CITY OF ALBANY

LOCAL PLANNING SCHEME NO. 1

LOCAL STRUCTURE PLAN NO. 4

RURAL RESIDENTIAL AREA NO. 43
FRENCHMAN BAY, HARDING & HOME ROADS
ROBINSON

AYTON BAESJOU
PLANNING

ABN: 15 061 140 172
59 Peels Place
Albany WA 6330
Ph 9842 2304 Fax 9842 8494

Endorsement

This structure plan is prepared under the provisions of the City of Albany Local Planning Scheme No. 1.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

12-Nov-2020
_____ Date

Signed for and on behalf of the Western Australian Planning Commission:

_____

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

_____ Witness

12-Nov-2020
_____ Date

12-Nov-2030
_____ Date of Expiry

Amendments:

Amendment No.	Summary of Amendment	Amendment Type	Date Approved (WAPC)

EXECUTIVE SUMMARY

This Local Structure Plan has been prepared to guide subdivision and development of Lots 84, 85, 86 and a portion of Lots 87 & 98 Home, Harding & Frenchman Bay Roads Robinson for Rural Residential purposes.

The land is located less than 5.5km from the Albany Central Area and is currently used for Rural Small Holding/ Rural Residential Purposes.

In accord with local and state policy promoting the efficient use of underutilised zoned and serviced land, the Local Structure Plan provides for the intensification of Rural Residential landuse to the density set and permitted in the locality and as established by local scheme and strategy.

Lot yield and arrangement is based on capability, site opportunities and constraints and is informed by specific site and fire assessments.

This Local Structure Plan should be read with and is adjunct to Local Planning Scheme No. 1 Amendment No. 27.

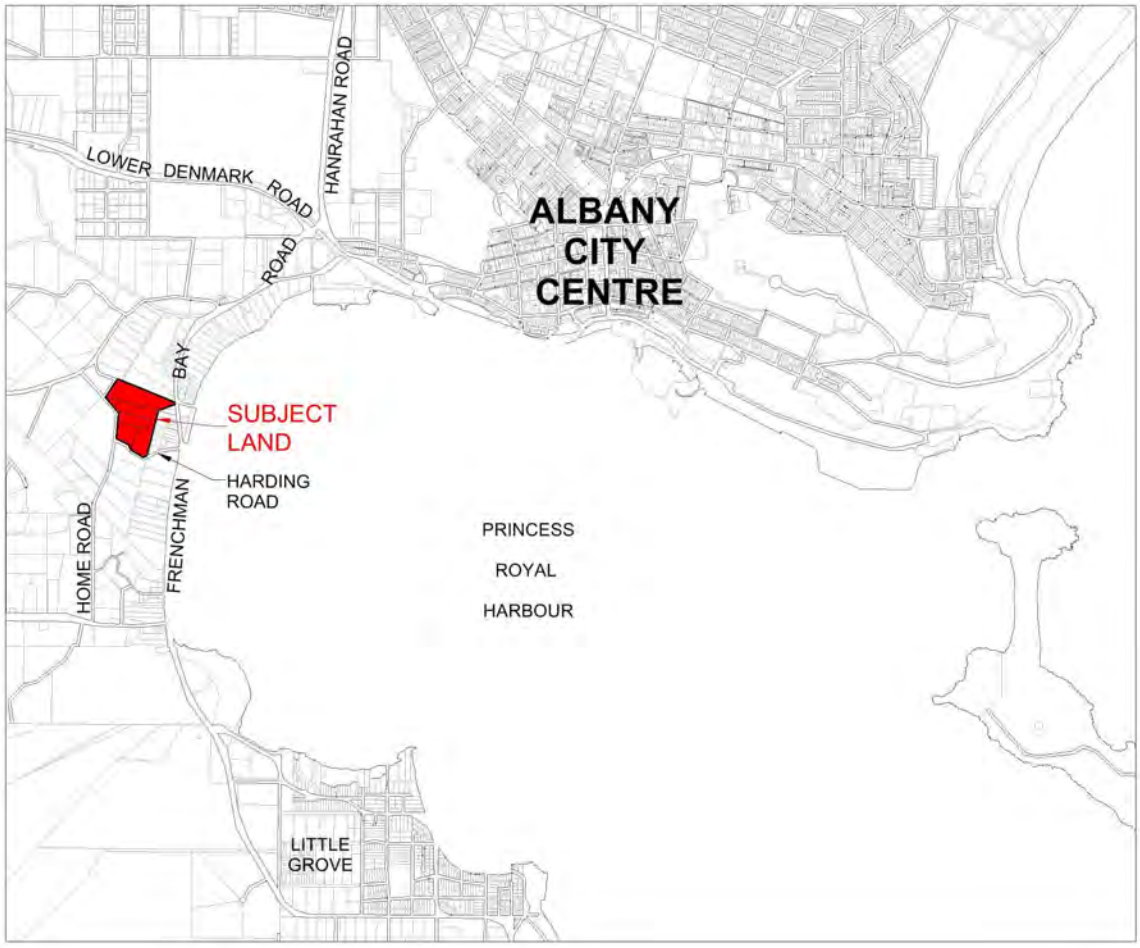
Local Structure Plan No. 4 Summary Table:	
Total Area	14.80ha
Existing Lots	5
Lot Yield	10
Dwelling Density	1.48ha/Dw
Estimated Population	24pp
Estimated Additional Population	12pp
School Sites/ Other	NA

Contents

PART 1. – STATUTORY

1.0 Structure Plan Area

The Structure Plan covers Lots 84, 85, 86 and a portion of Lots 87 & 98 Home, Harding & Frenchman Bay Roads Robinson zoned Rural Residential and as shown below.



2.0 Content of Local Structure Plan

The Local Structure Plan comprises two parts being:

1. Statutory; Containing the Local Structure Plan Map (Following Page).
2. Explanatory; referring to the background for and issues inherent in the Local Structure Plan per Local Planning Scheme No. 1 Amendment No. 27.

3.0 Relationship to Local Planning Scheme No. 1

The requirements of the Local Structure Plan (LSP) apply as if they were part of the Scheme.
In any conflict between scheme clauses or provisions and the LSP, the provisions or clauses of the scheme shall prevail.
Words and expressions used in the LPS have the same meaning as given in Local Planning Scheme No. 1.
Pursuant to clause 27 Schedule 2 Part 4 of the Planning and Development (Local Planning Schemes) Regulations 2015, due regard is to be given to the requirements of the Local Structure Plan in any subdivision and development applications.

4.0 Operation

The LSP will come into effect following certification by the WA Planning Commission.

5.0 Subdivision and Development Conditions

- In addition to the general clauses of the Scheme and the Special Provisions of Schedule 14 relating to Rural Residential Area No. 43, subdivision is to follow that shown on the LSP Map. Minor variations may be approved by the WA Planning Commission.

- At the time of subdivision, a Notification is to be placed on the certificate(s) of title of the proposed lot(s) advising of the existence of sand extraction and horticulture activity taking place within 500m and such activity may affect rural amenity.

- At the time of subdivision, arrangements are to be made with a licensed water provider for the provision of a suitable water supply service to each lot shown on the approved plan of subdivision.

- On-site stormwater management should be designed in accordance with the 'Decision process for stormwater management in WA (DoW 2009)' and the 'Stormwater Management Manual for WA (DoW 2004-2007).

- Onsite effluent disposal systems and their disposal areas are not be located in areas identified as Effluent Disposal Exclusion Areas on the Structure Plan Map.

- A detailed site-specific site-and-soil evaluation is to be provided at subdivision stage to demonstrate that the proposed onsite sewerage disposal systems are capable within the designated building envelopes.

- Further development is to be concentrated in existing cleared areas where clearing for development and fire protection is minimised.

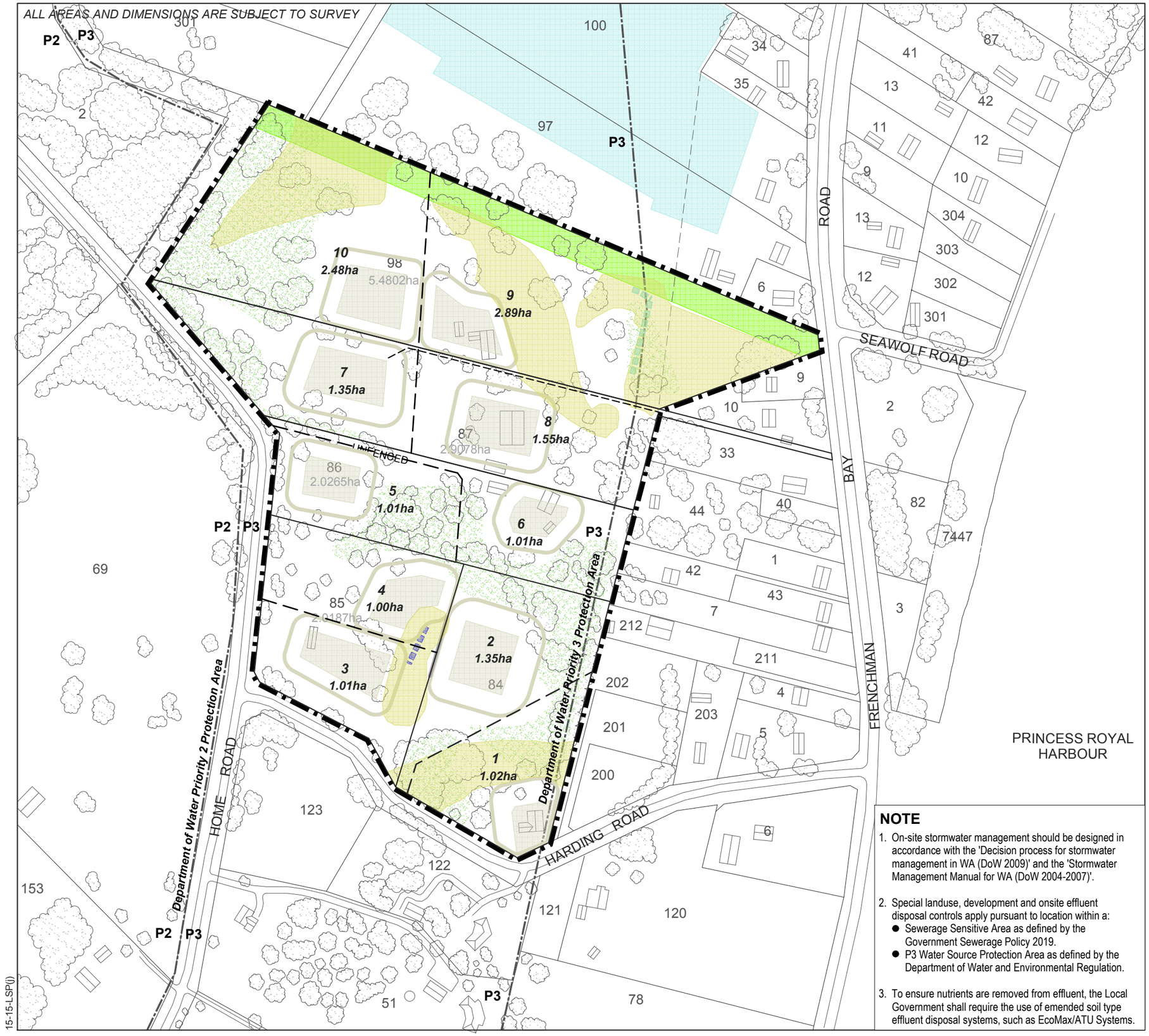
- At the time of subdivision, a Notification is to be placed on the certificate(s) of title of the proposed lot(s) advising of this land is within a bushfire prone area as designated by an Order made by the Fire and Emergency Services Commissioner and is subject to a Bushfire Management Plan. Additional planning and building requirements may apply to development on this land" (Western Australian Planning Commission).

ALL AREAS AND DIMENSIONS ARE SUBJECT TO SURVEY

Local Structure Plan B

Frenchman Bay,
Home & Harding Roads
Rural Residential Area 43

Lots 84, 85 Harding Road &
Lots 86, Pt87 & Pt98 Home Road
Robinson, City of Albany



LEGEND

- Subject Land
- Existing Lot Boundaries
- Proposed Lot Boundaries
- Existing Buildings
- Existing Vegetation
- Vegetation Protection Area
- Soak (to be filled)
- Vegetated Agricultural Buffer
- Effluent Disposal Exclusion Area
- Market Garden
- Proposed Building Envelope
- Indicative APZ (Refer to BMP)
- SFB/ Private Access (LO Access Easement)
- P2 DoW Priority 2 Protection Area
- P3 DoW Priority 3 Protection Area

NOTE

1. On-site stormwater management should be designed in accordance with the 'Decision process for stormwater management in WA (DoW 2009)' and the 'Stormwater Management Manual for WA (DoW 2004-2007)'.
2. Special landuse, development and onsite effluent disposal controls apply pursuant to location within a:
   - Sewerage Sensitive Area as defined by the Government Sewerage Policy 2019.
   - P3 Water Source Protection Area as defined by the Department of Water and Environmental Regulation.
3. To ensure nutrients are removed from effluent, the Local Government shall require the use of emended soil type effluent disposal systems, such as EcoMax/ATU Systems.

ORIG A3
SCALE 1:3000

Map Modification -	1a
Map Creator -	BQ/MRT
Copyright -	Ayton Baesjou Planning
Sources -	Landgate (Cadastre & Contours)
Datum -	AHD
Contact -	Ayton Baesjou Planning
Disclaimer -	Subject to Verification & Survey

0 15 30 45 60 75

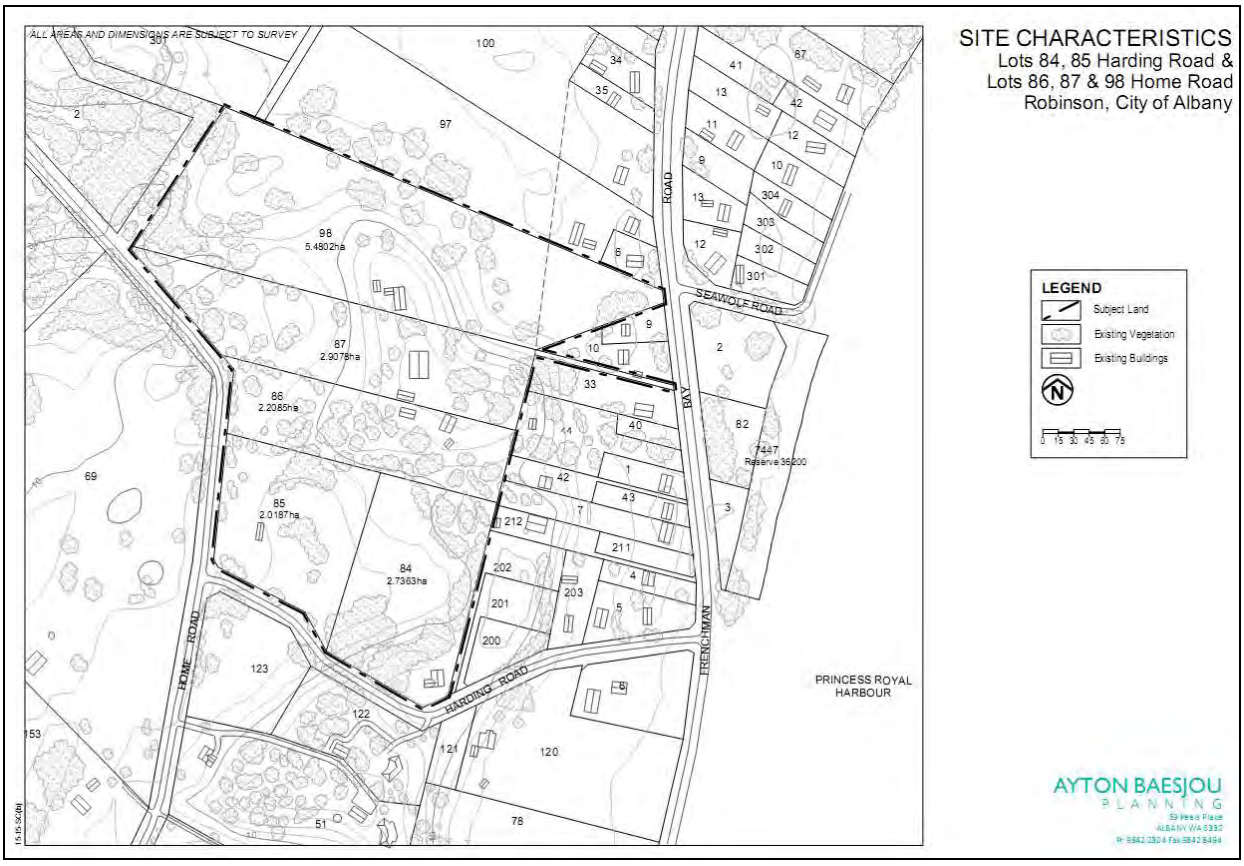
AYTON BAESJOU
PLANNING
59 Peels Place
ALBANY WA 6330
Ph 9842 2304 Fax 9842 8494

15-15-LSP(j)

PART 2 – EXPLANATORY

The land is located some 5.5km by road south west of the Albany City Centre (Princess Royal Drive and Frenchman Bay Road). The land has access to Frenchman Bay Road, Harding Road & Home Road.

Lot sizes range from 2ha to 5.4ha and are used for rural retreat or rural small holdings purposes. The land is in a precinct comprised of residential lots fronting and east of Frenchman Bay Road, rural residential and rural pursuits on the low flat land to the north with established rural residential estates to the south and west.



As a part of Amendment No. 27 to Local Planning Scheme No. 1 which seeks to transfer the land from Rural Residential Area No. 29 to Area No. 43, a Local Structure Plan (Map) is required. This plan identifies the future lot layout and associated spatial subdivision and development issues and requirements following on from the special provisions identified in Amendment 27 necessary to apply to the land.

As a result, reference should be made to the Amendment No. 27 reports and technical assessments covering site and capability, bushfire safety, existing provisions, servicing and the requirements for future subdivision.

The LSP area is located within a Public Drinking Water Source Area (P3) and Sewerage Sensitive Area. The LSP depicts the general layout, outlines effluent disposal exclusion areas, indicative building envelopes, access arrangements and the other subdivisional components necessary to provide for development.

The plan is based on capability, site opportunities and constraints and is informed by specific site assessment (see Attachment 1. Land Capability Assessment Report Dec. 2015) and fire assessments (see Attachment 2. Bushfire Management Plan). Additional background and analysis including these site specific assessments is also included in the Amendment No. 27 documentation.

Supporting the LSP, Amendment No. 27 and the existing rural residential controls include measures to:

- Include the land within Rural Residential Area No. 43 and reference the LSP Map as the guide to future subdivision.
- Provide for subdivisional and development servicing as necessary.
- Provide for landowner notifications covering agricultural activities and bushfire safety.
- Include specific bushfire safety provisions via the Bushfire Management Plan (see Attachment 1 following).
- Provide prudent landuse control and approval requirements.
- Provide building envelope and effluent disposal location control.

Vegetation Protection Area

Areas of high-quality vegetation are to be identified as Vegetation Protection Area on the Structure Plan Map.

Attachment 1.

LAND CAPABILITY ASSESSMENT

LOCAL STRUCTURE PLAN NO. 4

RR 43 Home & Harding Road Precinct

Land Assessment Pty Ltd

(#1512 11-1-2020)

LAND CAPABILITY ASSESSMENT AND PRELIMINARY GEOTECHNICAL INVESTIGATION

- Lots 84, 85 Harding Road & Lots 86, 87 & 98 Home Road, Robinson, City of Albany

Prepared for

AYTON BAESJOU PLANNING

by

Land Assessment Pty Ltd

LA Report No 1512
11 January 2016

LAND ASSESSMENT PTY LTD
P.O. Box 117 SUBIACO, WA 6008
Phone: (08) 9388 2427
Email: landass@iinet.net.au

CONTENTS

CONTENTS (continued)

1.0 INTRODUCTION

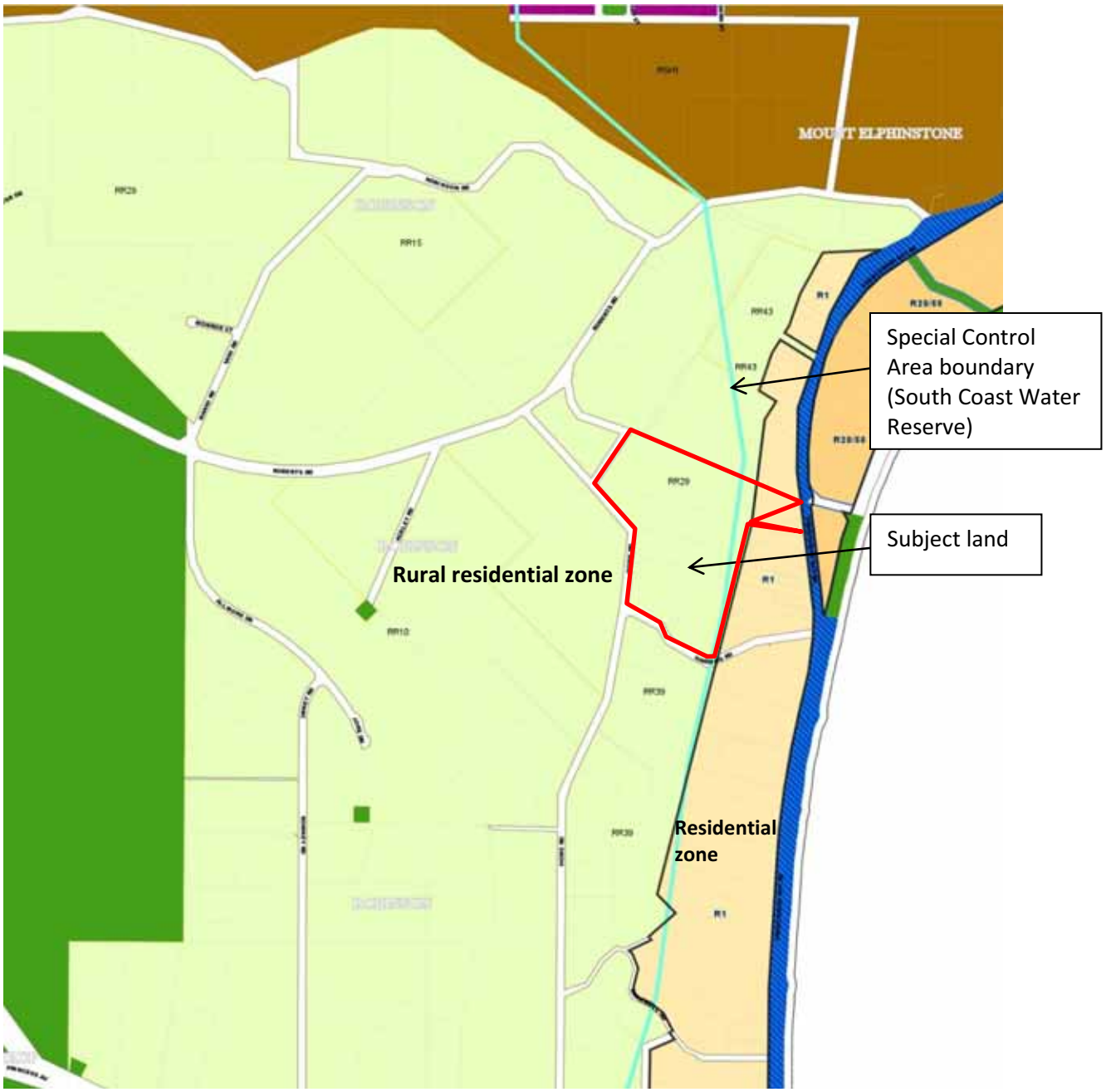
This report has been prepared at the request of Ayton Baesjou Planning to assist preparation of a Guide Plan for further subdivision of existing Lots 84, 85 Harding Road and Lots 86, 87 & 98 Home Road, within the Robinson locality of the City of Albany. Attachment A shows a base plan with site characteristics.

The subject land of approximately 15.3 ha is located on the southern side of Princess Royal Harbour, to the west of Frenchman Bay Road and approximately 3.5 km west-south-west of the Albany central business district. Figure 1 shows the study area is zoned 'Rural residential' (RR29) with the exception of the lower-lying eastern portion of Lot 98 and the battle-axe leg entrance to adjacent Lot 87, both of which are zoned 'Residential' (R1).

The land contains a mixture of cleared and vegetated areas and there is a residence on each of the five existing lots. There are no significant rural pursuits although portions of lots 85 and 98 are used for stabling and exercise of horses, and the eastern part of lot 98 is subject to grazing by goats.

As parts of the subject land are located on relatively low-lying terrain inland from Princess Royal Harbour, environmental assessment of the land needs to consider its capability to support on-site disposal of domestic effluent and wastewater, and to address the potential for further development to be affected by any Acid Sulfate Soil conditions.

FIGURE 1: LOCATION AND ZONING



Source: City of Albany Local Planning Scheme No 1 (District Scheme) Map 21.

2.0 POLICY CONTEXT

2.1 Local Planning Scheme (City of Albany 2014) and Policy

Rural Residential Zone (major portion)

It is understood from planners Ayton Baesjou that the possible minimum allowable average lot size within area RR29 is 1 ha. In relation to matters addressed by this report, relevant planning objectives for the Rural Residential Zone include;

Provide for residential and limited incidental land uses which:

> *(i) Are compatible with the preservation and protection of environmentally sensitive areas such as remnant vegetation and groundwater protection areas;*
>
> *(ii) Do not visually detract from the landscape and the visual amenity of the locality;*
>
> *(iii) Allow for uses and developments that are fit for purpose and minimise any on-site or off-site impacts such as soil erosion, nutrient loss, drainage and potential land use conflicts.*

Residential Zone (minor portion)

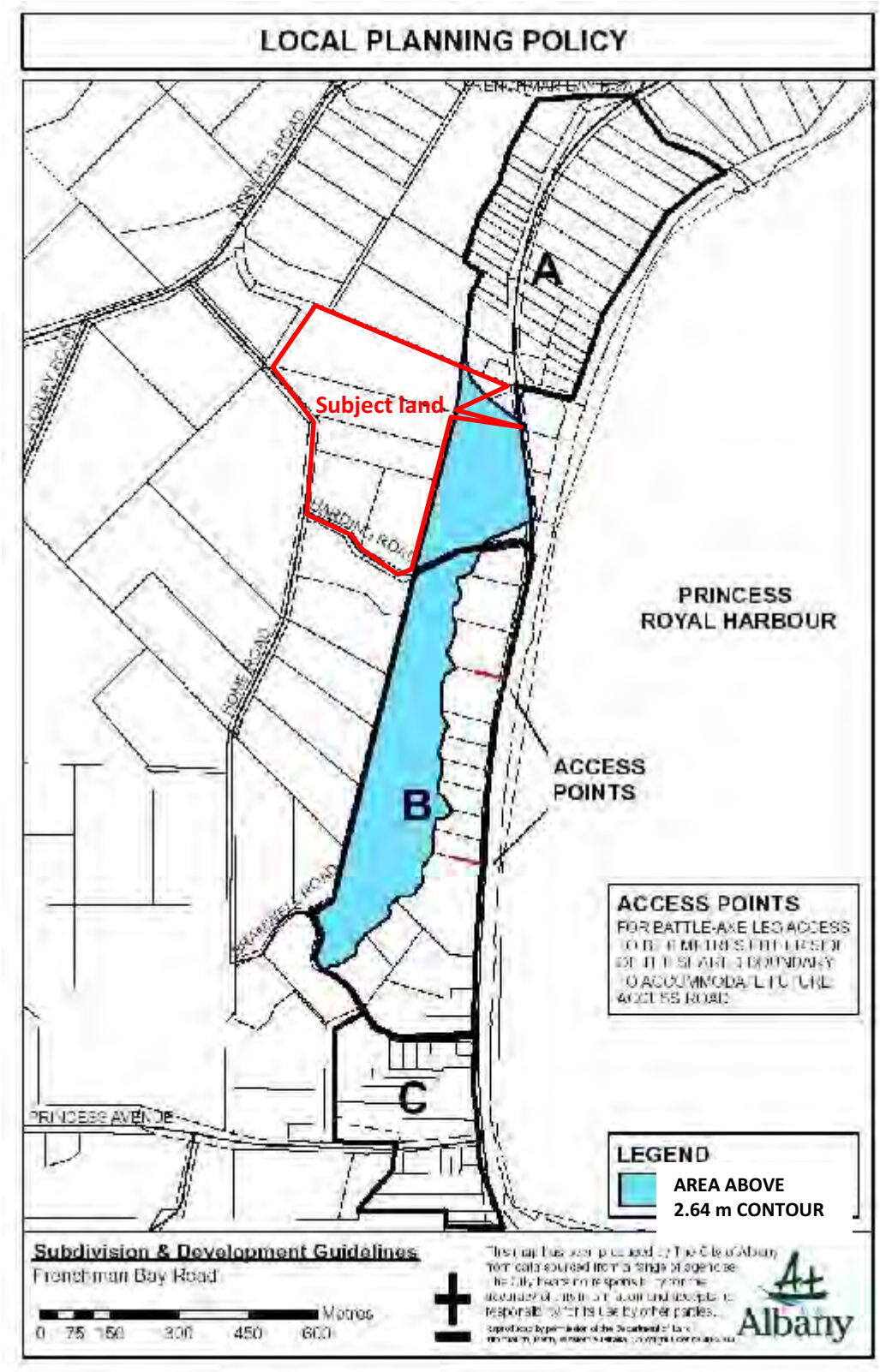
In relation to the Residential Zone portion encompassing the smaller eastern part of Lot 98, as well as the battle-axe entrance to adjacent Lot 87, it is understood from planners Ayton Baesjou that the minimum allowable lot size in this R1 designated area is 8500 sq m.

A Local Planning Policy for the Frenchman Bay Road Residential Development Area (City of Albany undated) addresses the effects of potential flooding or high ground water levels in this low lying area. It identifies this land as part of Precinct A with portions above and below a designated contour line at 2.64 m AHD (Figure 2).

The Local Planning Policy specifies that no subdivision proposals (within the Residential Zone) will be supported until such time as a conceptual local structure plan has been prepared for the portion of land above 2.64m AHD and, for the remaining lower lying area, until such time as infrastructure services (sewerage) have been extended to this locality.

For any subdivision of the Residential zoned land within the area above the 2.64m AHD contour, the policy also states that Council will require the resultant lots to utilise alternative effluent disposal systems, such as approved amended soil and/or aerobic systems.

FIGURE 2: FRENCHMAN BAY ROAD RESIDENTIAL DEVELOPMENT POLICY AREA



Source: City of Albany (undated) Policy - Frenchman Bay Road Residential Development Area

2.2 Local Planning Strategy (City of Albany 2010)

Rural residential zones are encompassed within a broad 'Rural Living' category where strategic objectives of Albany's Local Planning Strategy (ALPS) include

"In the long term encourage the efficient use of existing rural living areas, based on land capability to maximise their development potential."

The ALPS supports lot sizes from 1ha to 4ha in new Rural Residential areas subject to the provision of reticulated water and land capability analysis.

2.3 Special Control Area (South Coast Water Reserve)

As shown in Figure 1 the major part of the subject land is designated under the Local Planning Scheme as part of a Special Control Area (SCA) for the protection of public drinking water sources.

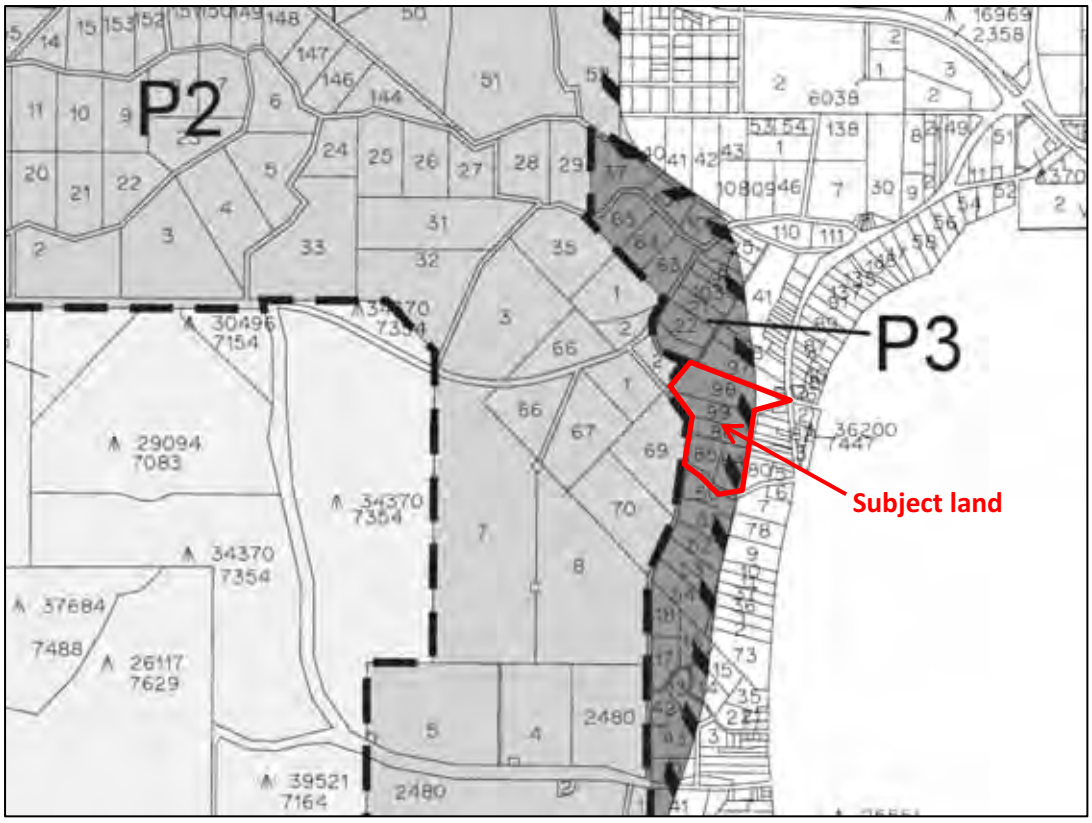
This particular SCA covers the South Coast Water Reserve, and the Planning Scheme reflects the objectives of the *South Coast Water Reserve and Limeburners Creek Catchment Area Water Source Protection Plan* (Water and Rivers Commission 2001) where the dominant 'rural-residential' portion of subject land is designated a Priority 3 (P3) category. The lesser 'residential' zoned area closest to Frenchman Bay Road is outside of the SCA (Figure 3).

Appendix 1 of the Water Source Protection Plan outlines the (now) Department of Water's guidelines on *Land Use Compatibility in Public Drinking Water Source Areas* (Department of Environment 2004). Under a P3 category, water supply sources need to co-exist with other land uses, and rural-residential subdivision to a lot size of between 1 and 2 hectares is considered 'compatible' with water source protection subject to the following conditions;

- *An average, rather than minimum, lot size may be accepted if the proponent can demonstrate that the water quality objectives of the source protection area are met, and caveats/memorials are placed on titles of specified blocks stating that further subdivision shall not occur.*

- *Lots should only be created where land capability assessment shows that effective on-site soakage of treated wastewater can be achieved. Conditions apply to siting of wastewater disposal systems in areas with poor land drainage and/ or a shallow depth to groundwater, animals are held or fertiliser is applied. Alternative wastewater treatment systems, where approved by the Department of Health, may be accepted with ongoing maintenance requirements.*

FIGURE 3: RELEVANT PORTION OF WATER SOURCE PROTECTION PLAN



Source: Water and Rivers Commission (2001) *South Coast Water Reserve and Limeburners Creek Catchment Area Water Source Protection Plan*

2.4 On-site Sewage Management

The following policies and guideline documents have been considered in relation to the capability of the subject land to support further un-sewered development;

- *Draft Country Sewerage Policy* (Government of Western Australia 1999 - as amended to 2003).
- *Code of Practice for Onsite Sewage Management* (Department of Health 2012) Consultation Draft November 2012
- *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs) Serving Single Households.* (Department of Health 2001).

These documents show the capability of land to accommodate an on-site effluent disposal system is influenced by a number of factors including system type, site drainage conditions, topography, soil depth, permeability, and depth to watertable.

Site requirements for on-site effluent disposal based on health criteria include the following specifications;

Gradient of the land - not to exceed one in five (i.e. not greater than 20% slope)

Site drainage – not subject to inundation or flooding at greater than once in 10 years

Depth to groundwater

- greater than 1.2 m from the underside of a wastewater disposal system prescribed under regulation 49 of the Regulations (*for example, leach drains associated with septic tanks*)
- as prescribed by Executive Director, Public Health for other approved wastewater disposal systems (*required separation from watertable varies with type and design of other approved systems – see DoH 2001 and DoH 2012 with the latter indicating a range 0.6 – 1.5 m is required above groundwater).*
- greater than 0.5 m from natural ground surface irrespective of type of system

Available area - unencumbered area of at least 150 m^2 required.

Soil depth - greater than 1.2 m depth to bedrock or impervious clay.

In addition to the requirements based on health criteria, the existing Government Sewerage Policy states; *the responsible authorities may require compliance with any special conditions of the* (then) *Department of Environment.*

The 'special conditions' based on environmental criteria relate to the protection of wetlands and watercourses, and are primarily expressed through setback distances as described in Appendix 2 of the *Draft Country Sewerage Policy* and reiterated in the City of Albany Local Planning Scheme (2014) as follows*;*

- Watercourses with permanent water – 50 metres;
- Seasonally flowing watercourses – 30 metres;
- Estuary or marine environment - 100 metres

The *Code of Practice for Onsite Sewage Management* (DoH 2012) also specifies setbacks from various types of effluent disposal systems for sub-soil or open drains as follows;

- Soil absorption systems (trenches, beds and mounds) – 6 metres;
- Dripper irrigation systems (associated with ATUs) - 3 metres
- Spray irrigation systems (associated with ATUs) - 6 metres.

Furthermore, in relation to dams or bores, the *Code of Practice for ATUs* (DoH 2001) specifies a 30 m setback where they are used or available for human or animal consumption. It has been assumed here that a 6 m setback is applicable where such water sources are precluded from human or animal consumption.

2.5 Acid Sulfate Soils

Acid sulfate soils (ASS) are wetland soils and unconsolidated sediments that contain iron sulfides which, when exposed to atmospheric oxygen in the presence of water, form sulfuric acid. This acid can mobilise or release heavy metals to the detriment of biota and built infrastructure in contact with drainage water.

ASS commonly occur in low-lying coastal lands such as marine or estuarine muds and sands that potentially underlie the surface soils within the eastern-most portion of the subject land. The City of Albany's *Local Planning Strategy* (2010) identifies lower lying portions of the Robinson locality as a high risk area.

The Western Australian Planning Commission's *Acid Sulfate Soils Planning Guidelines* (WAPC 2008) require a preliminary site assessment to be undertaken in 'at risk' areas, and wherever practicable to avoid disturbance of any subsequently identified acid sulfate soils. The potential for ASS is addressed in this report and an acid sulfate soils self-assessment form is included as Attachment E.

3.0 ENVIRONMENTAL SETTING

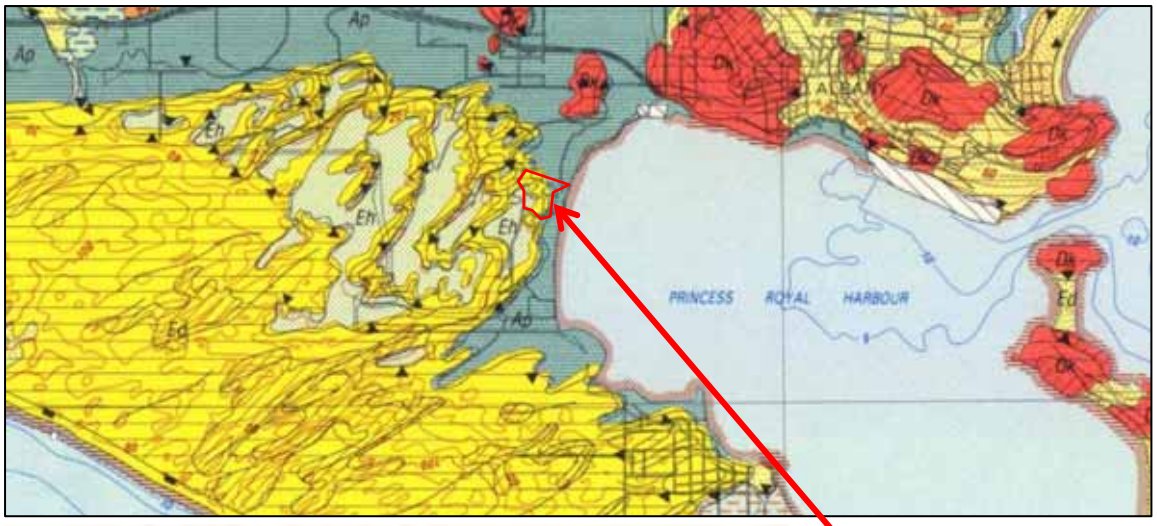
3.1 Geomorphology and Geology

The subject land predominantly encompasses an area of parabolic and nested parabolic dunes (and an associated deflation hollow) that extend over part of the estuarine plain fringing, and extending inland from, the western margins of Princess Royal Harbour (Figure 4).

The dunes are comprised of sands that are variably leached and have a core of calcareous limestone (aeolianite – LS_4) which is pale yellowish brown in colour and weakly cemented.

The underlying estuarine plain is exposed in the north eastern portion of the subject land as well as in the deflation hollow to the south west. The estuarine plain is reported by the Geological Survey of Western Australia to be overlain by predominantly siliceous, white to pale grey, alluvial sand (S_{14}) which, although being well drained (i.e. very permeable), is subject a high watertable and considered prone to flooding in part (Gozzard 1989).

FIGURE 4: GEOMORPHOLOGY & ENVIRONMENTAL GEOLOGY MAPPING



GEOMORPHOLOGICAL CLASSIFICATION

Ed	Parabolic and nested parabolic dunes, Quindalup Dune System	Ar	Estuarine beach ridges
Es	Parabolic and nested parabolic dunes, Spearwood Dune System	At_{1-2}	Estuarine terraces, where identified
Eh	Deflation hollow	Cs	Colluvial slope
Er	Relict foredunes	Gk	Granitic knolls, inselbergs and bornhardts
Ap	Estuarine/alluvial plain	Ds	Denudational slopes in Tertiary sediments

Subject land

GEOLOGY CLASSIFICATION

S_{14} SAND – white to pale grey (Quaternary Alluvium)

LS_4 LIMESTONE – pale yellowish brown, weakly cemented (Quaternary dunes over estuarine deposits).

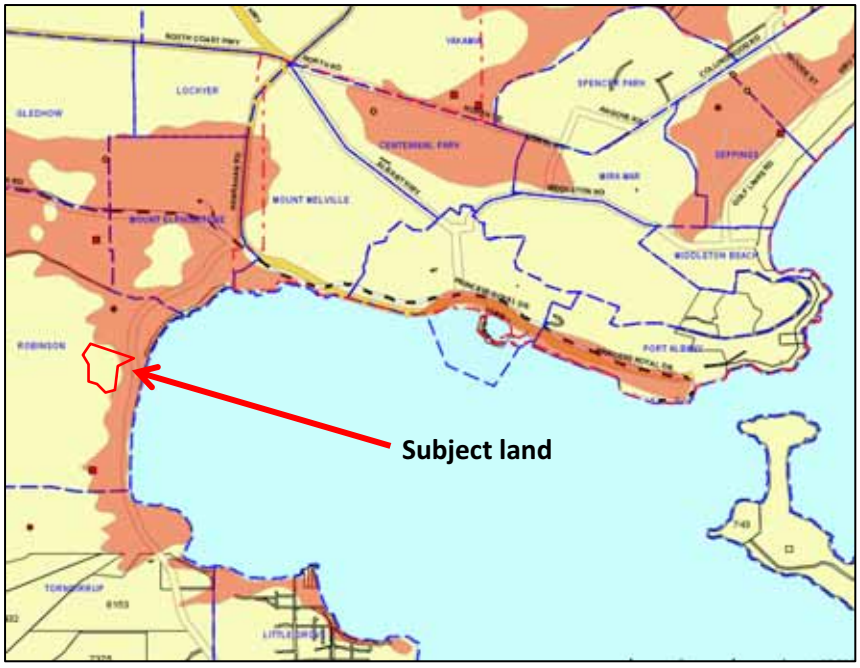
Sp1 PEATY SAND – (Quaternary lake and swamp deposits)

Source: Gozzard (1989).

3.2 Acid Sulfate Soil Risk Mapping

Acid Sulfate Soil Risk Maps are available online through the Landgate's WA Atlas portal https://www2.landgate.wa.gov.au/bmvf/app/waatlas/ Figure 5 shows the relevant portion of the Albany-Torbay map-sheet where the (former) Department of Environment and Conservation (DEC) has identified risk areas (in brown). The risk areas are based on the geomorphological classifications associated with the environmental geology mapping (Gozzard 1989) including the estuarine / alluvial plain areas (Ap in Figure 4).

FIGURE 5: ACID SULFATE SOIL RISK MAPPING



Source: Landgate WA Atlas recent online query.

3.3 Soil-landscape Mapping

CSIRO (Churchward et al 1988) have produced broad-scale mapping of the soils and landforms of the Albany region. This mapping has subsequently been incorporated into the soil-landscape mapping database of the Department of Agriculture and Food (DAFWA). Figure 6 shows the relevant portion, with the subject land forming part of the Meerup coastal dunes system, predominantly subsystem Mp which is described as; *Podzols over calcareous sand; banksia-bullich-yate woodland.*

* Podzols are siliceous sands with leached (light coloured) sandy topsoil over a stronger coloured sandy subsoil. Calcareous sands have an appreciable calcium carbonate content.

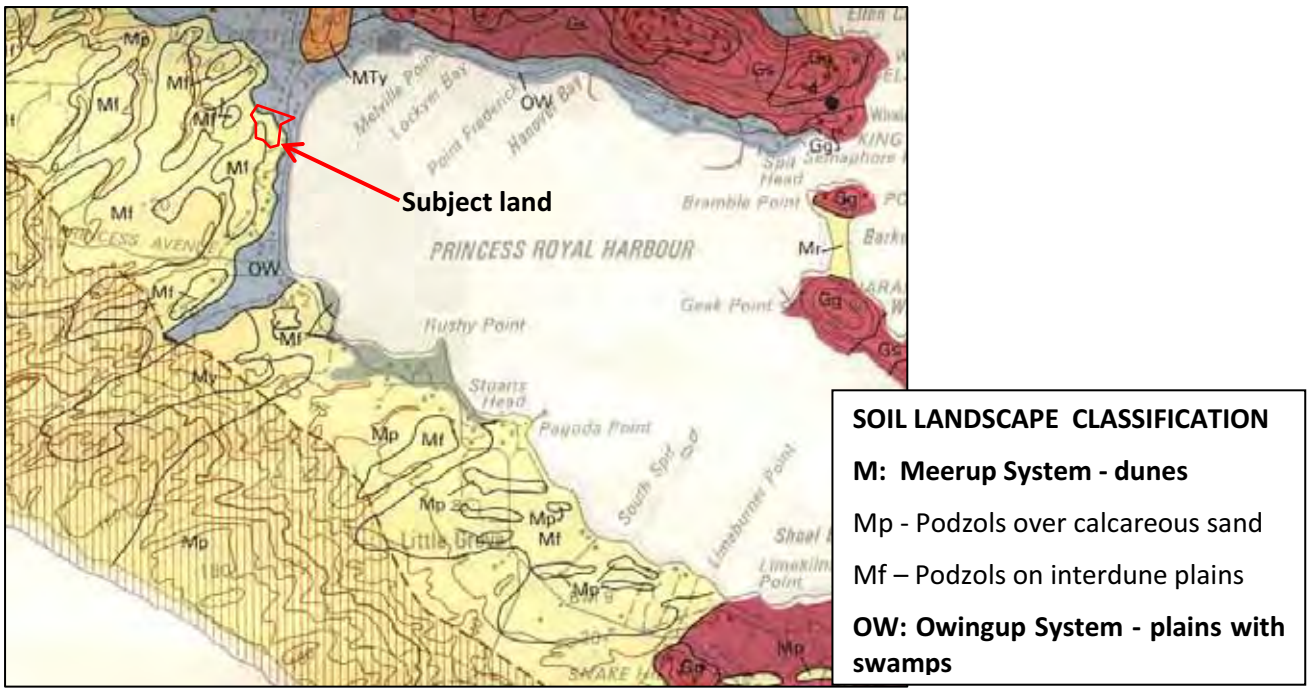


FIGURE 6: BROAD-SCALE SOIL LANDSCAPE MAPPING
Source: Churchward et al 1988).

3.4 Vegetation

As shown in the aerial image within Attachment A, the subject land contains a mixture of cleared and vegetated areas. It occurs inland from the western edge of Princess Royal Harbour although no portion is within 100 m of that waterbody.

The extent and nature of the remaining vegetation within the subject land is also indicated in Figure 7 sourced from the Albany Regional Vegetation Survey, ARVS (Sandiford and Barrett 2010).

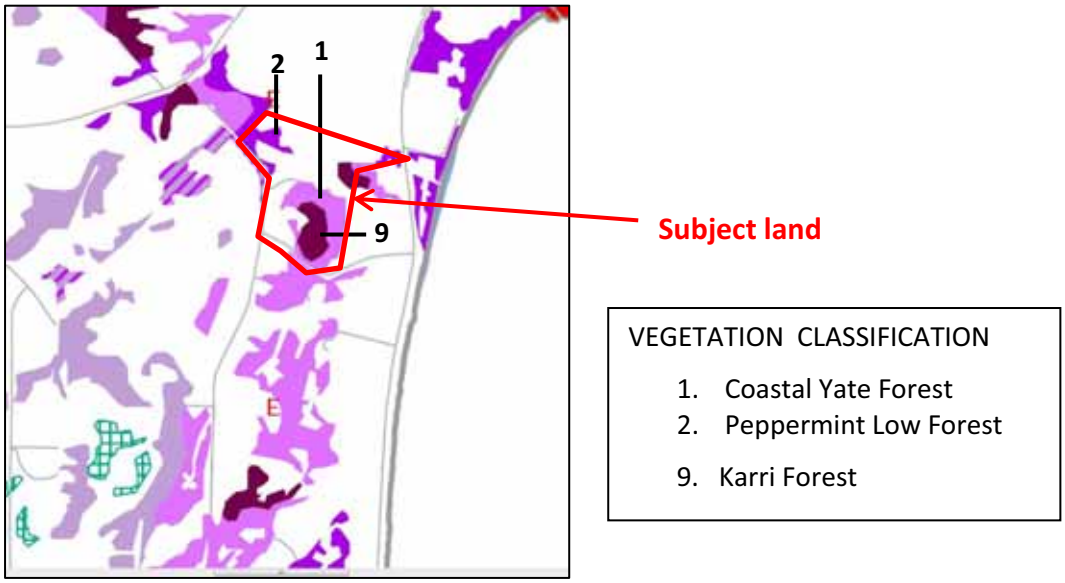
The ARVS mapping is relatively broad-scale and identifies most of the remaining vegetation within lots 84 – 86 as part of vegetation unit 1 (Coastal Yate Forest).

Vegetation unit 9 (Karri Forest) is shown as occurring on lower-lying terrain near the eastern end of Lot 87, and also within the deflation hollow in lots 84 and 85. In the latter area however examination of the aerial image in Attachment A shows that most of the Karri is no longer present.

Vegetation unit 2 (Peppermint Low Forest) is shown within the western portion of lot 98, and to a lesser extent within its central eastern portion.

Attachment B contains descriptions of each of these ARVS vegetation units.

FIGURE 7: VEGETATION MAPPING



Source: Sandiford and Barrett (2010).

Taking into account the known occurrences of these vegetation units (1, 2, and 9) within all types of reserves in the Albany region, only vegetation unit 9 (Karri Forest) might be considered in need of specific conservation measures.

Notwithstanding this, none of the three vegetation units occur at <30% of their pre-clearing extent, and further subdivision of the subject land in accordance with lot size allowed under its zoning category would not directly require any clearing of remnant vegetation to create additional house sites or property access ways.

3.5 Water Resources

Surface water

The subject land occurs inland from the margins of Princess Royal Harbour where the importance of protecting this waterbody from further addition of nutrients is recognised in both the Local Planning Scheme (City of Albany 2014) and the Albany Local Planning Strategy (City of Albany 2010) through the application of a general 100 m development setback.

As shown by the aerial image in Attachment A, all portions of the subject land occur at greater than 100 m from the margins of Princess Royal Harbour, and it contains no natural watercourses. A man-made drain does however run along the northern side of the entrance way into Lot 98 off Frenchman Bay Road. There are also a small number of wetland 'soaks' within Lots 98 and 85 that appear to have been excavated to facilitate earlier agricultural pursuits.

Groundwater

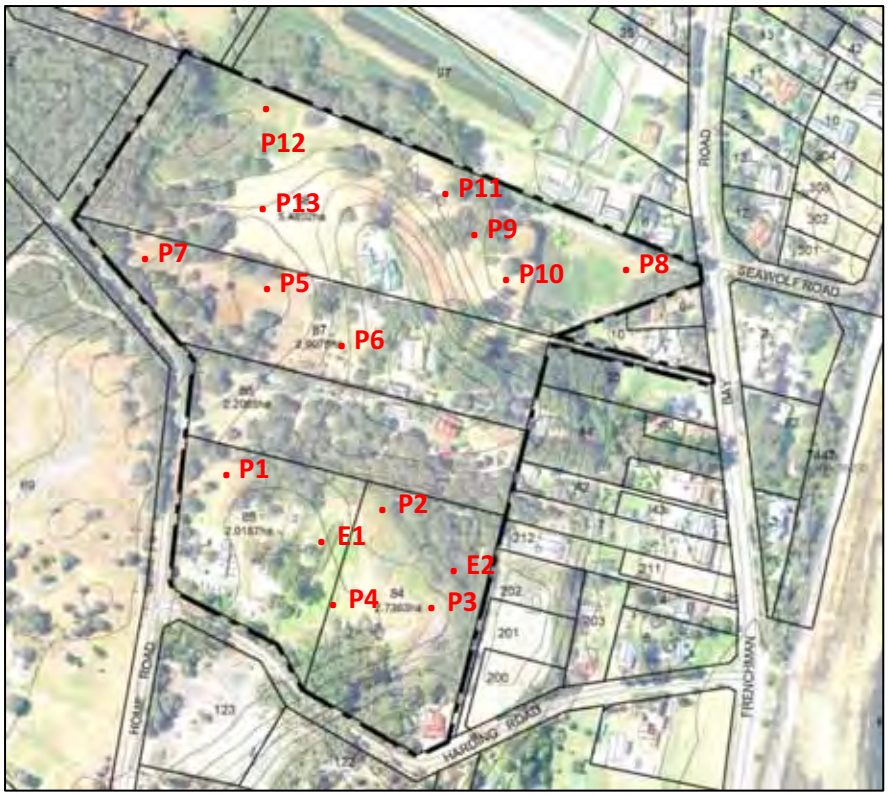
As part of Albany's water supply, groundwater is abstracted from borefields in the South Coast Water Reserve drawing from the Werillup Formation aquifer. The South Coast Water Reserve (Water and Rivers Commission 2001) encompasses most of the subject land which is part of the Priority 3 protection category for land-use planning purposes as discussed earlier in Section 2.3.

4.0 SITE ASSESSMENT

Given the broad scale of soil-landscape mapping depicted in Figure 6, some 'on-ground' variation can be expected in soil and landform conditions. Field obervations are therefore required to determine the capability of the land to support unsewered development and the actual presence or otherwise of acid sulfate soil.

Site assessment was undertaken during December 7 – 9. In addition to site traverses and associated photography, the field work involved description and sampling of soils from thirteen machine - excavated pits and two existing exposed cuttings. Figure 8 shows the location of the soil sites over an aerial image.

FIGURE 8: SOIL SITE LOCATIONS



Soil profile descriptions and photographs are contained within Attachment C.

4.1 Land Unit Mapping

Method

Soil and landform conditions within the subject land were surveyed in general accordance with the methodology outlined in Department of Agriculture and Food publications (van Gool et al 2005, Wells and King 1989). This involved examination of aerial photos followed by the field survey work during December.

The soils were classified in accordance with the WA Soil Group nomenclature (Schoknecht 2002) and consideration of the earlier Great Soil Group (Stace et al 1968) classification system used by Churchward et al (1988).

Site positions were recorded using a GPS unit and slope gradients were measured using a hand-held inclinometer correlated with the 2 m interval contour mapping shown on the base plan provided by Ayton Baesjou (refer Attachment A).

Results

A site results summary is provided in Table 1. In combination with aerial photo observations, the soil profile conditions were used to refine and subdivide the broad-scale soil landscape mapping (Meerup Mp & Mf, and Owingup) into eleven component 'land units'.

The resulting more-detailed 'land unit' mapping, shown in Figure 9, depicts areas of more homogeneous landform and soil conditions compared to the earlier soil landscape mapping unit (Figure 6). It therefore provides a more accurate spatial framework on which to assess the capability of the land and the suitability of a subdivision design.

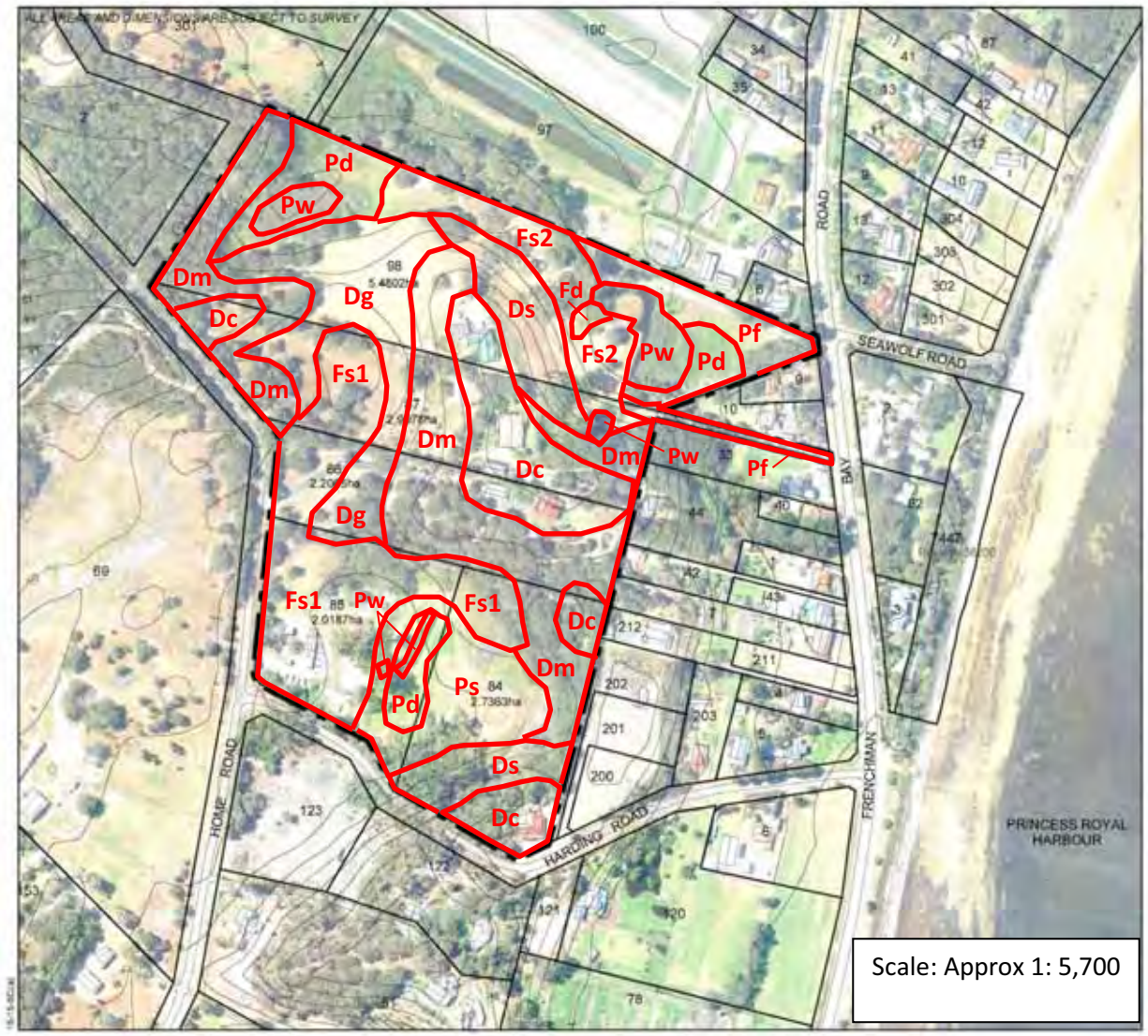
The land units are described in Table 2, and further appreciation of site conditions can be gained by reference to the property photographs which follow Table 2, and by reference to those accompanying the soil pit descriptions in Attachment C.

TABLE 1: SOIL SITE SUMMARY

Site *	Soil Classification**	Landform
P1	***Pale deep sand*** (Podzol; deep siliceous sand).	Well drained, low sandy rise over interdunal flats.
P2	***Pale deep sand*** (Podzol; deep siliceous sand).	Well drained sandplain at margin of interdunal flats or deflation basin.
P3	***Pale deep sand*** (Podzol; calcareous at depth).	Moderately well drained depression within interdunal flat or deflation basin.
P4	***Alkaline grey shallow sandy duplex*** (over calcareous sand).	Imperfectly drained interdunal flat or deflation basin.
P5	***Pale deep sand*** (Podzol; deep siliceous sand).	Well drained interdunal depression.
P6	***Pale deep sand*** (Podzol; calcareous at depth).	Rapidly drained sand dune (moderate sideslope).
P7	***Pale deep sand*** (Podzol; deep siliceous sand).	Rapidly drained sand dune (gentle upper slope).
P8	***Disturbed land*** *(Semi-wet soil* – siliceous sand mantled by loamy soil fill material)	Imperfectly drained estuarine plain with fill material.
P9	***Semi-wet soil*** (calcareous organic loam over siliceous sand)	Imperfectly drained depression within sandplain margin or footslope area.
P10	***Pale deep sand*** (Podzol; calcareous at depth).	Gently undulating, well drained sandplain margin or footslope area.
P11	***Pale deep sand*** (Podzol; calcareous at depth).	Gently undulating, well drained sandplain margin or footslope area.
P12	***Alkaline grey deep sandy duplex*** (over calcareous sand).	Imperfectly drained estuarine plain fringing wetland area.
P13	***Pale deep sand*** (Podzol; deep siliceous sand).	Gently undulating upland surface of well drained dunes.
E1	***Alkaline grey shallow loamy duplex*** (over calcareous sand).	Imperfectly drained interdunal flat or deflation basin.
E2	***Pale deep sand*** (Podzol; calcareous at depth).	Rapidly drained sand dune (moderate sideslope).

* Refer Figure 8 ** Classification in bold according to DAFWA system (Schoknecht 2002).

FIGURE 9: LAND UNIT MAPPING



Abbreviated Legend – see also Table 2

Dunes	
Dc Crests; pale deep sands.	**Dm** Moderate slopes; pale deep sands.
Ds Steep slopes; pale deep sands.	**Dg** Gentle slopes; pale deep sands.
Footslopes *(margins with plain)*	
Fs1 Sandplain; pale deep sands (siliceous).	**Fd** Depression; semi-wet organic soil.
Fs2 Sandplain; pale deep sands (subsoils calcareous).	
Plains *(estuarine plain and portions exposed within deflation basin)*	
Ps Pale deep sands (subsoils calcareous).	**Pd** Duplex soils with clayey marl / l'stone.
Pf Fill; semi-wet soil (loamy fill over sand).	**Pw** Wetland

TABLE 2. LAND UNIT DESCRIPTIONS

Unit	Description
Dunes *– Higher portions of the parabolic sand dunes of the Meerup system*	
Dc	Elevated crests with flat to gentle slopes (< 10 % gradient) and well drained pale deep sands. (Podzols - deep leached grey siliceous sand with yellowish brown sandy subsoil which may be calcareous at greater than 2m depth).
Ds	Steeply sloping dune areas (> 20 % gradient) with well drained pale deep sands similar to unit Dc.
Dm	Moderately sloping dune areas (10 - 20 % gradient) with well drained pale deep sands similar to unit Dc although subsoils may be calcareous at 1 – 2 m depth.
Dg	Gently sloping dune areas (3 – 10 % gradient) with well drained pale deep sands similar to unit Dc although subsoils may be calcareous at 1 – 2 m depth.
Footslopes *- Lower portions of the parabolic dunes and inter-dune sandplain of the Meerup system in proximity to adjacent areas of estuarine / alluvial plain.*	
Fs1	Well drained low sandy rises, inter-dune depressions or sandplain with pale deep sands (Podzols - deep grey siliceous sand with yellowish brown sandy subsoil)
Fs2	Gently undulating, well drained sandplain margin or footslope with pale deep sands similar to unit Fs1 although subsoils may be calcareous at 1 – 2 m depth.
Fd	Imperfectly drained depression within sandplain margin or footslope with semi-wet soil (calcareous organic loam over siliceous sand).
Plains *– Flat terrain forming part of the estuarine / alluvial plain (Owingup System) and including portions exposed by deflation hollows within the dunes (Meerup System).*	
Ps	Moderately well drained inter-dune flat or deflation basin with pale deep sands (Podzols - deep grey siliceous sand over a very weak iron-organic hardpan and calcareous yellowish brown sandy subsoil). Seasonally high groundwater levels likely to be at 1 – 2 m depth.
Pf	Imperfectly drained area of estuarine plain with semi-wet soil (siliceous sand mantled by loamy soil fill material). Seasonally high groundwater levels likely to be at 1 – 2 m depth.
Pd	Imperfectly drained area of deflation basin or estuarine plain with duplex soils (alkaline sandy or loamy surfaced duplex soils with clayey marl / limestone rubble subsoil layer over buried calcareous sand). Seasonally high groundwater levels likely to be at 1 – 2 m depth.
Pw	Wetland depressions and associated poor- very poorly drained wet soils.

Lot 98 – **Dg** gently undulating upland dune surface

Lot 97- Moderate slopes **Dm** and dune depression **Fs1**

Lot 98 – Peppermint low forest within moderately sloping dunes **Dm**

Lot 97 – **Ds** steep dune slope

Lot 98 –**Ds** leading to sandy footslopes **Fs2**

Lots 84 & 85 - **Ps** sandy deflation basin with wetland.

Lot 85 – Remnant area of Karri forest within unit **Ps**

Lot 98 – Plain unit **Pf** wetlands **Pw** and steep dunes **Ds**

Lot 98 – Wetland **Pw** within area of plain with duplex soils **Pd.**

4.2 Land Capability Assessment

'Land capability' is a term referring to the ability of land to support a proposed change in use with minimal risk of degradation to its soil and water resources. In this report, where the subject land is already zoned for rural-residential land use* the capability assessment relates only to the ability of the land to accommodate on-site effluent disposal systems associated with more intensive subdivision of existing lots.

The assessment is expressed in accordance with the DAFWA's five class system (ranging from very high to very low capability) as described by van Gool et al (2005) and Wells and King (1989), and is based on the methodology outlined in those publications. Site requirements relating to soil depth, permeability, and separation from groundwater and surface waterbodies under the *Draft Country Sewerage Policy* (Gov't of Western Australia 1999) and the more recent Department of Health (2001 & 2012) *Code of Practice* documents are also considered.

Figure 10 provides a qualitative assessment of the capability of the subject land based on this approach. Four colour-coded categories are shown as follows;

Green - **High capability** (land units Dc, Dg, Fs1 and Fs2)

- Very minor land use limitations and suitable for conventional on-site effluent disposal using septic tanks and leach drains.
- Free draining soils that are well elevated above water-table and deeper subsoil likely to have moderate nutrient retention ability (based on iron content and calcareousness) and these areas are generally not close to surface waterbodies.
- Within unit Fs2 consideration needs to be given adequate setback distance from nearby wetland areas.

Yellow - **Fair capability** (land units Ps, Pf and Dm).

- Dunal areas (unit Dm) are suitable for conventional on-site effluent disposal using septic tanks and leach drains, although gradients require cut and fill activity and areas left devoid of vegetative cover are subject wind erosion risk.
- Areas of the estuarine plain and deflation basin are constrained for on-site effluent disposal due to proximity to the seasonally high watertable but this can be addressed through use of partially inverted leach drains (within imported soil fill material).
- Alternative effluent disposal systems (with lesser minimum depth to water requirement, and greater nutrient retention ability) can also be used. Within the R1 residential zoned portion of the subject land, Alternative Treatment Units are mandatory under the local planning policy (City of Albany - undated) for areas above 2.64 m AHD (such as unit Ps).

* A minor portion of Lot 98 near Frenchman Bay Road is zoned Residential R1.

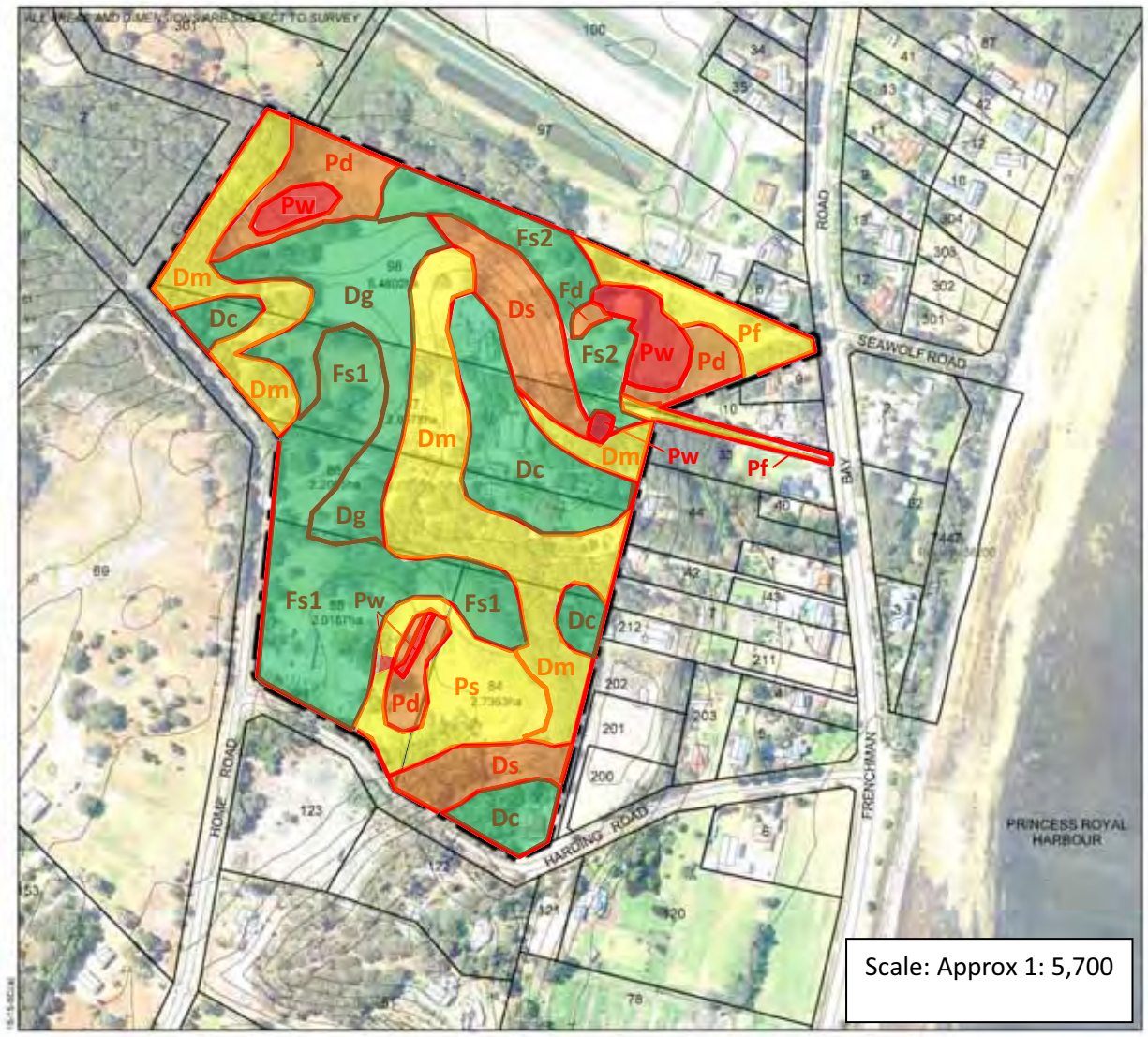
Orange - Low capability (land units Ds, Pd and Fd).

- Significant land use limitations.
- Dunal areas (Ds) are too steep for location of residences and associated on-site effluent disposal systems without significant engineering works, and areas left devoid of vegetative cover are subject to a high risk of slope instability and wind erosion.
- The duplex soil portions of the estuarine plain (Pd), and the organic soils within footslope depression area (Fd), are imperfectly drained and best avoided for on-site effluent disposal. Conventional septic tank systems would need fully inverted leach drains within imported soil fill material to achieve adequate separation from clayey subsoil within unit Pd.
- Setback requirements from nearby wetland areas also need to be considered for both Pd and Fd units, and their relatively limited extent suggests they would easily, and logically, be avoided when positioning building envelopes.
- If building envelope positioning is not able to be achieved outside of these areas (Pd and Fd), use of alternative treatment units should be mandatory.

Red - **Very low capability** (land unit Pw)

- Prohibitive land use limitations.
- Unsuitable for any form of on-site effluent disposal given the surface expression of the watertable and likely local conservation values.
- Underlying buried sediments of the estuarine plain potentially include acid sulfate soils which pose a risk to water quality if they are exposed through attempts to lower wetland watertable levels by drainage.
- Wetland areas (including excavated soaks) require a general 50 m minimum setback for conventional septic tank / leach drain systems, however this might be reduced to 30 m if alternative treatment units are used.
- Existing drains (such as the one along the northern side of the access route from Frenchman Bay Road into Lot 98) require a minimum 6 m setback in relation to positioning of any on-site effluent disposal systems within adjacent land units., (assuming that none of the water in such will be used for livestock consumption).

FIGURE 10: LAND CAPABILITY ASSESSMENT



High capability – Very minor limitations. Suitable for rural-residential development with conventional septic tanks and leach drains.

Fair capability – Moderate limitations associated with risk of wind erosion and need for cut and fill within dunes unit Dm, and need to address proximity to seasonally high groundwater levels within 'plain' units where on-site effluent disposal will require partially inverted leach drains (within imported soil fill material) or the use of alternative effluent disposal systems (with lesser minimum depth to water requirement). Unit Pf is within 'Residential zone R1 where Local Planning Policy mandates the use of alternative effluent disposal systems

Low capability – Significant limitations associated with steep slopes and erosion risk within dunes unit Ds, as well as either proximity to groundwater or wetlands, or slow subsoil permeability, within 'plain' unit Pd and footslope unit Fd. Generally areas that would be logically avoided for building envelopes.

Very low capability – Major limitations in terms of direct impacts of development. Unsuitable for any on-site effluent disposal given watertable exposure, and possible conservation values.

4.3 Testing for Acid Sulfate Soil

Testing of soil pH (1:5 water) for most layers of soil at each of the 13 pit and 2 existing exposure sites is reported within the description in Attachment C and shows predominantly neutral to alkaline soil pH and calcareous subsoil which is not suggestive of acid sulfate soil conditions.

Should the proposed subdivision of the land create additional residences within the estuarine plain portion where watertable proximity is a limiting factor, this can be addressed through partially inverted leach drains (Ps) or mandatory use of alternative treatment systems (as required for unit Pf) rather than any form of additional site drainage.

Notwithstanding this, two subsoil areas were sampled for Acid Sulfate Soil testing by the ChemCentre of WA. (Site 8 within estuarine plain land unit Pf, and site 9 within footslope depression land unit Fd).

The SPOCAS (complete suspension peroxide oxidation combined acidity and sulfur) analysis method was used. This is a standardized set of procedures recommended by the (former) Department of Environment and Conservation for assessing the potential for an acid sulfate soil problem in sandy soils in Western Australia.

The results are contained in Attachments D and E and show the buried soils within unit Pf are within action guideline limits and have high excess acid neutralizing capacity. However the result for the smaller area of highly organic soil within unit Fd is less clear-cut as indicated by the email correspondence copied below;

Copy of Email Communication from Chemistry Centre

The second sample (P9) was interesting. It appears to have a significant carbon content (black colour and sample tends to float on liquid). The ***TPA is very high but is not supported by the sulphide sulphur content (Spos).*** *Based on the Spos value a TPA of approximately 950 moles H^+/tonne would have been expected if all the sulphide was as FeS_2, a strongly acid producing sulfide. I* ***strongly suspect the additional acidity is due to the formation of organic acids from the oxidation of carbon/ carbon compounds.***

I feel this is supported by the pHox which at 3.4 is certainly acidic, but not as acidic as expected from the TPA value- organic acids tend to have higher pH values than mineral acids such as H2SO4 as they do not readily produce hydrogen ions in solution. Non sulfidic acidity can also come from reactions of iron and manganese compounds in solution but there appeared to be very little iron or manganese in this sample. I believe it ***unlikely that the non sulfidic acidity of this sample would be realized in practice*** *as the hydrogen peroxide oxidation used in the method is much more severe than aerial oxidation.*

It appears therefore that although the result for site 9 is not within the actionable guideline, it is considered likely to be the result of the oxidation of the atypically high soil organic matter content rather than an indication of acid sulphate soil conditions.

Notwithstanding the results which indicate Acid Sulfate Soils are not present beneath the subject land, it is relevant to point out that rural-residential development need not involve any form of deep excavation or drainage to expose or aerate previously buried waterlogged subsoils. Any impacts on the limited 'interesting area' of Fd / site 9 can also be easily avoided by appropriate positioning building envelopes.

5.0 CONCLUSIONS

5.1 Capability of the land to support more intensive subdivision

Figure 10 presents the results of land capability assessment for rural-residential development and provides a spatial framework for preparing a plan of subdivision that adequately responds to the nature and capability of the land.

Subject to the proposed pattern of subdivision enabling positioning of building envelopes for all 'new' lots within areas of either high (green) or fair (yellow) capability, the subject land is capable of supporting additional subdivision to the lot sizes permissible for the relevant land use zoning categories under the planning scheme (City of Albany 2014).

Comment in relation to on-site effluent disposal.

For the major portion of the subject land (elevated dunal areas) conventional son-site effluent disposal systems (septic tanks and leach drains) will be appropriate for un-sewered rural residential lots.

Should the plan of subdivision result in building envelopes being positioned within lower-lying portions where alternative treatment units are required, setback distances (both vertical and horizontal) are applicable to land application areas for effluent disposal.

Specific setbacks, and the required area for land application of treated effluent, can vary according to the type of system (i.e. a soil absorption system such as leach drains with amended soil, or an irrigation system associated with an aerobic treatment unit, ATU) and according to the method of any irrigation (i.e. surface sprays or drippers, or subsoil drippers).

Attachment F provides a list of alternative treatment systems approved for use in Western Australia. Subject to landowner choice of type of system, installers can determine specific setback requirements (vertical and horizontal) through reference

to the manufacturer's specifications, and the Department of Health's Code of Practice documents (DoH 2001, 2012).

5.2 Potential for further development to be affected by Acid Sulfate Soil

The Albany Local planning Strategy (City of Albany 2010) addresses acid sulphate soils as a land contamination issue and seeks to; *Ensure the suitability of land uses on existing or potential contaminated sites and require hazard reduction mechanisms to prevent harm to human health or the environment.*

A search has been conducted of the State Government's contaminated sites database by planners Ayton Baesjou, who report that there are no records of contaminated sites within the subject land.

Notwithstanding the absence of any need for deep excavation works associated with further subdivision and development of the land for rural-residential use, field survey observations and some laboratory testing of subsoil material within the estuarine plain portion, indicate acid sulfate soils are not present.

An acid sulfate soils self-assessment form is included here as Attachment E should it be considered necessary to refer this report to the Department of Environment Regulation in the context of assessing potential impacts of the proposed subdivision.

5.3 Protection of remnant vegetation

The proposed intensity of further subdivision should not require any significant clearing of the remaining native vegetation within the subject land.

Outside of the parkland cleared areas, where understorey species have been already been depleted, the more intact areas of remaining vegetation occur near the property fringes and are unlikely to be considered prospective sites for building envelopes given the proposed lot sizes.

Subject to site responsive subdivision design, the ALRS objective of protecting areas of remnant vegetation would not be compromised by the development proposal.

5.4 Protection of groundwater

The Local Planning Scheme (City of Albany 2014) takes into consideration the Water Source Protection Plan for the South Coast Water Reserve (Water and Rivers Commission 2001) via designation of a special control area which extends over most of the subject land.

Subject to the plan of subdivision responding to the land capability mapping through appropriate positioning of 'new' building envelopes, and the creation of lots of equal or greater size to those determined by the Water Source Protection Priority Code (P3 – with a possible minimum average of 1 ha), the proposed intensification of rural-residential development in this area should not jeopardize groundwater protection.

6.0 REFERENCES

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.* CSIRO Division of Water Resources Divisional Report 88/1. April 1988.

City of Albany (2014) *City of Albany Local Planning Scheme No 1.* Initiated at the Ordinary Council Meeting dated 17 February 2009, and prepared by the Department of Planning - Gazettal Date: 28 April 2014

City of Albany (2010) *Albany Local Planning Strategy* - Final Draft adopted by Council 15 June 2010 and endorsed by WAPC on 26 August 2010.

City of Albany (undated) City of Albany Policy - Frenchman Bay Road Residential Development Area

Department of Agriculture and Food (2012) *Regional Soil Landscape Mapping – NRM Info* (Online) Available: http://www.spatial.agric.wa.gov.au/slip

Department of Environment (2004) *Land use compatibility in Public Drinking Water Source Areas* Water Quality Protection Note WQPN 25. July 2004.

Department of Health (2001) *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs) Serving Single Households.*

Department of Health (2012) *Code of Practice for Onsite Sewage Management* Consultation Draft November 2012

Government of Western Australia (1999) *Draft Country Sewerage Policy* – document endorsed by the Cabinet Committee on Waste Management and released for public comment by Environmental Health Service, Health Department of Western Australia Perth, Western Australia - as amended to 2003.

Government Printer (1985) *Bacteriolytic Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations.* Extract from Government Gazette (No 12) of 6 February 1985 - Health Act 1911.

Gozzard J. R. (1989) *Albany Part Sheets 2427 I, 2428 II, 2527 IV, & 2528 III, Environmental Geology Series,* Geological Survey of Western Australia.

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.

Schoknecht, N. (2002) *Soils Groups of Western Australia - a simple guide to the main soils of Western Australia. Edition 3.* Resource Management Technical Report 246. Agriculture Western Australia, Perth. June 2002.

Stace, H.C.T, Hubble, G.D., Brewer R, Northcote K.H., Sleeman J.R., Mulcahy M.J and Hallsworth, E.G. (1968) *A Handbook of Australian Soils* - published by Rellim Technical Publications, Glenside, South Australia, for the CSIRO and the International Society of Soil Science.

Standards Australia & Standards New Zealand (2012) - AS/NZS 1547:2012 - *On-site Domestic Wastewater Management* - published by SAI Global Limited under license from Standards Australia Limited, Sydney, N.S.W.

van Gool, D. Tille P, and Moore, G (2005) *Land Evaluation Standards for Land Resource Mapping. Guidelines for assessing land qualities and determining land capability in south-west Western Australia.* Resource Management Technical Report 298. Agriculture WA, Perth. December 2005.

Water and Rivers Commission (2001) *South Coast Water Reserve and Limeburners Creek Catchment Area Water Source Protection Plan.* Water and Rivers Commission Report WRP 44 2001.

Western Australian Planning Commission (2008) *Acid Sulfate Soils Planning Guidelines*.

Wells, M.R. and King, P.D. (1989) *Land Capability Assessment Methodology for Rural-Residential and Associated Agricultural Land Uses.* Land Resources Series No. 1. Western Australian Department of Agriculture, Perth.

ATTACHMENT A

SITE CHARACTERISTICS – BASE PLAN

SITE CHARACTERISTICS

Lots 84, 85 Harding Road & Lots 86, 87 & 98 Home Road Robinson, City of Albany

LEGEND

- Subject Land
- Existing Vegetation
- Existing Buildings

ORIG A3
SCALE 1:3000
0 15 30 45 60 75

15-15-SC(a)

AYTON BAESJOU
PLANNING
59 Peels Place
ALBANY WA 6330
Ph 9842 2304 Fax 9842 8494

ATTACHMENT B

ARVS VEGETATION UNIT DESCRIPTIONS

1 Coastal Yate Woodland.

No. of relevés 7 **Mean spp. richness** 11.7 **Area** 419 ha **% of Rem. Veg**. 0.9 **% in IUCN Reserve 1-IV** 21.4

Description

Coastal Yate Woodland is found along the coastal fringe in protected swales, slopes, crests and flats on grey sand. It is dominated by an upper canopy of *Eucalyptus cornuta* over a sparse secondary tree stratum of *Agonis flexuosa*. There is usually one shrub layer, a tall open scrub or open heath and common dominant shrubs include *Hibbertia furfuracea, Bossiaea linophylla* and *Spyridium globulosum*. Ground cover is frequently sparse and there is a high degree of variability in sedge dominance with *Desmocladus flexuosus* most common.

This unit is one of four units that equate to "Scrub heath on dunes" as mapped by Beard (1979), and described as "Peppermint Low Woodland and Scrub-heath". The other units are Peppermint Low Forest (2), Coastal Heath (3) and Limestone Coastal Heath (4). This unit shares many species with Peppermint Low Forest (2), with which it merges, but differs in the absence of *Adenanthos sericeus* and presence of *Hibbertia furfuracea*. It is usually found in more protected and damper sites. In some areas this unit merges with Karri Forest (9).

Comments

Infestations of **Dipogon lignosus* (Dolichos Pea) and **Zantedeschia aethiopicum* (Arum Lily) were observed within this unit in the Little Grove and Robinson areas. This unit is largely restricted to coastal and near coastal consolidated dunes with occasional occurrences along near coastal drainage lines, though one site near Bornholm was recorded on a hill top. The distribution of dominant understorey species suggest that this unit reaches it eastern limit just east of the survey area (the eastern limit of *Hibbertia furfuracea and Hardenbergia comptoniana*) and it probably extends to the west along the coastal fringe of the Warren Botanical District. Direct comparison with units described in the Walpole region by Wardell-Johnson and Williams (1996) is difficult, though it is likely that this unit falls within their community group A4.

This unit is naturally restricted to the coastal fringe. The only other *Eucalyptus cornuta* dominated unit within the survey area, Unit 24, is restricted to granite outcrops.

Floristic Summary

Lifeform	%cover	Species
Trees 10-30m	S-M	*Eucalyptus cornuta*
Trees <10m	V	*Agonis flexuosa*
Shrubs >2m	M	*Hibbertia furfuracea, Bossiaea linophylla, Spyridium globulosum*
Shrubs 1-2m		*Leucopogon obovatus, Hibbertia cuneiformis, Pimelea clavata*
Shrubs <1m		*Tremandra stelligera, Rhagodia baccata*
Sedges/rushes	Nil -V	*Desmocladus flexuosus, Lepidosperma densiflora, Lepidosperma densiflora* forma proliferous, *Lepidosperma effusum, Lepidosperma effusum* forma small, *Lepidosperma gladiatum, Ficinia nodosa*
Herbs		*Billardiera fusiformis, Clematis pubescens, Stylidium adnatum, Opercularia hispidula, Hardenbergia comptoniana*
Grasses		*Tetrarrhena laevis*

Key identifying Features

- Canopy of *Eucalyptus cornuta* above *Agonis flexuosa* and shrubland dominated by *Hibbertia furfuracea, Bossiaea linophylla* and *Spyridium globulosum.*
- Coastal distribution on sand.

Conservation species None recorded

2 Peppermint Low Forest

No. of relevés 10 **Mean spp. richness** 10 **Area** 1232 ha **% of Rem. Veg**. 2.8 **% in IUCN Reserve 1-IV** 23.0

Description
Peppermint Low Forest is restricted to the coastal dune system where it commonly occurs in swales and flats. A dense canopy of *Agonis flexuosa* (Peppermint) is characteristic of this unit with the structure varying from a closed heath on exposed coastal slopes to a low closed forest in swales with shrub species often sub or co-dominant in exposed areas. A tall shrubland of *Spyridium globulosum, Adenanthos sericeus, Bossiaea linophylla* and *Leucopogon obovatus* is usually present over an open or closed sedgeland with *Rhagodia baccata, Hardenbergia comptoniana* and *Clematis pubescens* common.

This unit forms a mosaic with Coastal Heath (3), Limestone Coastal Heath (5), Coastal *Banksia ilicifolia/*Peppermint Low Woodland (4) and Coastal Yate Woodland (1) and appears to be the climax of Coastal Heath (Beard 1979).

Three sub-units are described:

2a Peppermint Low Forest occurs on coastal dunes and swales and is described above.

2b Peppermint/*Eucalyptus megacarpa* Low Forest occurs along minor drainage lines on lower slopes of the coastal dunes. *Eucalyptus megacarpa* is co-dominant in the upper strata and *Lepidosperma effusum* and *Pteridium esculentum* are common.

2c Peppermint Low Forest/*Lepidosperma gladiatum* Sedgeland occurs in the swale behind the fore dune and occasionally in deep valleys on the inland dunes. *Lepidosperma gladiatum, Desmocladus flexuosus, Rhagodia baccata* and *Hardenbergia comptoniana* are prominent understorey species with *Hibbertia cuneiformis* and *Pimelea clavata* common shrubs.

Comments
This unit also includes *Agonis flexuosa* thickets that have invaded other units. In the Little Grove and Big Grove area, *A. flexuosa* is invading what was once *Banksia littoralis/*Woodland *Melaleuca incana* Shrubland (44) as indicated by the dead and dying *Banksia littoralis* and the presence of scattered species indicative of winter wet areas such as *Villarsia parnassiifolia, Sphenotoma gracilis* and *Melaleuca incana* under dense canopies of *A. flexuosa*. This invasion suggests that a significant and prolonged lowering of the water table may have occurred. Anecdotal evidence indicates that large areas of Little Grove and Big Grove were more swampy forty to fifty years ago (T. Allen, pers. comm.).

Many infestations of **Acacia longifolia* were observed within this unit, particularly in the Little Grove area. *Agonis flexuosa* occurs as a lower tree stratum or as a co-dominant in a number units (1, 4, 9 and 10) and where this species occurs as stands over pasture, identification of the unit has been based on the nearest intact vegetation.

Peppermint Low Forest is common along the south west coastline though those with *Adenanthos sericeus* in the understorey (2a) are restricted to areas around Albany as this species only occurs from the Nullaki Peninsula to Waychinnicup with an outlying population at Warriup. *Eucalyptus megacarpa* and *Hardenbergia comptoniana* reach their eastern limit near Mt Manypeaks and Cheyne Beach respectively (DEC 2009).

Floristic Summary

Lifeform	%cover	Species
Mallee/Tree <8m	M-D	*Agonis flexuosa +/-Eucalyptus megacarpa,+/-Hakea oleifolia*
Shrubs 1m to >2m	S	*Spyridium globulosum, Adenanthos sericeus, Bossiaea linophylla, Leucopogon obovatus, Hibbertia cuneiformis*
Shrubs 0.5-1m	V	*Rhagodia baccata*
Sedges/rushes	V-D	*Desmocladus flexuosus, Lepidosperma densiflora* forma proliferous, *Lepidosperma gladiatum, Lepidosperma effusum*
Herbs	V	*Hardenbergia comptoniana, Clematis pubescens, Opercularia hispidula, Billardiera fusiformis*

Key identifying Features
- Thickets with *Agonis flexuosa* dominant or co-dominant.
- Occurs on sand in coastal areas

Conservation species None recorded

9 Karri Forest

No. of relevés 11 **Mean spp. richness** 10.6 **Area** 885 ha **% of Rem. Veg**. 2.0 **% in IUCN Reserve 1-IV** 1.6

Description
Karri Forest is found in the southern and south western areas of the survey area with isolated pockets along the north-west boundary. It is distinguished by the dominance of *Eucalyptus diversicolor* (Karri) trees in the canopy. Three sub-units are described, differing in floristic composition, landform and soil type and distribution. However, two of these sub-units were poorly sampled and further survey is required to clarify floristic differences.

Sub-units:
9a Coastal Karri Forest is found in a scattered band on the flats and lower slopes north of the coastal hills from Goode Beach to Torbay Townsite, with isolated pockets occurring south of Manypeaks. It often occurs on grey sand often overlying limestone and typically it is an open forest, occasionally reaching > 30 m in height. *Eucalyptus cornuta* is often a sub-dominant canopy species and *Agonis flexuosa* forms an open secondary tree stratum. The understorey shrubs vary from a closed tall scrub on very moist sites to a tall open scrub or open heath over open sedgeland. Common species include *Chorilaena quercifolia, Trymalium odoratissimum, Thomasia solanacea, Hibbertia furfuracea, Bossiaea linophylla, Tremandra stelligera. Lepidosperma effusum, Ficinia nodosa, Gahnia sclerioides* and *Desmocladus flexuosus.* The climbers *Hardenbergia comptoniana, Clematis pubescens* and *Billardiera variifolia* are frequently prominent. This sub-unit often grades into *Eucalyptus cornuta* Open Forest on drier sites.

9b Karri Tall Open Forest
This sub-unit is found on the deep red Karri loams on the hills around Torbay, Bornholm and Torbay townsite. This unit was poorly sampled (1 relevé) and is differentiated from the Coastal Karri sub-unit by the presence and/or dominance of *Allocasuarina decussata* and/or *Acacia pentadenia* in the lower tree/upper shrub strata and the absence of *Thomasia solanacea* and *Templetonia retusa.* This sub-unit occasionally merges with sub-unit 9a on the lower slopes/flats of hills near Bornholm and Torbay townsite where colluvial sands occur. An unsurveyed pocket in the Goode Beach area also appears transitional with subunit 9a with *Acacia pentadenia* present (WA Herbarium records). Other common species include *Agonis flexuosa, Hibbertia furfuracea, Trymalium odoratissimum* and *Bossiaea linophylla.* This unit often occurs upslope of Marri/Jarrah Forest/Peppermint Woodland (10) and appears to have close floristic affinities with Karri forests in the Denmark Walpole/Manjimup area with *Allocasuarina decussata and Acacia pentadenia* in the understorey.

9c Redmond Karri Forest
This sub-unit was recorded on the north west boundary of the survey area along a broad valley on skeletal soils overlying a very dark exposed lateritic rock. All areas had been recently burnt (2002) and post fire opportunistic species including *Rulingia corylifolia, Acacia pulchella* and *Opercularia hispidula* were dominant beneath a *Bossiaea linophylla* Tall Open Scrub. Other species present were *Leucopogon obovatus, Cyathochaeta avenacea, Ficinia nodosa, Opercularia hispidula, Pteridium esculentum, Xanthosia candida* and *Tetrarrhena laevis.*

Comments
The Karri forests observed on several previously cleared remnants on the plains south of Manypeaks have regenerated well following fencing and the presence of *Chorilaena quercifolia* and *Templetonia retusa* suggest they belong to sub-unit 9a.

Karri forests are common throughout the Warren Botanical District with the eastern limit occurring on the slopes of Mt Manypeaks just east of the survey area. An outlying population occurs in the Porongurup Range north of the context area. The floristic similarity of Karri forests outside the study area to the sub-units recorded here has not been assessed. The occurrence of sub-unit 9c on skeletal dark lateritic soil may be unusual as Karri forests are typically found on deep loam or sand.

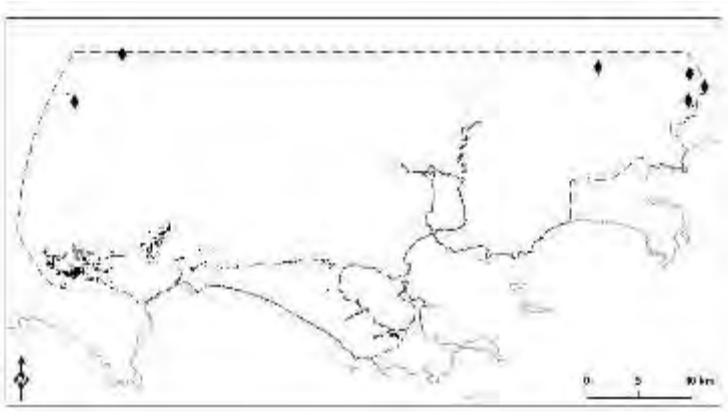
Floristic Summary

Lifeform	%cover	Species
Trees 10-30m	M	*Eucalyptus diversicolor, Eucalyptus cornuta*
Trees <10 m	V	*Agonis flexuosa, Allocasuarina decussata, Hakea oleifolia*
Shrubs >2m	S-M	*Trymalium odoratissimum, Chorilaena quercifolia, Thomasia solanacea, Hibbertia furfuracea, Bossiaea linophylla, Templetonia retusa, Acacia pentadenia, Rulingia corylifolia*
Shrubs <2m	V	*Acacia alata, Tremandra stelligera*
Sedges/rushes	V	*Lepidosperma effusum, Ficinia nodosa, Desmocladus flexuosus, Lepidosperma squamatum, Lepidosperma densiflora*
Herbs	V	*Opercularia hispidula, Hardenbergia comptoniana, Clematis pubescens, Billardiera variifolia, Lagenophora huegelii, Pteridium esculentum*
Grasses		*Tetrarrhena laevis, Poa porphyroclados, Microlaena stipoides*

Key identifying Features

- Canopy of *Eucalyptus diversicolor* (Karri).

Conservation species *Thomasia solanacea* P3, *Gahnia sclerioides* P3



Unit 9 Karri Forest

ATTACHMENT C

SOIL PROFILE DESCRIPTIONS AND PHOTOGRAPHS

Site Number: Pit 1 **Lot 85** 50 H 577015 m E; 6122659 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf	**Land unit: Fs1**

Landform: Well drained, low sandy rise (up to 6 % gradient) over interdunal flats.

WA Soil Group: ***Pale deep sand*** (Deep siliceous podzol)

Depth (cm)	**Description**
0 – 45	Very dark grey (10YR 3/1) **loamy sand**, dry; clear boundary to;
45 - 90	Dark grey (10YR 4/1) **sand,** dry; clear boundary to;
90 - 140	Light grey (10YR 7/1) **sand**, dry, neutral (pH 7.3), non-saline (ECe 60 mS/m) clear boundary to;
140-180+	Dark brown (7.5YR 3/3) fine **sand,** (very weak pan), dry, slightly acid (pH 6.2), non-saline (ECe 77 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have limited nutrient retention ability but site is not close to water table or surface waterbodies).

Site Number: Pit 2 **Lot 84** 50 H 577130 m E; 6122649 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf	**Land unit: Fs1**

Landform: Well drained sandplain (< 2% gradient) at margin of interdunal flats or deflation basin.

WA Soil Group: ***Pale deep sand*** (Deep siliceous podzol)

Depth (cm)	**Description**
0 - 25	Very dark grey (10YR 3/1) **loamy sand**, dry; clear boundary to;
25 - 50	Dark grey (10YR 4/1) **sand,** dry; clear boundary to;
50 - 95	Light grey (10YR 7/1) **sand**, dry, neutral (pH 7.3), non-saline (ECe 60 mS/m) clear boundary to;
95 – 180+	Dark brown (7.5YR 3/3) fine **sand,** dry.

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 2.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Pit 3 **Lot 84** 50 H 577188 m E; 6122562 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf over Owingup flats OW	**Land unit: Ps**

Landform: Moderately well drained depression within interdunal flat or deflation basin.

WA Soil Group: ***Pale deep sand***
(Podzol; calcareous at depth).

Depth (cm)	**Description**
0 – 10	Very dark grey (10YR 3/1) **loamy sand**, dry; clear boundary to;
10 – 25	Dark grey (10YR 4/1) **sand,** dry; clear boundary to;
25 – 95	Light grey (10YR 7/1) **sand**, dry, clear boundary to;
95 – 155	Dark brown (7.5YR 3/3) **sand,** (very weak pan), calcareous, dry, gradual boundary to;
155-180+	Dark brown (7.5YR 3/3) **sand,** calcareous, moist, moderately alkaline (pH 8.0), moderately saline (ECe 474 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: 180 cm.

Comment: Suitable for conventional on-site effluent disposal subject to use of partially inverted leach drains (within imported soil fill material) to achieve adequate separation from groundwater**.** Also suitable for alternative effluent disposal systems (with lesser minimum depth to water requirement).

Site Number: Pit 4 **Lot 85** 50 H 577095 m E; 6122557 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf over Owingup flats OW	**Land unit: Pd**

Landform: Imperfectly drained interdunal flat (**partly obscured at photo left**) or deflation basin.

WA Soil Group: ***Alkaline grey shallow sandy duplex*** - over buried calcareous sand.

Depth (cm)	**Description**
0 - 25	Very dark grey (10YR 3/1) **loamy sand**, calcareous, slightly moist; clear boundary to;
25 – 65	Light brownish grey (10YR 6/2) C**lay loam, sandy**, calcareous, slightly moist; moderately alkaline (pH 8.8), non-saline (ECe 116 mS/m); clear to;
65 - 80	Light yellowish brown (10YR 6/4) **sand,** with few black mottles (cutans), calcareous; slightly moist; gradual boundary to;
80 - 180	Greyish brown (10YR 5/2) **sand,** calcareous, with few black mottles (cutans), slightly moist; strongly alkaline (pH 9.0), non-saline (ECe 165 mS/m); gradual boundary to;
180-200+	Very dark greyish brown (10YR 3/2) **clayey sand**, calcareous, moist.

Indicative subsoil permeability and drainage class (at leach drain depth): 0.12 – 0.5 m/d (Imperfectly drained). **Depth to water**: 190 cm.

Comment: Best avoided as generally not suitable for conventional on-site effluent disposal due to need for fully inverted leach drains within imported soil fill material to achieve adequate separation from clayey subsoil near surface and need for setback from soakage dam. Possibly suitable for alternative effluent disposal systems (with lesser minimum depth to water requirement).

Site Number: Pit 5 **Lot 87** 50 H 577048 m E; 6122828 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf	**Land unit: Fs1**

Landform: Well drained interdunal depression (< 2% gradient).

WA Soil Group: ***Pale deep sand*** (Deep siliceous podzol)

Depth (cm)	**Description**
0 – 20	Very dark grey (10YR 3/1) **loamy sand**, dry; strongly acid (pH 5.4), non-saline (ECe 110 mS/m); gradual boundary to;
20 - 100	Grey (10YR 5/1) **sand,** dry, moderately alkaline (pH 8.6), non-saline (ECe 111 mS/m); clear to;
100 –135	Very dark brown (7.5YR 2.5/2) **sand**, dry, neutral (pH 7.6), non-saline (ECe 56 mS/m); clear to;
135– 190+	Pale brown (10YR 6/3) **sand,** with few black mottles (cutans), slightly moist, neutral (pH 7.4), non-saline (ECe 87 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered here but > 3.0 m based on observation in adjacent excavated area.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Pit 6 **Lot 87** 50 H 577101 m E; 6122786 m N	**DAFWA Soil landscape mapping:** Meerup dunes Mp	**Land unit: Dm**

Landform: Rapidly drained sand dune (moderate sideslope, 14 % gradient). Note Steeper bank is edge of excavated terrace

WA Soil Group: *Pale deep sand*
(Podzol; calcareous at depth).

Depth (cm)	**Description**
0 – 20	Dark grey (10YR 4/1) **sand**, dry; clear boundary to;
20 - 70	Light grey (10YR 7/2) **sand,** dry, clear boundary to;
70 – 120	Yellowish brown (10YR 5/6) **sand,** dry; moderately alkaline (pH 8.0), non saline (ECe 51 mS/m).); diffuse boundary to;
120 - 185	Yellowish brown (10YR 5/6) **sand,** with few bleached mottles, dry; gradual boundary to;
185–220+	Very pale brown (10YR 7/4) **sand,** calcareous, strongly alkaline (pH 9.2), non saline (ECe 99 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Pit 7 **Lot 87** 50 H 576958 m E; 6122855m N	**DAFWA Soil landscape mapping:** Meerup dunes Mp	**Land unit: Dc**

Landform: Rapidly drained sand dune (gentle upper slope, 7 % gradient).

WA Soil Group: ***Pale deep sand*** (Deep siliceous podzol)

Depth (cm)	**Description**
0 - 40	Dark grey (10YR 4/1) **sand**, dry, gradual boundary to;
40 – 110	Grey (10YR 5/1) **sand**, dry, moderately acid (pH 5.6), non-saline (ECe 56 mS/m); gradual boundary to;
110 - 165	Light grey (10YR 7/1) **sand**, dry; clear boundary to;
165–210+	Dark yellowish brown (10YR 4/4) **sand**, mottled, dry, slightly acid (pH 6.5), non-saline (ECe 48 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Pit 8 **Lot 98** 50 H 577352 m E; 6122837 m N	**DAFWA Soil landscape mapping:** Owingup flats OW	**Land unit: Pf**

Landform: Imperfectly drained estuarine plain (< 2% gradient) with fill material.

WA Soil Group: Disturbed land / *Semi-wet soil* (Loamy fill material over siliceous sand)

Depth (cm)	**Description**
0 – 60	Brown (10YR 4/3/) **loamy sand**, with few ferruginous gravels, (fill material) dry, neutral (pH 7.2), non-saline (ECe 57 mS/m); clear boundary to;
60 - 105	Very dark greyish brown (10YR 3/2) **clay loam fine sandy**, (fill material) calcareous, dry, moderately alkaline (pH 8.4), non-saline (ECe 142 mS/m); clear boundary to;
105 -150	Dark grey (10YR 4/1) **sand**, (former land surface?) dry, moderately alkaline (pH 8.5), non-saline (ECe 132 mS/m); clear boundary to;
150 -170+	Grey (10YR 5/1) **clayey sand,** moist.

Indicative subsoil permeability and drainage class (at leach drain depth): 0.12 – 0.5 m/d (Imperfectly drained). **Depth to water:** 170 cm. **Estimated depth of fill**: 105 cm.

Comment: Fill material brings site above 2.64m AHD but not suitable for conventional on-site effluent disposal using septic tanks and leach drains due to policy requirements (City of Albany - Frenchman Bay Road Residential Development Area - undated local planning policy). Suitable for effluent disposal using Alternative Treatment Units subject to 6 m setback from drain on north side of property access way.

Site Number: Pit 9 **Lot 98** 50 H 577221 m E; 6122844 m N	**DAFWA Soil landscape mapping:** Intergrade area Meerup dunes Mp over Owingup flats OW	**Land unit: Fd**

Landform: Imperfectly drained depression within sandplain margin or footslope area.

WA Soil Group: ***Semi-wet soil***
(calcareous organic loam over siliceous sand)

Depth (cm)	**Description**
0 – 20	Black (10YR 2/1) **loamy sand**, dry; gradual boundary to;
20 - 80	Black (10YR 2/1) **loam fine sandy** calcareous, slightly moist, moderately alkaline (pH 8.6), moderately saline (ECe 699 mS/m); gradual boundary to;
80 – 140	Black (10YR 2/1) **clayey fine sand,** slightly moist; clear boundary to;
140 - 210	Black (10YR 2/1) **loamy fine sand**, moist (with some seepage inflow).

Indicative subsoil permeability and drainage class (at leach drain depth): 1.5 - 3.0 m/d (Moderately well drained). **Depth to water:** 210 cm (although gradual seepage inflow above).

Comment: Limited area, best avoided and generally not suitable for on-site effluent disposal systems.

Site Number: Pit 10 **Lot 98** 50 H 577248 m E; 6122827 m N	**DAFWA Soil landscape mapping:** Intergrade area Meerup dunes Mp over Owingup flats OW	**Land unit: Fs2**

Landform: Gently undulating, well drained sandplain margin or footslope area.

WA Soil Group: ***Pale deep sand***
(Podzol; calcareous at depth).

Depth (cm)	**Description**
0 - 35	Dark grey (10YR 4/1) **sand**, dry, gradual boundary to;
35 - 80	Grey (10YR 5/1) **sand**, dry, neutral (pH 7.6), non-saline (ECe 57 mS/m); gradual boundary to;
80 - 85	Dark brown (10YR 3/3) **loamy sand**, dry; weak hardpan, neutral (pH 7.7), slightly-saline (ECe 228 mS/m); clear boundary to;
85 - 100	Very dark brown (7.5YR 2.5/2) **loamy sand** (with limestone / marl rubble); dry, clear to;
100-180+	Pale brown (10YR 6/3) **sand**, calcareous, dry, moderately alkaline (pH 9.0), non-saline (ECe 144 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.0 m based on topography and geomorphology.

Comment: Limited area, but suitable for conventional on-site effluent disposal using septic tanks and leach drains subject to adequate setback distance from nearby soakage dam.

Site Number: Pit 11 **Lot 98** 50 H 577190 m E; 6122929 m N	**DAFWA Soil landscape mapping:** Intergrade area Meerup dunes Mp over Owingup flats OW	**Land unit: Fs2**

Landform: Gently undulating, well drained sandplain margin or footslope area. (site on cleared area beyond access road)

WA Soil Group: ***Pale deep sand***
(Podzol; calcareous at depth).

Depth (cm)	**Description**
0 - 35	Dark grey (10YR 4/1) **sand**, dry, slightly acid (pH 6.0), non-saline (ECe 69 mS/m); clear boundary to;
35 - 60	Grey (10YR 5/1) **sand**, clear boundary to;
60 – 90	Light yellowish brown (10YR 6/4) **sand,** dry, gradual boundary to;
90 - 130	Yellowish brown (10YR 5/4) **sand**, calcareous, dry, neutral (pH 6.9), non-saline (ECe 35 mS/m); gradual to;
130-180+	Very pale brown (10YR 7/4) **sand**, calcareous, dry, moderately alkaline (pH 9.0), non-saline (ECe 119 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Pit 12 **Lot 98** 50 H 577052 m E; 6122975 m N	**DAFWA Soil landscape mapping:** Intergrade area Meerup over Owingup flats OW	**Land unit: Pd**

Landform: Imperfectly drained estuarine plain (< 1% gradient) fringing wetland area (at far left).

WA Soil Group: ***Alkaline grey deep sandy duplex*** - over buried calcareous sand.

Depth(cm)	**Description**
0 – 20	Very dark grey (10YR 3/1) **sand**, dry, gradual boundary to;
20 - 50	Dark grey (10YR 4/1) **sand**, dry, neutral (pH 6.7), non-saline (ECe 74 mS/m); clear boundary to;
50 – 60	Very dark brown (10YR2/2) **sand**, (weak hardpan); dry, clear boundary to;
60 - 80	Light brownish grey (10YR 6/2) C**lay loam, sandy**, calcareous with limestone / marl rubble, slightly moist; clear boundary to;
80 –150+	Pale brown (10YR 6/3) **sand**, calcareous, moist, with few black mottles (cutans**),** moderately alkaline (pH 8.2), slightly-saline (ECe 338 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): partly within rapidly drained sand (> 3.0 m/d) and imperfectly drained clay loam (0.12 – 0.5 m/d). **Depth to water**: 150 cm (although gradual seepage inflow above).

Comment: Best avoided as generally not suitable for conventional on-site effluent disposal due to need for partially inverted leach drains within imported soil fill material to achieve adequate separation from clayey subsoil and need for setback from nearby wetland.

Site Number: Pit 13 **Lot 98** 50 H 577055 m E; 6122889 m N	**DAFWA Soil landscape mapping:** Meerup dunes Mp	**Land unit: Dg**

Landform: Gently undulating upland surface of well drained dunes (4 – 5 % gradient).

WA Soil Group: ***Pale deep sand*** (Deep siliceous podzol)

Depth (cm)	**Description**
0 – 20	Dark grey (10YR 4/1) **sand**, dry, neutral (pH 6.8), non-saline (ECe 87 mS/m); clear boundary to;
20 – 85	Grey (10YR 5/1) **sand**, dry, clear to;
85 - 105	Light grey (10YR 7/2) **sand**, dry; neutral (pH 7.1), non-saline (ECe 54 mS/m); clear boundary to;
105 –125	Pale brown (10YR 6/3) **sand**, dry, clear to;
125-150+	Strong brown (7.5YR 4/6) **sand**, with few bleached mottles, dry; neutral (pH 6.5), non-saline (ECe 68 mS/m).

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have moderate nutrient retention ability and site is not close to water table or surface waterbodies).

Site Number: Exposure 1 **Lot 85** 50 H 577095 m E; 6122598 m N	**DAFWA Soil landscape mapping:** Meerup flats Mf over Owingup flats OW	**Land unit: Pd/Pw**

Landform: Interdunal flat or deflation basin; Imperfectly drained (0 -1% gradient) and adjacent wetland (excavated soak).

WA Soil Group: ***Alkaline grey shallow loamy duplex*** (over buried calcareous sand)**.**

Depth (cm)	**Description**
0 - 15	Very dark grey (10YR 3/1) **clayey sand**, calcareous; dry, gradual boundary to;
15 - 30	Very dark brown (10YR 2/2) **sandy loam**; dry, clear boundary to;
30 - 55	**Limestone / marl, in clay loam** matrix; dry, clear boundary to;
55 - 90	Very pale brown (10YR 7/3) **sandy clay loam**, with calcareous rubble; dry, gradual boundary to;
90 – 120+	Pale brown (10YR 6/3) **sand**, calcareous; slightly moist.

Indicative subsoil permeability and drainage class (at leach drain depth): 0.5 – 1.5 m/d (Moderately well drained). **Depth to water**: 130 cm.

Comment: Possibly **s**uitable for conventional on-site effluent disposal (apart from need for setback from soakage dam) using partially inverted leach drains within imported soil fill material to achieve adequate separation from groundwater**.** Possible also suitable for alternative effluent disposal systems (with lesser minimum depth to water requirement).

Site Number: Exposure 2 **Lot 84** 50 H 577193 m E; 6122600 m N	**DAFWA Soil landscape mapping:** Meerup dunes Mp	**Land unit: Dm**.

Landform: Rapidly drained sand dune (moderate sideslope, 18 % gradient).

WA Soil Group: ***Pale deep sand***
(Podzol; calcareous at depth)

Depth (cm)	**Description**
0 - 50	Greyish brown (10YR 5/2) **sand**, dry, clear boundary to;
50 - 120	Light yellowish brown (10YR 6/4) **sand,** slightly calcareous; dry, gradual boundary to;
120–190+	Yellowish brown (10YR 5/4) **sand,**; with few bleached mottles; calcareous; dry, moderately alkaline (pH 8.7), non-saline (ECe 156 mS/m)

Indicative subsoil permeability and drainage class (at leach drain depth): > 3.0 m/d (Rapidly drained).
Depth to water: Not encountered, likely to be > 3.5 m based on topography and geomorphology.

Comment: Suitable for conventional on-site effluent disposal using septic tanks and leach drains. (Subsoil likely to have limited nutrient retention ability but site is not close to water table or surface waterbodies).

ATTACHMENT D

ACID SULFATE TEST RESULTS

ChemCentre

Inorganic Chemistry Section

Report of Examination

PO Box 1250, Bentley Delivery Centre
Bentley WA 6983
T +61 8 9422 9800
F +61 8 9422 9801
www.chemcentre.wa.gov.au
ABN 40 991 885 705

Purchase Order: 1512
Your Reference:
ChemCentre Reference: 15S1434 R1

Land Assessment Pty Ltd
PO Box 117
Subiaco WA 6008

Attention: Martin Wells

Final Report on 2 samples of soil received on 21/12/2015

LAB ID	Client ID and Description
15S1434 / 001	P8/4
15S1434 / 002	P9/4

Analyte		ANCe	pHkcl	pHox	Skcl	Sp	Spos
Method		iSPOCAS	iSPOCAS	iSPOCAS	iSPOCAS	iSPOCAS	iSPOCAS
Unit		moles H+/t			%	%	%
Lab ID	Client ID						
15S1434/001	P8/4	3.0	7.2	4.1	<0.01	0.02	0.02
15S1434/002	P9/4	<1.0	6.7	3.4	0.06	1.56	1.50

Analyte		Stones	TAA	TPA
Method		(>2mm)	iSPOCAS	iSPOCAS
Unit		%	moles H+/t	moles H+/t
Lab ID	Client ID			
15S1434/001	P8/4	0.7	<1.0	<1.0
15S1434/002	P9/4	33.7	<1.0	3200

Analyte	Method	Description
Stones	(>2mm)	Stones - sieved particles greater than 2 mm (sample preparation method manual 3.3.2)
TAA	iSPOCAS	Titratable Actual Acidity Method 23F
TPA	iSPOCAS	Titratable Peroxide Acidity
ANCe	iSPOCAS	Excess Acid Neutralisation Capacity (AS4969.3)
pHkcl	iSPOCAS	pH in a KCl soil extract (1:40 w/v)
pHox	iSPOCAS	pH in a soil suspension after 30% H2O2 digest
Skcl	iSPOCAS	Sulfur soluble in 1M KCl after TAA titration
Sp	iSPOCAS	Sulfur soluble in 1M KCl after 30%H2O2 digest and TPA titration
Spos	iSPOCAS	Sulfur oxidise by peroxide digest, calculated as S_P minus S_KCl

The results apply only to samples as received. This report may only be reproduced in full.

Unless otherwise advised, the samples in this job will be disposed of after a holding period of 30 days from the report date shown below.

Results for soil analysis are reported on an air-dry (40C) less than 2 mm basis, whereby stones are removed (material >2mm) by sieving.

When stone content is deemed significant the result is recorded and reported.

Unless otherwise specified, all analytes (except Stones) are reported in the listed concentrations and on a dry, less than 2 mm basis.

Stones are reported on a dry, whole sample basis.

Barry Price
Team Leader
Scientific Services Division
8-Jan-2016

ATTACHMENT E

ACID SULFATE SOILS: SELF-ASSESSMENT FORM

Acid Sulfate Soils Self-Assessment Form

Applicant

The applicant is the person with whom the WAPC will correspond and, if the application is approved, the person to whom the approval will be sent.

WAPC reference no	Not yet assigned		
Full name	Martin Richard Wells (on behalf of landowners)		
Postal address	P O Box 117 SUBIACO		
Town / suburb	SUBIACO, PERTH WA	Postcode	6008
Email	landass@iinet.net.au	Phone number	9388 2427
Applicant signature	Mark Wells	Date	11/1/16
Application property details	Lots 84, 85 Harding Road and Lots 86, 87 & 98 Home Road, Robinson, City of Albany		

Step 1

Assess the possibility of acid sulfate soils disturbance

Question 1: Are any dewatering or drainage works (either temporary or permanent) proposed to be undertaken? ☐ yes ☑ no

Question 2: Is excavation of 100 cubic metres or more of soil proposed? ☐ yes ☑ no
(In lay person's terms 100 cubic metres is about 10 standard-sized dump truck loads.)

If no to both question 1 and question 2 then no further investigation is required at this stage. Please sign this form and submit it, together with a completed 'Clearance of Conditions Request' form along with supporting documentation, to Department of Environment Regulation (DER).

If yes to either question 1 or question 2 go on to step 2.

Step 2

Conduct an acid sulfate soils investigation in accordance with DER's *Identification and Investigation of Acid Sulfate Soils* guideline

Question 3: Did the acid sulfate soils investigation indicate that there are acid sulfate soils present? ☐ yes ☑ no

If no to question 3, then no further investigation is required at this stage. Please sign this form and submit it, together with the written results of the investigation (in the form of an acid sulfate soils report) and a completed 'Clearance of Conditions Request' form and required information, to DER with a request for clearance of the acid sulfate soils condition.

If yes to question 3, please sign this form and submit it, together with the written results of the investigation (in the form of an acid sulfate soils report), an acid sulfate soils management plan and a copy of the approved subdivision plan, to DER with a request for approval of the management plan.

Note: After completion of site works in accordance with the approved management plan you will be required to submit a closure report, prepared in accordance with DER's acid sulfate soils guideline series, to DER together with a request for clearance of the acid sulfate soils condition.

Version: 2.0 (November 2012)

Tick box for attchments as appropriate

- ☐ Clearance of conditions request form
- ☐ Copy of approved subdivision plan
- ☐ Copy of approved development plan
- ☑ Acid Sulfate Soils investigation report
- ☐ Acid Sulfate Soils management plan

- Addressed as part of land capability report

Declaration

I declare that the information provided is true and correct to the best of my knowledge.

A completed 'Clearance of Conditions Request' form and required information is attached to this form (a copy can be downloaded from http://www.der.wa.gov.au/your-environment/acid-sulfate-soils/68-ass-forms)

Applicant signature: ..... Date: .....

Submit form to the
Department of Environment Regulation (DER)
Locked Bag 33
Cloisters Square, Perth WA 6850

If you have any questions relating to the Acid Sulfate Soils Self-Assessment form, please contact Acid Sulfate Soils Section (DER) on 1300 762 982 for assistance or email contaminated.sites@der.wa.gov.au.

Mark Wells

Land Assessment Pty Ltd

11/ 1 /16

ATTACHMENT F

ALTERNATIVE TREATMENT SYSTEMS

APPROVED FOR USE IN WA

Approved Aerobic Treatment Units

What are Aerobic Treatment Units (ATUs)?

Aerobic Treatment Units (ATUs) are small ('package') wastewater treatment plants. Due to the treatment and disinfection process, the treated wastewater from several systems may be used for garden irrigation. Some ATUs are also approved for Phosphorus removal. The listed systems have standard approval as domestic models (they may also be used in commercial situations). They are to be installed and operated in accordance with the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 and the **Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units (ATUs) Serving Single Dwellings.**

As the conditions of approval can vary between designs, persons interested in installing a particular ATU should confirm it meets their needs and discuss site requirements with the local government.

ATUs have regular service requirements (usually quarterly) and maintenance must be through an **Authorised person** or their staff/subcontractors.

More detailed information on ATUs is contained in the **Aerobic Treatment Units** pamphlet and the **Code of Practice**.

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Allied Pumps 2 Modal Crescent CANNING VALE WA 6155 Ph: 9350 1000 / 1800 447 777 Fax: 9356 5255 Website: www.aquanova.com.au Email: sms@alliedpumps.com.au	Everhard Aqua-Nova 2000 Model 80100	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	Global Certification PL No. 077 27/03/2017
Aquarius Wastewater Management Pty Ltd Unit 1/20 Abrams Street BALCATTA WA 6021 Ph: 9240 8545 Fax: 9240 8542 Website: www.aquariuswastewater.com.au Email: admin@aquariuswastewater.com.au	Aquarius O–3	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation. Capable of removing nutrients to the following concentrations: TP (% removal): <1 mg/L (98.5%) TN (% removal): <10 mg/L (97.8%)	SMKH21519 25/03/2018
	Aquarius O–2	Single dwelling units up to 10 person capacity.	Approved only for below ground disposal via sub-surface irrigation, leach drains, soak wells or AquaSafe Drains. The system does not include Alum Sulphate dosing and disinfection system. The system does not remove nutrients.	
	Aquarius O–2 NR	Single dwelling units up to 10 person capacity.	Approved only for below ground disposal via sub-surface irrigation, leach drains, soak wells or AquaSafe Drains. The system does not include disinfection system. Capable of removing nutrients to the following concentrations: TP (% removal): <1 mg/L (98.5%) TN (% removal): <10 mg/L (97.8%)	

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Biomax Pty Ltd PO Box 462 MIDLAND DC WA 6936 Ph: 9250 7733 Fax: 9250 5844 Website: www.biomax.com.au Email: biomax@iinet.net.au	BioMax P10-M (phosphorus removal) BioMax C–10	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	No AS1546.3 certification 30/06/2015
BioSeptic Pty Ltd Concrete Products WA Ph: 9274 6988 Fax: 9274 6939 Website: www.bioseptic.com.au Email: sales@bioseptic.com.au	Performa 2000	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	SMK02221 18/10/2015
BioSystems 2000 Pty Ltd 3 Carlow Circle WATERFORD WA 6152 Ph: 9450 2570 Fax: 9450 1635 Email: biosystems2000@yahoo.com.au	Biosystem 2000	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	No AS1546.3 certification 30/06/2015
Earthsafe Environmental Pty Ltd PO Box 605 WYONG NSW 2259 Ph: 1300 327 847 Email: steven@rivatec.com.au	Earthsage Environmental ES10PC	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	SMKH20612 27/08/2016

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Fuji Clean Australia Pty Ltd 5/520 Mulgrave Road Earlville, Cairns QLD 4870 Website: www.fujiclean.com.au WA Distributor Ecowater WA 37 Granite Place YANCHEP WA 6035 Ph: 0417 098 281 Email: ecowaterwa@bigpond.com	CE1200	Single dwelling units up to 8 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation.	No AS1546.3 certification 30/06/2015
	CE1500EX	Single dwelling units up to 10 person capacity or 1500L/day	Approved for sub-surface or sub-strata or above ground spray irrigation. Capable of removing nutrients to the following concentrations: TP (% removal): 1.3 mg/L (84%) TN (% removal): 21.0 mg/L (58%)	SMKH21993 09/05/2016
	CRX1500	Single dwelling units up to 10 person capacity.	Approved for sub-surface or sub-strata or above ground spray irrigation. Capable of removing nutrients to the following concentrations: TP (% removal): 0.24 mg/L (97%) TN (% removal): 8.29 mg/L (82%)	No AS1546.3 certification 30/06/2015

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Galvin Concrete & Sheetmetal Pty Ltd Ph: 9302 2175 Website: www.galvins.com.au Email: csm@galvins.com.au WA Distributor Clearwater Domestic Sewerage 52 Railway Parade WELSHPOOL WA 6106 Ph: 9258 6933 Fax: 9258 6944 Email: naiquip@iinet.net.au	Clearwater 90 Compact	Single dwelling units up to 10 person capacity.	Approved for above ground spray irrigation.	No AS1546.3 certification 30/06/2015
Icon-Septech Pty Ltd Lot 265 Valencia Way MADDINGTON WA 6109 Ph: (08) 9493 2352 or 1300 557 143 Fax: (08) 9493 2548 Website: www.icon-septech.com.au	Septech Turbojet 2000	Single dwelling units up to 10 person capacity.	Approved for sub-surface or above ground spray irrigation.	SMK0239 13/11/2015
Jowa Group Pty Ltd 8 Lander Avenue SHEIDOW PARK SA 5158 Ph: (08) 8381 9100 Fax: (08) 8381 9116 Website: www.biocyclejowagroup.com.au Email: sales@biocyclejowagroup.com.au	Biocycle 5800	Single dwelling units up to 10 person capacity.	Approved for sub-surface or above ground spray irrigation.	No AS1546.3 certification 30/06/2015

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Krystel Kleer Pty Ltd 59 Commerce Circuit Yatala QLD 4207 Ph: (07) 3382 7666 Website: www.qualitytanks.com.au Email: Nicole@qualitytanks.com.au	Krystal Kleer ADV5000 (Concrete and plastic models)	Single dwelling units up to 10 person capacity.	Approved for sub-surface or above ground spray irrigation.	Cert No. 125 13/09/2014
Suncoast Waste Water Management 59 Industrial Avenue KUNDA PARK QLD 4556 Ph: 1800 450 767 Website: www.ozzikleen.com Email: info@ozzikleen.com	Ozzi Kleen RP10	Single dwelling units up to 10 person capacity.	Approved for sub-surface or above ground spray irrigation.	SMK02608 14/08/2016

Manufacturer or supplier	Brand name and model	Capacity	Comments and restrictions	AS certification & Approval Expiry Date
Taylex Industries Pty Ltd 56 Prairie Road Ormeau QLD 4208 Ph: (07) 3441 5200 Fax: (07) 3287 4199 Email: Taylex@bigpond.com.au	Taylex DMS (Domestic Membrane System)	Single dwelling units up to 10 person capacity.	Approved for above ground spray irrigation, sub-surface or sub-strata drip irrigation.	No AS1546.3 certification 30/06/2015
			Capable of removing nutrients to the following concentrations: TP (% removal): 0.29 mg/L (96%) TN (% removal): 6.19 mg/L (86%)	
	Taylex ABS (Advanced Blower System)	Single dwelling units up to 10 person capacity.	Approved for above ground spray irrigation, sub-surface or sub-strata drip irrigation.	
	Taylex Poly ABS (Advanced Blower System)	Single dwelling units up to 10 person capacity.	Approved for above ground spray irrigation, sub-surface or sub-strata drip irrigation.	

Assessed and not approved OR Approval withdrawn

Manufacturer / Supplier	Brand name and model	Reason not approved / Further information
Biolytix Technologies PO Box 591 MALENY QLD 4552 Ph: (07) 5435 2700 Fax: (07) 5435 2701 Website: www.biolytix.com Email: info@biolytix.com	Biolytix BF–6 Aerated	Company liquidated. Biolytix units which have been issued a 'Permit to Use' by local government before 19 January 2011 can still be in use. For further information, visit the following webpage: www.lawlerpartners.com.au/creditor_reports/biolytix_group_of_companies/faqs
Water Gurus Pty Ltd 3/57 Inspiration Drive WANGARA WA 6065 Ph: 9302 6444 or 1800 043 956 Fax: 9302 6777 Website: www.watergurus.com.au	Novaclear	Company liquidated. For further information, visit the following webpage: http://www.asic.gov.au/

More information:

Water Unit
Environmental Health Directorate
Department of Health
PO Box 8172
PERTH BUSINESS CENTRE WA 6849

Telephone: 08 9388 4999
Facsimile: 08 9388 4910

This document is available in alternative formats on request for a person with a disability.

Approved Alternative Leach Drains

These phosphorus reducing systems have a conventional septic tank and leaching field (leach drain) arrangement. The leaching field is contained within an approved amended soil which binds phosphates from the effluent.

Manufacture / Supplier	Brand Name and Model	Comments and Restrictions	Approval Date
Filtrex Innovative Wastewater Solutions PO Box 5122 BUNBURY WA 6231 Ph: (08) 9726 0118 Fax: (08) 9726 0117 Website: www.filtrex.com.au Email: info@filtrex.com.au	Filtrex Split System	■ Leach drains (for blackwater) and subsurface irrigation (for greywater) only. ■ Minimum 600mm soil absorption from any ground or pooled waters at the wettest time of year	01/02/08
	Filtrex Phosphate and Nutrient Wastewater Irrigation System	■ Leach drains disposal only. ■ Minimum 600mm soil absorption from any ground or pooled waters at the wettest time of year	31/05/11
	Filtrex Leach Drain Cage	■ Has an infiltrative area of 0.9m^2 per metre length ■ Non-phosphorus retentive. ■ Install in accordance to Department of Health approval conditions	29/10/2008
	Filtrex Standard Leach Drain Cage SLD MK2	■ Has an infiltrative area of 1.5m^2 per metre length ■ Non-phosphorus retentive. ■ Install in accordance to Department of Health approval conditions	27/10/2009

More information

Water Unit
Environmental Health Directorate
Department of Health
PO Box 8172
PERTH BUSINESS CENTRE WA 6849

Telephone: (08) 9388 4999
Fax: (08) 9388 4910

Produced by Environmental Health Directorate

Attachment 2.

BUSHFIRE MANAGEMENT PLAN

LOCAL STRUCTURE PLAN NO. 4

RR 43 Home & Harding Road Precinct

Biodiverse Solutions Pty Ltd

(AB007 FINAL v2 26-6-2020)

Attachment 4 - Revised Bushfire Management Plan

Lots 84 & 85 Harding Road
and
Lots 86, Pt 87 & Pt 98 Home Road
Robinson
WA 6330

Bushfire Management Plan

BIO DIVERSE SOLUTIONS

07/05/2020

Kathryn Kinnear

Bio Diverse Solutions

DOCUMENT CONTROL

Title: Bushfire Management Plan – Lots 84 & 85 Harding Road and Lots 86, Pt87 & Pt 98 Home Road Robinson
Author (s): Kathryn Kinnear
Reviewer (s): Bianca Theyer, Bert Quale
Job No.: AB007
Client: Ayton Baesjou Planning

REVISION RECORD

Revision	Summary	Revised By	Date
Draft Id 2/5/2018	Internal QA Review	Theyer	2/5/2018
Draft ID 3/5/2018	Issued to Client as Draft report	K. Kinnear	3/5/2018
Final ID 8/5/2018	Issued to client from review	K. Kinnear	8/5/2018
Final ID 07/05/2020	Issued to client as final	K. Kinnear	07/05/2020
Final ID v2 19/06/2020	Issued to client as final	K. Kinnear	19/06/2020

The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959 – Building in Bushfire Prone Areas, WAPC SPP3.7, Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) and CSIRO's research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.

BIO DIVERSE SOLUTIONS

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Bio Diverse Solutions
29 Hercules Crescent
Albany WA 6330

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Executive Summary

Bio Diverse Solutions (Bushfire Consultants) were commissioned to undertake bushfire assessment and prepare a Bushfire Management Plan to guide all future bushfire management for a proposed Structure Plan development at Lots 84 & 85 Harding Road and Lots 86, Pt 87 & Pt 98 Home Road Robinson. The proposed subdivision for the subject site consists of 10 lifestyle size residential lots ranging in size from 1ha to 2.89ha. The proposed Local Structure Plan (Ayton Baesjou, 2020) for the subject site is shown in Appendix A.

There are Extreme, Moderate and Low bushfire hazards adjacent and internal to the proposed subdivision. The proposed buildings for the Structure Plan (SP) can have buildings (placed in BE's) in areas of low to moderate bushfire risks with BAL 29 or less applied. All future buildings can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5. Detailed assessment to the bushfire protection criteria (WAPC, 2017) is outlined in Section 5 of this document. APZ areas will apply to the lots ensuring bushfire risks are not exacerbated from the intensification of land use. The adjacent bushfire risks are manageable through the siting and design of the BE's ensuring people property and infrastructure is not placed at undue risks from bushfire.

Access in alternative directions will be provided through the existing road network with all lots having access to alternative destinations. Water supply will be through the extension of mains potable water into the lots meeting Acceptable Solution A4.1. A summary of the assessment to the Acceptable Solutions see Table 1.

Table 1: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	Compliant. BAL 29 or less applied to lots and Building Envelopes.
Element 2 – Siting and Design	A2.1 Asset Protection Zone	Yes	Compliant. APZ in BAL 29 or less, can be contained within the lots and conforms to WAPC standards.
Element 3 – Vehicular Access	A3.1 Two Access Routes	Yes	Compliant two access to 2 destinations.
	A3.2 Public Road	No	N/A
	A3.3 Cul-de-sacs	No	N/A
	A3.4 Battle axes	Yes	Compliant, meets minimum technical standards, linked by EAW.
	A3.5 Private driveways	Yes	Compliant, meets minimum technical standards.
	A3.6 Emergency Access Ways	No	N/A
	A3.7 Fire Service Access Ways	No	N/A
	A3.8 Firebreaks	Yes	Compliant to CoA notice.
Element 4 – Water	A4.1 Reticulated areas	Yes	Compliant, extension of scheme.
	A4.2 Non-reticulated areas	No	N/A.
	A4.3 Individual lots in non-reticulated areas	No	N/A

This BMP report provides details of the fire management strategies proposed to be implemented across the site as it is developed to ensure adequate protection of life, property and biodiversity assets. To ensure the bushfire mitigation measures are implemented, responsibilities are outlined in Section 6 for the future lot owners, the developer and CoA.

1. Proposal Details

Bio Diverse Solutions (Bushfire Consultants) were commissioned to conduct a bushfire hazard assessment and prepare a Bushfire Management Plan to guide all future bushfire management for a proposed Structure Plan development at Lots 84 & 85 Harding Road and Lots 86, Pt 87 & Pt 98 Home Road Robinson.

The proposed subdivision for the subject site consists of 10 lifestyle size residential lots ranging in size from 1ha to 2.89ha. The proposed Structure Plan (SP) for the subject site is shown in Appendix A. This BMP has been prepared to assess the subject site to the current and endorsed Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017) and State Planning Policy 3.7 (WAPC, 2015).

Such planning takes into consideration standards and requirements specified in various documents such as Australian Standard (AS)3959, Western Australian Planning Commission (WAPC) Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017) and State Planning Policy 3.7 (WAPC, 2015). These policies, plans and guidelines have been developed by WAPC to ensure uniformity to planning in designated "Bushfire Prone Areas" and consideration of the relevant bushfire hazards when identifying or investigating land for future development.

1.1. Location

Lots 84 & 85 Harding Road and Lots 86, Pt 87 & Pt 98 Home Road Robinson (herein referred to as the subject site) is located approximately 5.5km west of the Albany CBD in the locality of Robinson. The subject site is located west of Home Road and north of Harding Road in grazed rural land. The location of the subject site is shown on Figure 1.

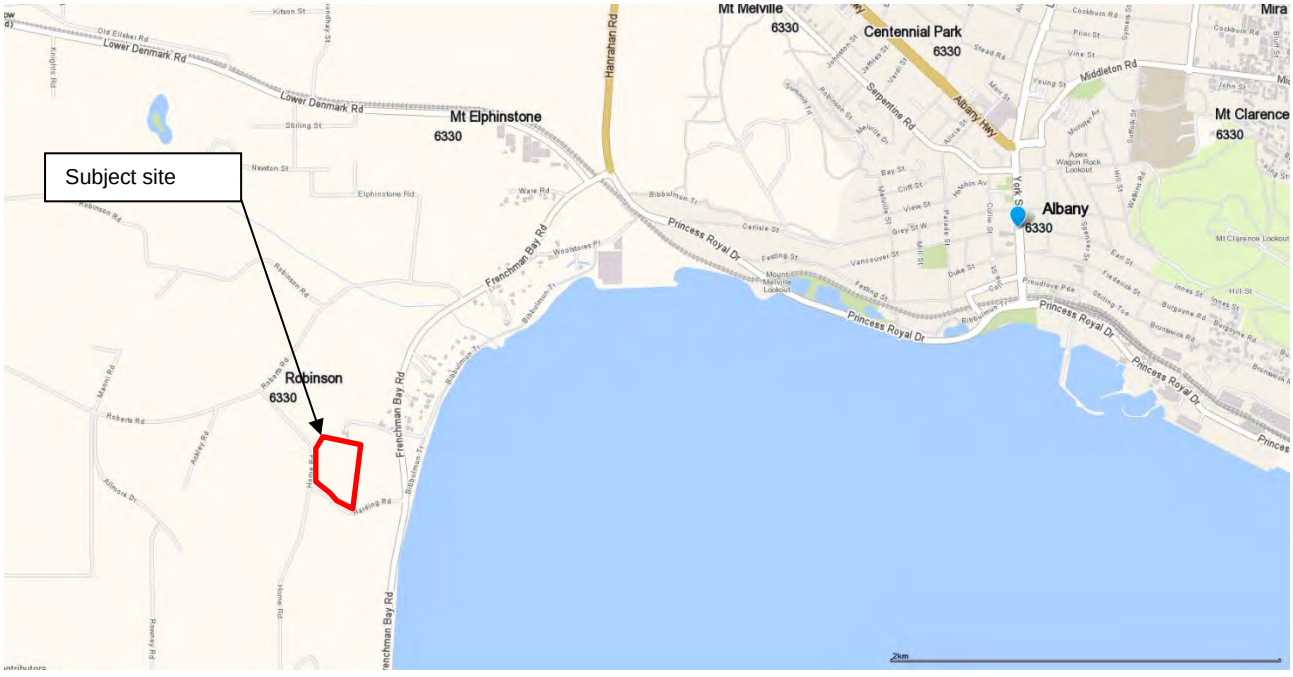


Figure 1: Location Plan

1.2. Development Proposal

The Structure Plan has been prepared to guide subdivision and development of Lots 84, 85, 86 and a portion of Lots 87 & 98 Home, Harding & Frenchman Bay Roads Robinson for Rural Residential purposes. The land is located less than 5.5km from the Albany Central Area and is currently used for Rural Small Holding/ Rural Residential Purposes. In accordance with local and state policy promoting the efficient use of underutilised

zoned and serviced land, the Structure Plan (SP) provides for the intensification of Rural Residential land use to the density set and permitted in the locality and as established by local scheme and strategy. The future proposed subdivision for the subject site consists of 10 lifestyle size residential lots ranging in size from 1ha to 2.89ha. Lot yield and arrangement is based on capability, site opportunities and constraints and is informed by specific site and fire assessments.

The proposed SP (Ayton Baesjou, 2020) for the subject site is shown in Appendix A. The SP depicts the general layout, outlines effluent disposal exclusion areas, indicative building envelopes, access arrangements and the other subdivisional components necessary to provide for development. The SP should be read with and is adjunct to Local Planning Scheme No. 1 Amendment No. 27.

1.3. Statutory Framework

This document and the recommendations contained within are aligned to the following policy and guidelines:

- *Planning and Development Act 2005*;
- *Planning and Development Regulations 2009;*
- *Planning and Development (Local Planning Scheme) Regulations 2015;*
- State Planning Policy 3.7 Planning in Bushfire Prone Areas;
- Guidelines for Planning in Bushfire Prone Areas Version 1.2 (2017);
- *Building Act 2011;*
- *Building Regulations 2012;*
- Building Code of Australia (National Construction Code);
- *Fire and Emergency Services Act 1998*;
- AS 3959-2009 “Construction of Buildings in Bushfire Prone Areas” current and endorsed standards;
- *Bushfires Act 1954*; and
- City of Albany Annual Fire Management Notice.

The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows that whole of the subject site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Bushfire Prone Area Mapping is shown on Figure 2.

Figure 2: Bushfire Prone Area Mapping

1.4. Suitably Qualified Bushfire Consultant

This BMP has been prepared by Kathryn Kinnear (nee White), who has 10 years operational fire experience with the (formerly) DEC (1995-2005) and has the following accreditation in bushfire management:

- Incident Control Systems;
- Operations Officer;
- Prescribed Burning Operations;
- Fire and Incident Operations;
- Wildfire Suppression 1, 2 & 3;
- Structural Modules – Hydrants and hoses, Introduction to Structural Fires, and Fire extinguishers; and
- Ground Controller.

Kathryn Kinnear currently has the following tertiary qualifications:

- BAS Technology Studies & Environmental Management;
- Diploma Business Studies; and
- Graduate Diploma in Environmental Management.

Kathryn Kinnear is an accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794). Bio Diverse Solutions are Silver Corporate Members of the Fire Protection Australia Association. Kathryn is a committee member of the WA Bushfire Working Group (FPAA), Kathryn is a suitably qualified Bushfire Practitioner to prepare this Bushfire Management Plan.

1.5. Objectives

The objectives of this BMP are to assess the bushfire risks associated with the existing site and the proposed subdivision to reduce the occurrence of, and minimise the impact of bushfires, thereby reducing the threat to life, property and the environment. It also aims to guide the subdivision design by assessing the proposed subdivision according to the Bushfire Protection Criteria Acceptable Solutions as outlined in the Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017).

The BMP aims to:

- Achieve consistency with objectives and policy measures of SPP 3.7 (WAPC, 2015);
- Assess any building requirements to AS3959 (current and endorsed standards) and BAL construction;
- Assess the subdivision proposal against the Bushfire Protection Criteria Acceptable Solutions as outlined in the Guidelines for Planning in Bushfire Prone Areas Version 1.3 (WAPC, 2017);
- Understand and document the extent of the bushfire risk to the subject site;
- Prepare bushfire risk management measures for bushfire management of all land within the subject site with due regard to people, property, infrastructure and the environment; and
- Nominate individuals and organisations responsible for fire management and associated works within the subject site.

2. Environmental Considerations

2.1. Native Vegetation

There is no site clearing required for this development, the area is previously grazed/disturbed pasture paddocks with scatted peppermint (paddock) trees. Depending on final placement of the buildings, individual trees may need to be removed/trimmed to meet WAPC, Asset Protection Zone (APZ) standards. Refer to Section 5 for further detail. It is not anticipated there will be a trigger of potential environmental impact/referral requirements under State and Federal environmental legislation.

2.2. Re-vegetation/Landscape Plans

There are no revegetation or landscaping plans associated with the SP. Any future planning of vegetation is to be planted in a low fuel state as per WAPC APZ standards (see Section 5 and Appendix B).

3. Bushfire Assessment

3.1. Bushfire Assessment Inputs

A site inspection was conducted in 1st and 8th November 2016 by Kathryn Kinnear to assess the current land use, topography/slope, vegetation and conditions of the site and its surroundings. Site re-assessment occurred in 2018 and 2020 to verify conditions still prevail during revisions of this BMP. Photographs of the subject site and surrounding areas were taken and have been presented in this report.

3.1.1. Topography

The subject site has gentle slopes associated with sand dune landscapes in the area. Generally, slopes are under 10 degrees with short slopes associated with sand dunes and ridges. Slope under classifiable vegetation (effective slope) was assessed in accordance with Section 2.2.5 of AS3959. Table 2 below summarises the slopes assigned to each plot of classifiable vegetation for the BAL calculation. Refer to detailed plot data Section 3.1.3 of this report.

Table 2: Effective slope allocation to classified vegetation

Plot Number	Vegetation Classification	Effective Slope
1	Forest Type A	Downslope >5 to 10 degrees
2	Forest Type A	Upslope
3	Forest Type A	Downslope >0 to 5 degrees
4	Forest Type A	Upslope/Flat
5	Scrub Type D	Upslope/Flat
6	Forest Type A	Downslope >0 to 5 degrees
7	Forest Type A	Upslope/Flat
8	Grassland Type G	Downslope >15 to 20 degrees
9	Woodland Type B	Downslope >15 to 20 degrees
10	Scrub Type D	Upslope/Flat
11	Forest Type A	Downslope >15 to 20 degrees
12	Forest Type A	Upslope/Flat
13	Woodland Type B	Upslope/Flat
14	Grassland Type G	Upslope/Flat
15	Woodland Type B	Upslope/Flat
16	Forest Type A	Downslope >10 to 15 degrees
17	Forest Type A	Upslope/Flat
18	Woodland Type B	Upslope/Flat
19	Forest Type A	Upslope/Flat
20	Forest Type A	Upslope/Flat
21	Woodland Type B	Upslope/Flat

Table 2 cont.

Plot Number	Vegetation Classification	Effective Slope
22	Low fuel or non-vegetated exclusion 2.2.3.2 (a)	N/A
23	Low fuel or non-vegetated exclusion 2.2.3.2 (e)	N/A
24	Low fuel or non-vegetated exclusion 2.2.3.2 (f)	N/A
25	Low fuel or non-vegetated exclusion 2.2.3.2 (c)	N/A

Plots 22, 23, 24 and 25 are allocated exclusion Clauses 2.2.3.2 and therefore do not have an effective slope allocation.

3.1.2. Fire Danger Index

The Western Australian adopted FDI is 80 as outlined in AS3959 and endorsed by Australasian Fire and Emergency Services Authorities Council. The FDI input for this project is also therefore 80.

3.1.3. Bushfire fuels – Vegetation

All vegetation within 150m of the site / proposed development was classified in accordance with Clause 2.3 and exclusions as per Clause 2.2.3.2 of AS3959. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified in the following pages. Each plot is representative of the Vegetation Classification to AS3959 Table 2.3 and shown on the Vegetation Classification Mapping (Figure 3, page 17).

Plot	**1**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Located to the north west of the SP external to the subject site. **Separation distance:** 3-4m (firebreak). **Description:** Consisting of Closed *Agonis flexuosa* forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Downslope 7 degrees.
Photo 1: View to north east from northern boundary. Boundary located on ridge running from east to west.			

Plot	2	Classification or Exclusion Clause	Forest Type A
			**Location:** Located to the north west of the SP internal of the subject site. **Separation distance:** 0m (internal). **Description:** Consisting of Closed *Agonis flexuosa* forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope Internal to site-APZ management can be applied.
Photo 2–Photo looking south east through Plot 2.			
Plot	**3**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Located to the west of the SP along road reserves and in adjacent private property. **Separation distance:** 10m. **Description:** Consisting of Closed *Agonis flexuosa* forest. Multi-layered vegetation structure. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Down slope 3 degrees.
Photo 3: View looking north west along Home Road. Road cuts through original ridge line.			
Plot	**4**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Located to the east of the SP internal and external of the subject site on dune ridge. **Separation distance:** 0m (internal). **Description:** Closed Warren River Cedar Forest and Peppermint forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope.
Photo 4: View to the south east. Steep slopes are located further south.			

Plot	5	Classification or Exclusion Clause	Scrub Type D
			**Location:** Located to the north of the SP, external of the subject site and internal in low lying areas. **Separation distance:** 0m (internal). **Description:** Pampas Grass to 3 metres in height growing on peat swamp. Disturbed from previous grazing pursuits. **Available fuels:** 25t/ha. **Vegetation Coverage:** >30% vegetative foliage cover. **Average height:** 2-3m. **Effective slope:** Upslope/flat land. Internal to site-APZ management can be applied.
Photo 5: View to the west (Plots 1 and 2 in background). Heavy Pampas grass infestation.			

Plot	6	Classification or Exclusion Clause	Forest Type A
			**Location:** Located to the north of the SP internal and external to the subject site. **Separation distance:** 0m. **Description:** Consisting of Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed and infested with weeds from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Downslope 4 degrees. Internal to site-APZ management can be applied.
Photo 6: View to the north east. Heavy infestation of Arum Lilly and Dolichos pea.			

Plot	7	Classification or Exclusion Clause	Forest Type A
			**Location:** Located external to the SP to the north east near Frenchman Bay Road. **Separation distance:** 61m. **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope.
Photo 7: Looking south east towards adjoining property. Heavy pasture invasion in understory.			
Plot	**8**	**Classification or Exclusion Clause**	**Grassland Type G**
			**Location:** Located internal of the subject site along dune ridge. **Separation distance:** 0m (internal). **Description:** paddock grasses 200-400mm in height. Presented in unmanaged state. **Available fuels:** 4.5t/ha. **Vegetation Coverage:** <10% trees. **Average tree height:** 200-400mm. **Effective slope:** Downslope >15-20 degrees. Mowing and slashing to meet APZ requirement. Internal to site-APZ management can be applied. CoA Fire management notice (Low fuel loads) can be applied.
Photo 8: View to the south from driveway-height of grasses exceeds 300mm. Patchy understorey regeneration displays frequency of current management.			

Plot	9	Classification or Exclusion Clause	Woodland Type B
			**Location:** Internal to site and located within development exclusion area. **Separation distance:** 0m (internal). **Description:** Open *Agonis flexuosa* (Peppermint) woodland, grassy understorey, not multilayered. Grazed by stock. **Available fuels:** 15-25t/ha. **Vegetation Coverage:** 10-30% vegetative foliage cover. **Average height:** 9-10m. **Effective slope:** Downslope 15- 20 degrees. APZ management standards can be applied.
Photo 9: Looking north towards Plot 6.			
Plot	**10**	**Classification or Exclusion Clause**	**Scrub Type D**
			**Location:** Located to the east, internal to subject site. **Separation distance:** 0m (internal). **Description:** Pampas grass infestation adjoining water hole. Currently grazed by goats. If grazing were discontinued the site would return to a state similar to plot 5. **Available fuels:** 25t/ha. **Vegetation Coverage:** >30% vegetative foliage cover. **Average height:** 2-3m. **Effective slope:** Upslope/flat land. Internal to site-APZ management can be applied.
Photo 10: View to the south east. Goats can just be seen in background.			
Plot	**11**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Located internal central to the site along dune ridge. **Separation distance:** 0m (internal). **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Downslope >15-20 degrees. APZ management can be applied.
Photo 11: View to the west. Plot 8 located top right of photo.			

Plot	12	Classification or Exclusion Clause	Forest Type A
			**Location:** Internal to site, south eastern side area of SP **Separation distance:** 0m (internal). **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope. APZ management can be applied.
Photo 12: View of Forest Type A from the east (LHS of Photo).			
Plot	**13**	**Classification or Exclusion Clause**	**Woodland Type B**
			**Location:** Internal to the south and east internal of the SP area. **Separation distance:** 0m (internal). **Description:** Karri woodland some over storey dying. Understorey cleared - replaced by mixed unmanaged pasture-grasses 100-300mm. Not multi layered. Disturbed from previous grazing pursuits. **Available fuels:** 15-25t/ha. **Vegetation Coverage:** 10-30% vegetative structure/cover. **Average tree height:** 15m. **Effective slope:** Upslope/flat land. APZ management can be applied.
Photo 13: View to the west adjacent to Lot 12. Heavy weed infestation present.			
Plot	**14**	**Classification or Exclusion Clause**	**Grassland Type G**
			**Location:** Located to the west of the SP in private property. **Separation distance:** 11m. **Description:** Paddock grasses 200-400mm in height. Presented in unmanaged state. Currently grazed. **Available fuels:** 4.5t/ha. **Vegetation Coverage:** <10% trees. **Average tree height:** 200-400mm. **Effective slope:** Upslope.
Photo 14: View to the north west from Home Road.			

Plot	15	Classification or Exclusion Clause	Woodland Type B
			**Location:** Located to the south of the SP, south of Harding Road. **Separation distance:** 11m. **Description:** Peppermint woodland, understory cleared and replaced by mixed unmanaged pasture-grasses 100-300mm. Not multi layered. Disturbed from previous grazing pursuits. **Available fuels:** 15-25t/ha. **Vegetation Coverage:** 10-30% vegetative structure/cover. **Average tree height:** 6-8m. **Effective slope:** Upslope/flat land.
Photo 15: View of Woodland Type B in private property to the south.			
Plot	**16**	**Classification or Exclusion Clause**	**Forest Type A**
Photo not available, private property			**Location:** Located external to the subject site along eastern boundary. **Separation distance:** 0m. **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Downslope >10-15 degrees.
Plot	**17**	**Classification or Exclusion Clause**	**Forest Type A**
Photo not available, private property			**Location:** Located external to the subject site along eastern boundary. **Separation distance:** 61m. **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Downslope >0-5 degrees.

Plot	18	Classification or Exclusion Clause	Woodland Type B
			**Location:** Internal to the south east of the SP area. **Separation distance:** 0m. **Description:** Peppermint woodland (Scattered remnant natives) understorey cleared-replaced by mixed unmanaged pasture-grasses 100-300mm. Not multi layered. Disturbed from previous grazing pursuits. **Available fuels:** 15-25t/ha. **Vegetation Coverage:** 10-30% vegetative structure/cover. **Average tree height:** 6-8m. **Effective slope:** Downslope >5-10 degrees. APZ management can be applied.
Photo 18:View of Woodland Type B north of existing house.			
Plot	**19**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Internal and external to site on and adjacent to Harding Road reserve. **Separation distance:** 0m. **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits (internal). External is in good condition. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope/flat land. APZ management can be applied to internal areas.
Photo 19: Looking west to Home Road of Plot 19 (RHS of photo).			
Plot	**20**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** External to site in Harding Road reserve and private property. **Separation distance:** 8m. **Description:** Closed *Agonis flexuosa* (Peppermint) forest. Multi-layered vegetation structure. Disturbed from previous grazing pursuits (internal). External is in good condition. **Available fuels:** 25-35t/ha. **Vegetation Coverage:** 30-70% vegetative structure/cover. **Average tree height:** 8-13m. **Effective slope:** Upslope/flat land
Photo 20: View to the north east of Plot 20.			

Plot	21	Classification or Exclusion Clause	Woodland Type B
			**Location:** External to site to the south and south east. **Separation distance: 13**m. **Description:** Peppermint woodland (Scattered remnant natives) understorey cleared-replaced by mixed unmanaged pasture-grasses 100-300mm. Not multi layered. Disturbed from previous grazing pursuits. **Available fuels:** 15-25t/ha. **Vegetation Coverage:** 10-30% vegetative structure/cover. **Average tree height:** 6-8m. **Effective slope:** Upslope.
Photo 21: View of Woodland Type B to the south east of the subject site. View from the north to the south along Plot 21 in private property.			
Plot	**22**	**Classification or Exclusion Clause**	**Low fuel or non-vegetated areas exclusion 2.2.3.2 (a).**
No photo available			**Location:** External to site >100m from the subject site. Areas of vegetation located >100m from the subject site boundary. As per AS3959-2018 exclusion clause 2.2.3.2 (a).
Plot	**23**	**Classification or Exclusion Clause**	**Low fuel or non-vegetated areas exclusion 2.2.3.2 (e).**
			**Location:** Located along established road reserves and existing buildings. Driveways, roads, hardstand areas and other non-vegetated areas as per AS3959-2018 exclusion clause 2.2.3.2 (e).
Photo 22: View along Harding Road to the west.			

Plot	24	Classification or Exclusion Clause	**Low fuel or non-vegetated areas exclusion 2.2.3.2 (f).**
			**Location:** Internal and external to the site in APZ areas around existing houses. Mowed grasses, maintained gardens and windbreaks. As per exclusion clause 2.2.3.2. (f) of AS3959.
Photo 23: View of low fuel maintained APZ area to the south of the subject site.			
Plot	**25**	**Classification or Exclusion Clause**	**Low fuel or non-vegetated areas exclusion 2.2.3.2 (c).**
No photo available			**Location:** Located along the Harding road within private property. As per exclusion clause 2.2.3.2. (c) of AS3959.
.			

Plot No.	Vegetation Classification	Effective Slope
1	Forest Type A	Downslope >5 to 10 degrees
2	Forest Type A	Upslope
3	Forest Type A	Downslope >0 to 5 degrees
4	Forest Type A	Upslope/Flat
5	Scrub Type D	Upslope/Flat
6	Forest Type A	Downslope >0 to 5 degrees
7	Forest Type A	Upslope/Flat
8	Grassland Type G	Downslope >15 to 20 degrees
9	Woodland Type B	Downslope >15 to 20 degrees
10	Scrub Type D	Upslope/Flat
11	Forest Type A	Downslope >15 to 20 degrees
12	Forest Type A	Upslope/Flat
13	Woodland Type B	Upslope/Flat

Plot No.	Vegetation Classification	Effective Slope
14	Grassland Type G	Upslope/Flat
15	Woodland Type B	Upslope/Flat
16	Forest Type A	Downslope >10 to 15 degrees
17	Forest Type A	Upslope/Flat
18	Woodland Type B	Upslope/Flat
19	Forest Type A	Upslope/Flat
20	Forest Type A	Upslope/Flat
21	Woodland Type B	Upslope/Flat
22	Low fuel or non-vegetated exclusion 2.2.3.2 (a)	N/A
23	Low fuel or non-vegetated exclusion 2.2.3.2 (e)	N/A
24	Low fuel or non-vegetated exclusion 2.2.3.2 (f)	N/A
25	Low fuel or non-vegetated exclusion 2.2.3.2 (c)	N/A

Figure 3: Vegetation Mapping

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

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

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

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Existing Dwelling
- Photo ID
- Slope Degrees
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Scrub Type D
- Grassland Type G
- Low fuel or non vegetated 2.2.3.2

Scale
1:3,250 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Ayton Baesjou
Lots 84, 85, 87, 98 Home and Harding Road
Albany, WA 6330

Vegetation Classes

BAL Assessor	*QA Check*	*Drawn by*
KK	**JB**	**BT**
STATUS	*FILE*	*DATE*
FINAL	**AB007**	**7/05/2020**

3.2. Bushfire Assessment - Outputs

3.2.1. Bushfire Attack Levels (BAL)

Bushfire Attack Level (BAL) is the process in AS3959 for measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. The threat or risk of bushfire attack is assessed by an accredited BAL Assessor. BAL rating determinations are of 6 levels BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40, BAL FZ. Building is generally not recommended in BAL-40 or BAL-FZ areas. The BAL rating is determined by the distance of the building to vegetation, slope and vegetation type adjacent to the dwelling. Refer to Figure 4.

Figure 4: Building to BAL

Bushfire Attack Level (BAL) for the subject site has been calculated using the Method 1 procedure as outlined in AS3959. This incorporates the following factors:

- WA adopted Fire Danger Index (FDI);
- Vegetation Classes;
- Slope under classified vegetation; and
- Distance between proposed development site and classified vegetation.

The outcomes of the above inputs then allocate a specified BAL construction/setback for proposed buildings.

3.2.2. Method 1 BAL Calculation

A Method 1 BAL calculation (in the form of BAL contours) has been completed for the proposed SP in accordance with AS3959 and WAPC defined methodology. The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by proposed buildings and subsequently informs the standard of building construction required to increase building tolerance to potentially withstand such impacts in line with the assessed BAL. A BAL contour Plan at SP stages is used to give a measure of risk and likely BAL allocation to future buildings.

Indicative BAL ratings for the SP are presented in Table 3 with BAL Contours for the subject site shown on Figure 5. All proposed buildings will be in Building Envelopes (BE) and will be subject to a BAL rating of BAL-29 or lower. Internal Grasslands are to be future APZ areas and will be maintained in a low fuel state and applied across the whole of the lots.

Table 3: BAL Allocation to Building Envelopes

Lot number	Vegetation Type	Distance to Vegetation (m)	Effective Slope	Highest BAL Contour	Applicable BAL Rating to BE
1	Woodland Type B (Plot 18)	<16m	Downslope >5-10 degrees	BAL FZ	BAL FZ and 40 over existing house
2	Forest Type A (Plot 12)	16-<21m	Upslope	BAL 40	BAL 29 & BAL 19 can apply
	Woodland Type B (Plot 13)	14-<29m	Upslope	BAL 19	BAL 12.5 can apply
3	Forest Type A (Plot 12)	<16m	Upslope	BAL FZ	BAL 29 & BAL 19 can apply
	Forest Type A (Plot 19)	21-<31m	Upslope	BAL 29	BAL 19 and BAL 12.5 can apply
4	Forest Type A (Plot 12)	0m	Upslope	BAL FZ	BAL 29 & BAL 19 can apply
	Woodland Type B (Plot 13)	14-<20m	Upslope	BAL 29	BAL 29 & BAL 19 can apply
5	Forest Type A (Plot 7)	<16m	Upslope	BAL FZ	BAL 29 can apply
	Woodland Type B (Plot 13)	10-<14m	Upslope	BAL 40	BAL 29 can apply
	Forest Type A (Plot 12)	<16m	Upslope	BAL FZ	BAL 29 can apply
6	Forest Type A (Plot 7)	<16m	Upslope	BAL FZ	BAL FZ and 40 over existing house
	Woodland Type B (Plot 13)	10-<14m	Upslope	BAL 40	
	Forest Type A (Plot 12)	<16m	Upslope	BAL FZ	
7	Forest Type A (Plot 2)	<16m	Upslope	BAL FZ	BAL 29 & BAL 19 can apply
8	Forest Type A (Plot 7)	<16m	Upslope	BAL FZ	BAL FZ and 40 over existing house
	Forest Type A (Plot 6)	<20m	Downslope >0 to 5 degrees	BAL FZ	
	Forest Type A (Plot 11)	<42m	Downslope >15 to 20 degrees	BAL FZ	
9	Forest Type A (Plot 6)	<20m	Downslope >0 to 5 degrees	BAL FZ	BAL FZ and 40 over existing house
	Woodland Type B (Plot 9)	<27m	Downslope >15 to 20 degrees	BAL FZ	
	Grassland Type G (Plot 8)	10-<14m	Downslope >15 to 20 degrees	BAL40	
10	Forest Type A (Plot 2)	16-<21m	Upslope	BAL 40	BAL 29, BAL 19 can apply
	Forest Type A (Plot 6)	27-<37m	Downslope >0 to 5 degrees	BAL 29	BAL 19 can apply

Where multiple BAL allocations are shown on Table 3, the highest BAL is to apply to the building.

Assumptions made in BAL Contour Mapping:

- The subject site will be developed according to the Structure Plan shown in Appendix A.
- Internal to the subject site will be low fuel areas associated with Asset Protection Zones (APZ) as depicted on the BAL Contour Plan, See Section 5.1 for more detail.
- The BAL Contour Plan gives a “worst case scenario”, further fuel reduction can occur outside of the APZ areas.
- The owner/developer of the subject site will maintain grasslands internal to the site at all times in a low fuel state (i.e. slashed to <100mm) as per WAPC APZ requirements and CoA Fire Management Notice until lots are relinquished to the new owners.

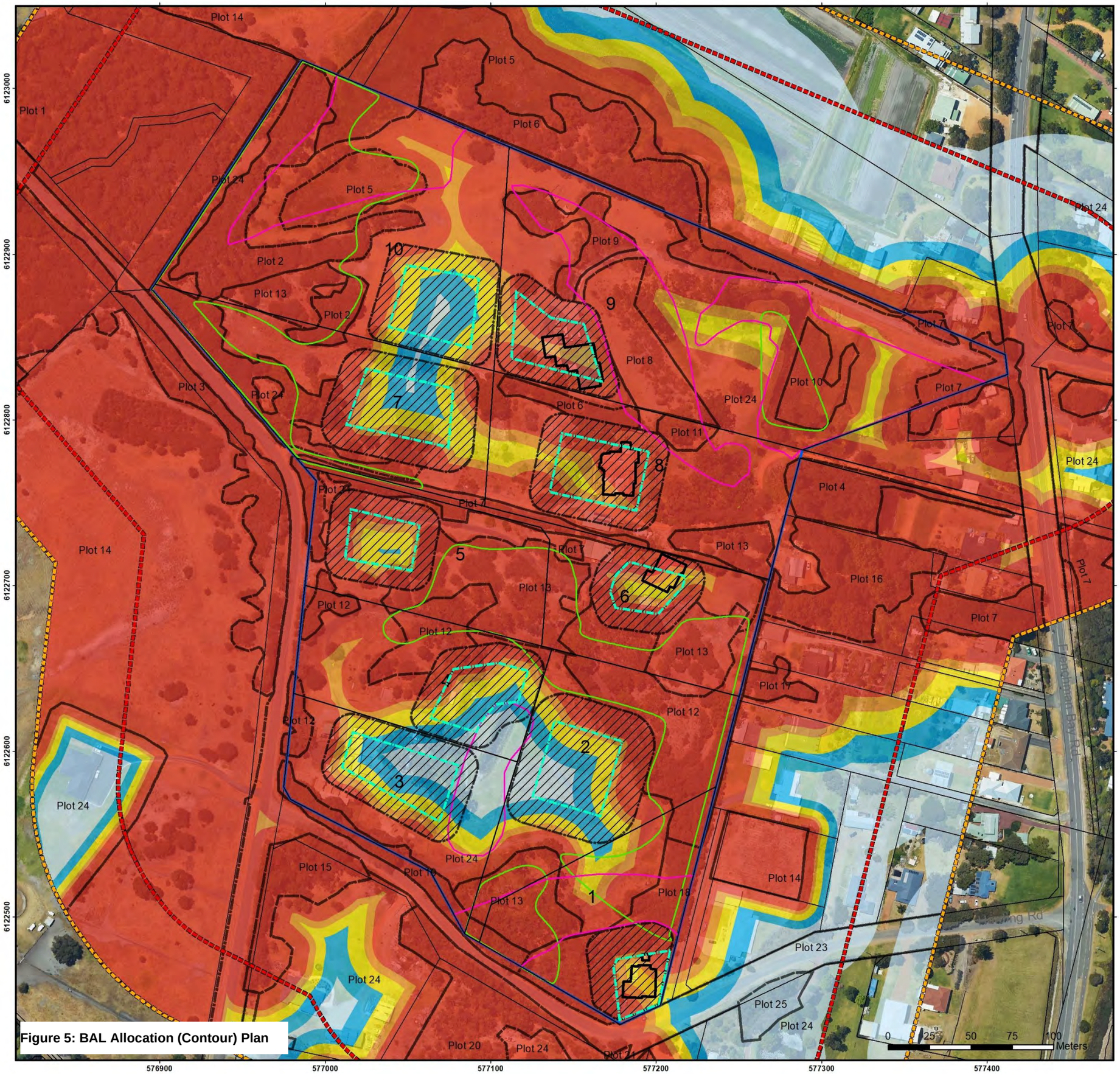


Figure 5: BAL Allocation (Contour) Plan

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

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

BIO DIVERSE SOLUTIONS

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

Overview Map Scale 1:100,000

Legend

- Subject Site
- Cadastre
- 100m Assessment Boundary
- Existing Dwelling
- 150m Assessment Boundary
- Lot Layout
- Vegetation Protection Areas
- Development Exclusion Area
- Proposed Building Envelopes
- APZ
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Scale
1:2,250 @ A3
GDA MGA 94 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Ayton Baesjou
Lots 84, 85, 87, 98 Home and Harding Road
Albany, WA 6330

BAL Contour Plan

BAL Assessor	*QA Check*	*Drawn by*
KK	**JB**	**BT**
STATUS	*FILE*	*DATE*
FINAL	**AB007**	**23/04/2020**

4. Identification of bushfire hazard issues

4.1. Bushfire Hazards

The bushfire hazards associated with the site include the remnant Forest Type A which is classified as an Extreme BHL (Bushfire Hazard Level) located to the north west and Grassland Type G (Moderate BHL) to the west in rural private properties (external to the site). Internal to the site has been predominantly cleared for the existing rural properties, however dune ridgelines have some remnant Forest and Woodland Vegetation areas (Extreme Bushfire Level Hazards).

To the east are urban properties (along Frenchman Bay Road) with some remnant Forest Type A, however are classified as predominantly low fuel areas. Further east is Princess Royal Harbour which presents limited fire run from the east. To the north is managed (active) horticultural gardens which are classified as low fuel or non-vegetated areas exclusion 2.2.3.2 (f) (AS3959). To the south is rural residential land similar to the subject site where existing APZ areas are low fuel and higher sandy dunes areas have remnant vegetation areas. The predominant bushfire attack to the subject site is from the north west and west, whereby continuous bushfire fuels exist and in hot, dry conditions can place the residents most at risk from bushfire attack.

The proposed buildings for the 10-lot subdivision can have buildings (placed in BE's) in areas of low to moderate bushfire risks with BAL 29 or less applied. All future buildings can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5. Existing buildings are located from previous planning approvals and the new proposed subdivision lot boundaries do not affect the ability of the dwellings to maintain their fire protectiveness. Detailed assessment to the bushfire protection criteria (WAPC, 2017) is outlined in Section 5 of this document. APZ areas will apply to the lots ensuring bushfire risks are not exacerbated from the intensification of land use. It is noted that all areas outside the vegetation protection areas can be hazard reduced to APZ standards. A provision at subdivision will prevail noting these areas be hazard reduced by the developer and thereafter maintained to APZ standards as a result post development BAL rating are going to be significantly different (lower in many areas) than mapped in Figure 5 (Figure 5 is a worst-case scenario).

4.2. Access Issues

Access to and from the site will be along Home and Harding Road with all the lots having the ability of a frontage onto the CoA managed roads. A full public road along the north or internal of the SP is not practical as would require CoA minimum standards of a 16-15m wide reserve and 12m wide pavement to be accommodated within the subject site. As the development is proposing an additional 8 lots (5 existing) the cost and land efficiency of a public road for the scale of development is not considered economically viable or deemed to be required.

4.3. Environmental Considerations

The subject site lies within the Jarrah Forest IBRA bioregion. Hearn *et al* (2002) describes the bioregion as; '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.'

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

- **System Association Name**: Torndirrup.
- **Vegetation Association Number:** 423.
- **Vegetation Description:** Shrublands; Acacia scrub-heath.

A search of the Albany Regional Vegetation Survey data (ARVS, Sandiford, EM & Barrett, S, 2010) indicates the site has Coastal Yate Forest, Karri Forest and Peppermint Low Forest. Site survey for bushfire assessment confirms the Peppermint Low Forest to be in existence in the north west, however the Yate and Karri forest areas have been reduced to Woodland areas or are now more dominated by regrowth of Peppermint trees (*pers. obs*. K. Kinnear, 2016).

The vegetation across the subject site and surrounding areas is consistent with rural farmland, with the majority of the site and surrounds comprising of heavily grazed pasture dominated interspersed with remnant vegetation which has been grazed or disturbed with weed infestations and pasture grass species. Only the road reserve areas and to the north west (external to the SP) are less disturbed areas without grazing present.

Internal to the site will require fuel modification/clearing of vegetation to assist in meeting APZ requirements. Analysis of publicly available Landgate Imagery indicates the area was partially cleared in 1961, with the market gardens over the northern and eastern portion of the subject site. The small rural blocks have been used for grazing and horse agistment (Home Road leads to Albany racecourse) (*pers. obs*. K. Kinnear, 2016).

Most of the internal areas (as noted in the vegetation classifications (See Section 3.1 of this report) can be modified to meet APZ requirements through fuel modification/thinning of vegetation in Forest Type A areas.

5. Assessment to the bushfire protection criteria

The Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) outlines bushfire protection criteria which subdivision and development proposals are assessed for compliance. The bushfire protection criteria (Appendix 4, WAPC, 2017) are performance-based criteria utilised to assess bushfire risk management measures and they outline four elements, being:

- Element 1: Location
- Element 2: Siting and Design of Development;
- Element 3: Vehicle Access; and
- Element 4: Water.

(WAPC, 2017)

The SP is required to meet the “Acceptable Solutions” of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal will be assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4. A summary of the assessment is provided in Table 4. The following sections of this report outlines how the proposal complies with the bushfire protection criteria Acceptable Solutions as per the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017).

5.1. Assessment to bushfire protection criteria – 4 elements

Table 4: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Subdivision meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	Compliant. The publicly released Bushfire Prone Mapping (OBRM, 2019) indicates this area as bushfire prone. The BAL Contour Plan (Figure 5) demonstrates the future dwellings could be subject to BAL 29, BAL 19 and BAL 12.5 depending on final placement of buildings in the Building Envelopes. No higher than BAL 29 should apply to any proposed dwellings located in Building Envelopes (BE) on the lots. Existing dwellings cannot in most instances achieve BAL 29 or less either due to the location to the existing boundary (not the new lot boundary) or due to further fuel reduction required adjacent to the dwellings (due to slope under classifiable vegetation). Most existing dwellings have an APZ complaint to the CoA fire notice. Staged subdivision construction may occur during the life of the SP. Where staged subdivision may be influenced by bushfire hazards located outside the application area, BAL Contours may need reassessment and an updated BAL Contour provided to the CoA demonstrating compliance at subdivision stages. The plan of subdivision is deemed to be compliant with A1.1.
Element 2 – Siting and Design	A2.1 Asset Protection Zone (APZ)	Yes	Compliant. All future buildings can achieve an APZ area associated with a BAL allocation of BAL 29, BAL 19 or BAL 12.5. This can be applied within the parent property and within each individual lot. APZ setbacks associated with BAL allocation is to apply to individual buildings and is dependent on final placement of the dwelling on the BE. The APZ area will apply as demonstrated on the lots to maintain BAL setback requirements to bushfire risks. The developer will be responsible for maintenance of the lots within their ownership to APZ standards at all times until the lots are relinquished to new lot owners. The APZ area will apply to the individual lots as shown on the BAL Contour Plan to maintain BAL setback requirements. Existing dwellings and future dwellings are to implement WAPC APZ standards refer to Appendix B. A 20m APZ or to the lot boundary should be achieved on existing dwellings prior to title clearances stages (consistent with the CoA Fire Management Notice). Any future plantings and landscaping areas are to be to an APZ standard as outlined in this report. New lot owners are to conform to any planting on their lot for revegetation, screening or windbreaks to APZ standards, refer to Appendix B. The SP is deemed to be compliant with A2.1.

Table 4 cont.

Element	Acceptable Solution	Applicable or not Yes/No	Subdivision meets Acceptable Solution WAPC 149702 & WAPC 149408
Element 3 – Vehicular Access	A3.1 Two Access Routes	Yes	Compliant. Access will be from road fronting lots directly on to Home, Harding Road and Frenchman Bay Road. Home and Harding road link to other CoA managed public roads to the north, west or to the east. The SP is deemed compliant with A3.1
	A3.2 Public Road	No	N/A, no public roads are proposed for the SP. Not assessed to A3.2
	A3.3 Cul-de-sacs	No	N/A, no cul-de-sacs are proposed for the SP. Not assessed to A3.2
	A3.4 Battle axes	Yes	Compliant. Lot 8 has an existing reciprocal rights access from Frenchman Bay road to Lot 8 dwelling and meets the minimum technical requirements. The battle axe to Lot 8 measures 137m meeting the maximum allowable length (600m). This battle axe lot cannot be avoided in the design and having the existing access allows for frontage onto Frenchman Bay Road. The battle axe lot to Lot 6 measures approximately 180m from Home Road. All widths of the battle axes comply to the minimum 6m wide horizontal clearance (Lot 5 is 5m (existing/legacy) and Lot 6 is 6m) meeting the minimum requirements of Table 5, column 3. The SP is deemed compliant with A3.4.
	A3.5 Private driveways	Yes	Compliant. Private driveways will conform to the minimum technical standards as outlined in Table 5 – Column 3. Where driveways exceed 50m a turnaround area will be required at the house to accommodate heavy duty vehicles, refer to Figure 6. The driveways do not exceed 200m, therefore passing bays will not be required. The plan of subdivision is deemed compliant to Acceptable Solution A3.5. The SP is deemed compliant to A3.5.
	A3.6 Emergency Access Ways	No	No Emergency Access Ways proposed not assessed to 3.6
	A3.7 Fire Service Access Ways	No	No Fire Service Access is proposed as the public road network will be utilised, not assessed to 3.7.
	A3.8 Firebreaks	Yes	Compliant. Firebreaks are in existence on the Subject site and maintained regularly by the current owners. These will be maintained as per the CoA Fire Management Notice (updated annually) until developed. Individual future lot owners will be required to maintain internal areas to an APZ standard and have 3m perimeter firebreaks as per the CoA Fire Management Notice. The SP is deemed compliant to Acceptable Solution A3.8.

Element	Acceptable Solution	Applicable or not Yes/No	Subdivision meets Acceptable Solution
Element 4 – Water	A4.1 Reticulated areas	Yes	Compliant. The development will be provided with reticulated scheme water in accordance with the specifications of the relevant water supply authority (Water Corporation WA (WCWA)) and DFES requirements. This will be detailed in the detailed engineering drawings and be subject to approval from WCWA and DFES at subdivision condition stages, meeting the Acceptable Solution. Fire hydrant (street) outlets are required, these must be installed to WCWA standards in accordance with the *Water Corporation's No 63 Water Reticulation Standard* and are to be identified by standard pole and/or road markings and installed by the Developer. SP construction is deemed compliant to this Acceptable Solution 4.1.
	A4.2 Non-reticulated areas	No	Not assessed to A4.2
	A4.3 Individual lots in non-reticulated areas	No	Not assessed to A4.3.

Table 5: Vehicular Access Technical Requirements (WAPC, 2017)

Technical requirements	Public Road	Cul-de-sacs	Private Driveways & Battle Axes	Emergency Access Ways (EAW)	Fire Service Access Ways
Minimum trafficable surface (m)	*6	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5	4.5
Maximum grades	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5
Maximum Length	N/A	200m	50m	600m	N/A

*Denotes the width can include a 4m wide paving with one metre wide constructed road shoulders

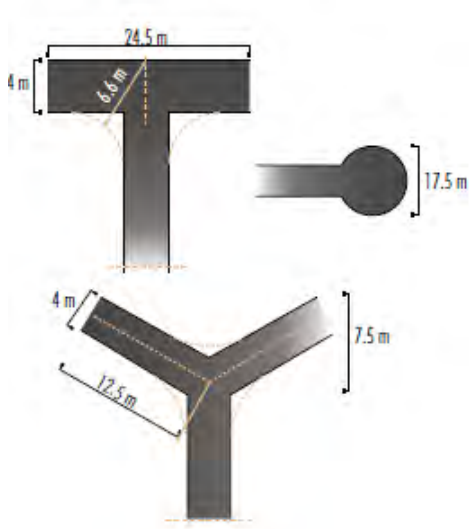


Figure 6: – Design requirements for turnaround areas (WAPC, 2017)

5.2. Other Fire Mitigation Measures

5.2.1. Evaporative air conditioners

Evaporative air conditioning units can catch fire as a result of embers from bushfires entering the unit. These embers can then spread quickly through the home causing rapid destruction. It can be difficult for fire-fighters to put out a fire in the roof spaces of homes. It is also recommended that the developer:

- Ensure that suitable external ember screens are placed on roof top mounted evaporative air conditioners compliant with AS3959-2018 (current and endorsed standards) and that the screens are checked annually; and
- Maintain evaporative air conditioners regularly as per DFES recommendations, refer to the DFES website for further details:
  http://www.dfes.wa.gov.au

5.2.2. Barrier Fencing

In November 2010 the Australian Bushfire CRC issued a "Fire Note" (Bushfire CRC, 2010) which outlined the potential for residential fencing systems to act as a barrier against radiant heat, burning debris and flame impingement during bushfire. The research aimed to observe, record, measure and compare the performance of commercial fencing of Colourbond steel and timber (treated softwood and hardwood).

The findings of the research found that:

".. *Colourbond steel fencing panels do not ignite and contribute significant heat release during cone calorimeter exposure"* (exposure to heat)

..."Colourbond steel (fencing) had the best performance as a non-combustible material. It maintained structural; integrity as a heat barrier under all experimental exposure conditions, and it did not spread flame laterally and contribute to fire intensity during exposure"

It is also noted that non-combustible fences are recommended by WAPC (APZ standards: Fences and sheds within the APZ are constructed using non-combustible materials e.g. colourbond iron, brick, limestone, metal post and wire). The developer will encourage landowners to build Colourbond or non-combustible fences where applicable.

5.2.3. Individual Bushfire Plan

Residents should prepare their own individual fire plans, as they need to make a commitment to develop a bushfire survival plan detailing preparations and actions to take if a bushfire threatens. By compiling information as outlined above, the individual lot owner can be prepared for their response in a bushfire emergency. Home owners should not rely on emergency personnel to attend their home and thus it is stressed to prepare an individual bushfire emergency plan regarding their intentions and property. This Bushfire Management Plan is not an individual bushfire emergency plan. More information can be gained from the DFES website (s):

www.dfes./wa.gov.au and www.emergency.wa.gov.au

(DFES, 2018)

6. Responsibilities for implementation

6.1. Future Lot owner's Responsibility

It is recommended the future property owners shall be responsible for the following:

Table 6: Implementation actions future lot owners

Future Lot owner– Ongoing management				
No	**Implementation Action**	**Initial**	**Annual**	**All times**
1	Build to AS3959 as it applies to their property	✓		
2	Maintain individual lot fuels in accordance with the City of Albany Fire Break Notice and WAPC APZ standards (Appendix 1).		✓	
3	Construct driveway standards to Table 5.	✓		

6.2. Developer's responsibility

It is recommended the developer be responsible for the following:

Table 7: Implementation actions current land owners/developer

Developer – Prior to issue of titles		
No	**Implementation Action**	**Subdivision Clearance**
1	Ensure prospective buyers are aware of the certified BAL Contour Plan and the applicable BAL to their property through provision of BAL Contour Plan. Update the BAL contour plan and provide certification of BAL Contour prior to lodgement of titles (post construction).	✓
2	Staged construction of the subdivision is to include an updated BAL Contour provided to the CoA demonstrating compliance.	
3	Maintain balance of land in accordance with the CoA Fire Management Notice and the WAPC APZ standards as stated in the provisions of the BMP.	✓
4	Construct all vehicle access in the subdivision to the minimum standards as outlined in Table 5.	✓
5	Install reticulated water to WCWA standards installed in accordance with the *Water Corporation's No 63 Water Reticulation Standard*	✓

6.3. Local Government Responsibility

It is recommended the local government be responsible for the following:

Table 8: Implementation actions City of Albany

LGA– Clearance of conditions		
No	**Implementation Action**	**Subdivision Clearance**
1	Request for the update of the BAL contour plan and certification of BAL Contour prior to clearance of titles (post construction).	✓
2	Ensure vehicle access standards are achieved as per Table 6 and demonstrated in the civil engineering drawings.	✓
4	Developing and maintaining District Fire Fighting Facilities and related infrastructure.	N/A, ongoing
5	Provide advice on standards and methods to achieve community fire protection to owners/occupiers of land through issue and enforcement of the current CoA Fire Management Notice (yearly advice brochure updated annually).	N/A, ongoing

7. References

AS3959 Australian Standard, *Construction of buildings in bushfire-prone areas*, Building Code of Australia, Primary Referenced Standard, Australian Building Codes Board and Standards Australia.

Bushfire CRC (2010) *Managing Forest in South West Western Australia*, Research project undertaken by Dr Lachlan McCaw and Dr Roy Wittkuhn, retrieved from: http://www.bushfirecrc.com/projects/b11/managing-forest-fires-south-western-australia

City of Albany Fire Management Notice, yearly advise brochure, accessed April 2018 from: http://www.albany.wa.gov.au

Department of Fire and Emergency Services Website accessed April 2018: http://www.dfes.wa.gov.au

Hearn, R., Williams, K. and Comer, S. (2002) Jarrah Forest (JF2 Southern Jarrah Forest Sub-region), A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, Department of Conservation and Land Management.

Personal observations by Kathryn Kinnear (Environmental Consultant and Bushfire Practitioner) (2016) during site survey November 2016.

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.

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2002) *Native Vegetation in Western Australia, extent Type and Status, Technical Report 249*, Department of Agriculture WA.

Western Australian Planning Commission (WAPC) (2017) Guidelines for Planning in Bushfire Prone Areas. Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.

Western Australian Planning Commission (WAPC, 2015) State Planning Policy 3.2 Planning in Bushfire Prone Areas. Department of Planning WA and Western Australian Planning Commission.

State Land Information Portal (SLIP) (2015 & 2016) Map of Bushfire Prone Areas. Office of Bushfire Risk Management (OBRM) data retrieved from:
https://maps.slip.wa.gov.au/landgate/bushfireprone/

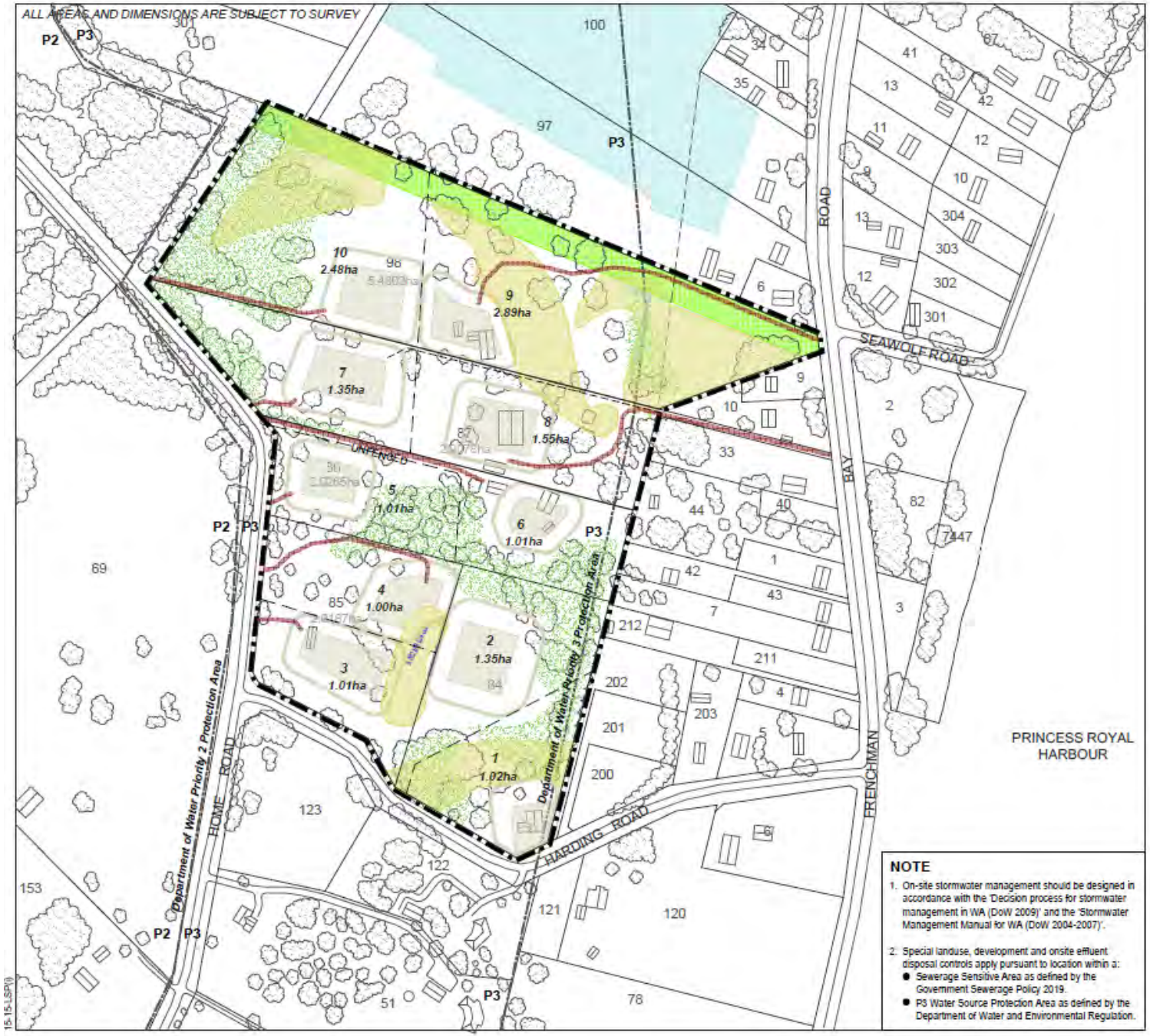
Appendices

Appendix A –Structure Plan

Appendix B – WAPC APZ standards

Appendix A

Structure Plan



NOTE

1. On-site stormwater management should be designed in accordance with the 'Decision process for stormwater management in WA (DoW 2009)' and the 'Stormwater Management Manual for WA (DoW 2004-2007)'.
2. Special landuse, development and onsite effluent disposal controls apply pursuant to location within a:
   - Sewerage Sensitive Area as defined by the Government Sewerage Policy 2019.
   - P3 Water Source Protection Area as defined by the Department of Water and Environmental Regulation.

Local Structure Plan B

Frenchman Bay, Home & Harding Roads Rural Residential Area 43

Lots 84, 85 Harding Road & Lots 86, Pt87 & Pt98 Home Road Robinson, City of Albany

LEGEND

- Subject Land
- Existing Lot Boundaries
- Proposed Lot Boundaries
- Existing Buildings
- Existing Vegetation
- Vegetation Protection Area
- Soak (to be filled)
- Vegetated Agricultural Buffer
- Effluent Disposal Exclusion Area
- Market Garden
- Proposed Building Envelope
- Indicative APZ (Refer to BMP)
- Driveway
- SFB/ Private Driveway (LO Access Easement)
- P2 DoW Priority 2 Protection Area
- P3 DoW Priority 3 Protection Area

ORIG A3
SCALE 1:3000

Map Modification - 1a
Map Creator - BOMRT
Copyright - Ayton Baesjou Planning
Sources - Landgate (Cadastre & Contours)
Datum - AHD
Contact - Ayton Baesjou Planning
Disclaimer - Subject to Verification & Survey

0 15 30 45 60 75

AYTON BAESJOU
PLANNING
59 Peels Place
ALBANY WA 6330
Ph 9842 2304 Fax 9842 8494

15-15-LSP(i)

Appendix B

WAPC APZ standards to apply

WAPC Guidelines for an APZ (WAPC, 2017)

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

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

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

Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. See Figure 9 (WAPC Figure 16, Appendix 4) below.

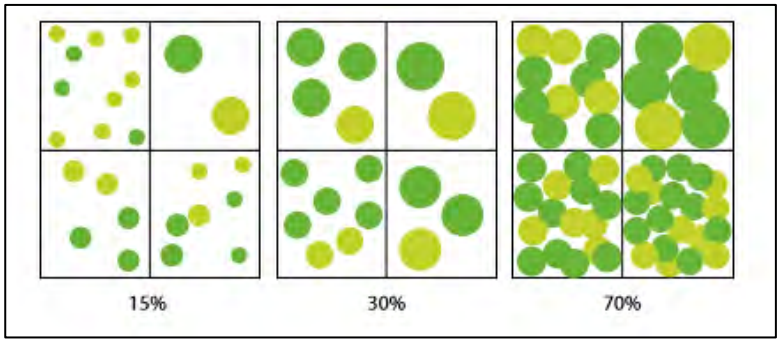


Figure 9: Tree Canopy Coverage – ranging from 15 to 70% at maturity (WAPC, 2017)

Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m^2 in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

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

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

(WAPC, 2017).