be designed to perform both a detention storage function as well as a treatment function regarding the removal of sediment in the conveyance of stormwater. A series of vegetated open swales could be adopted within the POS areas as an alternative to the traditional kerb and gutter system of conveying stormwater runoff to the road drainage system.

8.7 Non-Structural Best Management Practices

A series of non-structural BMPs derived from the *Stormwater Management Manual for Western Australia* (DoW 2007) will be implemented for use in the development in combination with structural measures.

At a development scale, landscaping will consist primarily of native plantings with turf used sparingly where appropriate. If treated wastewater is used for irrigation, then fertiliser will not be necessary and will not be applied. If treated wastewater is not used, then fertiliser will be applied sparingly to turf areas, when rain is not forecast. Slow release fertilisers will be used.

At a lot level, residents will be encouraged to use native vegetation for planting. Sustainability Packages will be provided at the point of sale, outlining appropriate fertiliser regimes and when and how it should be applied.

9 IMPLEMENTATION

9.1 Maintenance Measures

The surface water drainage system will require regular maintenance to ensure its efficient operation. It is considered that the following operating and maintenance practices will be implemented periodically:

- Removal of debris to prevent blockages;
- Street sweeping to reduce particulate build up on road surfaces and gutters;
- Cleaning of sediment build up and litter layer on the bottom of basins;
- Mowing of grassed open channel sections monthly and grass clippings removed;
- Undertake education campaigns regarding source control practices to minimise pollutant runoff into stormwater drainage system.

Specifically, the operation and maintenance program provided within **Table 8** is proposed.

Table 8. LWMS actions and responsibilities.

Element	Action	Responsibility	Timing
Water Quality and Quantity	Maintenance of bio-swales and surface water drainage infrastructure	The proponent	Quarterly, until two years after practical completion of the development or until hand over to the City of Albany
Public Open Space	Fertiliser application		As required during revegetation and ongoing maintenance until hand over to the City of Albany
	Plant establishment		One to two years after planting
	Irrigation scheduling		As required following planting until hand over to the City of Albany
	Maintenance of Foreshore Reserve		Annually for two years until handover to the City of Albany
Drainage Infrastructure	Maintenance of drainage infrastructure		As required until two years after completion of the development. The extent of the maintenance commitment will be confirmed with the City of Albany at the UWMP stage of the development.
Subdivision Management	Construction and site works management		As required during construction until hand over to the City of Albany
	Waste and pollution management		As required during construction until hand over to the City of Albany

9.2 Monitoring

9.2.1 Pre Development

Groundwater monitoring across the subject site should be undertaken in accordance with the requirements of water monitoring guidelines for *Better Urban Water Management Strategies/Plans* (DoW 2011) to characterise the existing groundwater quality and levels across the subject site.

9.2.2 Post Development

Post-development monitoring will be undertaken in line with the water monitoring guidelines for *Better Urban Water Management Strategies/Plans* (DoW 2011). Post development monitoring will occur from the completion of first subdivision to three years after 80 per cent of the development has been completed (DoW 2011).

Any change in the water quality parameters during this period will be investigated. A Post-development Monitoring Plan will be included as part of the UWMP and will contain:

- Details of monitoring required
- Baseline results from the pre-development period
- Methods to determine whether the development's design criteria are being met
- Contingency plans and management responses should variation occur between pre and post development monitoring results.

Monitoring reports will be provided to City of Albany and DWER on an annual basis.

9.3 Additional Work

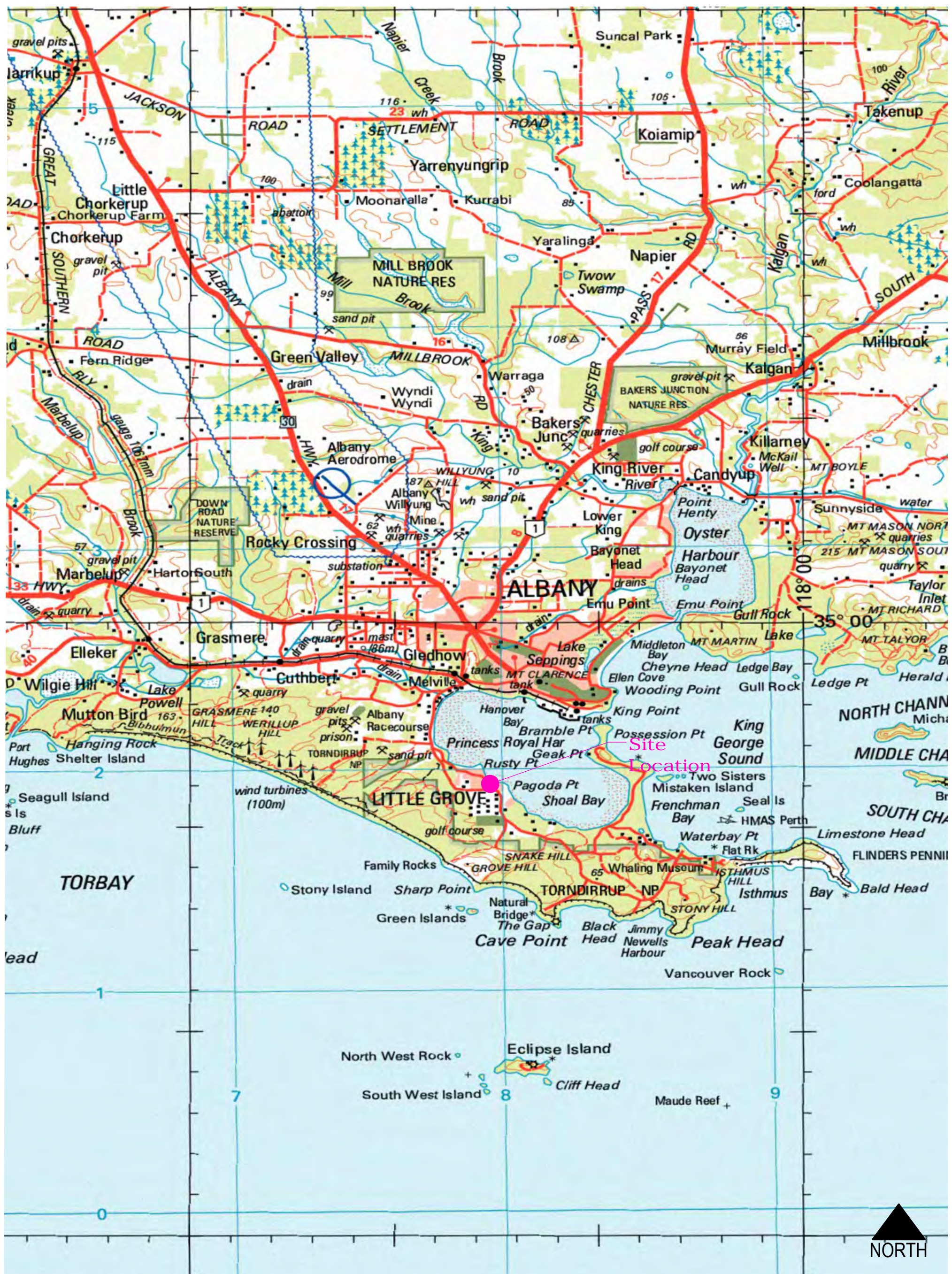
The preparation of an UWMP will be required as a condition of subdivision clearances. It is recommended that a UWMP is completed for the entire Structure Plan area regardless of whether subdivision occurs on a staged basis. Specifically, the UWMP will include the following design measures in more detail:

- Detailed stormwater drainage design including landscaping details;
- Specific detailed information on structural and non-structural best management practices to be implemented;
- Final subdivision layout including final cut and fill levels, minor and major drainage layouts and overland flow paths;
- Management of subdivisional works, including dewatering or dust suppression if required;
- Public Open Space management, including fertiliser regimes and irrigation scheduling;
- Finalised monitoring performance values and list of likely contingency measures; and
- Finalised implementation plan including roles and responsibilities of all parties involved.

REFERENCES

- ANZECC. 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- Coffey Environments. 2010. *Big Grove Structure Plan Area – Environmental Assessment*. Unpublished report prepared for Peet Limited and Humphrey Land Development. Report 2007/006, V5.
- Department of Water (DoW). 2007. *Stormwater Management Manual for Western Australia*.
- Department of Water (DoW). 2008. *Interim: Developing a Local Water Management Strategy*.
- Golder Associates. 2006. *Preliminary Geotechnical and Acid Sulfate Soils Due Diligence Investigation. Lot 109 Frenchman Bay Road, Albany*. Unpublished report.
- Golder Associates. 2007. *Geotechnical Investigation and Preliminary Acid Sulphate Soils Assessment Lot 20 Frenchman Bay Road, Albany, May 2007*, prepared for Peet & Company Limited.
- Government of Western Australia. 2007. *Western Australian State Water Plan*.
- Government of Western Australia. 2006. *State Planning Policy 2.9: Water Resources* (Government of Western Australia, 2006).
- Gozzard, J.R. 1989. Albany Part Sheets 2427 I, 2428 II, 2527 IV and 2528 III, Environmental Geology Series, Geological Survey of Western Australia, Perth, WA.
- Leighton and Gilfillan. 2008. Level 1 Fauna Survey at Lot 105 Frenchman Bay Road. Unpublished.
- Opus Consultants. 2012. *Addendum to Environmental Opportunities and Constraints Analysis. Lot 105 Frenchman Bay Road, Big Grove*. Unpublished.
- Pilgrim, DH, (ed). 1987. *Australian Rainfall & Runoff – A Guide to Flood Estimation*, Institution of Engineers, Australia, Barton, ACT.
- 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.
- Sandiford, E.M. 2012. *Vegetation and Flora of Lot 105 Frenchmans Bay Rd, Big Grove*. Unpublished.
- WAPC 2003. *Statement of Planning Policy No. 2.6 – State Coastal Planning Policy*. Western Australian State Government, Perth.
- Western Australian Planning Commission (WAPC). 2008. *Better Urban Water Management*.
- WRC. 2001). *South Coast Water Reserve and Limeburners Creek Catchment Area Water Source Protection Plan: Albany Water Supply*. Water and Rivers Commission (WRC), Water Resource Protection Series No. 44.

FIGURES



PROJECT Lot 105 Frenchman Bay Road, Big Grove - Local Water Management Strategy

DRAWING TITLE FIGURE 1 - Regional Location

CLIENT Roman Catholic Bishop of Bunbury

Scale
Diagrammatic





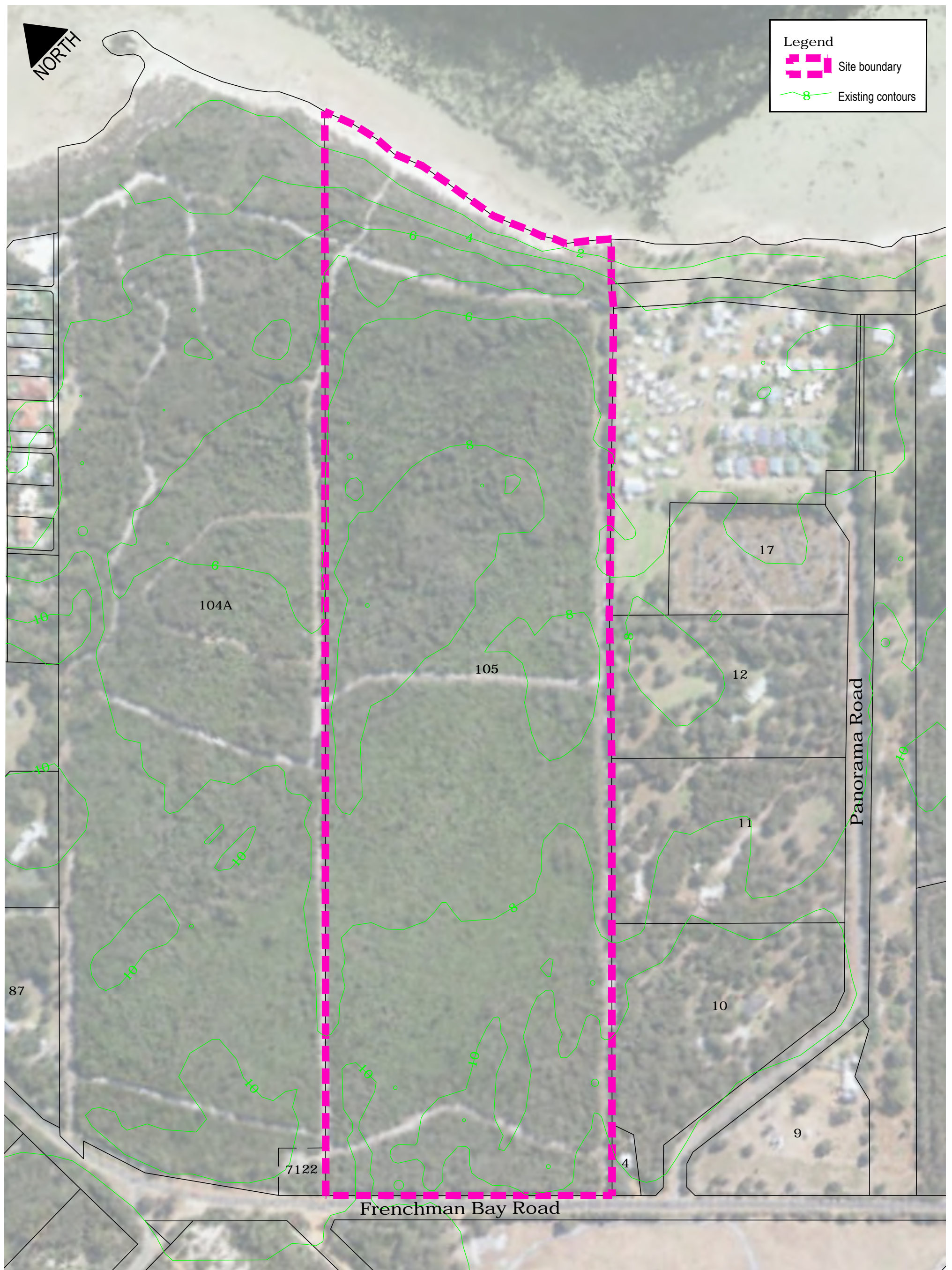
PO Box 5178
West Busseton
Western Australia 6280
Telephone (08) 9755 7217
Mobile 0418 950 852

Project Number	Drawing Number	Revision	Original
1504	FIG 1	A	A3
Designed KMT	Checked	Date 29-01-16	
Drawn DTF	Approved	Sheet 1 of 1	
Local Authority City of Albany			



Legend

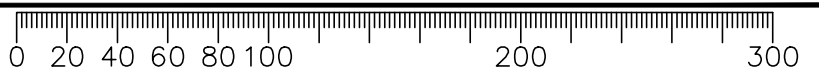
-  Site boundary
-  Existing contours



PROJECT Lot 105 Frenchman Bay Road, Big Grove - Local Water Management Strategy

DRAWING TITLE FIGURE 2 - Subject Site

CLIENT Roman Catholic Bishop of Bunbury

Scale 1:3000 

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Project Number 1504	Drawing Number FIG 2	Revision A	Original A3
Designed KMT	Checked	Date 29-01-16	
Drawn DTF	Approved	Sheet 1 of 1	
Local Authority City of Albany			

APPENDIX A – GROUNDWATER MONITORING REPORT

20 November 2017

Aaron Bell
c-/ Roman Catholic Bishop of Bunbury
PO Box 2005
Bunbury WA 6230
Aaron@ableplanning.com.au

Dear Aaron,

RE – Groundwater Monitoring Report for Lot 105 Frenchman Bay Road, Big Grove

The expectations regarding pre-development hydrological monitoring and stormwater management have been provided by the Department of Water and Environmental Regulation (DWER) and are documented within a number of guidelines, including the *National Water Quality Management Strategy* (ANZECC, 2000) and the *Stormwater Management Manual for Western Australia* (DoW, 2007). These documents indicate that groundwater data coverage should be sufficient to provide characterisation of the existing hydrological environment to not only direct management actions, but to also allow assessment of the need for post-development contingency actions.

The usual expectations of the DWER are that groundwater levels will be collected over two seasonal peaks and that the groundwater quality will be characterised. Given the intensity of groundwater monitoring undertaken on the adjacent site and the geological conditions encountered during bore installation, a single winter's monitoring has been deemed sufficient.

Accendo Australia Pty Ltd (Accendo) understands that it is proposed to rezone and subdivide Lot 105 Frenchman Road, Big Grove (herein referred to as the 'subject site') (refer to **Attachment A**). Accordingly, Accendo has undertaken pre-development hydrological monitoring to support rezoning.

The subject site is approximately 20.5 hectares (ha) in size and is located within the City of Albany, approximately 5.5 km southwest of Albany with its northern boundary adjoining the Princess Royal Harbour shoreline. Pursuant to the City of Albany's Local Planning Scheme No. 1, the subject site is currently zoned 'Public Purpose'.

The purpose of the hydrological monitoring investigation was to characterise the underlying groundwater levels and demonstrate the extent of seasonal fluctuations. This information will assist in the design of lot levels in consideration of Maximum Groundwater Levels (MGLs) and identify any potential changes to the hydrological environment post development.

Methodology

Three groundwater monitoring bores were installed within Lot 105 Frenchman Bay Road, on the 5th April 2017 (refer to **Figure 1**). The monitoring bores were positioned based on Accendo's understanding of the hydrology of the subject site and to ensure maximum longevity of the bores.

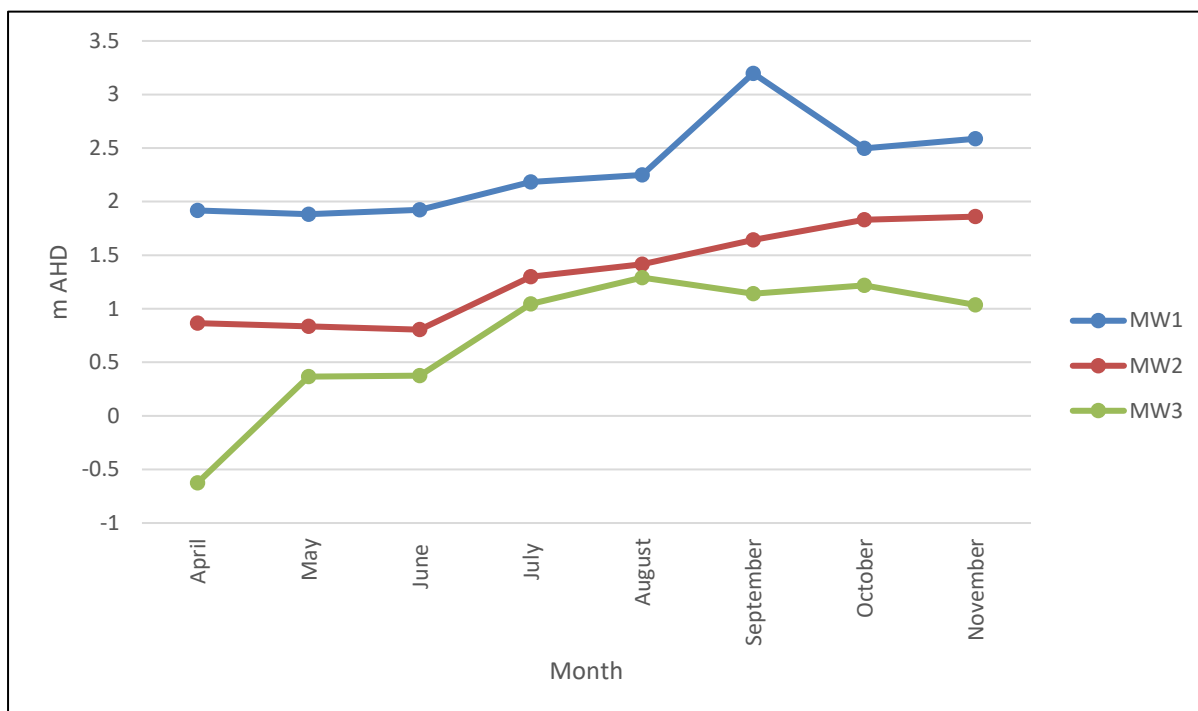
The monitoring bores were installed using a drill rig to an approximate depth of 4m below ground level (BGL). Each monitoring bore was installed with 50 mm PVC casings and approximately 3 m screening to capture seasonal fluctuations. In order to obtain accurate groundwater level readings, the bore heights were surveyed to an accuracy of +/- 2 mm. During the installation of the monitoring bores, light sandy soil types were observed. This is confirmed by observations recorded in the *Local Water Management Strategy* for the Big Grove Development Area (Aurora Environmental 2011) whereby light grey to white sands (predominantly quartz sand) overlying calcareous sands with low dunes and swales and minor underlying limestone, were recorded.

Groundwater level monitoring was conducted at each of the three bores within the subject site from April to November 2017. The sampling program involved measurement of groundwater level monitoring on a monthly basis.

Results

A summary of the monthly groundwater monitoring results is provided within **Appendix A**. The groundwater level results were analysed for the subject site to determine if a peak existed within the data. For the monitoring period, localised peaks were exhibited on the 20th September, 14th November and August 17th for groundwater monitoring bore MW1, MW2 and MW3, respectively. Variability in the timing of the peak groundwater levels in the three bores could be due to the presence of limestone outcrops that were evident during the site visit, which may produce localised perched water tables. Results for the seasonal peak ranged from 1.0m BGL in MW3, located adjacent to the foreshore, to 3.5m BGL in MW1, located in proximity to Frenchman Bay Road. The groundwater level results for the monitoring period are provided below in **Graph 1**.

Graph 1. Groundwater levels within the subject site.



In order to establish long-term trends for groundwater behaviour within the subject site, a search for neighbouring DWER bores was undertaken. The search did not identify any DWER bores within proximity to the subject site that have sufficient data to enable a meaningful comparison, and that are geologically similar. As a result, data from DWER bores has not been used to calibrate groundwater levels within the subject site.

Alternatively, a review of Albany’s long-term averages for rainfall (between 1997 and 2017) was undertaken to determine when a seasonal peak is likely to have occurred during this period. This data shows peak rainfalls usually occur within the June to September period, with the exception of 2008, when an extreme rainfall (1-100yr ARI) event occurred in November. Based on climatology data, peak rainfall in the monitoring period occurred in August and the wettest August in the period reviewed was recorded in 2013 with a total of 203.8mm. The total rainfall recorded within Albany during August 2017 was 166.8mm which equates to an approximate 20% decrease in comparison to the recorded rainfall in August 2013.

Adjustment factors are typically applied to MGLs to provide conservative values in consideration of potential risks associated with the monitoring data. Given that no comparative data is available from nearby DWER bores, it is considered reasonable to apply a 20% adjustment factor to the recorded MGLs in consideration of the rainfall data recorded in 2013. The recorded MGLs for each of the three monitoring bores are provided below in **Table 1**.

Table 1. Adjusted MGLs for the subject site.

Monitoring Bore	Adjusted MGL (m AHD)	Ground Level (m AHD)	Separation Distance (m AHD)
MW1	3.8	6.7	2.9
MW2	2.2	4.8	2.6
MW3	1.5	2.3	0.8

For the monitoring bores within the proposed development footprint a separation distance between the MGL and building floor level of 2.6m AHD is achieved. Monitoring bore MW3 is located within the proposed foreshore reserve and recorded a separation distance of 0.8m AHD, which can be attributed to its location immediately adjacent to the foreshore. Based on these results and in consideration of the proposed Structure Plan, it is likely that adequate separation exists between static groundwater level and the ground surface. Maximum groundwater levels appear to be closest to the surface within the proposed foreshore reserve, where no development will occur.

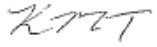
Conclusion

Three groundwater monitoring bores were installed within the subject site on the 5th April 2017. Groundwater level monitoring was conducted at each of the three bores monthly from April to November in 2017.

Based on available groundwater data, it is likely that adequate separation exists between static groundwater level and the ground surface. Maximum groundwater levels appear to be closest to the surface within the proposed foreshore reserve, where no development will occur.

Should you have any queries or concerns relating to any of the above, please do not hesitate to contact the undersigned.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'KMT', enclosed in a thin black rectangular border.

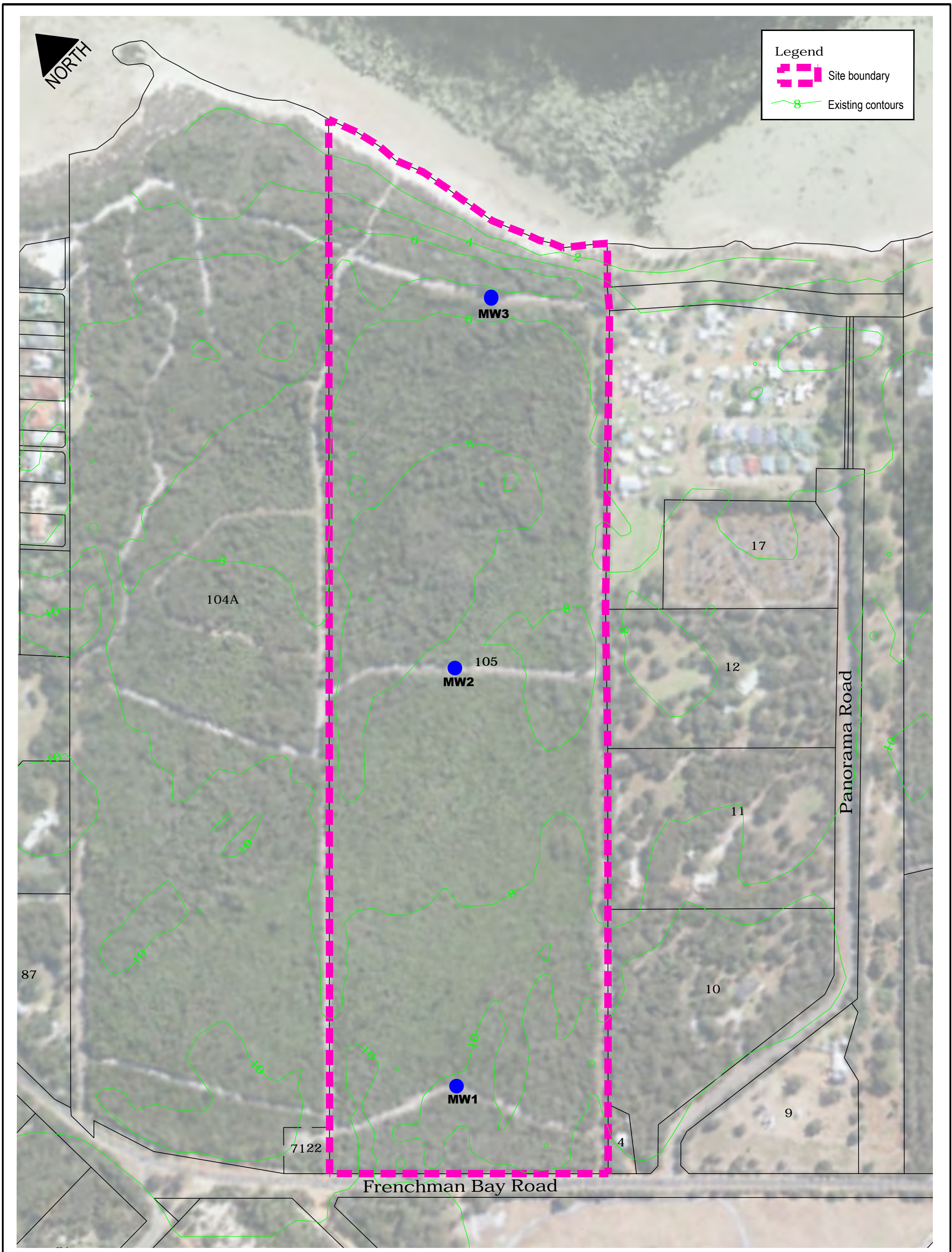
Kirsten Muir-Thompson

Principal Consultant

Telephone 9755 7217

Mobile 0418 950 852

FIGURES



PROJECT Lot 105 Frenchman Bay Road, Big Grove

DRAWING TITLE **FIGURE 1** - Subject Site

CLIENT Roman Catholic Bishop of Bunbury

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Scale **1:3000** 0 20 40 60 80 100 200 300

	PO Box 5178 West Busseton Western Australia 6280 Telephone (08) 9755 7217 Mobile 0418 950 852	Project Number 1702	Drawing Number FIG 1	Revision A	Original A3
	Designed KMT Drawn DTF Local Authority City of Albany	Checked Approved	Date 29-01-16 Sheet 1 of 1		

APPENDIX A – STRUCTURE PLAN



LEGEND	
	SUBJECT LAND
	EXISTING CONTOURS
	PROPOSED BOUNDARIES
	PROPOSED FORESHORE RESERVE
	PROPOSED VEGETATION CORRIDOR
	SOUTH COAST WATER RESERVE
	BIO-RETENTION BASIN (INDICATIVE)
	VEGETATION RETENTION IN WATER RESERVE
	BLACK ASPHALT
	RED ASPHALT
	GRAVEL/LIMESTONE TRACK (4.0m)
	SHARED PATH (2.5m)
	FOOTPATH (2.0m)
	RESIDENTIAL

1:1500 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

PROJECT: LOT 105 / HOUSE 795 FRENCHMAN BAY ROAD, BIG GROVE
 DRAWING TITLE: STRUCTURE PLAN
 PRINCIPAL: ROMAN CATHOLIC BISHOP OF BUNBURY

ABLE
 PLANNING & PROJECT MANAGEMENT
 29 New River Road, West Bunbury WA 6280
 Mobile: 0818 521 419
 Email: Abledesign@ablepm.com.au
 ABN: 64 950 568 762

Date	22/06/16	Scale	1:1500
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Drawn	DF	Approved	AB
Local Authority	City of Albany	Sheet	1 of 1
Plan/Diagram Number	230421	CF Number	2182-323
Revision			A

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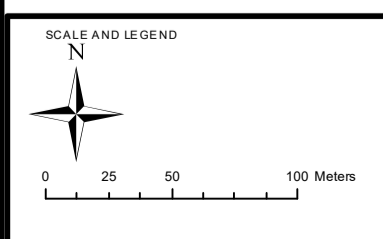
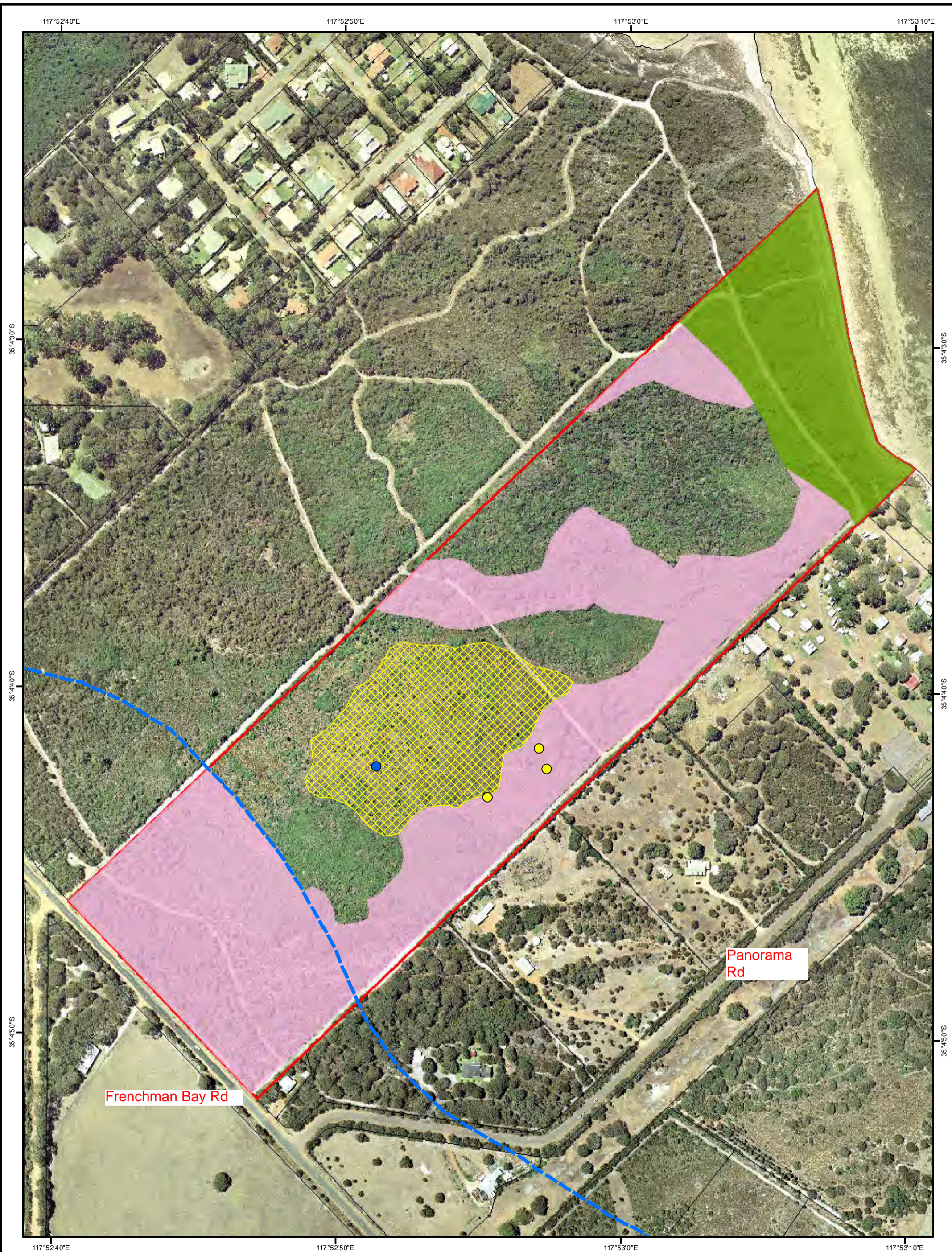
ORIGINAL A1

APPENDIX B – GROUNDWATER LEVEL MONITORING DATA

Groundwater Level Monitoring 2017

	12-Apr		10-May		7-Jun		19-Jul		17-Aug		20-Sep		18-Oct		14-Nov	
	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD	Level from Cd	Level AHD
MW1	5.46	1.918	5.495	1.883	5.455	1.923	5.195	2.183	5.13	2.248	4.18	3.198	4.88	2.498	4.79	2.588
MW2	4.725	-0.865	4.755	-0.835	4.785	-0.805	4.29	1.3	4.175	1.415	3.948	1.642	3.76	-1.83	3.73	-1.86
MW3	3.646	-0.625	2.655	-0.366	2.645	0.376	1.975	1.046	1.73	1.291	1.88	1.141	1.802	1.219	1.985	1.036

APPENDIX B - CONSTRAINTS MAPPING (OPUS 2014)



Legend

Subject site	Amperea protensa P3
PEC 23 Priority 1	Adenanthos cunninghamii P4
Proposed Foreshore Reserve	South Coast Water Reserve

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TITLE		Lot 105 Frenchman Bay Road, Albany	
Constraints Mapping			
STATUS	FINAL	FILE	W-A1138.00/004AN
SCALE	1:3,000	PLOT DATE	05/05/14

APPENDIX C – CORRESPONDANCE FROM WATER CORPORATION

From: Frank Kroll
To: Aaron@ableplanning.com.au
Subject: FW: Lot 105 Frenchman Bay Road Big Grove Albany
Date: Wednesday, 11 March 2015 8:40:17 AM
Attachments: [201503101614.pdf](#)
[201503101614.pdf](#)

File: JT 2011 09903 V01

Hi Aaron

With respect to your email requesting information dated 24 February 2015.
Refer also to Plan showing existing water and sewer networks.

Report - Environmental Opportunities and Constraints Analysis:

The only comment we have is that if you wish to extract groundwater, the matter should be referred to the Department of Water.

Wastewater:

Attached is plan of proposed system (Long Term Scheme Little Grove SD219).
A new Little Grove Pump Station C will be required that will pump via a DN100 pressure main to an existing DN225 gravity sewer. This is a headworks item that would need to be scheduled by the Corporation once developer intentions were quantified. Should funds not be available when required by development, prefunding may be an option.

Water Supply:

The area is supplied from the Albany Mt Melville Tank that at the South Coast Headworks is a DN200, then into smaller diameter mains ending in DN100 at Little Grove. This supply is likely to be inadequate for the development of Lot 105. It is planned to augment supply via a new DN375 in the future. These works have not yet been scheduled, and will be constructed in stages based on development demand.

Funding:

All reticulation size mains (those under DN300) are to be funded by the developer. Prefunding of headworks (pipes DN300 and over and pump stations) may be required.

Should you have any further queries, please contact me.

Regards

Frank Kroll
Senior Development Planner
Development Services Branch

Water Corporation
Planning & Capability Group

629 Newcastle Street Leederville 6007
Telephone: (08)9420 2221
Fax: (08)9420 3193
Email: frank.kroll@watercorporation.com.au

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EXISTING WATER
& WASTE WATER
NETWORKS.

EXISTING
DN 225
SEWER.

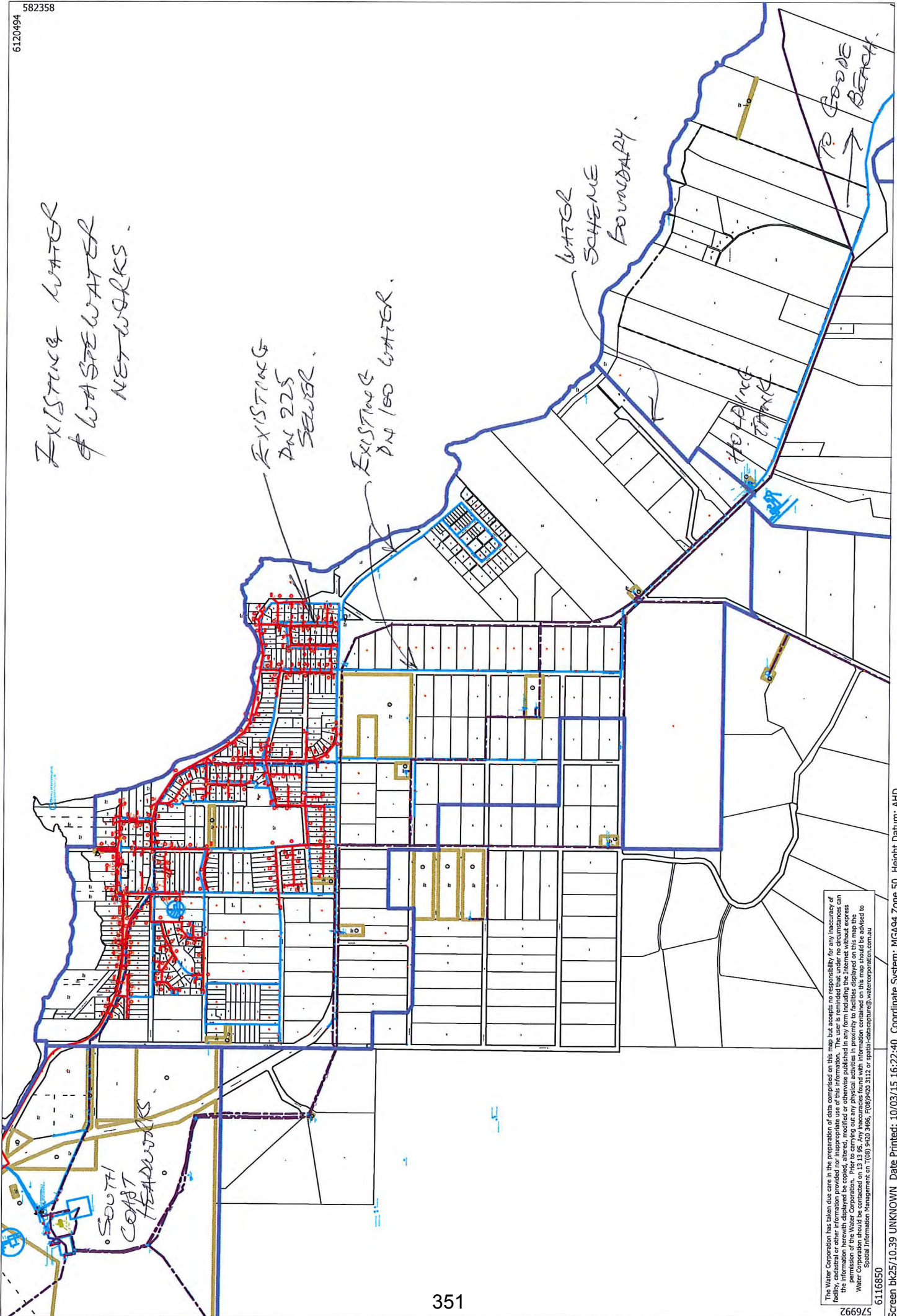
EXISTING
DN 100 WATER.

WATER
SCHEME
BOUNDARY.

HOLDING
TANK

GOODE
BEACH.

SOUTH
COAST
HEADWORKS



The Water Corporation has taken due care in the preparation of data compiled on this map but accepts no responsibility for any inaccuracy of facility, cadastral or other information provided nor inappropriate use of this information. The user is reminded that under no circumstances can the information shown be copied, altered, modified or otherwise published in any form including the internet without express consent of the Water Corporation. For more information on the data displayed on this map the user should contact the Spatial Information Management on (08) 9420 3112 or spatial-data@watercorporation.com.au

TECHNICAL APPENDIX 3 – INFRASTRUCTURE SERVICING REPORT

(Able Planning & Project Management, 2016)

INFRASTRUCTURE SERVICING REPORT

*Lot 105 on Deposited Plan 230421, House 795 Frenchman Bay Road,
Big Grove (Certificate of Title 2182-323)*



PREPARED BY:

<p>ABLE</p> <p>PLANNING & PROJECT MANAGEMENT</p>	
<p>29 New River Ramble, West Busselton WA 6280 Mobile: 0438 521 419 Email: Aaron@ableplanning.com.au ABN: 64 565 568 362</p>	<p><i>"The subdivision experts in WA"</i></p>

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2.0	STUDY AREA	1
2.1	SITE DESCRIPTION	1
2.2	TOPOGRAPHY.....	2
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2.4	ACID SULFATE SOILS.....	2
2.5	ADJOINING LOTS & FUTURE SURROUNDING DEVELOPMENT	2
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Report Author: AJB

Report Date: February 2015

Revision No. 1

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1.0 INTRODUCTION

On 15th March 2011 the City of Albany council resolved as follows in respect to the submitted scheme amendment request (SAR):

“THAT Council ADVISE the proponent that it is PREPARED to consider a formal scheme amendment to rezone Lot 105 Frenchman Bay Road, Big Grove from the ‘Public Purpose’ reserve to the ‘Residential Development’ zone, subject to the following matters being addressed and/or included as part of that formal amendment application:

- A. Studies on the biodiversity and conservation values of the land being provided to the satisfaction of the Department of Environment and Conservation.***
- B. The identification of an appropriate foreshore reserve in accordance with the Western Australian Planning Commission Statement of Planning Policy 2.6.***
- C. The protection of the South Coast Water Reserve and the existing well-head on Reserve 931 to the satisfaction of the Department of Water and the Water Corporation.***
- D. The land required for vegetation protection, water resource protection, foreshore reserve and fauna habitat and corridor protection should be designated as ‘Parks and Recreation’ reserve.***
- E. The inclusion of a Local Water Management Strategy to the satisfaction of Council and the Department of Water.***
- F. The addressing of infrastructure provision and servicing requirements, inclusive of any associated buffers and easements to the satisfaction of the various servicing authorities.”***

The project team submitted studies and documents covering items A – D of the above resolution in June 2015. The City of Albany has since confirmed that these reports have broadly satisfied items A – D for the purposes of considering a scheme amendment.

At the time of preparing this report, only the local water management strategy and this infrastructure servicing report remain outstanding.

2.0 STUDY AREA

2.1 SITE DESCRIPTION

The subject lot is described as Lot 105 on Deposited Plan 230421, as contained within Certificate of Title 2182 Folio 323. The street address is 795 Frenchman Bay Road, Big Grove. The lot is freehold and is held in fee simple by the Roman Catholic Bishop of Bunbury.

The subject lot is 20.2343 ha in area and is approximately 10 km from the Albany city centre via road (see Figure 1 – Location Plan).

Legal access to the lot is provided by Frenchman Bay Road, which abuts the entire length of the southwest boundary. Frenchman Bay Road is constructed to a two-way asphalt / bitumen sealed standard.

The land is not currently used for any purpose.

2.2 TOPOGRAPHY

The land grades away from a height of approximately 8.5 m Australian Height Datum (AHD) near the southern corner adjoining Frenchman Bay Road to approximately 2.5 m AHD near the northern corner in proximity to the foreshore. It then rises to between 4.5 - 5.0 m AHD in the form of a relatively steep foreshore dune, then falls away towards the waterline.

2.3 VEGETATION

The subject lot contains bands of four main remnant vegetation complexes; sedge-land, low woodland, closed shrub-land and medium to tall woodland. Clearing has generally been limited to boundary and internal firebreaks / access tracks, but there have been numerous other incidental disturbances through trespass and fire. The condition and quality of this remnant vegetation has been documented by environmental scientists and peer reviewed by the Department of Parks and Wildlife (DPaW).

2.4 ACID SULFATE SOILS

The Department of Environment Regulation (DER) acid sulfate soil (ASS) mapping indicates that there is no known risk of any acid sulphate soils occurring within the site.

Readings by Department of Water at the nearby bore site also reveal that the elevation of maximum groundwater levels (MGLs) has decreased from approximately 3 – 3.5 m AHD in the late nineteen-seventies to 1.25 m AHD to the mid nineteen-eighties. Even discounting that further falls may have occurred since the nineteen-eighties, more than adequate clearance is provided on the site between estimated development levels and MGL.

Because on-site excavations for service installation and earthworks to re-contour and shape the land for development are not expected to intersect the ground water table, the risk of encountering acid sulphate soils is marginal. It is therefore not expected that any management plan would be required or dewatering licenses needed in the subdivision of Lot 105.

Notwithstanding this, normal precautions will be undertaken when carrying out any excavations, including trenching to extend / connect pipes and cables.

2.5 ADJOINING LOTS & FUTURE SURROUNDING DEVELOPMENT

Lot 7122 (Reserve 29669) and Lot 104 (Reserve 931) adjoin the northwest boundary. Lot 7122 is 1,616 m² in area and vested with the Water Corporation. It is used as a bore site for drinking water. Lot 104 is 20.840 ha in area and is not currently used for any purpose.

There is an endorsed outline development plan (ODP) for the land to the immediate southeast (i.e. Lots 2, 4, 16, 301 - 303 and 9000 Frenchman Bay Road and Lots 9 – 12 Panorama Road, Big Grove). It shows a local road adjoining the boundary common to the subject lot and the ODP area, with R10 transition lots fronting onto Lot 105. The adjoining road and the extension of the foreshore reserve provide excellent opportunities for through road access and the creation of a shared path system along the foreshore. Further, the addition of Lot 105 to this development cell will assist in extending vital reticulated services to the ODP area and beyond.

Lot 6926 (Reserve 27052) also adjoins the southeast boundary, and this forms part of the Princess Royal Harbour foreshore reserve system. Lot 66 adjoins the southeast too, but at just over 20 m wide, it is thought that this strip of land was / is intended to form part of a foreshore road. Lot 66 is owned by the State of WA.

The northeast boundary of the subject property is the waterline of Princess Royal Harbour. Any coastal setback to this waterline will need meet the requirements of *State Planning Policy 2.6 – State Coastal Planning Policy (SPP 2.6)* and have its foreshore reserve boundary tie in with that proposed for adjoining land. The proposed foreshore reserve for Lot 105 is identified on the environmental constraints map prepared by Opus and is defined by the prominent and stabilised dune ridge (rising to over 6 m AHD) and the coastal vegetation complex occupying this.

3.0 SITE WORKS & ROAD WORKS

3.1 GENERAL

Site works for residential development comprises the clearing of existing vegetation, stripping of topsoil on-site and earth-working the existing ground surfaces to facilitate a required form of development. Strict clearing protocols will be enforced to ensure the desired trees for retention are identified and suitably protected during civil works. Some tree retention may be possible in the road verges and if any open space or drainage areas are nominated on the plan of subdivision.

3.2 EARTHWORKS

Earthworks to prepare the site suitably for residential development would comprise of stripping topsoil on site. Depending on the subdivision outcomes of the OPD process, the lots may be sufficiently sized where no filling or partial filling may only be required by the authorities. The earthworks design for Lot 105 should in any case be undertaken in view of the surrounding landform and development levels, and take a minimalist approach to fill and retaining whatever the ODP outcomes.

Due to the expected sandy nature of the site (albeit underlain by some sedimentary cap-rock), if residential lots below 1,000 m² were to be created, earthworks would be undertaken such that foundations for residential development on the proposed lots can be designed for the Australian Standard Classification "A", as set out in AS 2870-1996. It should be noted, however, that this would be subject to-

- Geotechnical investigations and any necessary site preparation requirements.
- Cutting of the high point and battering into adjoining lots where possible to achieve a more efficient overall earthwork design and avoid unnecessary retaining walls on the boundary of lots.
- The use of retaining walls only where absolutely necessary to manage the level differences on site (retaining walls would be constructed from reconstituted limestone as is common industry practice).

Lots above 1,000 m² may require only partial working and no retaining at all, while low-density lots above 1,800 m² may require no working at all (i.e. owners develop their own sand pad within the confines of generous setbacks).

3.3 ROADWORKS

Access to the development is available from Frenchman Bay Road to the immediate southwest which is a City of Albany asset. Frenchman Bay Road is currently a 7.5 m wide chip sealed pavement with wide gravel shoulder. It is signposted at 70 km / h.

Although there is no current subdivision concept, it is envisaged that a single 'T' intersection onto Frenchman Bay Road would be the primary form of access to any subdivision. A detailed design review of the proposed intersection would not normally be required given that adequate sight distances exist and the fact that less than 100 lots / dwellings would likely be realised.

Notwithstanding this, the City of Albany has advised that–

- a traffic impact assessment will be required, possibly at the structure plan stage; and
- the intersection will also likely need special treatment, possibly in the form of a passing bulge and left turn pocket.

The client would likely seek clarification from the Department of Planning / Western Australian Planning Commission (WAPC) on the specific need for a traffic impact assessment depending on the number of lots yielded among other factors.

From a primary 'T' intersection, internal access roads shall provide for linkage to the road proposed to be developed along the southeast boundary of Lot 105 as per the endorsed ODP for the adjoining land. The City of Albany has advised that it is not supportive of only one point of access. It states that the absence of a second point of ingress or egress would be at odds with the requirements of the *Guidelines for Planning in Bushfire Prone Areas* wherein cul-de-sacs and / or dead-end roads are to be avoided in bushfire prone areas. That being the case, it will be necessary for the internal road network to connect back to Panorama Road via this new road system, or for a second 'T' intersection to be developed direct to Frenchman Bay Road.

In addition to this, and if at all possible, the City of Albany has also asked that the proponent explore a through road connection to Little Grove in the north-west. That is despite this adjoining land (i.e. Lot 104 on Deposited Plan 230421, Reserve 931) being reserved and hence severely limiting this from occurring. At the very least an emergency access way through to this northwest reserve will be explored.

The internal subdivision roads within Lot 105 would be paved with asphalt and kerbed in accordance with relevant City of Albany guidelines. Alternative treatments such as brick paving and coloured asphalt may be incorporated which will be resolved at the design stage. The road reserves will also include pedestrian and dual use path networks. A car park may also be required in proximity to the foreshore to satisfy the public access requirements of SPP 2.6.

The City of Albany has advised that a development contribution plan will be required prior to subdivision. This would most likely be required at the structure plan stage, unless it is envisaged that any subdivision would take place prior to structure planning. Proportionate contributions may be required to upgrade Frenchman Bay Road back to Hanrahan Road / Princess Royal Drive intersection.

4.0 STORMWATER DRAINAGE

Due to the expected sandy nature of soils within the site, good drainage through soak wells within subdivided lots should be available. As Lot 105 forms part of a slope towards the foreshore, stormwater drainage collected in the road reserves will be likely graded naturally towards the foreshore where it will be detained, treated and slowly released into the groundwater system. Such a drainage system would be designed and constructed according to City of Albany guidelines and specifications to capture and direct flows for a 1 in 5 year storm event. Events greater than a 1 in 5 storm event will be directed through overland flood paths.

The broad drainage management measures will be defined through the local water management strategy (LWMS) being prepared concurrently with this infrastructure servicing report.

After subdivision design is established via ODP process, a detailed urban water management plan (UWMP) will be prepared and implemented via condition of WAPC subdivision approval. Both the LWMS and UWMP will require approval of both the Department of Water and City of Albany.

5.0 WASTEWATER

In its email advice dated 11th of March (**see Figure B – Water Corporation Email**), the Water Corporation advised as follows with regard to wastewater.

“Wastewater: Attached is plan of proposed system (Long Term Scheme Little Grove SD219). A new Little Grove Pump Station C will be required that will pump via a DN100 pressure main to an existing DN225 gravity sewer. This is a headworks item that would need to be scheduled by the Corporation once developer intentions were quantified. Should funds not be available when required by development, prefunding may be an option.”

The relevant plan of the proposed sewer and water scheme is also enclosed (**see Figure C – Water Corporation Sewer and Water Strategy Plans for Big Grove**).

It is important to note here that, should the ODP outcomes provide for lots in excess of 2,000 m², such could be developed without the need for reticulated sewerage under the Country Sewerage Policy. In that case, conventional septic tank and leach drain systems may be appropriate, or even aerobic treatment units with surface irrigation if geotechnical investigations do not support conventional septic systems.

Notwithstanding this, the City of Albany has advised that 2000m² lots would not be supported in this location. As it explains, “[t]he **Big Grove Outline Development Plan indicates fully serviced urban lots and it is considered that the development of Lot 105 should be to the same standard. It will also improve the viability of development in the area if reticulated sewer is to be provided to all lots.**”

6.0 WATER SUPPLY

In its email advice dated 11th of March (see **Figure B – Water Corporation Email**), the Water Corporation advised as follows with regard to water supply.

“Water Supply: The area is supplied from the Albany Mt Melville Tank that at the South Coast Headworks is a DN200, then into smaller diameter mains ending in DN100 at Little Grove. This supply is likely to be inadequate for the development of Lot 105. It is planned to augment supply via a new DN375 in the future. These works have not yet been scheduled, and will be constructed in stages based on development demand. Funding: All reticulation size mains (those under DN300) are to be funded by the developer. Prefunding of headworks (pipes DN300 and over and pump stations) may be required.”

A plan showing the precise location of the existing DN100 pipe in the northeast verge of Frenchman Bay Road is included (see **Figure D – Water Corporation Water Reticulation Plan**).

7.0 POWER SUPPLY

There are existing high-voltage (22 kV), three-phase Western Power overhead aerials along the northeast side of Frenchman Bay Road (see **Figure E – Western Power Overhead Power Plan**) which provide services to surrounding areas from the Albany substation in north McKail. As these aerials are on the same side of Frenchman Bay Road to Lot 105, there may be a requirement to remove and relocate underground if Lot 105 were subdivided. This is unlikely, however, given that a significant groundwater protection / road buffer reserve would front Frenchman Bay Road if Lot 105 were subdivided. Further, the network capacity mapping tool on the Western Power website does not show this as a critical area, so it is unlikely any major upgrades or network reinforcement would be required for Frenchman Bay Road.

Works within the subdivision boundary would be designed with consideration to the surrounding proposed development areas. Therefore, the standard high-voltage pool and subdivision policies will apply. Street lights will be required as per the City of Albany policy.

The effects of any earth potential rise (EPR) issues have not been investigated, however if any high pressure steel Water Corporation pipelines are in the vicinity extra investigation and reporting may be required.

The details in this report are only indicative. Further in-depth study and analysis can only be required to determine the exact requirement of any (if required) reinforcement works once a formal application to Western Power has been lodged.

Western Power will neither reserve capacity nor guarantee supply to this or any development without a formal request being lodged.

8.0 TELECOMMUNICATIONS

The existing Telstra communications plan is enclosed (see **Figure F – Telstra Cable Plan**).

NBN Co has not been rolled out in Albany at this point. If it has occurred by the time the subdivision has reached engineering design submission phase, plans will need to be prepared and approved by NBN Co. Then a developer agreement will be necessary prior to any construction works commencing.

With the National Broadband Network rollout, the developer is responsible for providing pit and pipe infrastructure throughout the subdivision for the fibre to be installed. NBN Co will cover the costs of installing fibre infrastructure in the development, including backhaul.

Any NBN Co communications design will require the inclusion of a fibre distribution hub (FDH) within the road reserve system. The FDH is an unpowered, street side cabinet used to provide an optical connection point between the distribution and local network.

As part of any developer agreement conditions, NBN Co will take over ownership of the assets upon completion and ensure that fibre is ready 3 months prior to the first occupancy for a new development.

9.0 GAS SUPPLY

Albany is not yet serviced by a reticulated natural gas network.

Should it become serviced in the future, it is envisaged that the older parts of Albany would be serviced first, then it will be retrofitted to other suburbs over time.

While there is reticulated liquefied petroleum gas (LPG) in Albany, this is not connected to Little Grove or Big Grove localities and it is not expected that this network will be extended in the near future.

FIGURE A
LOCATION PLAN

FIGURE B

WATER CORPORATION EMAIL

Aaron Bell

From: Frank Kroll <Frank.Kroll@watercorporation.com.au>
Sent: Wednesday, 11 March 2015 8:40 AM
To: Aaron@ableplanning.com.au
Subject: FW: Lot 105 Frenchman Bay Road Big Grove Albany
Attachments: 201503101614.pdf; 201503101614.pdf

File: JT 2011 09903 V01

Hi Aaron

With respect to your email requesting information dated 24 February 2015. Refer also to Plan showing existing water and sewer networks.

Report - Environmental Opportunities and Constraints Analysis:

The only comment we have is that if you wish to extract groundwater, the matter should be referred to the Department of Water.

Wastewater:

Attached is plan of proposed system (Long Term Scheme Little Grove SD219). A new Little Grove Pump Station C will be required that will pump via a DN100 pressure main to an existing DN225 gravity sewer. This is a headworks item that would need to be scheduled by the Corporation once developer intentions were quantified. Should funds not be available when required by development, prefunding may be an option.

Water Supply:

The area is supplied from the Albany Mt Melville Tank that at the South Coast Headworks is a DN200, then into smaller diameter mains ending in DN100 at Little Grove. This supply is likely to be inadequate for the development of Lot 105. It is planned to augment supply via a new DN375 in the future. These works have not yet been scheduled, and will be constructed in stages based on development demand.

Funding:

All reticulation size mains (those under DN300) are to be funded by the developer. Prefunding of headworks (pipes DN300 and over and pump stations) may be required.

Should you have any further queries, please contact me.

Regards

Frank Kroll
Senior Development Planner
Development Services Branch

Water Corporation
Planning & Capability Group

629 Newcastle Street Leederville 6007

Telephone: (08)9420 2221

Fax: (08)9420 3193

Email: frank.kroll@watercorporation.com.au

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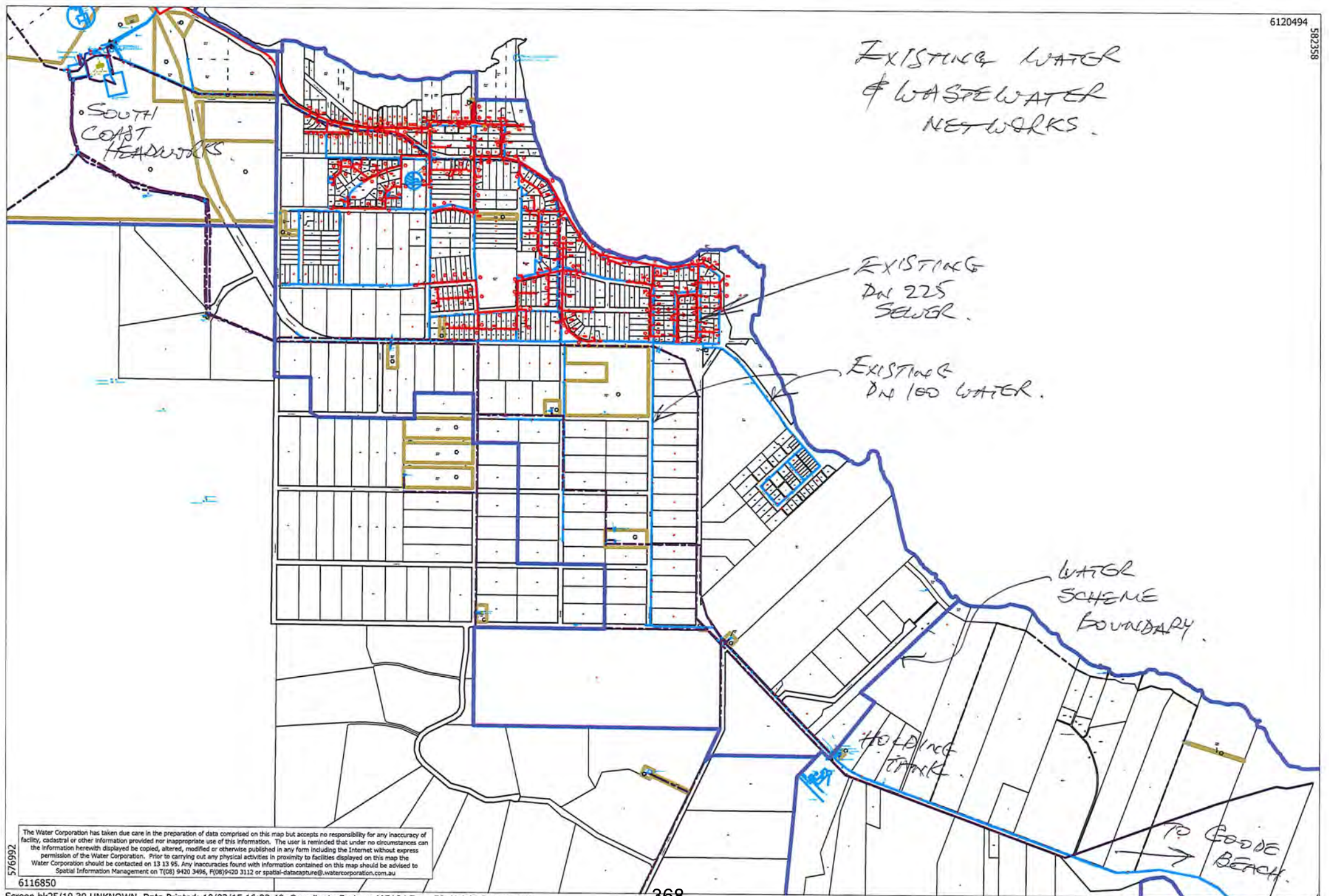
This Electronic Mail Message and its attachments are confidential. If you are not the intended recipient, you may not disclose or use the information contained in it. If you have received this Electronic Mail Message in error, please advise the sender immediately by replying to this email and delete the message and any associated attachments. While every care is taken, it is recommended that you scan the attachments for viruses.

This message has been scanned for malware by Websense. www.websense.com

FIGURE C

**WATER CORPORATION SEWER AND
WATER STRATEGY PLANS FOR BIG
GROVE**

EXISTING WATER & WASTEWATER NETWORKS



SOUTH COAST HEADWORKS

EXISTING DN 225 SEWER

EXISTING DN 100 WATER

WATER SCHEME BOUNDARY

HOLDING TANK

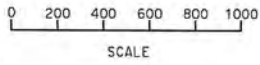
TO COODE BEACH

The Water Corporation has taken due care in the preparation of data comprised on this map but accepts no responsibility for any inaccuracy of facility, cadastral or other information provided nor inappropriate use of this information. The user is reminded that under no circumstances can the information herewith displayed be copied, altered, modified or otherwise published in any form including the Internet without express permission of the Water Corporation. Prior to carrying out any physical activities in proximity to facilities displayed on this map the Water Corporation should be contacted on 13 13 95. Any inaccuracies found with information contained on this map should be advised to Spatial Information Management on T(08) 9420 3496, F(08)9420 3112 or spatial-datacapture@watercorporation.com.au

576992

6116850

THE INFORMATION CONTAINED HEREIN IS SUBJECT TO ONGOING REVIEW AND AMENDMENTS AND SHOULD BE READ IN CONJUNCTION WITH THE ASSOCIATED REPORT.

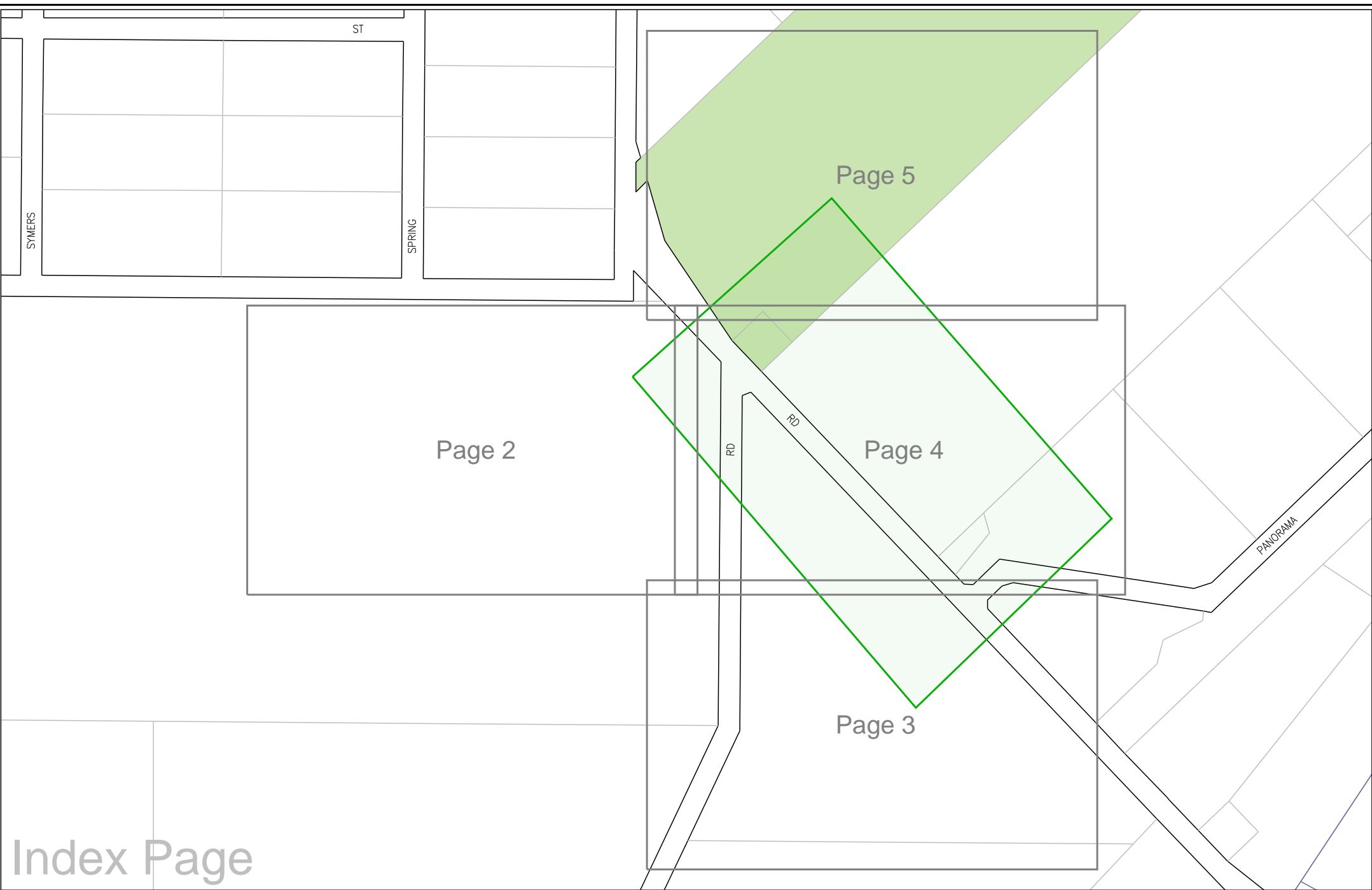


AUTHOR: ROWLESCO DESIGN FILE: SD129BOR.DGN
 PROJECT N°: WC211 DATE: 23/07/2009 COORDINATE SYSTEM: MGA84 - Zone 50



LONG TERM SCHEME
 LITTLE GROVE SD219

FIGURE D
**WATER CORPORATION WATER
RETICULATION PLAN**



Index Page

Scale: 1:4567

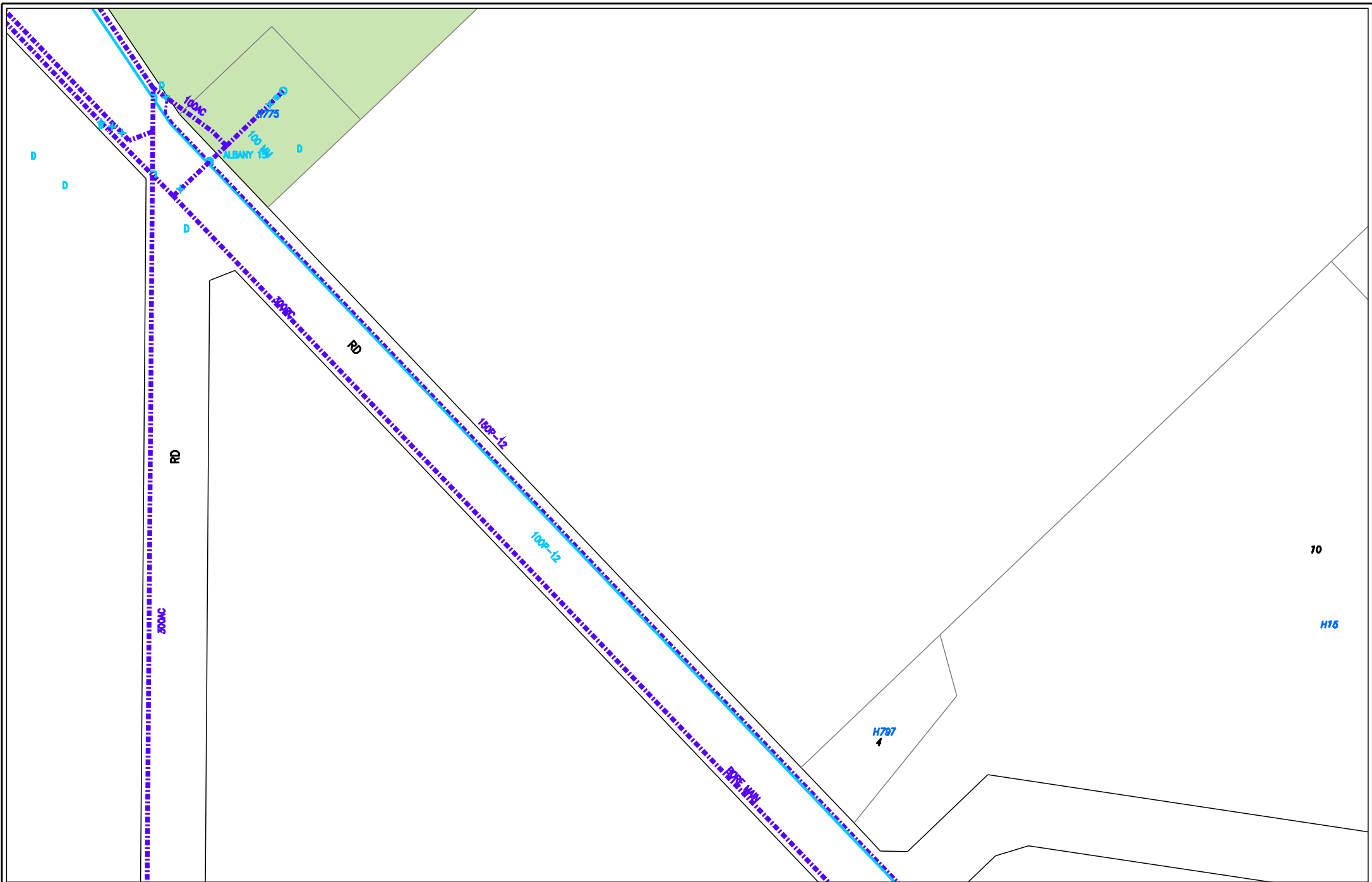
Sequence No: 48320224

Print Date: 06/10/2015 Page: 1 of 5



WARNING - CRITICAL PIPELINE
Refer to Information Brochure Damage
Prevention and **Legend for details**

The Water Corporation has taken due care in the preparation of this map but accepts no responsibility for any inaccuracies or inappropriate use. This plan may be reproduced in its entirety for the purpose of site work planning but shall not otherwise be altered or published in any form without the permission of the Water Corporation. The Water Corporation may need to be advised of any planned ground disturbing activities near facilities on this map. Refer to Brochure - "Protecting Buried Pipelines". Please report any inaccuracies to Spatial Information Management Group on (08) 9420 3496.



Scale: 1:1500 Centre Point: 117.879°, -35.080°
 Sequence No: 48320224
 Print Date: 06/10/2015 Page: 4 of 5



WARNING - CRITICAL PIPELINE
 Refer to **Information Brochure Damage Prevention and Legend** for details

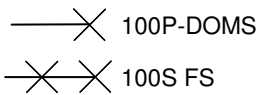
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This legend is provided to [Dial Before You Dig](#) users to assist with interpreting Water Corporation plans. A more detailed colour version can be downloaded from www.watercorporation.com.au.

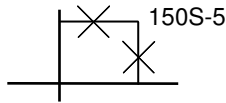
WARNING - Plans do not always show all pipes and associated equipment at a site or their accurate location. Pothole by hand to verify asset location before using powered machinery.

	<p>WATER, SEWERAGE AND DRAINAGE PIPELINES</p> <p>CRITICAL PIPELINE (thick line) EXTRA CAUTION REQUIRED A risk assessment may be required if working near this pipe. Refer to your Dial Before You Dig information or call 131375.</p> <p>Pipes are not always labelled on plans as shown here – assume all pipes are significant and pothole to prove location and depth.</p> <p>P.M. pressure main M.S. main sewer R rising main (i.e. drainage pressure main)</p> <p>Common material abbreviations: AC asbestos cement e.g. 100AC NOTE: AC is brittle and is easily damaged. CI cast iron GRP glass reinforced plastic P PVC - class follows pipe material (e.g.100P-12) RC reinforced concrete S steel VC vitrified clay</p>
	<p>NON-STANDARD ALIGNMENT Pipes are not always located on standard alignments due to local conditions. (i.e. Other than 2.1 m for reticulation mains and 4.5 m for distribution mains.)</p>
	<p>OTHER PIPE SYMBOLS Other numbers or codes shown on pipes are not physical attributes. These are Water Corporation use only.</p>
	<p>CONCRETE ENCASEMENT, SLEEVING AND TUNNELS May be in different forms: steel, poured concrete, box sections, slabs.</p>
	<p>CHANGE INDICATOR ARROW Indicates a change in pipe type or size. e.g. 150mm diameter PVC to 150mm diameter asbestos cement (AC).</p>
	<p>PIPE OVERPASS The overpass symbol indicates the shallower of the two pipes.</p>
	<p>VALVES Many different valve types are in use. Valve may be in a pit or have a visible valve cover. There may be no surface indication.</p> <p>Valves may be shallower than the main or offset from it. e.g. A scour valve (SC) may have a pipe coming away from main pipeline on the opposite side to that indicated on the plan.</p>



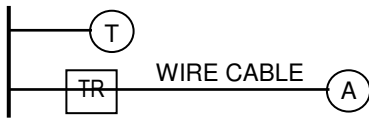
FIRE SERVICES

100 mm polythene domestic (DOMS) service
 FS Fire service
 FHS Fire hydrant service
 Hydrant may be visible external to the building. Even if not visible a substantial fire service may still be present.



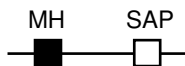
PIPE BYPASS

Bypass will not be on the same alignment as the main pipeline.



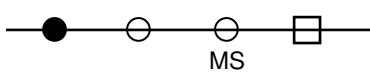
CATHODIC PROTECTION (CP)

Buried CP equipment may be located some distance from the pipeline being protected interconnected by buried cable. All CP fittings may not be visible.
 A buried anode – various sizes and configurations
 TP test point - may be visible on a post or in-ground
 TR transformer rectifier



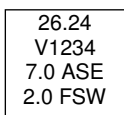
ACCESS TEE OR MANHOLE OR SERVICE ACCESS PIT

NOTE: Opening any manhole or pit is dangerous and is prohibited.
 Below ground. May not be any visible signs at ground level or may be located in a pit.



WASTEWATER ACCESS CHAMBERS (MANHOLES)

-- Manhole (shown not labelled)
 -- Tee or maintenance shaft (shown not labelled)
 MS maintenance shaft (labelled)
 WARNING: Opening any manhole or pit is dangerous and is prohibited.



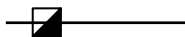
WASTEWATER MANHOLE INFORMATION BOXES

Square non-trafficable Do not drive vehicles over or place loads.
 Round trafficable
 In general if not located in the road treat as if non-trafficable.



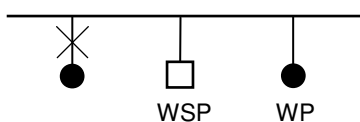
HAZARDOUS MANHOLE

Indicates a potential health hazard from risk of exposure to toxic waste.
 WARNING: Opening any manhole is dangerous and is prohibited.



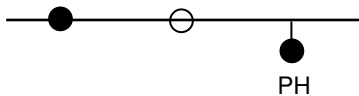
FLOWMETER

Various types of flow meters located in a pit. May be labelled with identifier. (e.g. 50 MFM, 50MM)

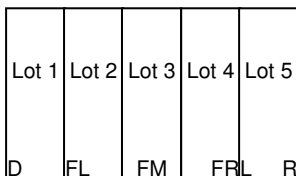


STANDPIPE, WATER SAMPLING POINT (WSP), WATER SUPPLY POINT (WP)

May be located adjacent to mains. Usually there will be some visible indication.



Hydrant May not be visible.
Hydrant Tee May not be visible.
Pillar hydrant Visible



PRE-LAID SERVICES

D Deferred
 FL Fully Pre-laid Left
 FM Fully Pre-laid Front Middle
 FR Fully Pre-laid Right
 L Left
 R Right

Code indicates on which side of a lot the water service is located:

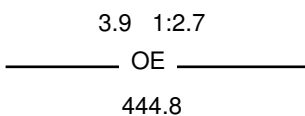
May be no visible indication at site.

SOUTH PERTH PS1



SEWER OR DRAINAGE PUMP STATION

Several pipes and a pressurised main will be in the vicinity.



OPEN CHANNEL

OA Landscaped
 OE Normal Open Earth
 OF Open channel with flood levee
 OH Half Pipe
 OL Lined Channel
 OS Swale-Shallow Depression
 OW Natural Water Course

Drainage structures, even if dry, must be kept clear of any obstruction such as sand stockpiles.

FIGURE E
**WESTERN POWER OVERHEAD POWER
PLAN**

OVERVIEW ONLY



OVERHEAD LEGEND

Structures

- Power Pole
- Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- ▭ Area of Interest

* Please refer to coversheet

Privately owned cables NOT SHOWN (including house services)

This map is **INDICATIVE ONLY**.
Check that you have enough clearance from the **DANGER ZONES** near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days from date of issue

A4

Scale : 1:5125

WARNING! Look out for overhead power lines

Tandrup

Spring

Panorama

Frenchman Bay

Humbrey

376



OVERHEAD LEGEND

Structures

- Power Pole ■ Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

**Privately owned cables NOT SHOWN
(including house services)**

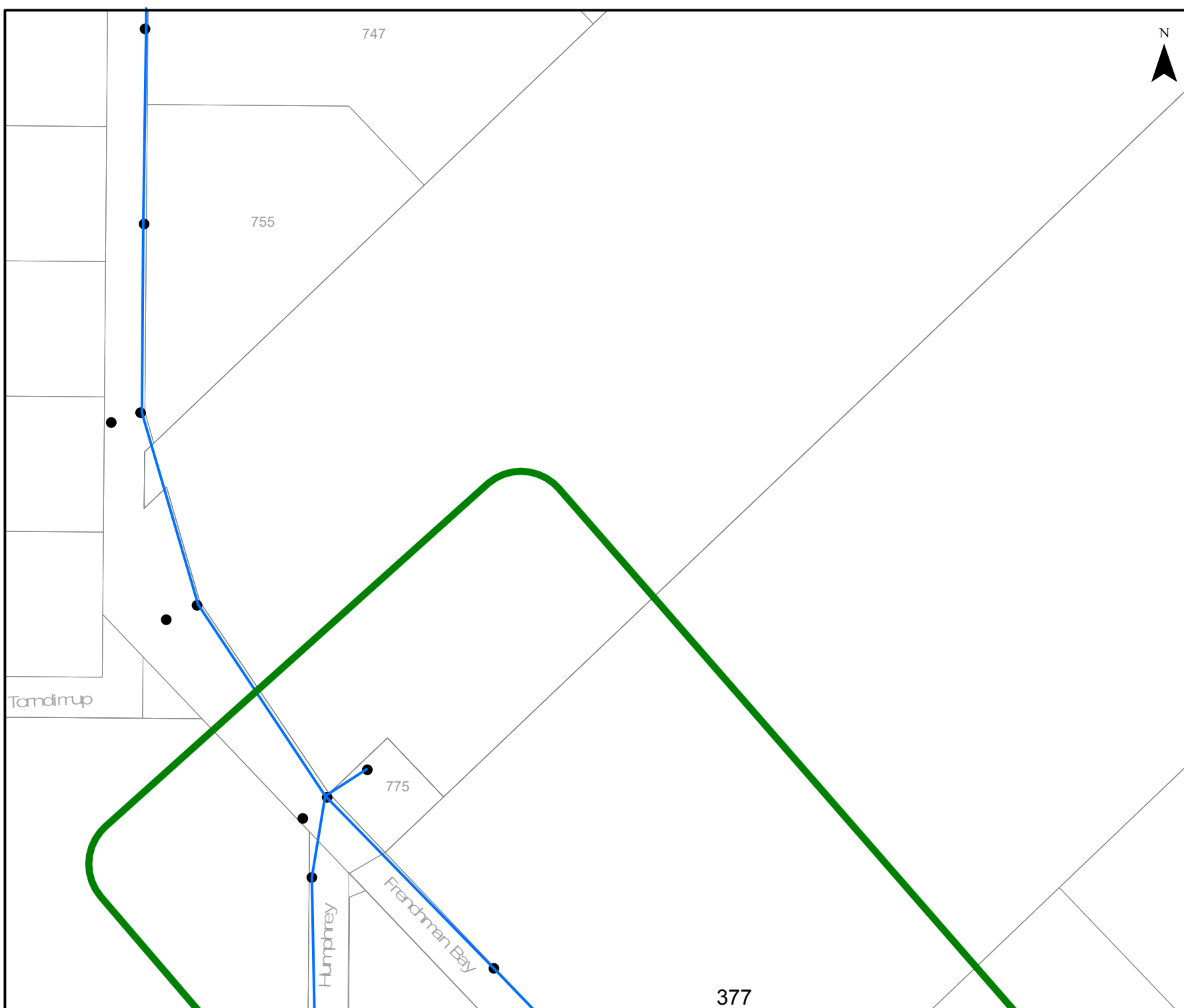
This map is **INDICATIVE ONLY**.
Check that you have enough
clearance from the **DANGER ZONES**
near overhead powerlines.

Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30

Information valid for 30 days
from date of issue

A4 Scale : 1:2500

**WARNING! Look out for
overhead power lines**





OVERHEAD LEGEND

Structures

- Power Pole ■ Transmission Poles

Transmission Overhead Powerline

- Transmission (33kV - 330kV)

Distribution Overhead Powerline

- High Voltage (1kV - 33kV)
- Low Voltage (< 1kV)

Proposed Construction Assets

- Design Area *
- High Voltage Overhead Powerline
- Low Voltage Overhead Powerline
- Power Pole

Communications Assets

- Overhead Pilot Cable

Feature

- Area of Interest

*** Please refer to coversheet**

**Privately owned cables NOT SHOWN
(including house services)**

**This map is INDICATIVE ONLY.
Check that you have enough
clearance from the DANGER ZONES
near overhead powerlines.**

**Telephone Support: 1300 769 345
Mon to Fri - 08:00 to 16:30**

**Information valid for 30 days
from date of issue**

A4 Scale : 1:2500

**WARNING! Look out for
overhead power lines**

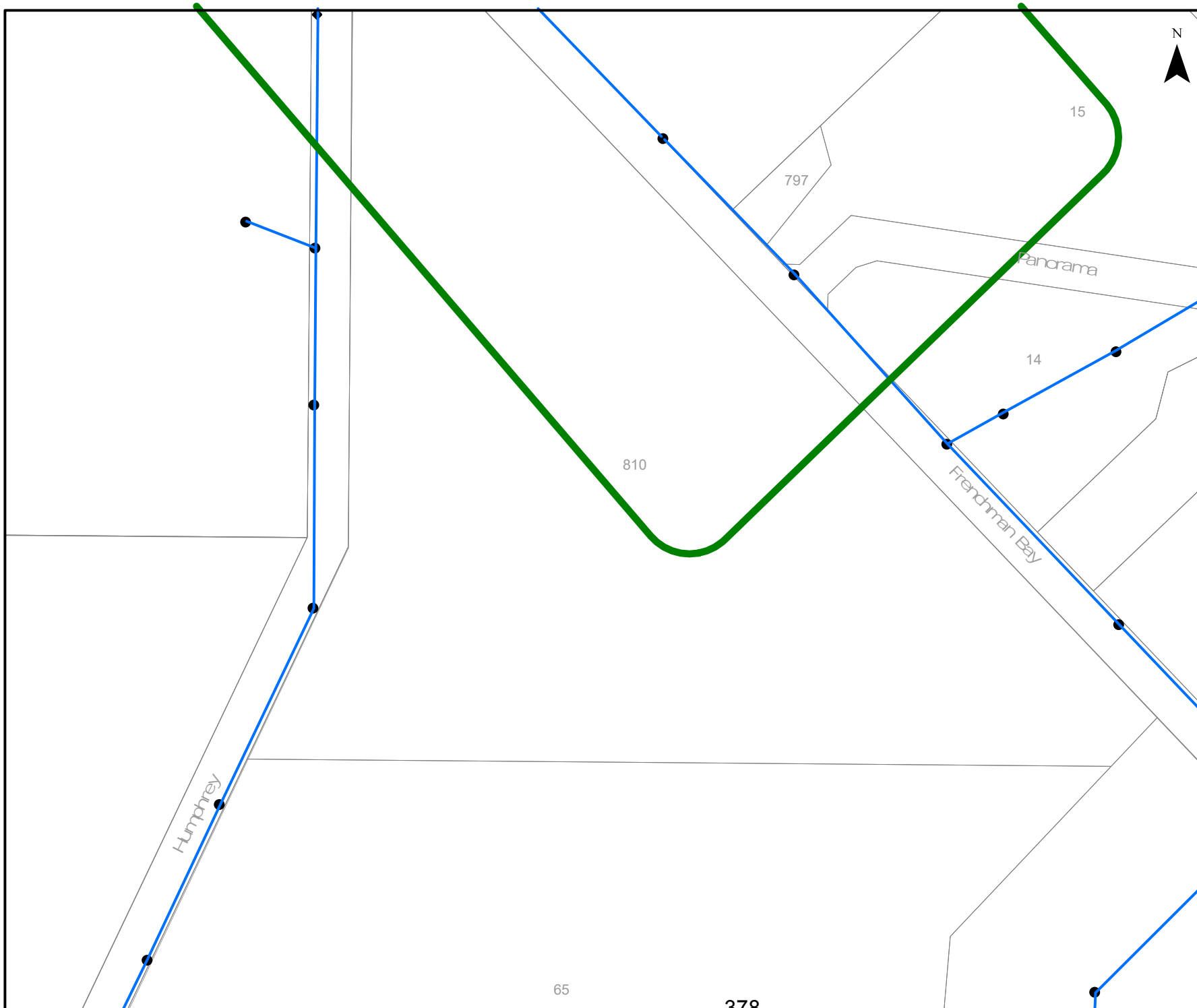
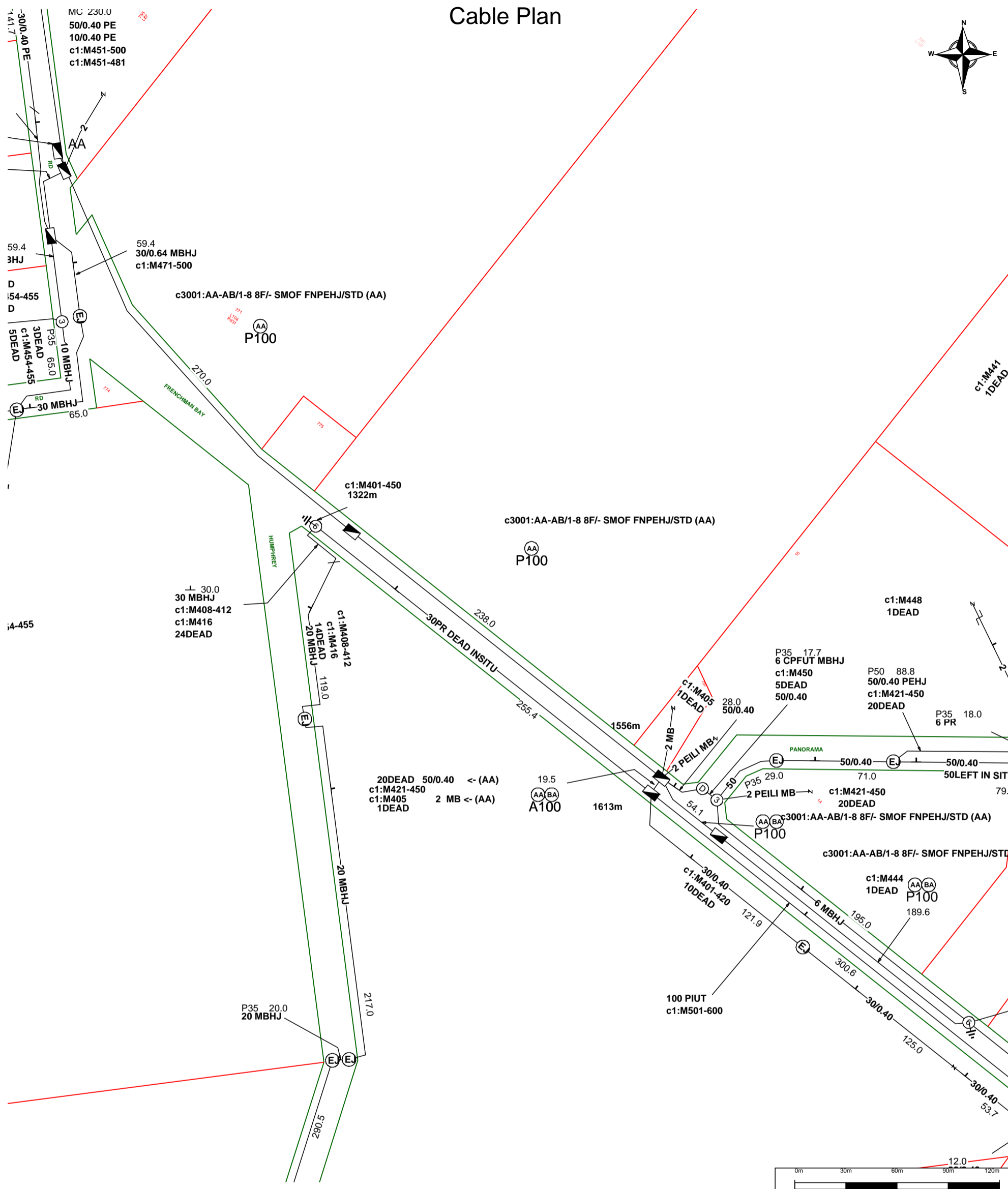


FIGURE F
TELSTRA CABLE PLAN

Cable Plan



For all Telstra DBYD plan enquiries -
email - Telstra.Plans@team.telstra.com
For urgent onsite contact only - ph 1800 653 935 (bus hrs)

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 06/10/2015 15:54:47

Sequence Number: 48320223

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

The above plan must be viewed in conjunction with the Mains Cable Plan on the following page

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

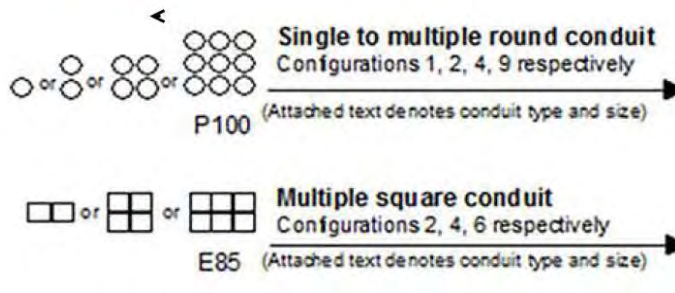
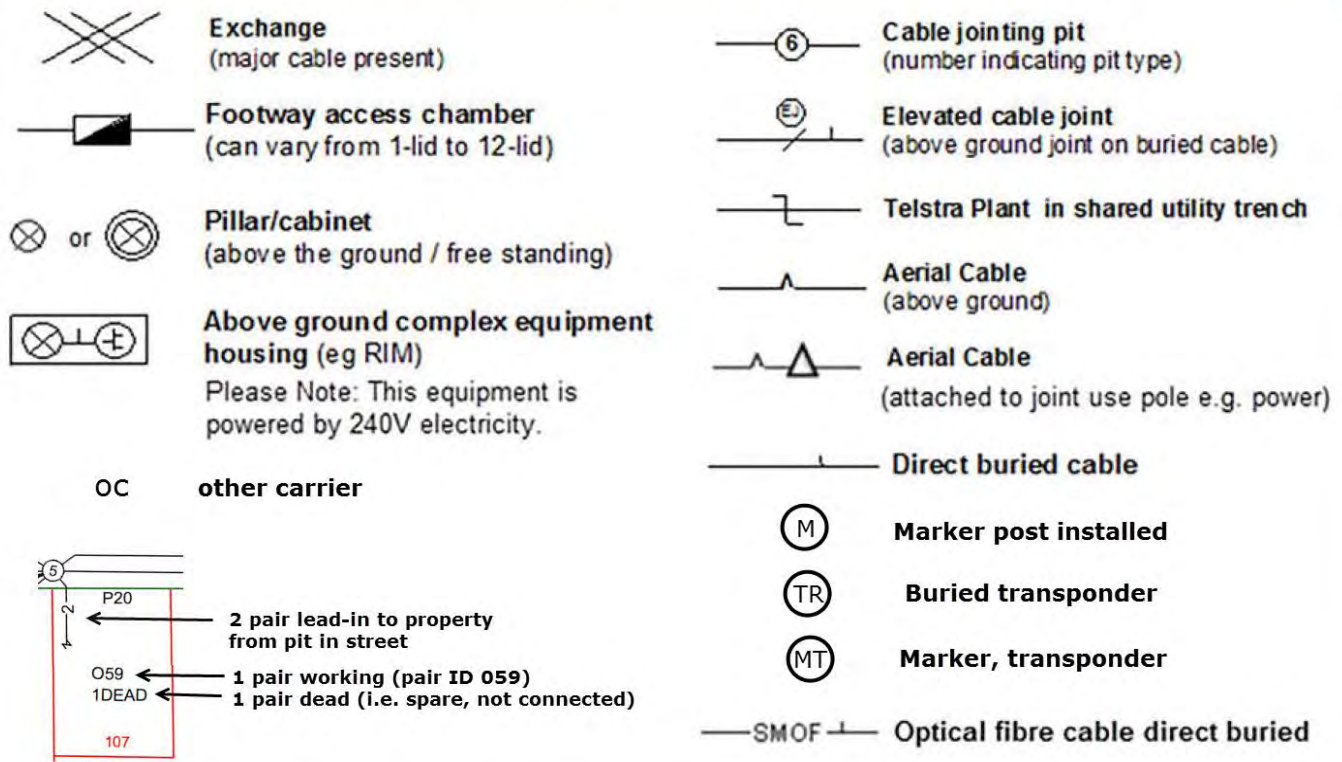
It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.



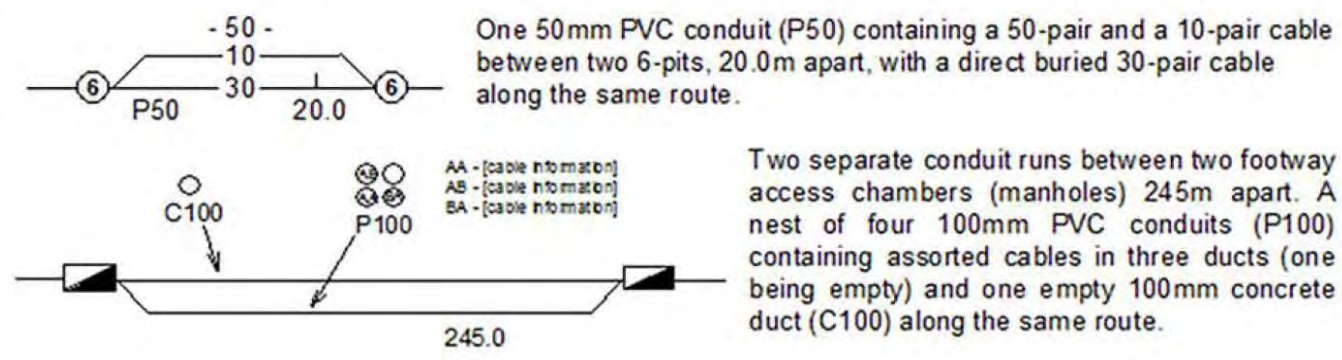
For more info contact a Telstra Accredited Locator or Telstra Plan Services 1800 653 935



Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

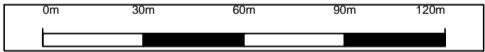
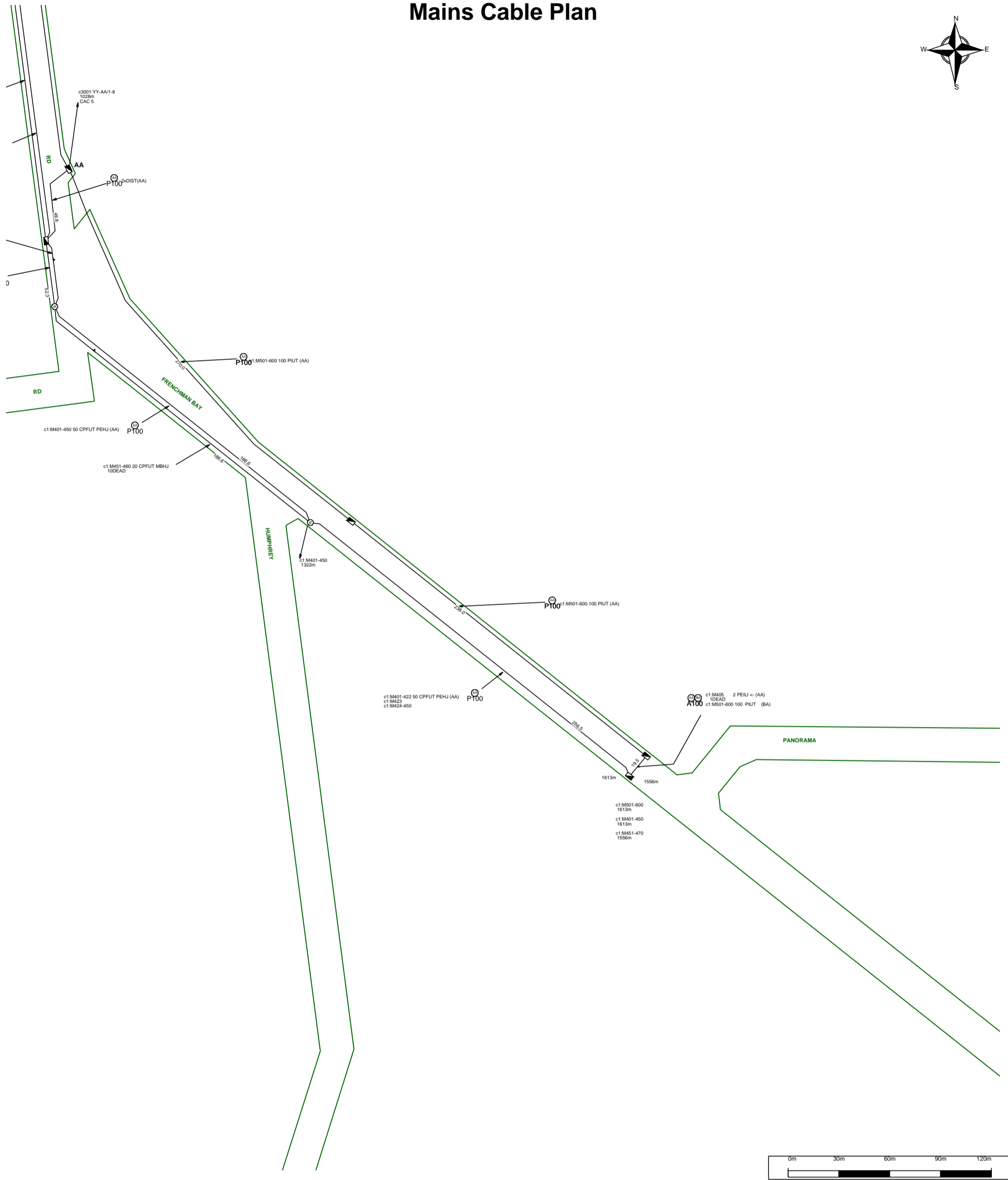
P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Some examples of how to read Telstra plans:



WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. **FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK.** A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Mains Cable Plan



For all Telstra DBYD plan enquiries -
 email - Telstra.Plans@team.telstra.com
 For urgent onsite contact only - ph 1800 653 935 (bus hrs)

Sequence Number: 48320223

CAUTION: Fibre optic and/ or major network present in plot area. Please read the Duty of Care and contact Telstra Plan Services should you require any assistance.

TELSTRA CORPORATION LIMITED A.C.N. 051 775 556

Generated On 06/10/2015 15:54:49

WARNING - Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied can not be guaranteed as property boundaries, depths and other natural landscape features may change over time, and accordingly the plans are indicative only. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans.

It is your responsibility to locate Telstra's underground plant by careful hand pot-holing prior to any excavation in the vicinity and to exercise due care during that excavation.

Please read and understand the information supplied in the duty of care statement attached with the Telstra plans. TELSTRA WILL SEEK COMPENSATION FOR LOSS CAUSED BY DAMAGE TO ITS PLANT.

Telstra plans and information supplied are valid for 60 days from the date of issue. If this timeframe has elapsed, please reapply for plans.

TECHNICAL APPENDIX 2 – LOCAL WATER MANAGEMENT STRATEGY

(Accendo Australia, 2018)

TECHNICAL APPENDIX 3 – INFRASTRUCTURE SERVICING REPORT

(Able Planning & Project Management, 2016)

