Harley Dykstra

PLANNING & SURVEY SOLUTIONS

Structure Plan

Lots 71, 72, 73 & 500 Fawcett Road, Munster

Prepared by Harley Dykstra Pty Ltd

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ENDORSEMENT PAGE

This Structure Plan is prepared under the provisions of the City of Cockburn Town Planning Scheme No.3

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

.....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

.....Date

.....Date of Expiry

TABLE OF AMENDMENT(S)

Amendment No.	Summary of Amendment	Amendment Type	Date approved by WAPC

DOCUMENT STATUS

Revision	DATE	Status	Distribution	Comment
A	5/10/2016	Draft	Client	For client review
B	6/02/2017	Draft	Local Authority	For preliminary review by Local Authority
C	30/09/2017	Draft	Local Authority	Revised following preliminary review by Local Authority
D	14/2/2018	Final for formal lodgement	Local Authority	Revised following further review by Local Authority

PROJECT DETAILS

Proponent		In collaboration with	
Prepared for:	The Landowners (Tolich, Monastra, Scidone)	LWMS Environmental	Bayley Environmental Services
Prepared by:	Harley Dykstra	Bushfire Management Plan	RUIC

Executive Summary

Structure Plan
Lots 71, 72, 73 & 500 Fawcett Road, Munster

This report represents an application to the City of Cockburn to consider a proposed Structure Plan over Lots 71, 72, 73 & 500 Fawcett Road, Munster ('the subject land'). The Structure Plan comprises a total area of 5.5669 ha (excluding the portion of Lot 71 zoned 'Urban Deferred' but including an 809m^2 portion of existing road reserve) and is situated approximately 20km due south-west of the Perth CBD, 2.5km east of the Indian Ocean coastline and 7km west of Cockburn Central and the Kwinana Freeway.

The proposed Structure Plan will provide for future development of the subject lots at densities ranging between Residential 30 (R30) to Residential 60 (R60), as well as demonstrating how the proposed use of the land will enable the management and conservation objectives for the Market Garden Swamp No.3 to be achieved.

The Structure Plan Summary Table below details the nature and key outcomes of the Structure Plan.

Table 1

Item	Data			Section number referenced within the Structure Plan Report (Part 2)
Total area covered by the Structure Plan	5.5669 ha			Section 1.2.1, 3.1.1
Area of each land use proposed Residential	1.1329 ha			Section 3.3.1
Total estimated lot yield	**R30**	**R40**		Section 3.3.1
	32 lots	43 lots		
Estimated number of dwellings	**R30**	**R40**	**R60**	Section 3.3.1
	32	43	79	
Estimated population	**R30**	**R40**	**R60**	Section 3.3.1
	83	111	158	
Estimated Residential Density - Dwellings per gross urban hectare - Dwellings per site hectare	**R30**	**R40**	**R60**	Section 3.1.3
	5.7	7	14	
	28	38	69	
Estimated area and percentage of Public Open Space given over to: - Local Parks	2620m² (14.85%)			Section 3.2.2
Estimated percentage of natural area (includes POS)	4.169ha (74.9%)			Section 3.2.2

Part One - Implementation

Part One | Implementation

Structure Plan
Lots 71, 72, 73, & 500 Fawcett Road, Munster

1.0 Structure Plan Area

This Structure Plan shall apply to Lots 71, 72, 73, & 500 Fawcett Road, Munster being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan Map (Plan 1).

2.0 Operation

The date the Structure Plan comes into effect is the date the Structure Plan is approved by the WAPC.

3.0 Staging

Staging of the Structure Plan is dependent upon the extension of Preston Drive over Lot 73. Boundary realignments between Lots 72 & 73 may be required to rationalise land areas necessary to achieve the development outcome envisaged by the Urban Design Principles Plan. Development fronting Fawcett Road and south of the existing 15m wide road can proceed independently of the Preston Drive extension and boundary realignments.

4.0 Subdivision and Development Requirements

4.1 Land use zones and reserves

Land use permissibility within the Structure Plan area shall be in accordance with the Structure Plan Map (Plan 1) and its land use designations. Land use permissibility for each land use designation is as the equivalent named zone and reserve within TPS3 except for the following:

<u>R30/R40/R60 Development Criteria</u>

Where the Structure Plan map (Plan 1) identifies an R30/R40/R60 split residential density coding, development shall accord with the R30 residential coding unless the following criteria can be met:

R40 Development Criteria	R60 Development Criteria
1. The majority of buildings (50%) are two storeys or more. 2. Two storey dwellings shall address the wetland by way of design, fenestration, a front entry, and must contain major opening(s) to a living area and/or master bedroom. 3. Development shall demonstrate variety in design, materials, height and rooflines and promote surveillance of the street and any private access ways.	1. All dwellings are two storeys. 2. Dwellings shall address the wetland by way of design, fenestration, a front entry and must contain major opening(s) to a living area and/or master bedroom. 3. Development shall demonstrate a suitable level of variety in design, materials, height and rooflines and promote surveillance of the street and private and access way.

<u>Dwelling Diversity Development Criteria</u>

Dwelling diversity shall be provided. No more than 50% of either 1 or 3 bed dwellings shall comprise the dwelling mix. The City may consider a variation to this requirement for applications for less than 10 dwellings.

4.2 Notifications on Title

In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate(s) of Title(s) to advise of the following:

1. Land or lots deemed to be affected by a Bush Fire Hazard as identified in a Bushfire Management Plan as outlined within the Bushfire Management Plan (14 December 2017).
2. Building setbacks and construction standards required to achieve a Bushfire Attack Level 29 or lower in accordance with Australian Standards (AS3959-2009): *Construction of buildings in bushfire prone areas.*
3. This land may be affected by midges from nearby lakes and/or wetlands. Enquiries can be made with the City of Cockburn Environmental Services.

4.3 Wetland Rehabilitation Management Plan

In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval that a Wetland Rehabilitation Management Plan shall be prepared and implemented.

4.4 Site Contamination Investigation

A preliminary site investigation for soil and groundwater contamination shall be required at subdivision/development application stage to determine if further investigation and/or remediation is required prior to commencement of subdivision works.

4.5 Acid Sulphate Soils Investigation

In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval that an acid sulphate soils self-assessment be provided and if required, an acid sulphate soils investigation and management plan submitted to and approved by the Department of Water and Environmental Regulation.

5.0 Local Development Plans

Local Development Plans shall be prepared in accordance with Part 6 of Schedule 2 – Deemed Provisions for Local Planning Schemes, *Planning and Development (Local Planning Schemes) Regulations 2015*, prior to any subdivision and/or development that are affected by the following:

1. Lots seeking the R40 or R60 density coding.
2. Lots with an interface or outlook towards public open space.
3. Lots that obtain access from a lane way or right-of way.
4. Lots that propose grouped or multiple dwelling developments.
5. Lots affected by a bushfire hazard, as identified within the Bushfire Management Plan (14 December 2017).
6. Lots less than 260sqm.

6.0 Other Requirements

The developer is to make satisfactory arrangements with the City of Cockburn to provide proportional contributions toward those items of development infrastructure defined in the City of Cockburn Town Planning Scheme No. 3 for Development Contribution Area 13 (DCA 13) and Development Contribution Area 6 (DCA 6).

PLAN 1

Structure Plan Map

Land Subject to Local Structure Plan Munster - Phase 3

50736
Lot 303

UCL
Lot 8000

UCL
Lot 8001

48213
Lot 221

48213
Lot 8002

Lot 500

Lot 72

13.5m Road Reserve

Lot 73

Market Garden Swamp #3
(Resource Enhancement Wetland)

Parks & Recreation

Fawcett Road

15m Road Reserve

Lot 71

Lot 8

LEGEND

Local Scheme Zones

Residential R30/40/60

Local Scheme Reserves

Parks and Recreation

Local Roads

Other Elements that Inform the Structure Plan

Structure Plan Area Boundary

STRUCTURE PLAN MAP

Lots 71 - 73 & 500
Fawcett Rd, MUNSTER

Plan No.	10757-SP-170904-J	
Date	04/09/17	
Drawn	JPW	
Checked	DM	
Revision	J	
Scale	1:1000@A3	0 10m 20m 30m

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NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

Harley Dykstra®
PLANNING & SURVEY SOLUTIONS

Part Two - Explanatory Report

DOCUMENT REFERENCE

Prepared for:	Monastra, Scidone and Tolich	**Harley Dykstra - PERTH**
Prepared by:	DM	PO Box 316 KELMSCOTT WA 6991 Phone: (08) 9495 1947 Email: metro@harleydykstra.com.au
Date:	14 February 2018	
Job No:	D10/757	
Ref:	Structure Plan	
	Lots 71-73 & 500 Fawcett Rd, Munster	

DISCLAIMER

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This document has been exclusively drafted. No express or implied warranties are made by the Consultant regarding the research findings and data contained in this report. All of the information details included in this report are based upon the existent land area conditions and research provided and obtained at the time the Consultant conducted its analysis.

Please note that the information in this report may not be directly applicable towards another client. The Consultant warns against adapting this report's strategies/contents to another land area which has not been researched and analysed by the Consultant. Otherwise, the Consultant accepts no liability whatsoever for a third party's use of, or reliance upon, this specific document.

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1 PLANNING BACKGROUND

1.1 Introduction and Purpose

This submission has been prepared by Harley Dykstra on behalf of the landowners of Lots 71, 72, 73, & 500 Fawcett Road, Munster ("the subject land").

This report represents an application to the City of Cockburn to consider a proposed Structure Plan over the subject land to enable future development at densities of Residential 30 (R30) to Residential 60 (R60). The Structure Plan also demonstrates how the proposed use of the land will enable the management and conservation objectives for Market Garden Swamp No.3 to be achieved.

The adoption of the proposed Structure Plan will facilitate the progressive redevelopment of land in this precinct, which has already proceeded to the north, west and east of the Structure Plan Area.

This proposal is accompanied by a Structure Plan Map (Plan 1) prepared in accordance with the *Planning and Development (Local Planning Schemes) Regulations, 2015*, which is included at Part One of this Report. The Structure Plan has been prepared following extensive consultation with the City of Cockburn, Department of Planning and (former) Department of Parks and Wildlife as summarised in Section 1.4 of this Report.

The Explanatory Section of this Structure Plan Report includes a detailed description of the proposal, provides an evaluation of the relevant town planning, local water management, bushfire hazard, environmental and servicing considerations applicable to the land, and details the rationale supporting the proposed Structure Plan.

The Structure Plan has been formulated by Harley Dykstra in collaboration with a team of specialist consultants, who have provided technical input in relation to matters as follows:

Bayley Environmental Services: Local Water Management Strategy and Wetland Investigations

RUIC Fire: Bushfire Management Plan

Copies of the relevant consultant Reports are appended to this submission and key findings incorporated within the body of the Report. The Consultants' Reports confirm there are no significant constraints to progressing urban development of the land. This Structure Plan Report also acknowledges previous planning, environmental and engineering work undertaken on land in the locality which has informed the preparation of this proposal.

1.2 Land Description

1.2.1 Location

The subject land is located within the suburb of Munster, between Market Garden Swamp No.3 to the east and Lake Coogee (to the west of Fawcett Road). The land is situated approximately 7km west of the Kwinana Freeway, and the Cockburn Central commercial precinct. The land is 20km due south-west of the Perth Central Business Area. The subject land is situated approximately 2.5km east of the coast (**Figure 1** *below*).

The Structure Plan contains four lots and a portion of existing road reserve, comprising a total area of 5.5669ha. The Structure Plan area has its primary frontage to Fawcett Road adjacent to its western boundary.

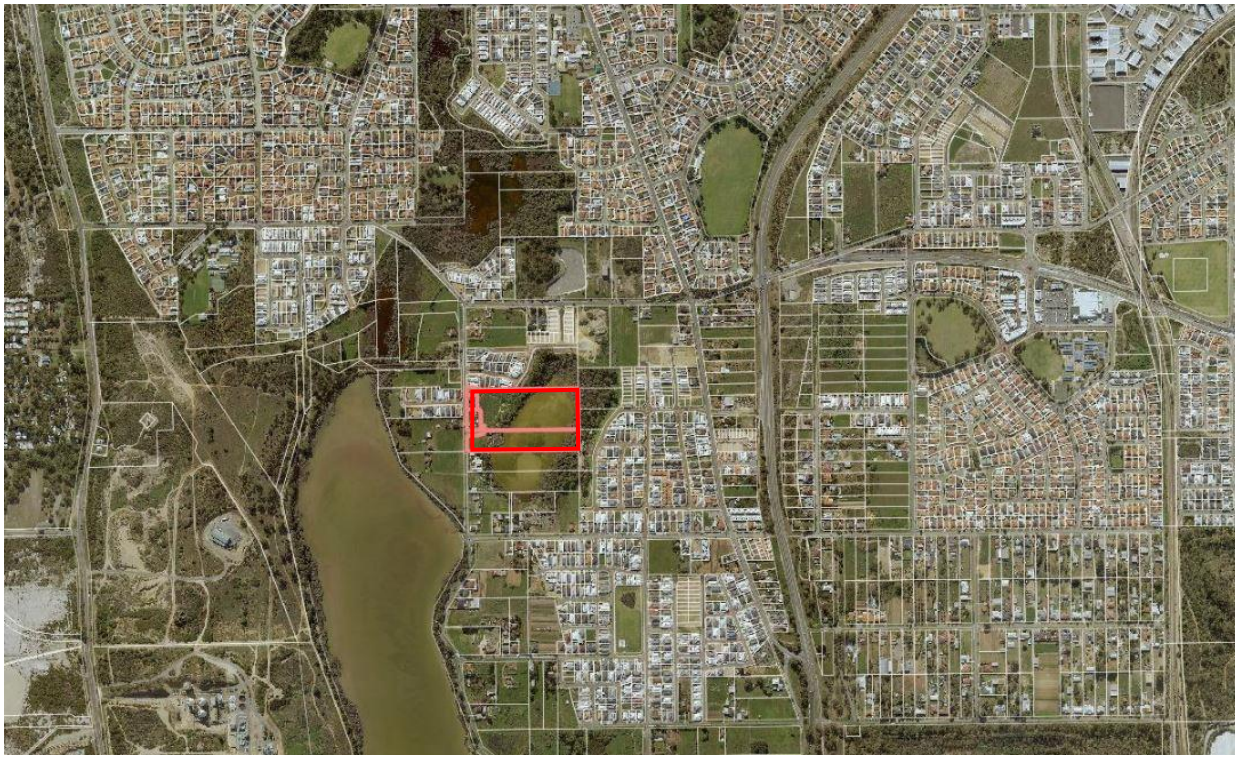


Figure 1: Location Plan (subject land outlined in red)

1.2.2 Area and land use

Lot 73 currently contains a single dwelling on its western part fronting Fawcett Road. Lot 500 contains a two storey grouped dwelling (comprising strata Lots 1 and 2) fronting Fawcett Road and Lot 72 accommodates a single dwelling. Lot 71 is generally vacant with the western portion of the lot adjacent to Market Garden Swamp having been used for storage of materials in the past. The cleared western part of Lot 71 has previously been used to graze sheep, primarily for grass control. The Aerial Photograph at **Figure 2** depicts the location of the dwellings and associated infrastructure, as well as the nature of existing land use over the balance part of the site.



Subject Land Figure 2- Aerial Photograph

1.2.3 Legal description and ownership

Lot No.		Plan / Diagram	Volume	Folio	Registered Proprietor(s)
71		403390	2863	856	Sarina Scidone Carmela Catalano
72		403390	2863	857	Vincenzo Monastra Guiseppe Monastra
73		403390	2863	858	Petar Tolich Katy Sillis
500	Strata Lot 1	SP3056	1419	362	Vincenzo Monastra
	Strata Lot 2	SP3056	1419	363	Giuseppe Monastra

Copies of the Certificates of Title are included at **Appendix 1.**

1.3 Planning Framework

1.3.1 Zoning and Reservations

1.3.1.1 Metropolitan Region Scheme

The Structure Plan area is zoned 'Urban' under the Metropolitan Region Scheme, and hence is appropriately zoned to support residential subdivision. The Urban Deferred zone associated with the Woodman Point Waste Water Treatment Plant Buffer (WWTPB) does not encroach on the subject land, with the exception of a small area (approx. 8m^2) at the south-west corner of Lot 71. This area is not included within the Structure Plan area.

1.3.1.2 City of Cockburn Town Planning Scheme No. 3

The subject land is designated 'Development Zone' under Town Planning Scheme No.3 (TPS 3). The objective of the Development Zone is to provide for future residential, industrial or commercial development in accordance with a comprehensive Structure Plan prepared under the Scheme. Thus, this proposal is consistent with the intention of the Development Zone and will facilitate future residential development at the subject land.

Schedule 11 – *Development Areas* enables additional provisions applicable to subdivision and development to be incorporated into the Scheme. The subject land is located within Development Area 5 for which the following provisions apply:

Ref No.	Area	Provisions
DA 5	Munster (Development Zone)	1. An approved Structure Plan together with all approved amendments shall apply to the land in order to guide subdivision and development. 2. To provide for residential development except within the buffers to the Woodman Point WWTP, Munster Pump Station and Cockburn Cement. 3. The local government will not recommend subdivision approval or approve land use and development for residential purposes contrary to Western Australian Planning Commission and Environmental Protection Authority Policy on land within the Cockburn Cement buffer zone.

The Structure Plan Area is not affected by any of the above mentioned buffers.

In addition, the land is included within a Special Control Area – Development Contribution Area 6 (DCA6) and Development Contribution Area 13 (DCA13) of the Scheme, which details common infrastructure costs applicable to DCA 6 and DCA 13. Special provisions apply to the subject land as set out in Schedule 12 – *Development Contributions Plans*.

1.3.2 Planning Strategies

1.3.2.1 (Draft) Perth and Peel@3.5million

The WAPC's (Draft) Perth and Peel@3.5million document establishes the vision for future growth of the Perth and Peel Metropolitan Regions and provides a framework to guide the delivery of housing, infrastructure and services necessary to accommodate anticipated population growth over the next 35 years. The document is expected to be finalised in late 2017 or early 2108.

The document includes the Sub-Regional Planning Framework consisting of three sub-frameworks, namely for the North-West, the North-East and the South Metropolitan Region. The subject land has been identified as 'Urban' under the draft South Metropolitan Peel Sub-Regional Planning Framework as have surrounding properties. Land further south-west along the eastern edge of Lake Coogee is identified as 'Industrial Investigation' due to this land's location within the Woodman Point WWTPB. Thus, development of the subject land for residential land use is consistent with the draft South Metropolitan Peel Sub-Regional Planning Framework and works to consolidate existing and planned residential development in the locality.

1.3.2.2 City of Cockburn Local Planning Strategy

The City of Cockburn Local Planning Strategy sets out the 15 year planning direction for the municipality and focuses on strategies to increase housing densities, employment, shopping and business activities, encourage walking, cycling and public transport use and reduce car use. The proposed Structure Plan is consistent with this philosophy in that it provides for a range of dwelling types and public open space within walking distance of nearby residences, as well as a permeable road network. The increase in density will provide greater housing opportunity within the locality which will support nearby shopping facilities and businesses, resulting in increased employment opportunities. The Structure Plan is consistent with the planning already commenced in the locality and corresponds to the surrounding approved and planned Structure Plans.

1.3.3 Statutory Planning Framework

1.3.3.1 Munster – Phase 3 Local Structure Plan

The Munster-Phase 3 Structure Plan has been adopted by the City of Cockburn and endorsed by the WAPC in relation to the immediately adjoining land to the north of Lot 73, extending up to Beeliar Drive. The portion of the Munster Phase 3 Structure Plan immediately adjoining Lot 73 has been implemented and developed with residential dwellings. The Structure Plan depicts a future road link between Preston Drive over Lot 73 connecting into the portion of road reserve between Lot 72 and Lot 71 which in turn intersects with Fawcett Road.

1.3.3.2 Munster – Phase 1 Consolidated Structure Plan

A Structure Plan has been adopted by the City of Cockburn and endorsed by the WAPC over the land on the east side of Market Garden Swamp No. 3, north of West Churchill Avenue and up to Rockingham Road. The staged subdivision of this land has been implemented, and is being developed with residential dwellings.

1.3.4 Planning Policies

1.3.4.1 SPP 2.8 Bushland Policy for the Perth Metropolitan Region

A large portion of the subject land is affected by Bush Forever Site (BFS) 429 as illustrated at Appendix B of the LWMS included at **Appendix 2** of this Report.

SPP 2.8 – Bushland Policy for the Perth Metropolitan Region under clause 5.1.22 provides that the WAPC may accept whole or part of a conservation area as a component of the 10 percent open space contribution where:

"a) the conservation area or portion serves a local passive recreational function which is consistent with the values of the bushland and the conservation management objectives for the site;

b) management infrastructure and other measures are provided that support the use and management of the conservation area in accordance with an endorsed management plan;

c) it is acceptable to the future proposed management body, relevant environmental agencies and local government;

d) the overall "land take" for open space is likely to jeopardise the overall development viability of the project, based on evidence supplied to the decision making body; and

e) other planning and environmental considerations and policies of the WAPC have been taken into account."

This notwithstanding, for the purpose of determining POS provision, the portion of the Structure Plan area affected by BFS 429 shall be deducted from the developable/subdivisable area of the site (refer to Section 3.2 of this Report). The draft Landscape Concept Plan included as part of the LWMS at **Appendix 2** outlines the manner by which the proposed area of Public Open Space may be used and managed in accordance with clause 5.1.22 of SPP 2.8. A condition of subdivision approval shall require the preparation and implementation of a Wetland Rehabilitation Management Plan which shall ensure the objectives of SPP 2.8 are achieved.

1.3.4.2 State Planning Policy 3.7 – Planning in Bushfire Prone Areas

State Planning Policy 3.7 (SPP 3.7) seeks to guide the implementation of effective risk based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. SPP 3.7 applies to strategic planning proposals, including Structure Plans over land designated as bushfire prone by the Map of Bushfire Prone Areas prepared by the Department of Fire and Emergency Services.

An extract from the Department of Fire and Emergency Services of Bushfire Prone Areas Mapping, as it relates to Lots 71, 72, 73 & 500 Fawcett Road is included at **Figure 3** *below*.

Given the subject land is identified in the Bushfire Prone Areas Mapping, a Bushfire Management Plan is required at Structure Planning stage.

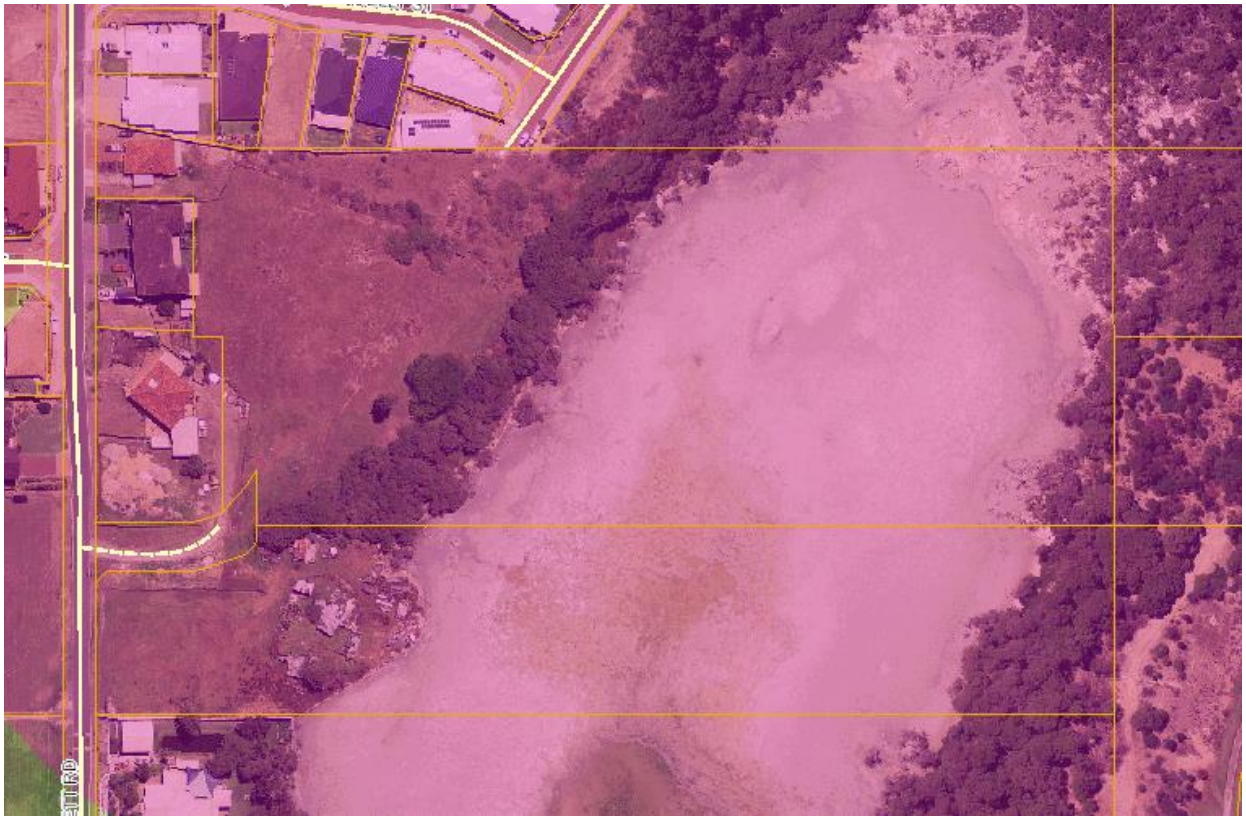


Figure 3 – Bushfire Prone Areas Mapping

1.3.4.3 Better Urban Water Management Guidelines

The WAPC's Better Urban Water Management Guidelines (BUWMG) document identifies a general requirement to prepare an LWMS to support a proposed Structure Plan.

An LWMS (**Appendix 2**) has been prepared by Bayley Environmental Services over the LSP area in support of the proposal.
The scope of this LWMS is to:

- Document the existing environment on the site in relation to soils, drainage, erosion, groundwater and water-dependent ecosystems.
- Briefly describe the proposed development in relation to water management.
- Address relevant regulatory requirements and design criteria for water harvesting, setbacks to water bodies, groundwater management and drainage.
- Describe the strategies to be implemented for water conservation, watercourse protection, groundwater management and stormwater drainage.
- Develop and document a drainage design for the subdivision/development.
- Outline the proposed water monitoring program.

Given the small size of the development area, this LWMS has been prepared with the aim of satisfying most of the requirements of an Urban Water Management Plan (UWMP) as well as those of an LWMS. The only item outstanding is the detailed design of the infiltration swales, which will be provided to the City of Cockburn at the time of detailed subdivision design.

1.3.4.4 Liveable Neighbourhoods

The WAPC's Liveable Neighbourhoods is an operational policy that guides the design and assessment of structure plans (regional, district and local) and subdivision for new urban neighbourhoods in the metropolitan area and country centres, on greenfield and large urban infill sites.

Liveable Neighbourhoods outlines that Local Structure Plans should depict:

- walkable neighbourhood catchments of approximately 400m–450m radius around proposed commercial centres;
- density targets expressed as dwellings per hectare;
- existing and proposed commercial centres;
- natural features to be retained;
- proposed street block layout;
- proposed street network, including street types and path networks;
- proposed transportation corridors, public transport network and cycle and pedestrian networks;
- proposed land uses, including distribution of higher, medium and lower density residential;
- proposed schools and community facilities;
- public parkland; and
- proposed urban water management measures.

Tables 1 and 2 identify the elements that are required to be addressed by the structure plan and/or subdivision application to allow assessment under Liveable Neighbourhoods.

Relevant considerations pertaining to the abovementioned planning elements have been addressed in this Report, in order to demonstrate compliance with the intent of Liveable Neighbourhoods.

Element 4 – Public Parkland is of particular relevance to this proposal and has guided the preparation of the Landscape Concept Plan forming part of the LWMS at **Appendix 2**. This in turn has informed the Structure Plan design, including the manner by which Public Open Space shall be provided, managed and credited at subdivision stage. Further details are provided at Section 3.2 of this Report.

The proposed Structure Plan is considered to comply with Liveable Neighbourhoods in relation to the provision of Public Open Space.

1.3.4.5 Local Planning Policies

Relevant Local Planning Policies prepared by the City of Cockburn have been considered during the preparation of the proposed Structure Plan design and documentation.

The land is located within 500 metres of Market Garden Swamp No.3.

Council Policy LPP 1.11 states:

"The City will require subdivider(s)/developer(s) of land between 500 meters and 800 metres of the lake or wetland edge to impose a Notification, pursuant to Section 165 of the Planning and Development Act 2005 on the title of each new residential lot advising prospective purchaser(s) that the land may be affected by midge infestation. Notice of this Notification is to be included on the Deposited Plan and shall state the following: This land may be affected by midge from nearby lakes and/or wetlands. Enquiries can be made with the City of Cockburn Environmental Services."

The above notification will also be required to be imposed on any infill residential subdivision, strata and development on land already zoned 'Residential' within 500 metres. The Notification will be included on the Deposited Plan(s) of all new lots created at subdivision stage, in accordance with Council requirements.

1.4 Pre Lodgement Consultation

Extensive consultation has been undertaken with the City of Cockburn's Strategic Planning and Environmental officers both prior to and following lodgement of the original Structure Plan proposal. Detailed discussions and meetings provided guidance on a range of issues including:

- Appropriate residential densities;
- Rationalisation of redundant portions of existing road reserves; and
- Appropriate development buffers from the Resource Enhancement Wetland having regard to the planned continuation of Preston Drive.

On 28 April 2015, the City of Cockburn provided initial comments on the submitted Structure Plan. A meeting was subsequently attended by the City of Cockburn, Department of Planning and Harley Dykstra to review and clarify the initial comments. Further feedback was sought from the Department of Planning and City of Cockburn subsequently to the joint meeting and a follow up meeting was attended between the City of Cockburn and Harley Dykstra on 30 June 2016 to discuss urban design principles that should be addressed as part of resubmitting the Structure Plan. This submission responds to the initial comments provided by the City and Department of Planning and the outcomes of subsequent discussions. A summary of previous consultation with the City of Cockburn, Department of Planning and (former) Department of Parks and Wildlife is included as **Appendix 3**.

2 SITE CONDITIONS AND CONSTRAINTS

2.1 Biodiversity and Natural Area Assets

2.1.1 Vegetation

Market Garden Swamp No.3 and fringing vegetation occurs within Bush Forever site 429. A vegetation assessment was conducted over Lots 71 and 73 by Dr Arthur Weston in May 2013, as referenced in the LWMS at **Appendix 2**. The Vegetation Report identified vegetation types around the western edge of the wetland mainly compromises Saltwater Paperbark/Freshwater Paperbark, woodland which varies between completely degraded to very good condition. The north and east fringe of the wetland includes Melaleuca woodland, Flooded gum and Tuart tall open woodland. The rest of the site is cleared and pastured and used for sheep grazing. The central bed of MGS3 is bare of vegetation due to its salinity and seasonal inundation. Around the south-west and south edge of the wetland, vegetation is absent or limited to scattered native and introduced trees and shrubs, with rubble and grass covering the rest of the ground. The south-west side also has an infestation of a serious environmental weed (*Juncus acutus*) that invades wetlands. The report advises once this weed is established, it can render the area impenetrable to humans and most animals, posing a serious threat to environmental, economic, aesthetic and recreational values.

2.1.2 Wetlands

The eastern part of Market Garden Swamp No.3 occupies a large portion of Lots 73 and 71 as evident by the Aerial Photograph at **Figure 2**. Market Garden Swamp No.3 is classified as a Resource Enhancement Wetland in the Department of Biodiversity, Conservation and Attractions (DBCA) geomorphic wetlands database. A preceding Wetland Boundary and Buffer Definition study referenced in the LWMS, describes Market Garden Swamp No.3 and notes the existing geomorphic wetlands mapping is inaccurate in several areas. A recommended amendment to the mapped boundary is included in the Bayley Report, which was submitted to the former Department of Parks and Wildlife (DPAW) for consideration on 17 January 2014. Correspondence received from DPAW is included within the LWMS.

The proposed alignment of Preston Drive road reserve impedes into the proposed wetland buffer recommended by DPAW. However, the City of Cockburn's environmental officer has confirmed the extension of Preston Drive through to Fawcett Road is desirable and the interface between the road reserve and the wetland area can be appropriately managed (**Appendix 3**).

2.2 Landform and Soils

2.2.1 Topography

Market Garden Swamp No.3 is located approximately at sea level, with the edge of the lake bed at 0m AHD. To the south-west, north and east, the land rises slowly at a gradient of about 3%. To the north-west, the subject land rises moderately steeply at about 10% to the highest point of Lot 73 at about 11m AHD.

2.2.2 Soils and Geology

Details relating to site geology and soils are included within the Local Water Management Strategy at **Appendix 2** prepared by Bayley Environmental Services.

The portion of the site proposed for residential development is situated on limestone derived soils of the Spearwood Dunes association. Market Garden Swamp No. 3 and its immediate surrounds are situated on limestone-derived soils overlain by lacustrine peaty and clay sediments. The Geological Survey of Western Australia maps most of the low-lying lake surrounds

as peaty clay with swamp soils. The high dune in Lot 73 north-west of the lake is mapped as Tamala Limestone with a surface of Limestone and Safety Bay Sand.

Bore-hole logs associated with groundwater and environmental investigations near the lake and at the high point of Lot 73 showed profiles typical of these map units, with holes near the lake having a silty clay profile and the bore hole on the dune being yellow-brown sand over limestone.

Market Garden Swamp No. 3 is mapped by the Department of Water and Environmental Regulation (DWER) as having a High Risk of Acid Sulphate Soil (ASS) occurrence. The High Risk mapping extends across about 70% of the proposed development site. The ASS mapping is based upon geological mapping by the GSWA; however comparison of the two shows that the ASS mapping is misaligned with the GSWA mapping by about 80m to the north-west. Correctly aligning the two maps, places the edge of the high ASS risk zone roughly on the edge of the proposed wetland buffer around MGS3 and outside the development zone.

The ASS mapping is based on the low elevation (<5m) of the site and the presence of lacustrine sediments in the lake; however the occurrence of limestone and limestone derived soils beneath both the development site and the lake suggest that ASS is highly unlikely to be present. This is supported by the results of groundwater analysis from bores in the site and adjacent to the lake, which show high or neutral pH, high alkalinity and very low acidity: alkalinity ratios. In any event, the Structure Plan requires a condition be imposed on the grant of subdivision approval for an acid sulphate soils self-assessment to be provided and if required, an acid sulphate soils investigation and management plan to be submitted to and approved by the Department of Water and Environmental Regulation.

2.3 Groundwater and Surface Water

The investigation by Bayley Environmental Services advises the groundwater level around Market Garden Swamp No.3 fluctuates little between summer and winter. DoW mapping suggests a seasonal variation of less the 0.5m, fluctuating from 0.385 to 0.759 meters. The ground water level to the west of the lake is higher than the lake level, indicating that the groundwater is flowing into the lake from the west. Market Garden Swamp No.3 dries out in most summers and has historically been used for grazing and recreation by the owners.

The site is well drained due to its sloping topography and porous surface soils. There is no defined surface drainage. Surface flow may occur over short distances for short periods during and immediately after very heavy rainfall. There is no shallow groundwater, surface waterlogging or ponding within the development area.

2.4 Bushfire Hazard

The Structure Plan area is identified as being Bushfire Prone on the *Map of Bushfire Prone Areas* as referenced in section 1.3.4.2 of this report. Hence, a Bushfire Management Plan has been prepared to support the Structure Plan in accordance with *SPP 3.7* and the *Guidelines for Planning in Bushfire Prone Areas*. A copy of the Bushfire Management Plan is included at **Appendix 4**. The Bushfire Management Plan confirms a BAL-29 or lower can be achieved for all habitable buildings, subject to an Asset Protection Zone along the eastern boundary of the residential development area including a mandatory 2m setback. The Bushfire Management Plan will be implemented at subdivision/development stage.

2.5 Site Contamination

Market gardening was carried out on parts of the land from 1953 or earlier until at least 1981. During the same period, market gardening was also carried out to the west between Fawcett Road and Lake Coogee, continuing until after 1995. Since 1985 the subject land has been used for broadacre grazing. Market gardening is regarded by the Department of Water and Environmental Regulation as a potentially contaminating land use. On the south-east part of Lot 71, is an area that is used for stockpiling timber, steel and building materials which shall be removed prior to

the subdivision or development of the land. The Structure Plan shall require a preliminary site investigation for soil and groundwater contamination to be undertaken at subdivision/development application stage to determine if further investigation and/or remediation is required prior to commencement of subdivision works.

2.6 Heritage

The Department of Aboriginal Affairs (DAA) Aboriginal Heritage Sites Database shows a registered Aboriginal heritage site over the subject land which is associated with Lake Coogee and Market Garden Swamp No 3. The development of the subject land will not involve any direct or indirect disturbance of the Aboriginal Heritage Site. A copy of the DAA site search is *attached* as **Appendix 5**.

The City's Municipal Heritage Inventory does not list any sites of relevance to the preparation of the Structure Plan.

3 LANDUSE AND SUBDIVISION REQUIREMENTS

3.1 Land Use

3.1.1 Design Overview

The Structure Plan design has been developed in consultation with the City of Cockburn having regard to the evolving strategic planning objectives for the locality, site specific environmental and bushfire hazard assessment, local water management planning, and the interface with adjacent Structure Plan areas and undeveloped land parcels.

The Structure Plan has been prepared to guide the development of the 5.5669ha site for urban purposes. The Structure Plan will facilitate the progressive development of a high quality, liveable urban precinct offering residents a diversity of lot products, and hence, housing choice. Residents will have access to the full range of established and planned urban services including primary and high schools, public open space and neighbourhood centres**.**

The design has been prepared having particular regard to the following considerations;

- The constructed subdivision layout to the north of Lot 73;
- The indicative road layout depicted over Lots 73 and the adopted Local Structure Plan – Munster (Phase 3);
- Opportunities for medium density development adjacent to the proposed Public Open Space fringing Market Garden Swamp No. 3;
- The opportunity for rationalisation and closure of redundant road reserves;
- The opportunity to achieve functional areas of POS which can be integrated with adjoining residential land use;
- The prevailing low density (R20) subdivision pattern in the immediate locality and the opportunity to achieve additional housing diversity via an increased range of dwelling types;
- Site inspections;
- Specialist consultant inputs;
- Clarification of wetland boundaries and appropriate environmental buffers; and
- Meetings and discussions with City of Cockburn technical officers.

Collectively, these factors have influenced the proposed road and lot layout distribution of residential densities, and location of public open space as depicted on the Structure Plan Map included as **Plan 1** in the Implementation Section of this Report and the Opportunities and Constraints Plan at **Appendix 6**. Further details relating to the relevant design opportunities and constraints as described below.

3.1.2 Integration with Adjoining Lots

The Structure Plan design recognises the location and alignment of the local road network connecting to the northern boundary of Lot 73 brought about by the adopted Munster – Phase 3 LSP.

The road layout provides for the continuation of Preston Drive in a south-westerly direction to enable a connection through to Fawcett Road. Lots to the south of the Structure Plan area on the east side of Fawcett Road through to the west are constrained from further residential development due to the Woodman Point WWTPB and wetland buffers/environmental constraints. Accordingly, the Structure Plan area boundary does not include these lots to the south.

In addition to road connectivity, the Structure Plan design also provides for a permeable network of dual use paths and footpaths.

Careful consideration has been given to achieving suitable integration with adjoining lots having regard to site topography, built form and street-scape objectives which have been reflected on the plan titled 'Urban Design Principles to Inform Local Development Plan' included at **Appendix 7.** The following Urban Design Principles should be addressed within a Local Development Plan for lots within the Structure Plan area seeking R40 and R60 densities:

1. Local Development Plans should ensure context sensitive interfaces are achieved with existing residential land use to the North, South and West of the development site as well as to Market Garden Swamp #3. Context sensitive responses should consider building height and scale, setbacks, visual privacy, overshadowing, articulation, landscaping and earth working requirements and visual connectivity between Fawcett Road and the wetland.
2. A pedestrian link to be provided between Fawcett Road and Market Garden Swamp #3 wetlands to facilitate connectivity, views to the wetlands and achieve breaks in the built form fronting roads.
3. Primary dwelling orientation should encourage passive surveillance of public roads, pedestrian links and private and public open space areas.
4. Should the dwelling on Lot 500 be retained, an LDP shall consider how surrounding built form will contribute to a consistent streetscape.
5. Car parking areas should be internally located and achieve good levels of passive surveillance.

3.2 Public Open Space

3.2.1 Existing POS

The Structure Plan area is well served by regional open space and recreation opportunities afforded by a chain of regional wetlands and the site's proximity to the coast. The site is located within close proximity to Lake Coogee Reserve, providing passive and conservation recreation opportunities. Market Garden Swamp No.3 is within the site and a system of dual use paths and passive recreation areas are progressively being developed around the perimeter of the wetland as adjoining residential subdivision proceeds. The site is located approximately 2km from Coogee Beach, a swimming and recreation beach and 1km from the Woodman Point Regional Park.

Beeliar Park (Radonich Park) is located approximately 1.3km north-east of the subject land and provides for active recreation activities. Santich Park is also located approximately 1km north-east of the subject land and provides for active recreational activities. Solta Park is located approximately 600m from the subject land and provides for passive recreational use.

3.2.2 Proposed POS

The table *below* illustrates the Structure Plan area is required to provide 1765m² of land for Public Open Space, in accordance with the 10% contribution required by Liveable Neighbourhoods.

The portions of the Structure Plan area identified as Bushforever will be ceded free of cost to the Crown for reservation for Parks and Recreation purposes.

The Structure Plan proposes the creation of an easily accessible area of Public Open Space, which will be integrated with existing POS fringing Market Garden Swamp No. 3 to the north. Unrestricted POS comprises 2,620m² which is equivalent to 14.85% of the subdivisable area as illustrated by the POS Schedule below. Consistent with Liveable Neighbourhoods, the unrestricted POS includes some land within the recommended REW buffer (but not within the REW itself, which is identified either as 'restricted' or otherwise is within BFS 429 and has been deducted from the subdivisable area).

The use and design of the POS area has regard to the City of Cockburn Market Garden Swamps Environmental Management Plan, 2009 ("the Environmental Management Plan"). The Environmental Management Plan establishes management objectives for the wetlands in this

locality, including Market Garden Swamp No.3 and identifies various management zones, including:

- Conservation and Protection;
- Nature Focus; and
- Recreation.

Figure 6 (Map D) of the Environmental Management Plan (**Appendix 8**) includes a large portion of the Structure Plan area comprising Market Garden Swamp No.3 within a Conservation and Protection zone, with a Recreation zone providing an interface with future residential land use.

Public Open Space Contributions

Public Open Space Schedule (As per liveable neighbourhoods 4)			
	Gross Area (ha)	(ha)	(ha)
	Lots 71, 72, 73 and 500	5.5669	
A	***TOTAL***		**5.5669**
	Less Environmental Assets		
	Bush Forever	3.7920	
	Deductions		
	1 Year ARI Bio-retention Areas	0.0104	
	Additional Restricted Open Space (above Maximum 20%)	0.0000	
B	**TOTAL**		**3.8024**
C	**Net Subdivisible Area (A-B=C)**		**1.7645**
D	**10% Requirement (10% of C=D)**		**0.1765**
	POS Requirement		
E	*Minimum 80% Unrestricted POS (80% of D = E)*	0.1412	
F	*Maximum 20% Restricted Open Space (20% of D = F)*	0.0353	
	TOTAL		**0.1765**
	POS Requirement		
	Unrestricted Open Space (Minimum 80%)		
	Unrestricted POS Areas (Less 1 Year ARI)	0.2620	
G	***SUB-TOTAL***		**0.2620**
	Restricted Open Space (Maximum 20% or 0.0353ha)		
	Bushforever (excluding portion deducted as Environmental Asset)	**0.0000**	
	Rehabilitation Area Outside Bushforever Boundary	0.1150	
H	**SUB-TOTAL**	**0.1150**	
I	***Credited Restricted Open Space (Maximum 20% of 0.0353ha)***		**0.0000**
J	**Total Credited POS (G + H)**		**0.2620**
K	**Surplus POS (J – D = K)**		**0.0856**
	Percentage of POS Provided (J as % of D)		**14.85%**

Given the size, configuration and conservation value of the proposed POS, it is anticipated the public open space shall be developed as part of a linear local park system primarily for passive recreation use. This is considered consistent with the function of the recreation zone reflected in the Environmental Management Plan. The use and management of the proposed POS is considered in the Landscape Concept Plan at Appendix C of the LWMS (**Appendix 2**) and is also reflected on the Opportunities and Constraints Plan at **Appendix 6** of this Structure Plan Report. It is anticipated preparation of a Wetland Rehabilitation Management Plan will be required to satisfy a condition of subdivision or development approval. Accordingly, the Landscape Concept Plan would be subject to future modifications and detailed design at this stage.

3.3 Residential

3.3.1 Land Use and Residential Density

The Structure Plan has regard to the progressive residential development occurring within the Munster locality. Retail, commercial and industrial land uses are not proposed within the Structure Plan area.

The proposed residential density is consistent with the strategic direction of the Sub-Regional Planning Framework which promotes higher densities in undeveloped areas zoned for urban use, particularly in areas close to transit corridors and high amenity. The Sub-Regional Planning Frameworks encourage new urban development to use an average residential density target of 15 dwellings per gross hectare of urban zoned land to guide the allocation of residential densities. Liveable Neighbourhoods also recommends medium density development in areas of higher amenity, including sites adjacent to public open space reserves and in close proximity to commercial centres.

Consistent with the broader strategic planning objectives for this locality, the site is proposed for residential development at densities ranging between R30 and R60. As part of providing for a range of residential densities, the Structure Plan seeks to achieve diversity in the mix of dwellings types that will ultimately be developed. Accordingly, Part 1 of the Structure Plan stipulates that no more than 50% of either 1 or 3 bed dwellings shall comprise the overall dwelling mix within the Structure Plan area.

The proposed R30/40/60 split density coding provides flexibility for different forms of residential development to be achieved within the Structure Plan area. Development at higher densities is incentivised where higher quality built form, increased passive surveillance and a high level of integration with existing development and the adjacent wetland areas are delivered.

Various assumptions have been made regarding the likely form of development that may occur in order to calculate a possible development yield for the Structure Plan area. It is emphasised that this yield is indicative only and may change, should the assumptions underpinning the yield calculations vary with the progression of detailed design.

Scenario 1 – R30 Single Dwellings and Grouped Dwellings

This scenario represents a 'lower limit' development outcome. Lot/dwelling yield is based on the average lot size requirements of the R-Codes at an R30 density (300m^2) with an 85% efficiency applied. Under this scenario, 32 dwellings may be achieved. 2011 ABS statistics indicate an average 2.6 persons per dwelling, accordingly an estimated population of 83 may result from development of the Structure Plan area.

Given the area of residential land use of 1.1329 ha and estimated yield of approximately 32 dwellings, the residential site density is equivalent to 28 dwellings per site hectare and 5.7 dwellings per gross urban hectare. Under each of the scenarios, the relatively low yield per gross urban hectare is accounted for due to a large portion of the site being affected by Market Garden Swamp No.3.

Scenario 2 – R40 Grouped Dwellings

This scenario represents a 'mid-range' development outcome. Lot/dwelling yield is based on the average lot size requirements of the R-Codes at an R40 density (220m^2) with an 85% efficiency applied. Under this scenario, 43 dwellings may be achieved. An estimated population of 111 may result from development of the Structure Plan area.

Given the area of residential land use of 1.1329 ha and estimated yield of approximately 43 dwellings, the residential site density is equivalent to 38 dwellings per site hectare and 7 dwellings per gross urban hectare.

Scenario 3 – R40 Grouped Dwellings and R40/R60 Multiple Dwellings

Under this scenario, dwelling yield has been calculated on the assumption that residential development comprises a combination of grouped and multiple dwellings. Indicative dwelling yields were informed by conceptual design work and generally have regard to the maximum plot ratio of 0.6 and 0.7 applicable to R40 and R60 densities respectively. Total multiple dwelling yield was calculated based on an average 70m^2 unit size and rounded down. Grouped dwelling yield was based on average lot size requirements of the R-codes and rounded down. Using this methodology, an indicative yield of 79 dwellings has been calculated. This figure represents a reasonable 'upper limit' of new dwellings to be developed in the Structure Plan area. Some sites assumed to be developed for multiple dwellings may instead be developed for grouped dwellings, resulting in a lesser yield. Similarly, market conditions at the time of development may dictate a particular unit size or configuration resulting in a variable dwelling yield. Further, detailed design may result in additional areas provided onsite for common amenity areas (i.e. landscaping and private open space) that reduces the land area available for residential development and consequently results in reduced dwelling yield.

Given the area of residential land use of 3709 ha and estimated yield of approximately 79 dwellings, the residential site density is equivalent to 69 dwellings per site hectare and 14 dwellings per gross urban hectare.

Under this scenario, it is assumed the Structure Plan area would predominantly be developed with smaller dwellings (comprising grouped and multiple dwellings). Therefore using a reduced average number of persons per dwelling to calculate the estimated population would be appropriate. Accordingly, a figure of 2 persons per dwellings has been adopted. Based on an expected dwelling yield of 79 dwellings, the estimated 'upper limit' population of the Structure Plan area is 158 persons.

3.3.2 Residential Development Layout

The road network has been designed to be integrated with the existing local road network. This, along with the environmental considerations affecting the site has guided the Structure Plan layout which is generally suited to grouped and multiple dwelling development as opposed to single residential subdivision. Detailed design will be progressed at a later planning stage and in the case of lots seeking R40 and R60 densities, will be guided by a Local Development Plan.

3.3.3 Streetscape Considerations

The Structure Plan area has a frontage of approximately 165m to Fawcett Road and approximately 200m along the extension of Preston Drive hence, it will be important to ensure a high quality streetscape is achieved.

These considerations will be reflected in a Local Development Plan(s) based on the Urban Design Principles for the Structure Plan area, which would guide future development applications.

3.4 Movement Networks

3.4.1 Existing Movement Network

3.4.1.1 Regional Road Network

The subject site is well connected with the metropolitan and wider regional road network, given its close proximity to the Kwinana Freeway, Stock Road/Rockingham Road and Beeliar Drive. The regional road network provides efficient access to the wider Perth Metropolitan Region including commercial and employment centres.

3.4.1.2 Local Road Network

The subject land has a 183.7m frontage to Fawcett Road along its western boundary. The approved Munster (Phase 3) Structure Plan adjoins the subject land and has established a road layout which will facilitate an extension of the existing local road network (Preston Drive) over the subject. Preston Drive will continue from the recently completed subdivision to the immediate north, passing through Lot 73 and connecting through to Fawcett Road. This creates an additional direct road access that can service the future development within the Structure Plan area, as well as providing an appropriate interface with Market Garden Swamp No.3. The existing road network to the north is evident on the Aerial photograph at (**Figure 2**).

The internal road within the subject land required to service new development lots will be standard kerbed asphalt roads in accordance with City of Cockburn requirements.

3.4.1.3 Public Transport Network

Transperth operates the Perth to Mandurah passenger rail service seven days a week. The closest station, Cockburn Central Station, is located at the intersection of the Kwinana Freeway and Armadale Road/Beeliar Drive approximately 7kms east of the site. The service operates:

- Monday to Friday from 5.00am to 1.00am,
- Saturday from 5.30am to 3.00am and
- Sundays & Public Holidays from 6.30am to 12.30am.

Transperth bus routes 533 and 522 travel between the Cockburn Central Train Station/Cockburn Gateway City Shopping Centre and the suburb of Munster.

Bus Route No. 881 travels into the Perth Central Business Area. The nearest bus stops are located approximately 300m to the north and 680m to the north-west of the site.

The service operates Monday to Friday from 5.45am to 10.10pm**,** on Saturday from 6.30am to 10.10pm and on Sundays and Public Holidays from 9.05am to 10.100pm. The service is timed to connect to the Mandurah to Perth passenger rail service**.**

It is expected that Transperth's bus service will be expanded to provide additional services once the development of the area surrounding the site is complete.

3.4.1.4 Cycle Network and Pedestrian Network

The site is located within relatively close proximity to a cycle network including Perth Bicycle Network (PBN) routes and a Principle Shared Path (PSP) running adjacent to the western side of the Kwinana Freeway.

The PSP connects the site with destinations along the entire north-south length of the Kwinana Freeway and Mitchell Freeway, stretching from Mandurah to Joondalup, where PBN routes provide connections to destinations located east and west of the PSP.

Mayor Road is located 300m to the north of the site and is identified as a bicycle friendly road. Rockingham Road is 600m to the east of the site and has certain parts with dedicated bike trails. West Churchill Avenue continuing onto Fawcett Road is located 300m to the south of the site and also has dedicated bike trails.

The progressive residential development in this locality will provide for additional local connections to the regional cycle network. Similarly, the progressive development of the area will facilitate the provision of a significantly upgraded pedestrian network, linking to destinations such as school sites, parkland and shopping centres.

Bicycle and pedestrian linkages will also be provided for via an extension of the dual use path system within the Public Open Space around the perimeter of Market Garden Swamp No. 3 and also via pedestrian links between Fawcett Road and the wetland areas as illustrated by the Urban Design Principles Plan (**Appendix 7**).

3.4.2 Traffic generation

The proposed extension of Preston Drive shall be designed to service future subdivision and development within the Structure Plan area to accommodate the increased traffic associated with residential development of the subject land. Access to development over the subject land will be derived from two different roads (Fawcett Road and Preston Drive) and thus vehicles will be disbursed across the local road network minimising traffic impact.

Under an R40 grouped dwellings/R60 multiple dwellings development scenario, a maximum of approximately 79 dwellings may be anticipated within the Structure Plan area. This may comprise approximately 59 dwellings serviced by Preston Drive and 20 dwellings serviced directly by Fawcett Road. Based on an average traffic generation rate of 7 vehicles per day (vpd) per grouped/multiple dwelling, as per the *Institute of Transportation Engineers (ITE) Trip Generation Manual – Residential Condominium/Townhouse (Category 230)* 553 vpd may be generated by the ultimate development of the Structure Plan area. It is likely, however that the development yield could be significantly lower than this upper estimate. Therefore, it is concluded that the proposed road network has the capacity to accommodate the anticipated Structure Plan traffic and the Structure Plan will not have an adverse impact on local traffic operations.

3.5 Water Management

The WAPC's Better Urban Water Management (BUWM) document identifies the requirement to prepare a Local Water Management Strategy (LWMS) to support a proposed Structure Plan. An LWMS (**Appendix 2**) has been prepared to support the proposed Structure Plan in accordance with the requirements of the BUWM document. The Urban Water Management framework within the locality has been established by the implementation of adjoining subdivisions. The development of the subject land for residential purposes is able to be integrated with the existing drainage infrastructure established as part of the previous residential subdivisions to the north.

The drainage system will be designed to maintain surface flow rates and volumes within and from the developed site at or below their predevelopment levels. The drainage design presented is conceptual and will be refined during the subdivision design stage.

The drainage characteristics of most of the site will be unchanged by the development. Within private lots, the runoff from building roofs and other impervious surfaces from storms up to 20-year ARI 5-minute duration (about 12mm) will be either captured for domestic water supply or disposed of by means of soakwells. The only runoff to be managed by the site drainage system

from storms of less than 20 year ARI will be that generated from the single internal road reserve, having a total area of about 2,690m^2. In storms over 20-year ARI, the drainage system will also receive excess runoff from some private lots, with a total area of about 8,760m^2.

The road reserve has been divided into two catchments based on the existing topography. In the eastern part, where the road runs roughly along the contour, the road will have standard mountable kerbing. A side entry pit (SEP)/gully pit shall be installed at a low point and connected to a bubble pit within the drainage swale. Runoff will be captured and infiltrated in a 0.3m deep bioretention swale within the road reserve. This arrangement is similar to that which exists on the already-constructed northward extension of this road.

The western part of the road runs downhill from east to west, reaching a low point where it curves west to join Fawcett Road. This section of road will be kerbed and runoff will be directed to a 0.5m deep linear swale located on the bend.

3.6 Education Facilities

South Coogee Primary School and St Jerome's Primary School are located 1.6km east and 800m north-west of the subject land respectively. Newton primary school is located 2.1km north east of the site. Spearwood Alternative school is 2.5km north of the site.

Lakeland Senior High School is located 6.0km north-east of the site. Hamilton Senior High School and South Fremantle Senior High school are located 5.0km and 7.0km north of the site respectively, although it is noted these two high schools will amalgamate with a new school to open in 2018. The new school, Fremantle College, will be located on the existing South Fremantle Senior High School site.

3.7 Activity Centres and Employment

The site is located in relatively close proximity to the industrial areas of Henderson, Naval Base and Kwinana Beach, which generate significant employment opportunities at a local and regional level across a range of trades, professions, and industries. The Latitude 32 Industrial Precinct approximately 2km to the south-east of the site will also provide extensive employment opportunities as this Precinct is developed.

Regional employment opportunities in the commerce, retail and service sectors are located within relatively close proximity at Rockingham and Fremantle. Locally, the Cockburn Central Commercial Precinct provides employment opportunities.

Professional and office based employment opportunities within the Perth Central Business Area are also readily accessible via public transport network, including the Cockburn Central train station.

A small local centre is located approximately 700m south-east of the site at the corner of West Churchill Avenue and Rockingham Road.

Weekly shopping needs of residents will be met at Stargate Shopping Centre 1.8km north of the site on Rockingham Road and at Cockburn Central Commercial Precinct, located approximately 7km east of the site. Phoenix Park shopping centre is 3.5km north of the site.

3.8 Infrastructure Coordination, Servicing and Staging

3.8.1 Servicing

3.8.1.1 Sewer Reticulation

The existing residential dwellings on Lots 73, 500, and 72 are not currently connected to the pressure sewer main located within Fawcett Road. It is envisaged development within the Structure Plan area can be connected to the existing reticulated sewer within Fawcett Road and via an extension of the existing sewer pipe work within the proposed continuation of Preston Drive.

3.8.1.2 Water Reticulation

A reticulated water supply is currently available to service the Structure Plan area within the Fawcett Road reserve. A scheme supply is also available within the Preston Drive servicing the existing residential subdivision immediately to the north, which could be extended to service the Structure Plan area.

3.8.1.3 Local Roads

All road networks will be designed according to the City of Cockburn standards and will meet the existing road network construction philosophy. The pavement composition would be required to meet the City of Cockburn specifications.

3.8.1.4 Gas Supply

Gas is readily available in the vicinity of these subdivisional works and additional pipes will be installed as required to provide these lots with a gas supply.

3.8.1.5 Electrical Supply and Telecommunications

Power and telecommunications infrastructure is available to service the Structure Plan area via the Fawcett Road reserve and proposed extension of the Preston Drive reserve.

3.8.1.6 Earthworks and Site Levels

Site levels will be determined at subdivision and/or development stage, having regard to the requirements of an Urban Water Management Plan, earth work and retaining considerations and sewer design. In addition, lot levels will need to facilitate vehicular access via the proposed road layout as envisaged by the Structure Plan. A condition of subdivision or development approval can require the preparation of an earthwork and site levels plan to ensure proper integration between the levels of residential development, roads and POS if required.

3.8.2 Staging

Staging of subdivision and development can generally occur within the separate land holdings, however boundary realignments between Lots 72 & 73 would be required to rationalise land areas necessary to achieve the development outcome envisaged by the Urban Design Principles Plan. The extension of Preston Drive would be required to enable the development of Lot 73.

3.9 Other Requirements

3.9.1 Bushfire Management

The Structure Plan design has been prepared having regard to the requirements of the Bushfire Management Plan prepared for the subject land (**Appendix 4**). A summary which outlines how each of the key elements of the *Guidelines for Planning in Bushfire Prone Areas* have been satisfied, is included below.

3.9.2 Location of Development

Upon completion of development and subject to the requirements of the Bushfire Management Plan, all habitable buildings will be subject to BAL-29 or lower.

3.9.3 Siting and Design of Development

No BAL for future dwellings will exceed BAL-29. A mandatory 2m setback will be required for habitable buildings from the eastern boundary of the residential development area.

3.9.4 Vehicular Access

The proposed Structure Plan area is connected to an extensive public road network and will receive direct access from Fawcett Road and an extension of Preston Drive. At least two different vehicular access routes connecting to the public road network to provide egress to two different destinations will be available at all times, including during staging of the development.

3.9.5 Water Supply

The development is provided with a reticulated water supply, together with fire hydrants, in accordance with the specifications of the Water Corporation and the Department of Fire and Emergency Services.

3.10 Developer Contribution Arrangements

Under the City of Cockburn Town Planning Scheme No.3, clause 6.3.1-*Development Contribution Areas* provides for a cost contribution scheme to be established, to ensure the equitable sharing of costs between owners towards infrastructure required as a result of the subdivision and development of land within the Developer Contribution Area (DCA). The subject land is included within Development Contribution Area 6 (DCA6) and Development Contribution Area 13 (DCA13), which details common infrastructure costs applicable to DCA 6 and DCA 13. Special provisions apply to the subject land as set out in Schedule 12 – *Development Contributions Plans*.

3.11 Implementation

The proposed Structure Plan has been prepared in accordance with the requirements of the *Planning and Development (Local Planning Schemes) Regulations 2015*. Further, the Structure Plan complies with the applicable State and Local Planning Policy Framework as set out in section 1.3 of this Report.

The *Planning and Development (Local Planning Schemes) Regulations 2015* stipulates the manner by which the Structure Plan will be processed by the City of Cockburn and thereafter, the Western Australian Planning Commission to enable final approval.

Following adoption of the Structure Plan, Local Development Plans, Development and Subdivision Applications can be considered and approved where they comply with the Structure Plan.

APPENDICES INDEX

Appendix No.	Nature of Document	Assessment Agency	Approval Status
1	Certificates of Title	N/A	For Information
2	Local Water Management Strategy (Bayley Environmental Services)	Local Authority/DWER	For Assessment
3	Summary of Pre-Lodgement Consultation	Local Authority/WAPC	For Information
4	Bushfire Management Plan (RUIC Fire)	Local Authority/DFES	For Assessment
5	Department of Aboriginal Affairs Site Search	N/A	For Information
6	Opportunities and Constraints Plan	Local Authority/WAPC	For Information
7	Urban Design Principles	Local Authority/WAPC	For Information
8	Market Garden Swamp Environmental Management Plan Extract	N/A	For Information

APPENDIX 1

Certificates of Title

WESTERN AUSTRALIA

REGISTER NUMBER	
71/DP403390	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 2863 FOLIO 856

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 71 ON DEPOSITED PLAN 403390

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

SARINA SCIDONE OF 59 FIFTH ROAD, ARMADALE
CARMELA CATALANO OF 22 DANBURY CRESCENT, GIRRAWHEEN
AS TENANTS IN COMMON IN EQUAL SHARES

(AF M989008) REGISTERED 5/5/2015

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

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents of for local govenment, legal, surveying or other professional advice.

SKETCH OF LAND: DP403390
PREVIOUS TITLE: 1060-437
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY: CITY OF COCKBURN

NOTE 1: M989008 THIS LOT/TITLE CREATED AFTER CROWN LAND INCLUDED INTO THE FREEHOLD ESTATE WITHOUT PRODUCTION OF THE DUPLICATE CERTIFICATE OF TITLE. CURRENT DUPLICATE FOR THE WITHIN LAND IS STILL VOLUME 1060 FOLIO 437 EDITION 1

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WESTERN AUSTRALIA

REGISTER NUMBER	
72/DP403390	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 2863 FOLIO 857

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 72 ON DEPOSITED PLAN 403390

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

VINCENZO MONASTRA OF 27A FAWCETT ROAD, MUNSTER
GUISEPPE MONASTRA OF 27B FAWCETT ROAD, MUNSTER
AS TENANTS IN COMMON IN EQUAL SHARES

(AF M989008) REGISTERED 5/5/2015

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

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents of for local govenment, legal, surveying or other professional advice.

SKETCH OF LAND: DP403390
PREVIOUS TITLE: 1371-101
PROPERTY STREET ADDRESS: 33 FAWCETT RD, MUNSTER.
LOCAL GOVERNMENT AUTHORITY: CITY OF COCKBURN

NOTE 1: M989008 THIS LOT/TITLE CREATED AFTER CROWN LAND INCLUDED INTO THE FREEHOLD ESTATE WITHOUT PRODUCTION OF THE DUPLICATE CERTIFICATE OF TITLE. CURRENT DUPLICATE FOR THE WITHIN LAND IS STILL VOLUME 1371 FOLIO 101 EDITION 2

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WESTERN AUSTRALIA

REGISTER NUMBER	
73/DP403390	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

RECORD OF CERTIFICATE OF TITLE

VOLUME 2863 FOLIO 858

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 73 ON DEPOSITED PLAN 403390

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

PETAR TOLICH OF 37 BRIDGE STREET, BRIGHTON, VICTORIA
KATY SILLIS OF 19 FAWCETT ROAD, MUNSTER
AS EXECUTORS OF THE WILL OF DOBRILA TOLICH WHO DIED ON 27/04/2011
(AF M989008) REGISTERED 5 MAY 2015

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

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP403390.
PREVIOUS TITLE: 1166-553.
PROPERTY STREET ADDRESS: 25 FAWCETT RD, MUNSTER.
LOCAL GOVERNMENT AREA: CITY OF COCKBURN.

NOTE 1: M989008 THIS LOT/TITLE CREATED AFTER CROWN LAND INCLUDED INTO THE FREEHOLD ESTATE WITHOUT PRODUCTION OF THE DUPLICATE CERTIFICATE OF TITLE. CURRENT DUPLICATE FOR THE WITHIN LAND IS STILL VOLUME 1166 FOLIO 553 EDITION 1

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WESTERN AUSTRALIA

REGISTER NUMBER	
1/SP3056	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 1419 FOLIO 362

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893 AND THE

STRATA TITLES ACT OF 1985

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 1 ON STRATA PLAN 3056
TOGETHER WITH A SHARE IN ANY COMMON PROPERTY AS SET OUT ON THE STRATA PLAN

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

VINCENZO MONASTRA OF 26A FAWCETT ROAD, COOGEE

(T B043529) REGISTERED 28/10/1975

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

1. INTERESTS NOTIFIED ON THE STRATA PLAN AND ANY AMENDMENTS TO LOTS OR COMMON PROPERTY NOTIFIED THEREON BY VIRTUE OF THE PROVISIONS OF THE STRATA TITLES ACT NO.33 OF 1985 AS AMENDED.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents of for local govenment, legal, surveying or other professional advice.

SKETCH OF LAND:	SP3056
PREVIOUS TITLE:	SP3056
PROPERTY STREET ADDRESS:	27A FAWCETT RD, MUNSTER.
LOCAL GOVERNMENT AUTHORITY:	CITY OF COCKBURN

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WESTERN AUSTRALIA

REGISTER NUMBER	
2/SP3056	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

VOLUME 1419 FOLIO 363

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893 AND THE

STRATA TITLES ACT OF 1985

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 2 ON STRATA PLAN 3056
TOGETHER WITH A SHARE IN ANY COMMON PROPERTY AS SET OUT ON THE STRATA PLAN

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

GIUSEPPE MONASTRA OF 26B FAWCETT ROAD, COOGEE

(T B043526) REGISTERED 28/10/1975

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

1. INTERESTS NOTIFIED ON THE STRATA PLAN AND ANY AMENDMENTS TO LOTS OR COMMON PROPERTY NOTIFIED THEREON BY VIRTUE OF THE PROVISIONS OF THE STRATA TITLES ACT NO.33 OF 1985 AS AMENDED.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents of for local govenment, legal, surveying or other professional advice.

SKETCH OF LAND:	SP3056
PREVIOUS TITLE:	SP3056
PROPERTY STREET ADDRESS:	27B FAWCETT RD, MUNSTER.
LOCAL GOVERNMENT AUTHORITY:	CITY OF COCKBURN

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FORM 1

STRATA PLAN 3056

Ca. 1

PARCEL OF LAND LOT 500 OF COCKBURN SOUND
LOC 2 ON DIA 45867

CERTIFICATE OF TITLE : 1370-199 1370-200

LOCAL AUTHORITY TOWN OF COCKBURN

LOCALITY COOGEE INDEX PLAN 6570

NAME OF BUILDING 26A & 26B FAWCETT RD. COOGEE

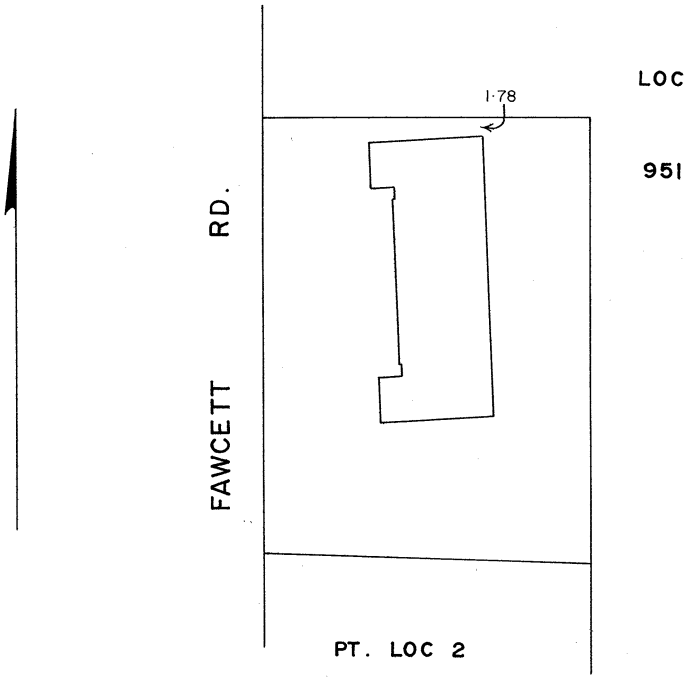
ADDRESS FOR SERVING OF NOTICES ON COMPANY 26A & 26B FAWCETT RD. COOGEE

LODGED 27 . 3 . 75

EXAMINED 3 . 4 . 74

REGISTERED 28 . 10 . 75 App. B463525

REGISTRAR OF TITLES



J. GIUDICE
Licensed Surveyor
8 Stirling St., Fremantle
35 6371

SCALE: 500 ~~LINKS TO AN INCH~~

CI

SCHEDULE OF UNIT ENTITLEMENT		OFFICE USE ONLY CURRENT Cs. of TITLE	
LOT No.	UNIT ENTITLEMENT	VOL.	FOL.
1	1	1619-362	
2	1	1619-363	
AGGREGATE	2		

SURVEYOR'S CERTIFICATE

I hereby certify that the building shown on the plan is within the external surface boundaries of the parcel ~~and where eaves or guttering project beyond those boundaries, that a registered easement has been granted as an appurtenance of the parcel or, where the projection is over a road that the Local Authority has consented thereto.~~

J. Giudice

DATE 5/2/75 LICENSED SURVEYOR.

APPROVED BY THE TOWN PLANNING BOARD
FOR THE PURPOSES OF THE STRATA TITLES ACT 39 OF 1966

DATE 25 MAR 1975 CHAIRMAN.

83770/9/70–2M–O/MGD

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FORM 3

STRATA PLAN No. 3056

CERTIFICATE OF LOCAL AUTHORITY

FOR THE PURPOSES OF THE STRATA TITLES ACT 39 OF 1966

TOWN OF COCKBURN, THE LOCAL AUTHORITY,

HEREBY CERTIFIES THAT:—

(1) The building shown on the plan has been inspected and that it is consistent with the building plans and specifications in respect thereof that have been approved by the Local Authority.

(2) The building, in the opinion of the local authority, is of sufficient standard and suitable to be divided into lots pursuant to the Strata Titles Act, 1966.

DESCRIPTION OF BUILDING:—

A DOUBLE STOREY BRICK AND TILE RESIDENTIAL DUPLEX SITUATED ON LOT 500 DIAGRAM 45867 AND BEING PORTION OF COCKBURN SOUND LOCATION 2 AND HAVING AN ADDRESS 26A AND 26B FAWCETT ROAD, COOGEE.

DATE 14th. March 1975

[redacted]/TOWN CLERK

62067/5/69—200—F802

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C.A. 4

SHEET No. 1 OF 2 SHEETS

STRATA PLAN No. 3056

GROUND FLOOR

As at 20th July 1997 unless a notice of resolution under section 21H or an objection under 21O has been recorded on the strata plan -

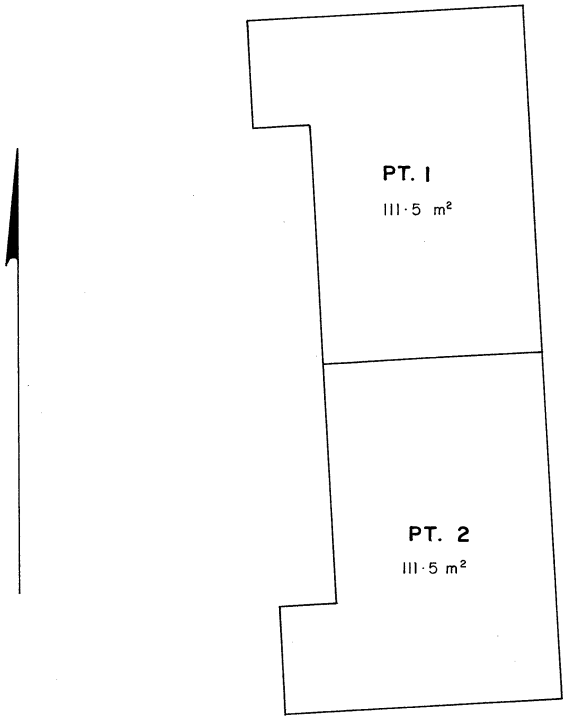
The boundaries of the lots or parts of the lots which are buildings shown on the strata plan are the external surfaces of those buildings, as provided by section 3AB of the *Strata Titles Act 1985;*

The scheme may not be a single tier scheme, as defined in section 3(1) of the *Strata Titles Act 1985;*

The areas of the lots shown on the strata plan may have changed;

Where 2 lots have a common or party wall, or have buildings on them which are joined, the centre plane of that wall or the plane at which they are joined, is the boundary;

The horizontal boundaries of the lots or parts of the lots which are not buildings shown on the plan (if any) remain as provided on this strata plan.



FOR OTHER PART LOTS
SEE SHEET 2 OF 2

SCALE 1:200 ~~FEET TO AN INCH~~

APPROVED

FOR THE PURPOSES OF THE STRATA TITLES ACT 39 OF 1966 AS AMENDED

TOWN PLANNING BOARD	LOCAL AUTHORITY TOWN OF COCKBURN
David Cain	
DATE 25 MAR 1975 CHAIRMAN	DATE 14th March 1975 ~~SHIRE~~/TOWN CLERK

85370/11/70-2M-C397

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C.A. 4

SHEET No. 2 OF 2 SHEETS

STRATA PLAN No. 3056

FIRST FLOOR

As at 20th July 1997 unless a notice of resolution under section 21H or an objection under 21O has been recorded on the strata plan -

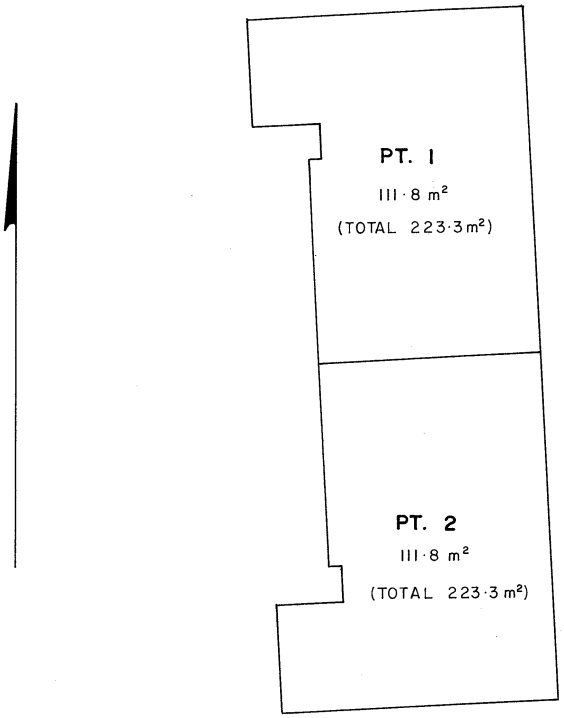
The boundaries of the lots or parts of the lots which are buildings shown on the strata plan are the external surfaces of these buildings, as provided by section 3AB of the *Strata Titles Act 1985;*

The scheme may not be a single tier scheme, as defined in section 3(1) of the *Strata Titles Act 1985;*

The areas of the lots shown on the strata plan may have changed;

Where 2 lots have a common or party wall, or have buildings on them which are joined, the centre plane of that wall or the plane at which they are joined, is the boundary;

The horizontal boundaries of the lots or parts of the lots which are not buildings shown on the plan (if any) remain as provided on this strata plan.



FOR OTHER PART LOTS
SEE SHEET 1 OF 2

SCALE 1:200 ~~FEET TO AN INCH~~

APPROVED

FOR THE PURPOSES OF THE STRATA TITLES ACT 39 OF 1966 AS AMENDED

TOWN PLANNING BOARD	LOCAL AUTHORITY TOWN OF COCKBURN
DATE 25 MAR 1975 CHAIRMAN	DATE 14th March 1975 ~~SHIRE~~ TOWN CLERK

85370/11/70-2M-C397

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ANNEXURE 'A' OF STRATA PLAN No. 3056 REGISTRAR OF TITLES

SCHEDULE OF REGISTERED PROPRIETORS

REGISTERED PROPRIETOR	INSTRUMENT			SIGNATURE OF REGISTRAR of TITLES
	NATURE	NUMBER	REGIST'D	

SCHEDULE OF ENCUMBRANCES, ETC.

INSTRUMENT		PARTICULARS	REGIST'D	SIGNATURE OF REGISTRAR of TITLES	CANCELLATION			
NATURE	NUMBER							

NOTE : ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SIGNATURE OF THE REGISTRAR OF TITLES ARE CANCELLED.

63673/10/69—500—G472

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APPENDIX 2

Local Water Management Strategy

(Bayley Environmental Services)

LOTS 71, 72, 73 & 500 FAWCETT RD, MUNSTER

LOCAL WATER MANAGEMENT STRATEGY

Prepared for

S. Scidone and C. Catalano
V. and J. Monastra
K. Sillis and P. Tolich
c/- Harley Dykstra
PO Box 316
KELMSCOTT WA 6111

Report No. J12011b
22 December 2017

BAYLEY ENVIRONMENTAL SERVICES
30 Thomas Street
SOUTH FREMANTLE WA 6162

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1.0 INTRODUCTION

1.1 Background

Lots 71, 72, 73 and 500 Fawcett Road, Munster (the subject lots) are located across and west of Market Garden Swamp No. 3 in the City of Cockburn. Figure 1 shows the subject lots and their surroundings. The owners of the subject lots propose to subdivide the western part of the land for urban residential development. The four lots total 5.5 hectares, of which about 1.3ha is proposed for development. The remainder is mostly within the mapped wetland or buffer zone of Market Garden Swamp No. 3.

The owners have prepared a structure plan to demonstrate the site's capacity to support the proposed subdivision and residential development. Figure 1 shows the location and layout of the site.

1.2 Scope of the LWMS

The scope of this LWMS is to:

- Document the existing environment on the site in relation to soils, drainage, erosion, groundwater and water-dependent ecosystems.
- Briefly describe the proposed development in relation to water management.
- Address relevant regulatory requirements and design criteria for water harvesting, setbacks to water bodies, groundwater management and drainage.
- Describe the strategies to be implemented for water conservation, watercourse protection, groundwater management and stormwater drainage.
- Develop and document a drainage design for the subdivision.
- Outline the proposed water monitoring program.

Given the small size of the development area, this LWMS has been prepared with the aim of satisfying most of the requirements of an Urban Water Management Plan (UWMP) as well as those of an LWMS. The only item outstanding is the detailed drainage design, which will be provided to the City of Cockburn in a Drainage Design Report at the time of detailed subdivision design.

1.3 Relevant Guidelines and Policies

1.3.1 State Planning Policy 2.9

State Planning Policy 2.9: *Water Resources* (WAPC, 2006) lists the following key principles for total water cycle management:

- Consideration of all water sources (including wastewater) in water planning, maximising the value of water resources.
- Integration of water and land use planning.
- Sustainable and equitable use of all water sources, having consideration of the needs of all water users including the community, industry and the environment.
- Integration of water use and natural water processes.
- A whole-of-catchment integration of natural resource use and management.

SPP 2.9 also lists the following general objectives for water-sensitive urban design:

- to manage a water regime;
- to maintain and, where possible, enhance water quality;
- to encourage water conservation;
- to enhance water-related environmental values; and
- to enhance water-related recreational and cultural values.

Element 5 of *Liveable Neighbourhoods* Edition 3 (WAPC, 2004) identifies specific objectives and requirements for Urban Water Management. These are based on Best Planning Practices which are defined as the best practical approach for achieving water resource management objectives within an urban framework.

1.3.2 Better Urban Water Management

Better Urban Water Management (WAPC, 2008) sets out the following objectives for water sensitive urban design:

Water Conservation

- Consumption of 100kL/p/yr including less than 40-60 kL/p/yr scheme water.

Water Quantity

- Ecological Protection – Maintain pre-development flow rates and volumes for the 1 year ARI event. Maintain or restore desirable environmental flows and/or hydrological cycles.

- Flood Management – Maintain pre-development flow rates and volumes for the 100 year ARI event.

Water Quality

- Maintain pre-development nutrient outputs (if known) or meet relevant water quality guidelines (e.g. ANZECC & ARMCANZ, 2000).

- Treat all runoff in the drainage network prior to discharge consistent with the Stormwater Management Manual.

- As compared to a development that does not actively manage stormwater quality, achieve:

    - at least 80% reduction of Total Suspended Solids;
    - at least 60% reduction of Total Phosphorus;
    - at least 45% reduction of Total Nitrogen; and
    - at least 70% reduction of gross pollutants.

Mosquitoes and Midges

- Design detention structures so that, between the months of November and May, stormwater is fully infiltrated within 96 hours.

- Design permanent water bodies (where accepted by DoW) to maximise predation of mosquito larvae by native fauna.

2.0 PRE-DEVELOPMENT ENVIRONMENT

2.1 Rainfall

Munster, like the rest of the Perth region, has a strongly seasonal rainfall, with most of the annual rain falling between May and September in association with winter cold fronts. Occasional heavy falls may occur from summer thunderstorms. The long-term average annual rainfall for Perth Airport is 774.7mm, of which over 78% falls between May and September.

Figure 2 shows a rainfall occurrence chart for Perth Airport. Figure 3 and Table 2.1 show rainfall intensity and frequency for the Munster vicinity.

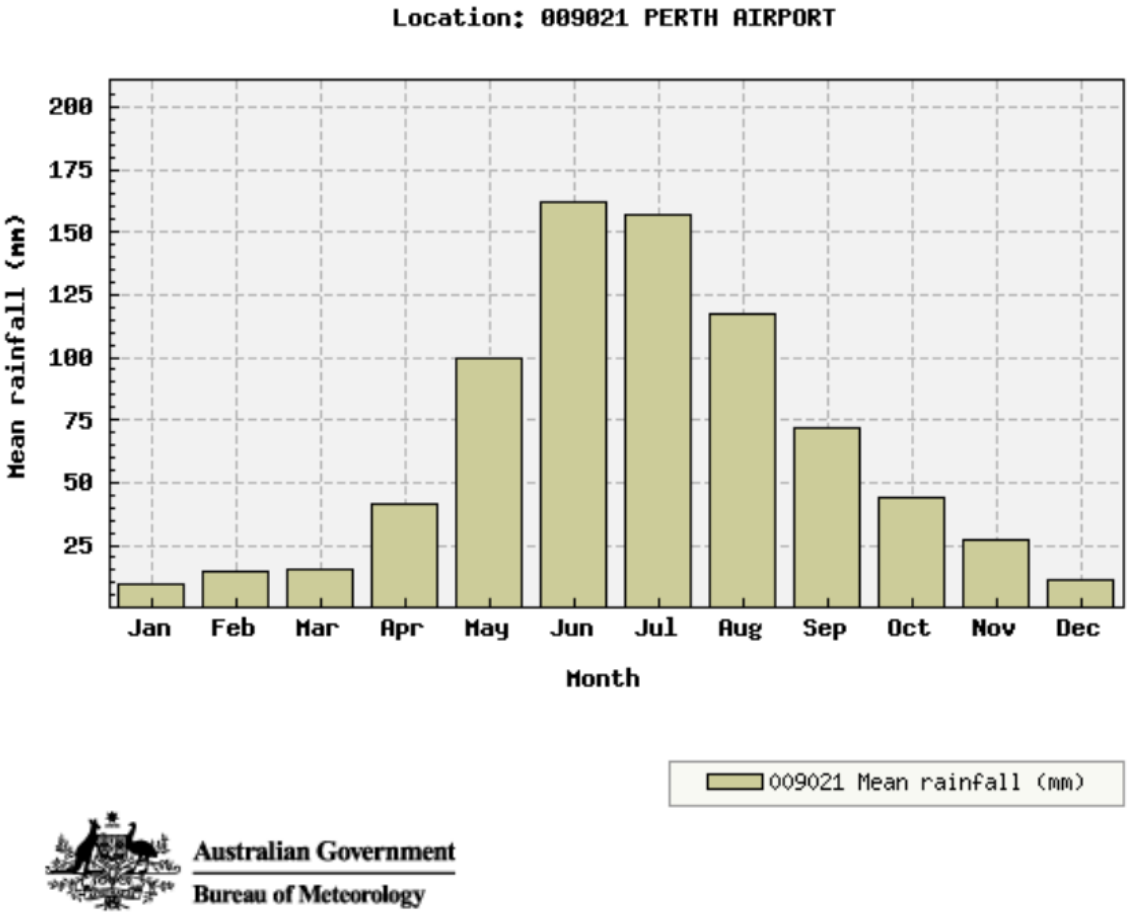


Figure 2 Perth Airport Mean Rainfall

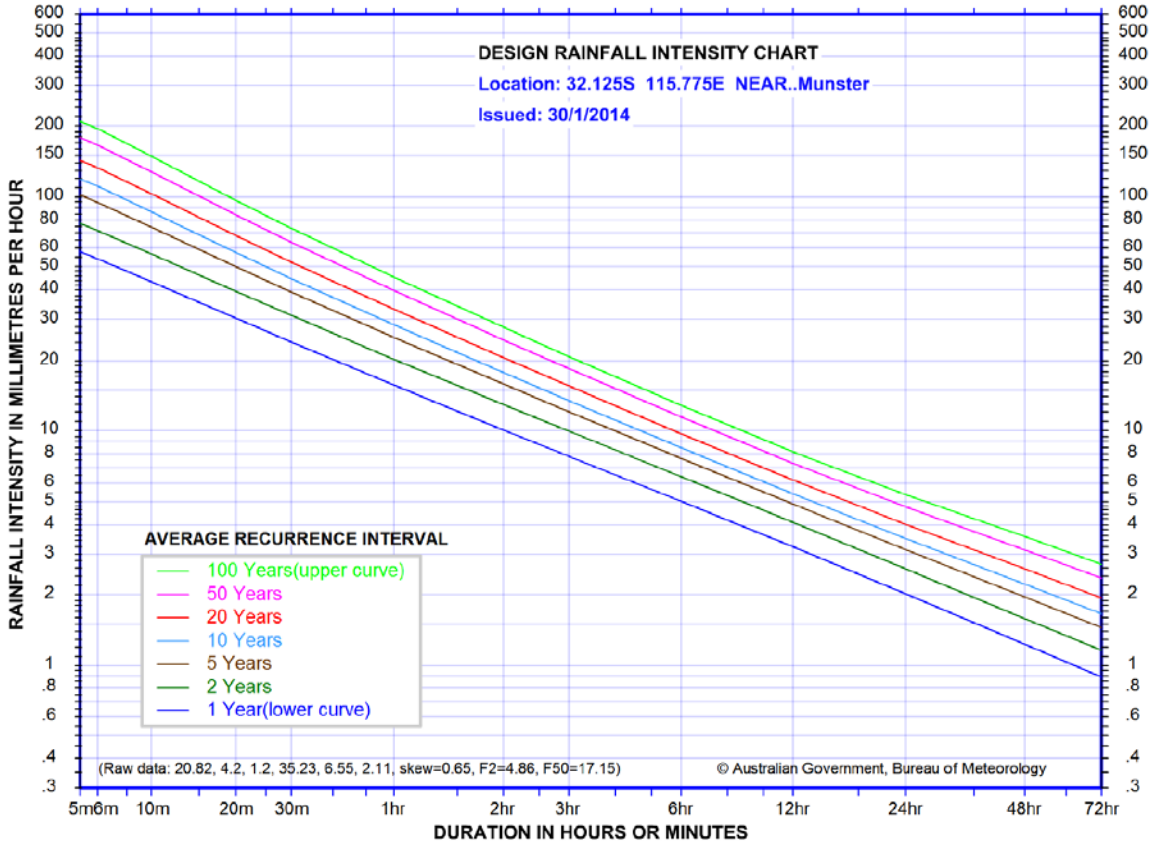


Figure 3 Rainfall Intensity Chart for Munster

Intensity-Frequency-Duration Table

Location: 32.125S 115.775E NEAR.. Munster Issued: 30/1/2014

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

	Average Recurrence Interval						
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	58.3	77.1	102	119	143	179	210
6Mins	54.3	71.7	94.4	111	133	166	195
10Mins	43.4	57.0	74.2	86.3	103	128	149
20Mins	30.3	39.5	50.3	57.8	68.3	83.6	96.4
30Mins	24.0	31.2	39.2	44.7	52.6	63.9	73.4
1Hr	15.7	20.2	25.1	28.4	33.1	39.8	45.4
2Hrs	10.1	13.0	15.9	17.8	20.6	24.5	27.8
3Hrs	7.82	10.0	12.1	13.5	15.6	18.5	20.8
6Hrs	5.02	6.39	7.66	8.49	9.73	11.5	12.9
12Hrs	3.21	4.08	4.88	5.40	6.18	7.28	8.16
24Hrs	2.02	2.58	3.12	3.48	4.00	4.75	5.35
48Hrs	1.23	1.58	1.96	2.22	2.58	3.11	3.55
72Hrs	.891	1.16	1.45	1.66	1.94	2.36	2.70

(Raw data: 20.82, 4.2, 1.2, 35.23, 6.55, 2.11, skew=0.65, F2=4.86, F50=17.15) © Australian Government, Bureau of Meteorology

Table 2.1 Rainfall Intensity for Munster

2.2 Physiography

2.2.1 Topography

The subject lots are located on and to the east of a southeast-facing dune. The eastern part of the site is within the water body of Market Garden Swamp No. 3 (MGS3). The proposed development area is all located west of MGS3.

MGS3 is located approximately at sea level, with the edge of the lake bed at 0m AHD. To the north-west, the subject land rises moderately steeply at about 10% to the highest point at about 11m AHD. The southern part of the subject lots (due west of the lake) slopes gently to the south-east at about 2%. Figure 4 shows the topography.

2.2.2 Geology and Soils

The development site is situated on limestone and limestone-derived soils of the Spearwood Dunes association. MGS3 and its immediate surrounds are situated on limestone-derived soils overlain by lacustrine peaty and clay sediments.

The Geological Survey of Western Australia (GSWA, 1983) maps most of the low-lying lake surrounds as peaty clay (Cps) with swamp soils (Qhw). The high dune north-west of the lake is mapped as Tamala Limestone (LS1) with a surface of Limestone (Qtl) and Safety Bay Sand (Qhs).

Drilling near the lake and at the high point of the site showed profiles typical of these map units, with holes near the lake having a silty clay profile and the one on the dune being yellow-brown sand over limestone. Borehole logs from the drilling are attached in Appendix A.

Figure 4 shows the geological and soil units on the site, and the borehole locations.

2.2.3 Soil Permeability

Constant-head permeability tests were carried out at 0.5m depth at five sites in February 2014, targeting the likely locations of infiltration swales. The tests were conducted in accordance with Australian Standard AS1547:2000. The results of the permeability tests are summarised in Table 2.2.

Table 2.2 Soil Permeability Test Results

Test Location (see Figure 4)	*Saturated Hydraulic Conductivity, Ks (m/day)*
I1	17
I2	0.25
I3	2
I4	13
I5	3

Table 2.2 shows a wide variability in conductivity between the test sites, with site I2 giving a very low permeability. This is attributable to the different soils encountered between the sites; I1 and I4 were located in loose sandy soil (probably fill), while I2 was in carbonate lake mud and I3 was immediately above the mud horizon. All of the test holes were in disturbed soil, probably consisting of either fill or redistributed topsoil following historic earthworks.

From the constant-head tests a saturated hydraulic conductivity of 2m/day for the subsoil has been adopted in the design of the infiltration swales. In practice, the swales will be located in roadside fill and the permeability of the swales will be determined by the soil used for construction of the road embankment. The adoption of the 2m/day permeability in the design is conservative.

2.2.4 Acid Sulphate Soils

Market Garden Swamp No. 3 is mapped by the DBCA as having a High Risk of acid sulphate soil occurrence. The High Risk mapping extends across about 70% of the proposed development site. The DBCA ASS mapping is based upon geological mapping by the GSWA (Gozzard, 1983); however comparison of the two shows that the ASS mapping is misaligned with the GSWA mapping by about 80m to the north-west. Correctly aligning the two maps places the edge of the high ASS risk zone roughly on the edge of the proposed wetland buffer around MGS3 (see Section 2.3.3) and outside the development zone.

The ASS mapping is based on the low elevation (<5m) of the site and the presence of lacustrine sediments in the lake; however the occurrence of limestone and limestone-derived soils beneath both the development site and the lake suggest that ASS is highly unlikely to be present. This is supported by the results of groundwater analysis from bores in the site and adjacent to the lake (see Table 2.5), which show high or neutral pH, high alkalinity and very low acidity:alkalinity ratios.

Despite the low likelihood of encountering ASS, if any dewatering is carried out within 50m of the lake, the abstracted water will be monitored for acidity and other ASS parameters, and an ASS Management Plan will be prepared if any ASS is detected.

2.2.5 Phosphorus Retention Index

Soil samples were taken from a depth of 0.5m in the infiltration test sites (Figure 4) and analysed for phosphorus retention index (PRI).

PRI is a measure of the ability of a soil to adsorb and retain phosphorus from solution. A high PRI indicates that a soil is unlikely to leach phosphorus to the water table. Typical ranges for PRI values in soils are as follows:

PRI Range	*Rating*	*Typical soils*
0 – 0.5	Very Low	Bassendean Sand
2 – 4	Low – Moderate	Karrakatta Sands
5 – 12	Moderate – High	Cottesloe Sands
12 – 20	High	Crushed Limestone, Limesand
20 – 1000+	Very High	Clay

The Department of Water recommends a minimum PRI of 15 for soils beneath infiltration basins.

Table 2.3 shows the Phosphorus Retention Index (PRI) values obtained from the on-site samples. The values range from low-moderate to very high, reflecting the different horizons encountered in the test holes; site I2 was located in lacustrine carbonate mud, while the other samples were located in fill or redistributed topsoil.

Table 2.3 Soil PRI Results

Sample Location (see Figure 4)	*Phosphorus Retention Index (PRI)*
I1	53.5
I2	363.1
I3	2.6
I4	4.4
I5	6.4

2.3 Hydrology

2.3.1 Surface Hydrology

Figure 5 shows the hydrology of the site. The site is well drained due to its sloping topography and porous surface soils. There is no defined surface drainage. Surface flow may occur over short distances for short periods during and immediately after very heavy rainfall. There is no shallow groundwater, surface waterlogging or ponding within the development area.

The water body of MGS3 is the major surface water feature of the nearby area. MGS3 is seasonal, drying out in most summers. The dry lake bed has historically been used for grazing and recreation by the owners in late summer.

2.3.2 Groundwater

Mapping by the DoW shows that the general regional groundwater flow is westerly towards the ocean. In summer, evaporation from the lakes may cause the local groundwater flow to reverse, with the formation of a groundwater divide west of Lake Coogee. Figure 5 shows the DoW's estimated regional maximum and minimum groundwater contours.

The local groundwater flow around MGS3 is dominated by the presence of Lake Coogee just to the southwest. In winter, groundwater flows into MGS3 from the east at a very low gradient of .0004 (1/2600). Given the proximity to the coast and lakes, the groundwater level around MGS3 fluctuates little between summer and winter. The DoW mapping suggests a seasonal variation of less than 0.5m.

Three bores were installed at varying distances from MGS3 in May 2013. At the same time, a staff gauge was installed in the lake edge. Water levels were measured in the bores and the lake on 17 May 2013 (after significant rainfall earlier that month) and again on 22 August 2013, 21 February 2014 and 5 September 2014. The water levels are shown in Table 2.4.

Table 2.4 Water Levels

Bore (see Figure 5)	*Water Level (m AHD)*			
	17/5/2013	*22/8/2013*	*21/2/2014*	*5/9/2014*
F1 (staff gauge in lake)	0.385	0.805	*0.355*	*0.805*
F2	0.759	0.829	*0.489*	*0.839*
F3	0.728	0.808	*0.468*	*0.808*
F4	0.589	0.829	*0.389*	*0.819*

The groundwater level data show that the groundwater to the west of the lake (nominally downgradient in regional mapping) is higher than the lake level, indicating that groundwater is flowing into the lake from the west. The water level in Bore F3, the furthest west, is consistently lower than F2, which is nearer to the lake, suggesting that a groundwater divide exists between about 30m and 100m west of the lake, from which groundwater is moving both east and west. This is likely to be a result of the presence nearby of the much larger Lake Coogee.

The water levels shown in Table 2.1 reflect both summer and winter conditions. These levels suggest that groundwater flows into the lake from all directions year-round. This would cause salts to accumulate and would be expected to lead to high salinity in the lake (see Section 2.4).

The nearest DoW monitoring bore is Lake Thomson T65, located about 2.7km east-southeast of MGS3. Although this bore is still in the Spearwood system, its distance from MGS3 and its proximity to Lake Thomson makes it of little use in predicting maximum groundwater levels around MGS3.

2.3.3 Wetlands

MGS3 is mapped by the DBCA as a Resource Enhancement Category Wetland. Aerial photography and field inspection in 2013 show that the DBCA mapping is inaccurate, showing the wetland boundary up to 60m into the water body in some areas and up to 50m onto dry land in others. In January 2014 a Wetland Boundary and Buffer Definition Report (BES, 2014) was submitted to the Wetland Branch of the DBCA (then DPAW),

proposing a modified boundary based on on-site mapping and aerial photography interpretation. The report also proposed a wetland buffer within the subject site that reflected the buffers in place elsewhere around the lake.

In its response on 25 March 2014, the Wetland Branch acknowledged that the boundary was inaccurate but declined to modify the boundary shown in its database. The Wetland Branch also recognised the preceding planning decisions around MGS3 and endorsed a buffer of 20-25 metres within the site. The response from the Wetland Branch is attached in Appendix B.

2.4 Water Quality

Water samples were collected from the lake and two bores located 25m and 100m west of the lake in May 2013. Table 2.5 shows the water quality analysis results.

Table 2.5 Water Quality in Market Garden Swamp 3 and Bores
(see Figure 4 for sample locations)

Parameter (all units mg/L unless stated otherwise)	*Guideline*	*F1 (lake)*		*F2 (adj)*		*F3 (100m)*	
		17/5/13	*5/9/14*	*17/5/13*	*5/9/14*	*17/5/13*	*5/9/14*
Nutrients							
Total Nitrogen	1.2[2]	4.6	2.3	1.3	2.5	13	92
NO_X	0.15[2]	0.49	<0.01	<0.01	<0.01	8.9	90
Total Kjeldahl Nitrogen	ng	4.1	2.3	1.3	2.5	4.1	2.0
Total Phosphorus	0.065[2]	0.10	0.12	0.14	0.68	2.8	1.6
Reactive Phosphorus	0.04[2]	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
Physico-chemical							
pH (no units)	6.5-8.0[2]	7.9	9.4	7.5	7.0	7.1	6.9
Conductivity (mS/cm)	0.12-0.30[2]	21	13	1.4	1.8	1.5	1.8
Salinity[1]	72-180	12,600	7,800	840	1,080	900	1,080
Acidity (as $CaCO_3$)	40[3]	23	<5	21	20	160	170
Alkalinity (as $CaCO_3$)	ng	230	130	310	1,300	9,200	4,900
Acidity:Alkalinity Ratio	1[3]	0.1	<0.038	0.07	0.015	0.02	0.034
Hardness (as $CaCO_3$)	ng	2,000	-	210	-	300	-
TSS	ng	16	<5	610	550	8,100	3,300
Ions							
Sulphate	ng	1,700	1,200	190	230	130	250
Chloride	350[4]	6,100	5,000	210	430	170	260
SO_4:Cl Ratio	0.5[3]	0.28	0.24	0.90	0.53	0.76	0.96
Metals							
Aluminium	0.08[2]	<0.1	-	<0.1	-	<0.1	-
Arsenic (III & IV)	0.136[2]	0.026	0.013	<0.001	0.006	0.002	<0.002
Calcium	ng	110	130	68	120	100	200
Cadmium	0.0004[2]	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Chromium (III & VI)	0.006[2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	0.0018[2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	10[4]	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Mercury	0.0019[2]	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Potassium	ng	150	160	9.8	48	9.2	13
Magnesium	ng	410	230	11	25	13	31
Sodium	230[4]	3,200	2,400	73	190	59	110
Nickel	0.0013[2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	0.0056[2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	0.015[2]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

1. Calculated as 600 x recorded electrical conductivity (mS/cm).
2. ANZECC (2000) Aquatic Ecosystem trigger values (Nutrient, pH and Conductivity are for lowland rivers; Dissolved Metals are for freshwater ecosystems (90% species protection)).
3. DEC (20__) oxidation indicator triggers for ASS–affected groundwater.
4. ANZECC (2000) Irrigation trigger values (long-term irrigation up to 100 years).

The results in Table 2.5 show that the water quality of MGS3 is poor, probably due to the hydrology of the lake and the effects of past market gardening, grazing and landfill. By contrast, the quality of the groundwater beneath the site is generally high, with low concentrations of phosphate, neutral pH, moderate salinity and low levels of ASS parameters and metals. Of interest is the very high and apparently increasing concentration of nitrogen (mostly present as nitrate) in Bore F3, at the highest point of the site. The reason for these high concentrations is unknown.

The results show that the water chemistry of the lake is quite different from that of the groundwater, supporting the notion that water is flowing into, not out of, the lake from the west. The high levels of salts and several other ions in the lake water indicate that significant evapoconcentration occurs in the lake during summer.

2.5 Vegetation

2.5.1 Vegetation Type and Condition

Consultant botanist Dr Arthur Weston mapped and described the vegetation of the western parts of the subject lots in May 2013. Figure 6 shows Dr Weston's vegetation mapping.

The development area is devoid of native vegetation apart from a narrow band of paperbarks and samphire on the western edge of the lake. The rest of the site is cleared and pastured and used for sheep grazing. The central bed of MGS3 is bare of vegetation due to its salinity and seasonal inundation. In the south-west, vegetation is absent or limited to scattered native and introduced trees and shrubs, with rubble and grass covering the rest of the ground.

An infestation of the introduced Sharp Rush (*Juncus acutus*) is present in the south-west and appears to be spreading. *Juncus acutus* is an invasive environmental weed

that is present in wetland and riparian habitats across the south-west from Perth to Esperance. Once established it can exclude all native vegetation and render areas impenetrable to humans and most animals. It poses a serious threat to environmental, economic, aesthetic and recreational values, although recently it has been reported that a large infestation adjacent to Market Garden Swamp No. 2 is providing habitat for Quenda.

J. acutus is difficult to eradicate once it becomes established. Control methods centre around physical removal and/or repeat spraying with glyphosate. The DEC has developed action plans (e.g. DEC, 2009) to combat the spread of the species.

2.5.2 Rare and Significant Flora

The botanical survey found no rare or significant flora on the subject land. Given the high degree of clearing, it is considered unlikely that any rare or significant species are present.

2.6 Land Uses and Potential Contamination

Examination of Landgate aerial photography of the subject site dating from since 1953 (Figure 8) shows that market gardening was carried out on parts of the land from 1953 or earlier until at least 1981. During the same period, market gardening was also carried out to the west between Fawcett Road and Lake Coogee, continuing until after 1995. Since 1985 the subject land has been used for broadacre grazing. Market gardening is regarded by the DER as a potentially contaminating land use.

In the south-east of the development area, within Lot 71, is an area that is used for stockpiling timber, steel and building materials. There is no visible sign of any contaminating materials (oils, pesticides etc.) but the possibility of contamination cannot be ruled out without testing.

The owners of Lot 71 will remove the stockpiled material before the subdivision application is submitted to Council. The area of the stockpile and all areas formerly used for market gardening will then be tested for residual soil or groundwater contamination in accordance with DER contaminated sites guidelines. The results of the assessment will be submitted to Council with the subdivision application.

3.0 WATER USE SUSTAINABILITY

3.1 Water Supply

The development will be supplied with reticulated scheme water.

Shallow groundwater may be available for POS irrigation, although the proximity of the site to the ocean and saline lakes may affect the available quantity and quality. Dept of Water records (wir.water.wa.gov.au) show several existing or previous bores west of MGS3 within 300m of the POS that have yielded water with salinities of 990 – 1500 mg/L TDS from depths of 6.5 - 20m. Shallow bore sampling for this LWMS has shown groundwater salinities of 840 – 1080 mg/L within 100m of MGS3.

Test drilling will be required to confirm the availability of groundwater suitable for turf irrigation within the site. However, the very small quantities required (see Section 3.3) could be supplied by a shallow, low-yielding bore coupled to a storage tank.

3.2 Water Efficiency Measures

Given the proposed R40 zoning of the development, the water demand for ex-house (lawn and garden) use is expected to be lower than for typical urban areas. Scheme water is expected to be the main source of water for domestic (in-house and ex-house) use, while a relatively small amount of groundwater may be used for irrigation of public (POS and landscaping) areas.

3.2.1 Public Open Space

Waterwise landscaping will be applied to the POS areas to reduce irrigation requirements. Measures to be adopted include the following:

- Landscape plantings (including POS, road verges, street trees, swales and wetland buffer) will be irrigated for the first summer after establishment by tanker or subsurface drip lines. After one summer the irrigation will cease, although the drip lines (if used) will remain in place and available for use if replacement plantings are required for any reason.

- All landscaping within the POS will employ waterwise native plants that do not require ongoing irrigation. Irrigated turf within the POS will be limited to an area of about 1,100 m^2, with an ongoing irrigation requirement of about 745 kL/yr.

- Passive open space will be planted with drought-resistant local native species suited to the prevailing site conditions.

- Most grass plantings within the POS will comprise hardy grass species that require minimal irrigation beyond the first season and can cope with drying out in summer.

- Turf irrigation will be by means of large droplet emitters or subsurface drip irrigation where applicable.

- Irrigation will be scheduled to encourage deep root growth during plant establishment, with application intervals progressively extended and eventually discontinued.

- Garden beds and landscaped areas will be mulched to minimise water loss.

- Plantings will be kept dense and compact, as these areas are more efficient to irrigate than dispersed plantings.

- Local road drainage measures such as flush kerbs and open-floored gully pits will be used to encourage local runoff and infiltration into landscaped road verges.

3.2.2 Domestic Use

3.2.2.1 Building Standards

In accordance with the amended *Building Regulations 1989*, new homes within the development will incorporate the following features:

- Minimum 4 stars WELS rated tap fittings, except bath outlets and garden taps.
- Minimum 3 stars WELS rated shower heads.
- Minimum 4 stars WELS rated dual-flush toilets.
- Covers on all private swimming pools.
- All internal hot water pipes installed and insulated in accordance with AS 3500:2003.
- Maximum run of pipe from hot water system to outlet will not exceed 20 metres length or 2 litres internal volume.

3.2.2.2 Rainwater Harvesting

The developer will provide information and/or incentives for lot purchasers to install rainwater tanks.

3.2.2.3 Waterwise Landscaping

The developer will provide information packs, consisting of brochures and other information published by the Water Corporation and other agencies, to lot purchasers advising them of waterwise garden strategies including soil management, mulching, plant species selection, irrigation and fertilisation. Ultimately, the developer can influence but not control individual lot owners' decisions on these matters.

3.3 Water Usage in Public Areas

The emphasis on unirrigated plantings in POS and landscaping areas will enable the development to have a very low water demand in public areas. The predicted water usage in public areas is summarised in Table 3.1 below.

Table 3.1 Public Area Water Usage

Element	*Area or Number*	*Irrigation Rate*	*Duration*
Irrigated turf	0.11 ha	6,750 kL/ha/yr	Ongoing
Landscaping (shrubs etc.)	0.4 ha	4,500 kL/ha/yr	1 year
Trees	25 (approx.)	1.56 kL/yr ea.	1 year
Total Water Demand Year 1 2,581 kL/yr Year 2 + 745 kL/yr			

3.4 Wastewater Management

All lots in the subdivision will be deep-sewered. Greywater recycling may be implemented by individual lot owners. Any person wishing to install a greywater reuse system must lodge an Application to Construct or Install an Apparatus for the Treatment of Sewage with the City of Cockburn.

4.0 STORMWATER MANAGEMENT STRATEGY

4.1 Principles and Objectives

The stormwater management strategy aims to comply with the principles and objectives for stormwater management identified in the *Stormwater Management Manual for WA* (DoW, 2004) and *Better Urban Water Management* (WAPC, 2008).

Nutrient concentrations and loads in water leaving the site will be managed to comply with the targets of the draft *Swan Canning Water Quality Improvement Plan* (SRT, 2009), as follows:

- Winter median TP concentration: 0.1 mg/L
- Winter median TN concentration: 1.0 mg/L
- Annual TP yield: 0.013 kg/ha
- Annual TN yield: 0.2 kg/ha.

4.2 Drainage Management System

The drainage system will be designed to maintain surface flow rates and volumes within and from the developed site at or below their predevelopment levels. The drainage design presented here is conceptual and will be refined during the subdivision design stage.

The drainage characteristics of most of the site will be unchanged by the development. Within private lots, the runoff from building roofs and other impervious surfaces from storms up to 20-year ARI 5-minute duration (about 12mm) will be either captured for domestic water supply or disposed of by means of soakwells. The only runoff to be managed by the site drainage system from storms of less than 20 year ARI will be that generated from the single internal road reserve, having a total area of about 2,690m^2. In storms over 20-year ARI, the drainage system will also receive excess runoff from some private lots, with a total area of about 8,760m^2.

The site has been divided into two catchments based on the existing topography. In the eastern catchment, where the road runs roughly along the contour, the road will be formed with a single camber and fitted with mountable kerbs. Runoff will be captured by side entry/gully pits leading to bubble-up pits in a 0.3m deep bioretention swale within the road reserve. This arrangement is similar to that which exists on the already-constructed northward extension of this road.

In the western catchment, the road runs downhill from east to west, reaching a low point where it curves west to join Fawcett Road. This section of road will be kerbed and runoff will be directed via SEP/gully pits and bubble-ups to a 0.5m deep linear swale located on the bend.

Figure 9 shows the proposed locations of the infiltration swales and their catchments.

Preliminary calculations of runoff from the drainage catchments and the sizing of the infiltration swales are summarised in Table 4.1. These calculations will be refined during the detailed subdivision design phase.

The runoff and storage volumes have been calculated using the Rational Method based on the rainfall intensities listed in Table 2.1 and the following parameters:

		Road Reserve	*Lots*
Catchment Areas	East	905 m^2	2,270m^2
	West	1,785 m^2	6,490m^2

Time of Concentration
(critical storm duration) 5 minutes

Runoff Coefficients		*Road Reserve*	*Lots*
Pre-development	1-10yr ARI	0.01	.01
	100yr ARI	0.2	0.2
Post-development	1–10yr ARI	0.8	0
	100yr ARI	0.8	0.13

Basin Permeability 2 m/day

Table 4.1 Preliminary Drainage Calculations

Storm Event (duration)	*Pre-Development*		*Post-Development*		*Storage Volume Required (m^3)*
	Peak Flow (l/sec)	*Total Flow (m^3)*	*Peak Flow (l/sec)*	*Total Flow (m^3)*	
Catchment A (East)					
1 year ARI (5 min)	10	3	12	4	4
1 year ARI (1 hr)	3	10	3	11	11
5 year ARI (5 min)	18	5	21	6	6
10 year ARI (5 min)	21	6	24	7	7
100 year ARI (5 min)	37	11	59	18	18
Catchment B (West)					
1 year ARI (5 min)	6	8	23	7	7
1 year ARI (1 hr)	2	26	6	22	22
5 year ARI (5 min)	10	14	40	12	12
10 year ARI (5 min)	12	6	47	14	14
100 year ARI (5 min)	21	29	133	40	40

The infiltration swales will be designed to retain and infiltrate the runoff from a 1-year 1-hour storm (about 16mm). The swales will be normally dry, with all runoff from a 1-year 1-hour storm infiltrating within 96 hours in order to minimise the potential for insect

breeding. With a nominal depth of 0.5m and a base permeability of 2m/day, the swales will drain from full to empty in six hours or less following the end of a storm.

Runoff from larger events up to the critical (5-minute) 100-year ARI storm will be detained within the swale surrounds and released via controlled outflows that limit the flow to the pre-development rate. The overflows will be discharged via rock-pitched channels into the revegetated wetland buffer, where they will be further slowed and filtered before finally reaching the lake.

4.3 Water Quality Management

Infiltration swales and other drainage features on the site will be designed to maximise on-site retention of nitrogen and phosphorus. This will be achieved by infiltrating all flows up to 1-year ARI in densely vegetated swales with a soil PRI of at least 15. High-PRI material such as lime sand, yellow sand or crushed laterite will be blended with the soils beneath the basins as necessary to raise the PRI to the DoW's preferred minimum of 15.

4.4 Maintenance

The small scale of the development means that the requirements for maintenance of the drainage system will be minimal. The following maintenance may be required to ensure that the stormwater drainage system continues to function as designed:

- Regular (possibly annual) cleaning of bubble-up pits, inlet pits and small culverts. More frequent cleaning may be required during the construction phase; this will be carried out by the developer.

- Tending and maintenance of roadside swales to remove trash, control weeds and encourage the growth of native species.

5.0 GROUNDWATER MANAGEMENT STRATEGY

5.1 Groundwater Levels

The depth to groundwater across the development area is sufficient to permit development without the need for subsoil drainage. Therefore, the development will not directly affect the depth or flow of groundwater.

Given the proposed R40 zoning (average 220m^2 lot size), there is likely to be little demand for groundwater abstraction for domestic irrigation by lot owners. If all grassed public open space in the development (approximately 1,100m^2) were irrigated with groundwater at the DoW's new recommended rate of 6,750 kL/ha/yr, this would require abstraction of less than 745 kL per year, which would have minimal impact on groundwater levels.

5.2 Groundwater Quality

The bore sampling undertaken to date indicates that the groundwater beneath the site contains low concentrations of phosphate and moderate concentrations of nitrogen. This is to be expected given the nature of the soils and the land use history of the site.

The relationship between nutrient inputs and exports is complex, especially in the case of phosphorus, which travels through the soil profile as a "front" in a complex series of adsorption and desorption reactions. Nitrogen, also, is subject to denitrification and mineralisation in the soil and groundwater. As a result, nutrient exports from the site at present will be a reflection of nutrient inputs over the last several decades, modified by soil hydrology and nutrient retention capacity.

The aim of nutrient management will be to limit nutrient inputs to the site so that nutrient outputs are minimised. The primary source of groundwater-borne nutrients will be soluble garden fertilisers. With low-phosphorus garden fertilisers being strongly promoted under the State government's Fertiliser Action Plan, most fertilisers now available in retail stores contain little or no phosphorus.

Measures available to minimise nutrient inputs and exports in the development will include:

- regular street sweeping to remove accumulated contaminants;
- selection of native species with low water and fertiliser requirements for public open space and landscaped areas;
- community education on waterwise gardening, fertiliser use and management of pet wastes;
- modification of soils beneath the infiltration basin to achieve a phosphorus retention index (PRI) of at least 15.

6.0 LANDSCAPE STRATEGY

The landscaping of the site will focus on the use of species with low water demand. Irrigation of street trees will be limited to hand watering for the first year after establishment. Irrigated turf will be limited to a small area in the central amenity area of the POS. Details of the water conservation strategies to be employed in landscaping were given in Sections 3.2 and 3.3.

Fertiliser use in public areas will be minimal. Street trees will be fertilised with slow-release granular fertilisers on establishment and will thereafter not be fertilised. Irrigated turf will be fertilised with nitrogen and phosphorus on establishment and thereafter at a low rate with nitrogen alone. Phosphorus will only be applied if the turf shows signs of deficiency and only after soil or tissue testing.

Details of water and nutrient management are further detailed in the Landscape Concept Plan (Appendix C). Further details of landscaping, including a species list for revegetation, will be provided in the Wetland Management and Revegetation Plan expected to be required as a condition of subdivision approval.

7.0 MOSQUITO AND MIDGE MANAGEMENT

The two infiltration swales proposed as part of the development will drain rapidly and will not provide breeding habitat for mosquitoes at any time of the year. As a result, the development will not increase the breeding habitat available to mosquitoes and midges.

The City of Cockburn has monitored mosquito and midge numbers in wetlands including Lake Coogee and Market Garden Swamps 1 and 2 since 1994. Since 2007 the City has also maintained a register of public complaints for midge problems. Wyse and Lund (2012) found that the main problem area for midge nuisance was Yangebup Lake, with a total of 137 complaints registered between 2007 and 2012. Lake Coogee was the source of 23 complaints over the same period, while Market Garden Swamps 1 and 2 each generated 15 complaints. No data are available for Market Garden Swamp 3.

The review found little correlation between public complaints and either adult or larval midge counts or lake water quality, suggesting that public nuisance is related more to factors such as wind direction and the presence and height of lakeside vegetation.

The City of Cockburn has carried out chemical treatment for midges and mosquitoes in North, Bibra and Yangebup Lakes since 1994 using the pesticide spray Abate (Temephos). The City is currently trialling an alternative, s-methoprene, which is reported to have fewer environmental side-effects including lower impact on non-target organisms. No chemical treatment has been required or carried out to date in any of the Market Garden Swamps.

MGS3 dries out in summer and so does not provide any breeding grounds for mosquitoes and midges in late summer. The available information suggests that the swamp presents a moderate to low risk of mosquito and midge problems that is unlikely to generate significant public complaint or require chemical treatment. Nevertheless, a number of measures are available that have been proven effective in managing mosquitoes and midges at other wetlands. These will be considered and, if appropriate, implemented to minimise mosquito and midge nuisance and health risks on the development. These include:

- Limiting nutrient inputs to the lake (achieved by infiltrating approximately 98% of all runoff in bioretention swales).
- Maintaining and/or establishing a screen of tall vegetation (e.g. Paperbarks) close to the water's edge to limit the spread of insects from the lake.
- Maintaining low vegetation in the buffer zone to minimise cover for mosquitoes between the lake and houses.
- Installing low-attractant street lighting (e.g. yellow lights on extended poles).
- Orienting streets and laneways in line with prevailing winds to promote wind flushing.

8.0 SUBDIVISION WORKS

The developer will implement a Construction Management Plan for the development dealing with dust management, erosion and sediment control, containment of environmental hazardous materials (chiefly fuel and oils) and spill response. The key elements of the Construction Management Plan will include the following:

Dust Minimisation

- No topsoil stripping will be undertaken when the wind speed exceeds 40km/h.
- Dust will be suppressed on open ground and stockpiles by regular watering, hydromulching, wind fencing and/or covering.
- An adequate supply of water for dust suppression will be kept on site at all times.
- Ground to be disturbed will be wet prior to soil disturbance.
- Soil stockpiles will be limited in height to minimise dust generation and facilitate watering.
- Other dust minimisation measures will include minimising areas of disturbance, limiting volume and speed of construction traffic, and instructing site workers in dust minimisation.

Erosion and Sedimentation

- Drains and bunds will be constructed as necessary to capture and direct all runoff from disturbed areas into settling ponds prior to discharge.
- Drains, bunds and ponds will be appropriately designed and sized.
- Vehicles and machinery will be kept to designated roads, tracks and work areas.

Water Conservation

- Water consumption during construction will be minimised by:
  - limiting dust suppression watering to prevent ponding and runoff
  - use of non-water dust control methods such as wind fencing and hydromulching.

Hazardous Materials

- All environmentally hazardous materials will be stored in their original labelled containers (or labelled jerrycans in the case of petroleum products) in a ventilated sea container equipped with appropriate signage, fire extinguishers and a spill response kit.
- Petroleum products will be held in a bunded enclosure.
- Material Safety Data Sheets (MSDS) and a chemical register for all hazardous materials on the site will be maintained by the site supervisor in the site office.

Acid Sulphate Monitoring

- If any dewatering is undertaken within 50m of the lake, abstracted water will be monitored for acidity and other ASS parameters in accordance with DWER standards.
- If ASS is detected, an ASS Management Plan will be prepared that will address lime dosing and proper disposal of abstracted water.

Complaints Register

- The Project Manager will maintain a record of any public complaints and the actions taken in response.

9.0 MONITORING AND RESPONSE

9.1 Monitoring Programme

The developer will monitor water quality on the site for two years after the completion of subdivision works. The monitoring points will include those used for pre-development monitoring, as shown on Figure 9. Any bores that are lost or damaged during development works will be reinstalled or replaced.

Water monitoring will be carried out twice each year in late winter and early summer. The monitoring parameters will include:

- Depth to water.
- Field parameters – temperature, pH, conductivity, salinity.
- Physical parameters – pH, TDS, TSS, hardness, acidity, alkalinity.
- Major ions – chloride, sulphate.
- Nutrients – Total P, FRP, Total N, TKN, NO_X.
- Metals – Al, As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Zn.

9.2 Criteria

The monitoring results will be compared with criteria based on two rounds of pre-development monitoring and on ANZECC water quality standards. The criteria have been designed to ensure that the water quality within and downstream of the site will be as good after development as before. The adopted criteria are listed below. Trigger values developed from these criteria and the pre-development monitoring are shown in Table 9.1. The criteria and trigger values will be reviewed after each round of monitoring to confirm their applicability and to assess the need for any revision.

Bore Criteria

- Target - Median of bore values should not exceed the median of all pre-development bore values by more than 20%.
- Limit - No bore should exceed twice the maximum of all pre-development bore values.

Lake Criteria

- Target - Lake values should not exceed the median of all pre-development lake values by more than 20%.
- Limit - No lake value should exceed twice the maximum of all pre-development lake values.

pH (all sites)

- Target - The median pH in the bores should be within 20% of the median of all pre-development bore values.

- The pH in the lake should be within 20% of the range of all pre-development lake values.

Table 9.1 Water Quality Trigger Values

Parameter	*Bores*		*Lake*	
	Target (mg/L) (median all bores)	*Limit (mg/L) (each bore)*	*Target (mg/L)*	*Limit (mg/L)*
Nutrients				
Total Nitrogen	9.3	184	4.14	9.2
NO_X	5.346	180	0.3	0.98
Total Kjeldahl Nitrogen	2.7	8.2	3.84	8.2
Total Phosphorus	1.368	5.6	0.132	0.24
Reactive Phosphorus	0.012	0.02	0.048	0.14
Physico-chemical				
pH (no units)	5.64-8.46	-	6.32-11.28	-
Conductivity (mS/cm)	1.98	3.6	20.4	42
Salinity	1188	2160	12240	25200
Acidity (as $CaCO_3$)	108.6	340	16.8	46
Alkalinity (as $CaCO_3$)	3720	18400	216	460
Acidity:Alkalinity Ratio	0.0324	0.14	0.0828	0.2
Hardness (as $CaCO_3$)	306	600	2400	4000
Ions				
Sulphate	252	500	1740	3400
Chloride	282	860	6660	12200
SO_4/Cl Ratio	0.996	1.92	0.312	0.56
Metals				
Aluminium	0.12	0.2	0.12	0.2
Arsenic (III & IV)	0.0024	0.012	0.0234	0.052
Calcium	132	400	144	260
Cadmium	0.0024	0.004	0.0024	0.004
Chromium (III & VI)	0.012	0.02	0.012	0.02
Copper	0.012	0.02	0.012	0.02
Iron	0.012	0.02	0.012	0.02
Mercury	0.00024	0.0004	0.00024	0.0004
Potassium	13.68	96	186	320
Magnesium	22.8	62	384	820
Sodium	109.8	380	3360	6400
Nickel	0.012	0.02	0.012	0.02
Lead	0.012	0.02	0.012	0.02
Zinc	0.012	0.02	0.012	0.02

9.3 Contingency Response

The results of each round of water monitoring will be compared with the criteria. If any criterion is breached, the developer will respond as follows:

1. Inform the City of Cockburn and discuss whether the breach is significant.

2. If judged significant, resample to confirm that the breach was not due to sample contamination or natural variation.

3. Assess whether the breach is an isolated, project or regional occurrence.

4. Assess whether the breach is attributable to the development or to external factors.

5. Take appropriate contingency action(s) in consultation with the City of Cockburn and the Department of Water. These may include:

    - Identify and remove any point sources of contamination.
    - Review operational and maintenance (e.g. fertiliser) practices.
    - Modify the stormwater system including enlarge or modify infiltration swales.
    - Reinforce community education/awareness programs.

6. Record the breach and the action taken.

7. If necessary, inform residents of any required actions and their purpose.

9.4 Recording and Reporting

The developer will keep a record of the results of all monitoring, including any exceedences of criteria and actions taken. Any exceedences and contingency actions will be reported immediately to the City of Cockburn.

At the end of the post-development maintenance period, the developer will prepare a report to the City of Cockburn containing all of the recorded data and records of any exceedences and contingency actions taken.

10.0 IMPLEMENTATION

The developer will implement and fund the monitoring and management activities outlined in this LWMS for two years after the completion of the final stage of subdivision works. At the end of this time, the responsibility for implementation will pass to the City of Cockburn, subject to the City's acceptance of the works.

11.0 REFERENCES

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Figures

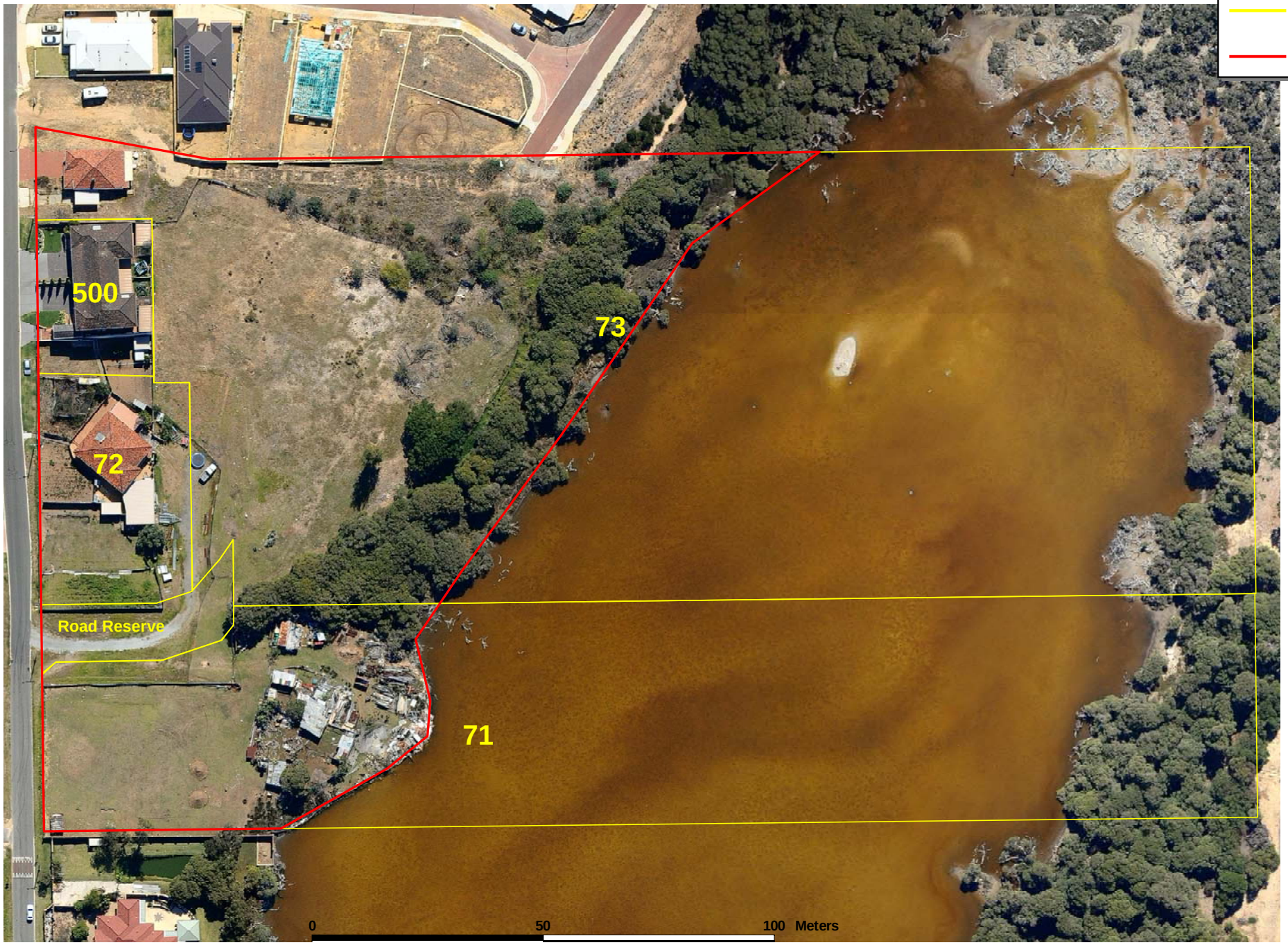


Figure 1

SITE LOCATION AND LAYOUT

bayley environmental services



Development Area
Topographic Contour

Geological Units (GSWA)

LS1 Limestone
Cps Peaty Clay
M6 Silt

Borehole
Infiltration Test

Figure 4

PHYSIOGRAPHY

bayley environmental services



Development Area

Groundwater contours as at 22/8/2013 (mAHD)

RE Wetland as mapped by DBCA

RE Wetland boundary based on ground survey

Proposed wetland buffer

Monitoring bore

Infiltration test

Figure 5

HYDROLOGY

bayley environmental services

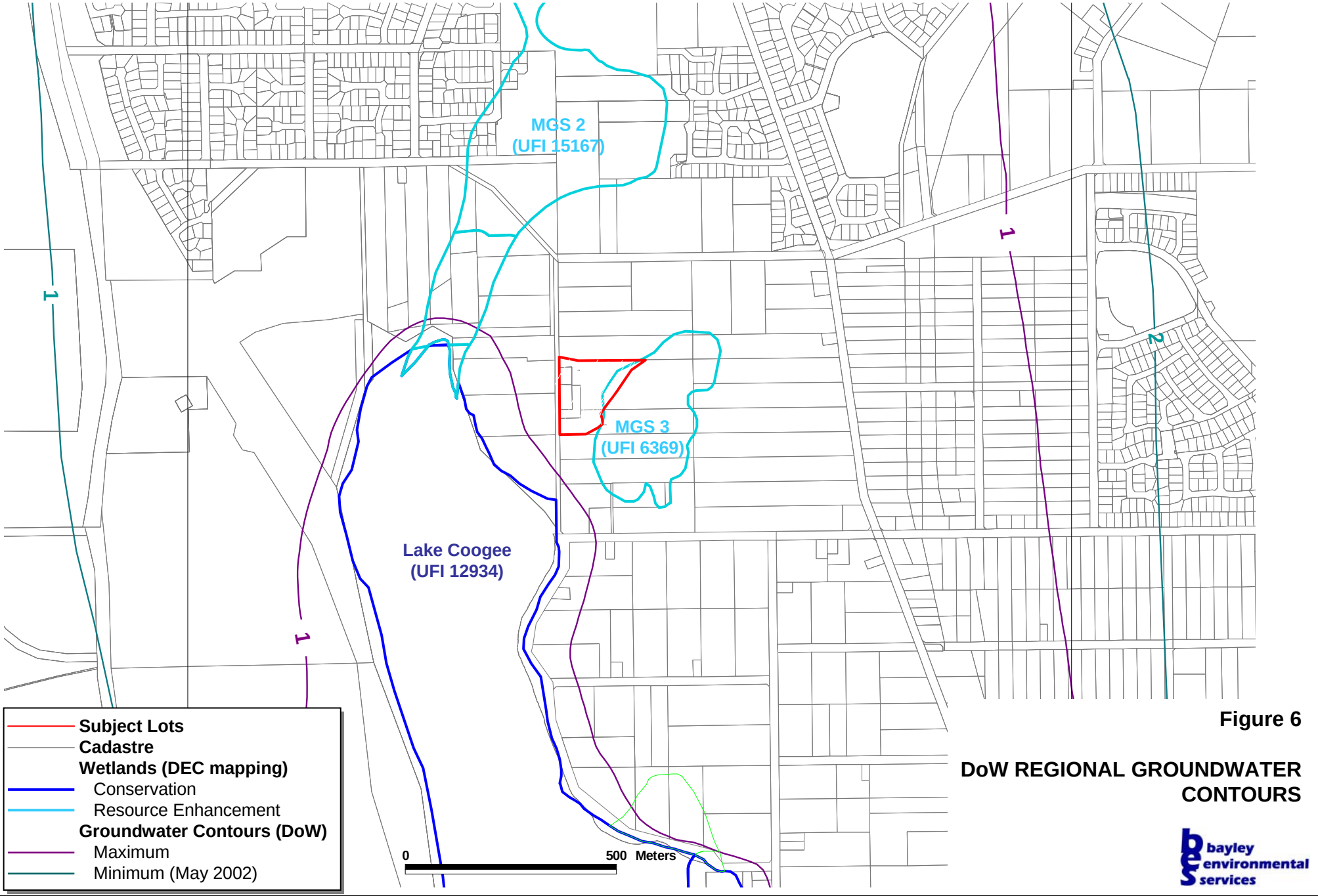


Figure 6

DoW REGIONAL GROUNDWATER CONTOURS

bayley environmental services



Mr	Melaleuca rhaphiophylla Low Open – Low Closed Forest
Pc	*Pennisetum clandestinum* Closed Grassland
Pc(Fv)	*Pennisetum clandestinum* Closed Grassland with *Foeniculum vulgare*
Pc(O)	*Pennisetum clandestinum* Closed Grassland with *Opuntia* sp.
Ja	*Juncus acutus* Closed Rushland

G-E	Good to Excellent
CD	Completely Degraded

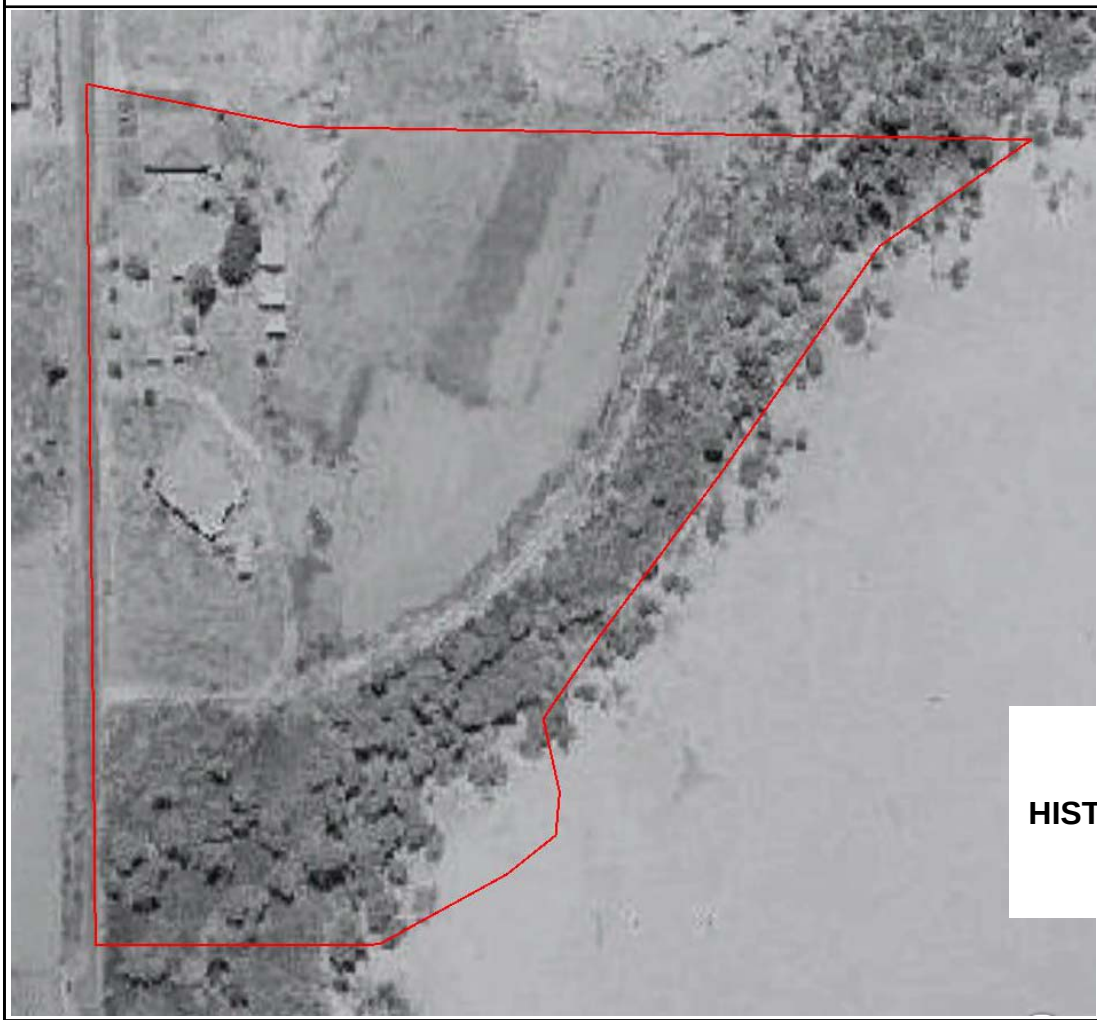
Figure 7

VEGETATION

bayley environmental services



November 1953



March 1965

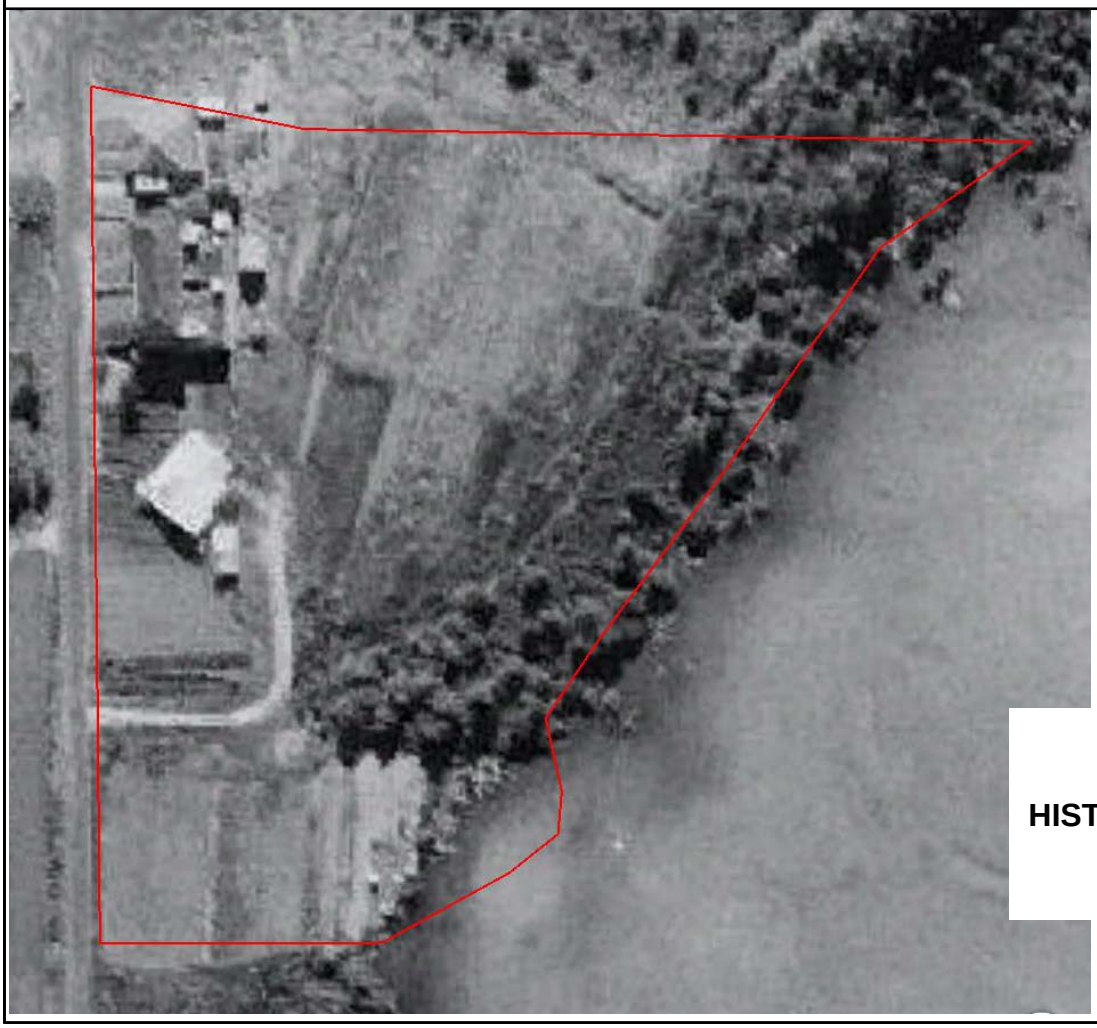
Figure 8a

HISTORICAL AERIAL PHOTOGRAPHS

bayley environmental services



September 1974



June 1977

Figure 8b

HISTORICAL AERIAL PHOTOGRAPHS

bayley environmental services



September 1977



August 1981

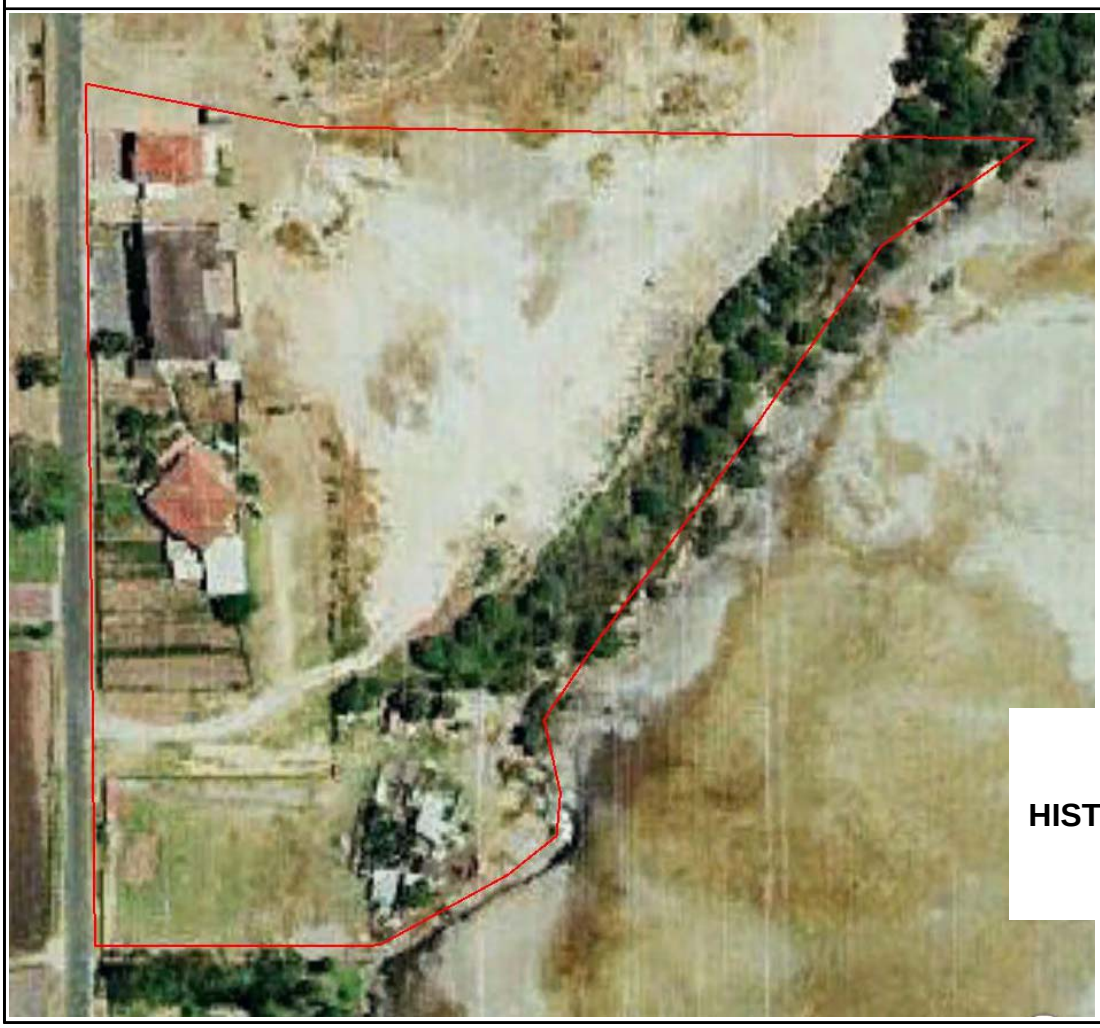
Figure 8c

HISTORICAL AERIAL PHOTOGRAPHS

bayley environmental services



June 1985



February 1995

Figure 8d

HISTORICAL AERIAL PHOTOGRAPHS

bayley environmental services



Development Area
Road Alignment
East Catchment
West Catchment
1-yr ARI Infiltration Swale
100-yr ARI Overflow Swale
Water Monitoring Point

Figure 9

DRAINAGE CONCEPT

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Appendix A

Soil Logs

SOIL PROFILE LOG

PROJECT NUMBER:	J12011
SITE ID:	F2
EASTING:	384957
NORTHING:	6444400
METHOD:	Auger rig
TOTAL DEPTH (mbgl):	3.0
REFUSAL (Y/N):	N
DATE:	13/05/2013

SOIL PROFILE		SAMPLE DATA	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 0.5	Brown sand with limestone fragments		
1	Yellow-brown sand with limestone fragments		
1.5	Dark grey-brown sand with limestone fragments		
2	Dark grey clayey silt, spongy, moist		
2.5 - 3	Dark brown clayey silt, wet		



SOIL PROFILE LOG

PROJECT NUMBER:	J12011
SITE ID:	F3
EASTING:	384908
NORTHING:	6444461
METHOD:	Auger rig / Mud rotary rig
TOTAL DEPTH (mbgl):	12.0
REFUSAL (Y/N):	N
DATE:	13/05/2013

SOIL PROFILE		SAMPLE DATA	
DEPTH (m)	SOIL DESCRIPTION	SAMPLE ID	INTERVAL (m)
0 - 7.5	Brown sand with limestone fragments - fill?		
7.5 - 12	Limestone, hard. Switched to mud rotary at 9m.		



Appendix B

Response from DPAW Wetland Branch

Government of Western Australia
Department of Parks and Wildlife
Nature Conservation Division

Your ref:
Our ref: 2014/000256-1
Enquiries: Jennifer Higbid
Phone: 08 9219 8763
Email: jennifer.higbid@dpaw.wa.gov.au

Phil Bayley
Bayley Environmental Services
30 Thomas Street
SOUTH FREMANTLE WA 6162

Dear Mr Bayley

APPLICATION TO REVIEW THE WETLAND MAPPING DISPLAYED WITHIN THE *GEOMORPHIC WETLANDS SWAN COASTAL PLAIN* DATASET

I refer to your correspondence dated 20 January 2014 requesting the Department of Parks and Wildlife to review the wetland mapping within the *Geomorphic Wetlands Swan Coastal Plain* dataset (the dataset) for UFI 6369 (known as Market Garden Swamp No. 3) within Lots 23, 500, 102 and 7 Fawcett Road, Munster (Figure 1).

The request proposed to modify the wetland boundary of Market Garden Swamp No. 3 and included a wetland buffer assessment. Parks and Wildlife has reviewed the information submitted and conducted a desktop analysis and provides the following assessment of the request.

Wetland values
Market Garden Swamp No. 3 (UFI 6369) is located to the east of Lake Coogee and historical aerial imagery indicates that areas surrounding the wetland were being utilised for horticulture by 1953 (Figure 2). UFI 6369 is currently mapped in the dataset as a Resource Enhancement category sumpland and is considered regionally significant being located within Bush Forever site 429.

The vegetation within the western area of Lots 23 and 7, within Market Garden Swamp No. 3, has been identified as *Melaleuca rhaphiophylla* low open – low closed forest with *Melaleuca cuticularis* and understorey of *Gahnia trifida*, *Baumea juncea*, *Lobelia anceps*, *Samolus repens* var. *paucifolius* and *Sarcocornia* sp. The vegetation was identified as Good to Excellent using the *Bush Forever* condition scale.

A vegetation community map of the entire extent of Market Garden Swamp No. 3 has been submitted, however, the condition of the wetland vegetation around the whole of the wetland has not been provided. Aerial imagery suggests that the majority of the wetland vegetation around Market Garden Swamp No. 3 is of a similar condition to Lots 23 and 7. It should be noted that if the draft *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (Department of Environment and Conservation 2013) were applied to the whole of Market Garden Swamp No. 3, assuming that the vegetation condition overall is Good to Excellent, the wetland would meet the preliminary evaluation criteria and be considered commensurate

with Conservation category. However, as the majority of the lots are private and the vegetation condition cannot be confirmed, a modification to the wetland management category has not been undertaken.

Market Garden Swamp No. 3 comprises a range of habitat types which may be supporting fauna of conservation significance. For example, within a one kilometre radius of the wetland, four bird species identified as migratory and one species identified as endangered under the national *Environment Protection and Biodiversity Conservation Act 1999* have been recorded (NatureMap 2014). Two priority fauna and one specially protected fauna species listed by Parks and Wildlife have also been observed. Market Garden Swamp No. 3 may also be contributing as part of an ecological linkage, particularly for highly mobile species moving through the north-south wetland chain.

Wetland boundary

A modified wetland boundary for the entire extent of Market Garden Swamp No. 3 has been proposed based on vegetation, surface soils and evidence of surface water or saturation. A broad vegetation community map of the whole sumpland has been provided, however, the information pertaining to soil and hydrology is restricted to Lots 23 and 7. It is noted that the southern extent of the wetland has not been traversed.

It is acknowledged that the current wetland boundary does not encompass the entire extent of the inundated area and it is agreed that the wetland boundary is misaligned (up to 20 metres in the south-west). While the misalignment is partly attributed to a scale issue (originally mapped at 1:25,000), it is difficult to accurately determine with the information provided, which areas around Market Garden Swamp No. 3 may still be functioning hydrologically as wetland, that is are seasonally inundated or waterlogged. While the proposed boundary has mapped the extent of wetland dependent vegetation, there are some currently cleared areas, that in the historical aerial imagery (Figure 2) appeared to be part of the wetland and may still be functioning as wetland.

Parks and Wildlife is required to provide a detailed justification to members of the public of any modifications made to the dataset if requested. While the information provided in this submission contributes to our understanding of the attributes and functions of Market Garden Swamp No. 3, there is insufficient information at this stage to support the boundary proposed by Bayley Environmental Services. Parks and Wildlife will register the boundary misalignment and potential for management category upgrade for future investigation.

Wetland buffer

It is acknowledged that the buffer assessment has been undertaken in accordance with the draft *Guideline for the determination of wetland buffer requirements* (WAPC 2005) and the relevant information has been provided. While the guideline provides a useful discussion of issues to consider when undertaking a wetland buffer assessment it should be noted that the document has since been redrafted. Until the guideline has been endorsed by the State Government, Parks and Wildlife generally apply the wetland buffer policy from *Guidance Statement 33 Environmental Guidance for Planning and Development* (Environmental Protection Authority 2008).

Parks and Wildlife and the Environmental Protection Authority recommend that wetlands that are to be protected require a minimum 50 metre buffer distance. Wetland buffers should be determined based on the values of the wetland and the threats posed by adjacent activities. The minimum buffer of 50 metres can be considered a separation

distance from land use change, but ideally should function to maintain ecological processes and functions associated within the wetland and provide protection from potential adverse impacts. In circumstances where the buffer area is degraded, consideration should be given to revegetation activities to provide ecological function inside the buffer area.

In regard to Lots 23 and 7, it is acknowledged that a planning precedent has occurred with the development north-west of Market Garden Swamp No. 3 resulting in a minimum wetland buffer of approximately 25 metres. It is also noted that there is an existing road in the northern development area which may continue south into Lot 23 and constrain an appropriate wetland buffer. While Parks and Wildlife do not support wetland buffers less than a minimum of 50 metres, it concedes that planning precedents are likely to impede wetland management in this area.

For Lots 23 and 7, and in consideration of the misalignment of the wetland boundary, it is recommended that the proposed 20-25 metre wetland buffer is measured from the extent of wetland dependent vegetation as delineated by Bayley Environmental Services in Figure 6. However, the 'finger' of wetland dependent vegetation (*Melaleucas*) at the junction of Lots 23 and 7 is part of the wetland and should be afforded a 20-25 metre wetland buffer consistent with the rest of the subject site. The area south of the 'finger' within Lot 7 has been filled over time and was historically part of the wetland (Figure 2). In order to mitigate potential impacts from a compromised wetland buffer, Parks and Wildlife recommends that the relevant decision maker obtains a commitment from the proponent/s that the proposed wetland buffer will be revegetated. In addition, the filled area within Lot 7 should be rehabilitated, with rubbish removed and also revegetated.

Please contact Dr Michael Coote on 9219 8714 if you require further information on this matter.

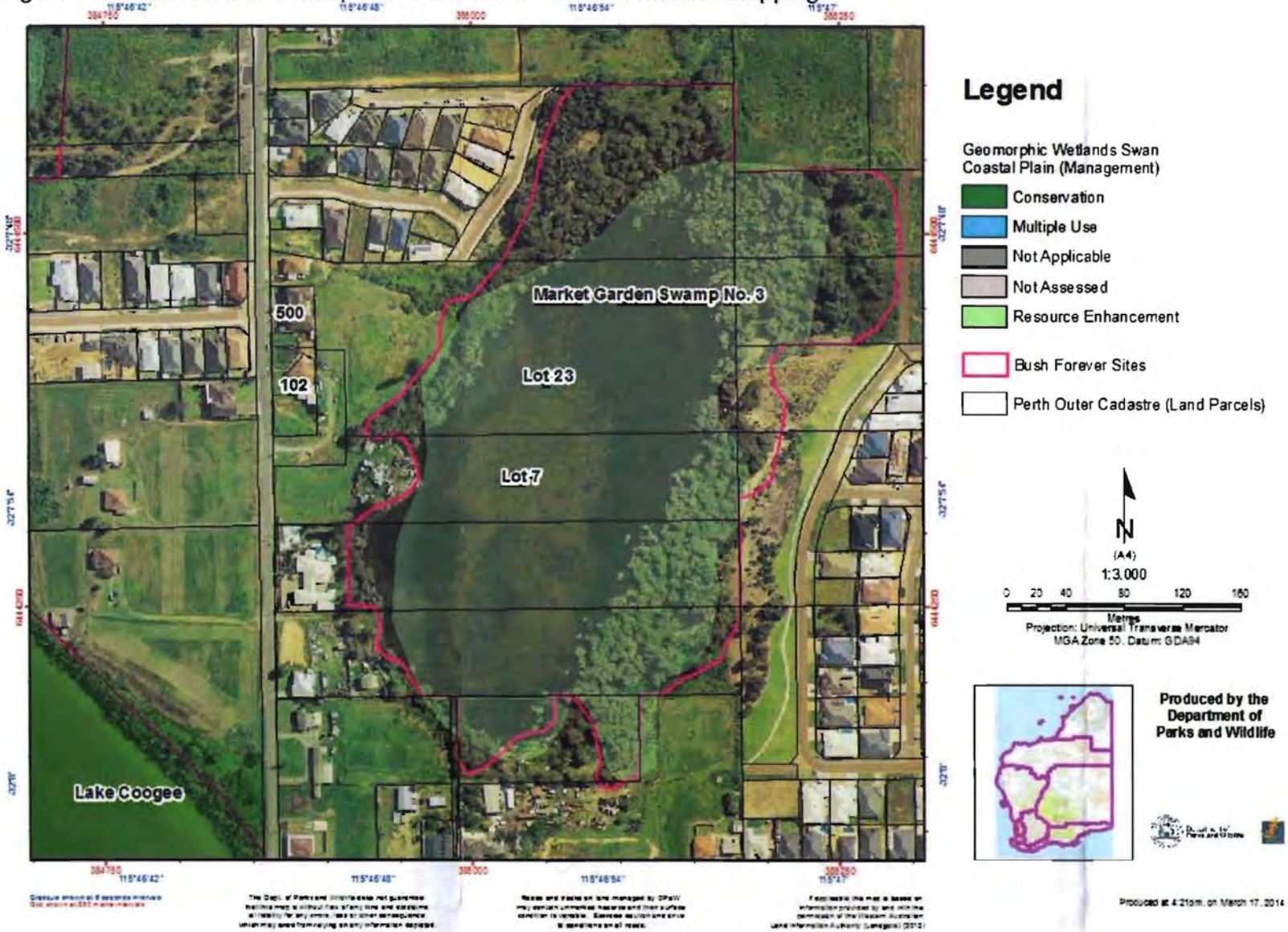
Yours sincerely

Dr Michael Coote
Principal Coordinator
Wetlands Section

25 March 2014

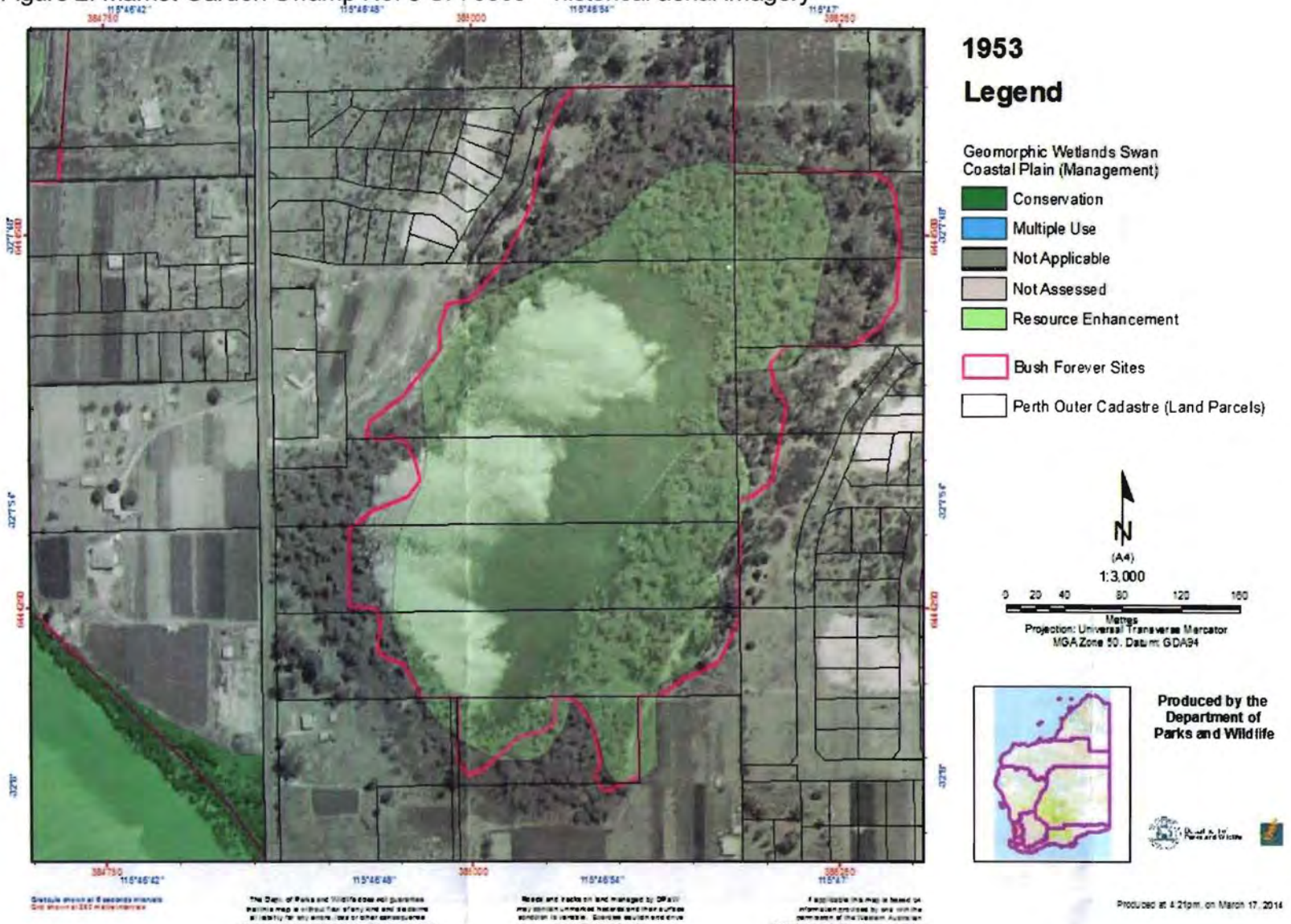
Cc. David Lodwick, Regional Leader, Land Use Planning, Swan Region, Department of Parks and Wildlife.

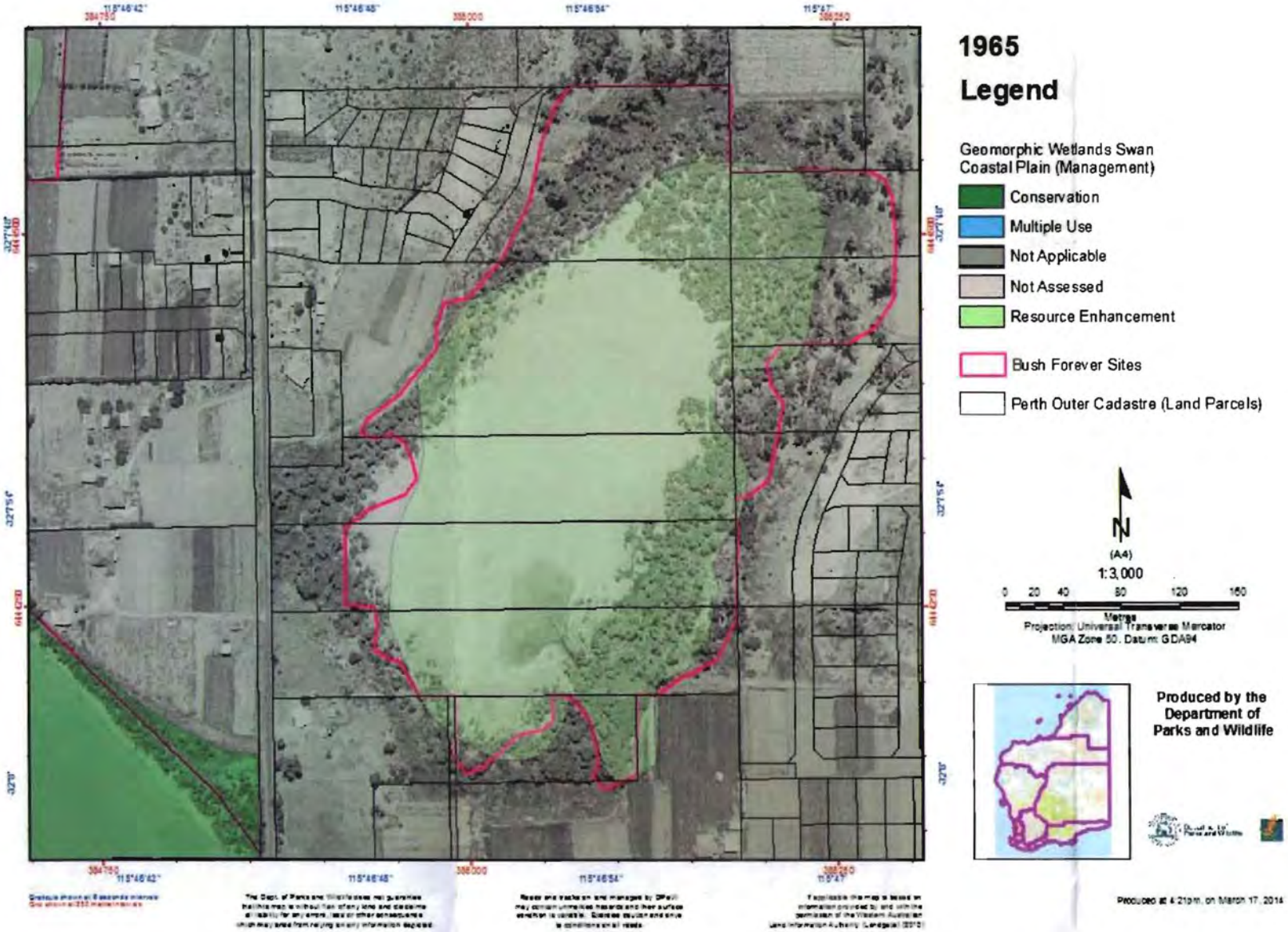
Figure 1. Market Garden Swamp No. 3 UFI 6369 – current wetland mapping.



Species and Communities Brar
Locked Bag 104, Bentley Delivery Centre, Western Australia 6
www.dpaw.wa.gov

Figure 2. Market Garden Swamp No. 3 UFI 6369 – historical aerial imagery




1965
Legend
Geomorphic Wetlands Swan Coastal Plain (Management)
Conservation
Multiple Use
Not Applicable
Not Assessed
Resource Enhancement
Bush Forever Sites
Perth Outer Cadastre (Land Parcels)
N
(A4)
1:3,000
0 20 40 80 120 160
Metres
Projection: Universal Transverse Mercator
MGA Zone 50, Datum GDA94
Produced by the Department of Parks and Wildlife
Produced at 4:21pm, on March 17, 2014



1974

Legend

Geomorphic Wetlands Swan Coastal Plain (Management)

- Conservation
- Multiple Use
- Not Applicable
- Not Assessed
- Resource Enhancement

- Bush Forever Sites
- Perth Outer Cadastre (Land Parcels)

(A4)

1:3,000

0 20 40 80 120 160

Metres

Projection: Universal Transverse Mercator
MGA Zone 50, Datum: GDA94



Produced by the Department of Parks and Wildlife

Produced at 4:21pm, on March 17, 2014

Appendix C

Landscape Concept Plan

FAWCETT ROAD LANDSCAPE CONCEPT PLAN

- Gross Subdivisible Area 1.89 ha
- POS Area required (5%) 945 m^2
- POS comprises: Paths 983 m^2 (5.2%)
  Park 1,000 m^2 (5.3%)
  Rehabilitation 3,836 m^2 (20.3%)

Fire Protection

- Entirety of each residential lot is to maintained as an Asset Protection Zone (APZ).
- For lots abutting Preston Drive, APZ comprises minimum 2m front building setback and 13m road reserve (total 15m).
- For lots in the south of site directly abutting the wetland buffer, APZ includes infiltration swale, path, grassed parkland and 3m minimum building setback from eastern boundary.

Road Verges

- Area (approx.) 730 m^2.
- Low-threat vegetation in accordance with AS 3959-2009 Clause 2.2.3.2(f) and *Guidelines for Planning in Bushfire Prone Areas* A2.1.
- Trees (paperbarks) every ~20m.
- Irrigate by tanker or subsurface drip during first summer as required.
- Concrete path on south/east side of Preston Drive.
- Residents/lot developers responsible for grass planting & irrigation.

Infiltration Swales

- Area (approx.) - Primary swales (1-year ARI): 162 m^2
  - Overflow swales (100-year ARI): 160 m^2.
- Amended soil (e.g. crushed laterite, limesand) with PRI > 15.
- Northern swale: Planted with dense drought-tolerant sedges and low (<2m) shrubs at 0.5–1 m spacing. Irrigated by tanker or subsurface drip for first summer as required; thereafter unirrigated.
- Southern swales: Irrigated turf; regularly mown.

Wetland Buffer Rehabilitation

- Area (approx.) 3,836 m^2.
- Remove rubble and unclean fill from south-east corner; backfill with clean sand.
- Remove *Juncus acutus* infestation.
- Construct unsealed (gravel/limestone) path on edge, following existing alignment from north.
- Plant with upland trees, shrubs & sedges e.g. Tuart (at >28m spacing), paperbarks, understorey species.

- Ultimate state will be a continuous horizontal and vertical vegetation structure with scattered emergent Tuarts (see Figure 2).
- Irrigated by tanker or subsurface drip for first summer as required; thereafter unirrigated.

Parkland POS

- Area (approx.) 1,000 m^2
- Remove rubble and unclean fill from south-east corner; backfill with clean sand.
- Loop concrete path around grassed area.
- Plant with irrigated turf.
- Pop-up sprinklers fed by bore.
- Possible observation platform/hide on edge of lake.
- Feature trees: Paperbarks.
- Bench seats.

Water Supply

- Water for short-term irrigation of new plantings in the rehabilitation zone, road verges and northern swale will be supplied by subsurface drip lines or tanker truck, filled from either scheme supply or bore water via an off-site standpipe.
- If supplied by tanker, the water source will be the responsibility of the contractor engaged to carry out the watering.
- Ongoing irrigation of lawn in the parkland will be by groundwater supplied from an on-site bore.
- The ongoing water requirement for POS irrigation will be about 745 kL/yr.
- The maximum water requirement (assuming all irrigation is supplied from onsite) is 2,581 kL in the first year.
- The subject land is located in the Kogolup sub-area of the Cockburn groundwater area.
- The Department of Water advised in June 2011 that the Kogolup sub-area had approximately 716,000 kL/yr available for allocation.
- DoW records (wir.water.wa.gov.au) show several existing or previous bores west of MGS3 within 300m of the POS that have yielded water with salinities of 990 – 1500 mg/L TDS from depths of 6.5 - 20m. Shallow bore sampling within the subject site has shown groundwater salinities of 840 – 1080 mg/L within 100m of MGS3.
- Test drilling will be required to confirm the availability of groundwater suitable for irrigation within the site. However, the very small quantity required (maximum 2,581 kL/yr for first year, equivalent to 600 litres/hr over 180 day irrigation period) suggests that sufficient water should be readily available from a domestic-scale bore.



Wetland Boundary (actual)
Wetland Buffer (agreed)
Road
Path
Observation Platform/Hide
Rehabilitation
1-yr ARI Infiltration Swale
100-yr ARI Overflow Swale
Road Verge
Parkland POS
Trees
Tuart
Paperbark
Bench Seats

Figure 1

LANDSCAPE CONCEPT

bayley environmental services

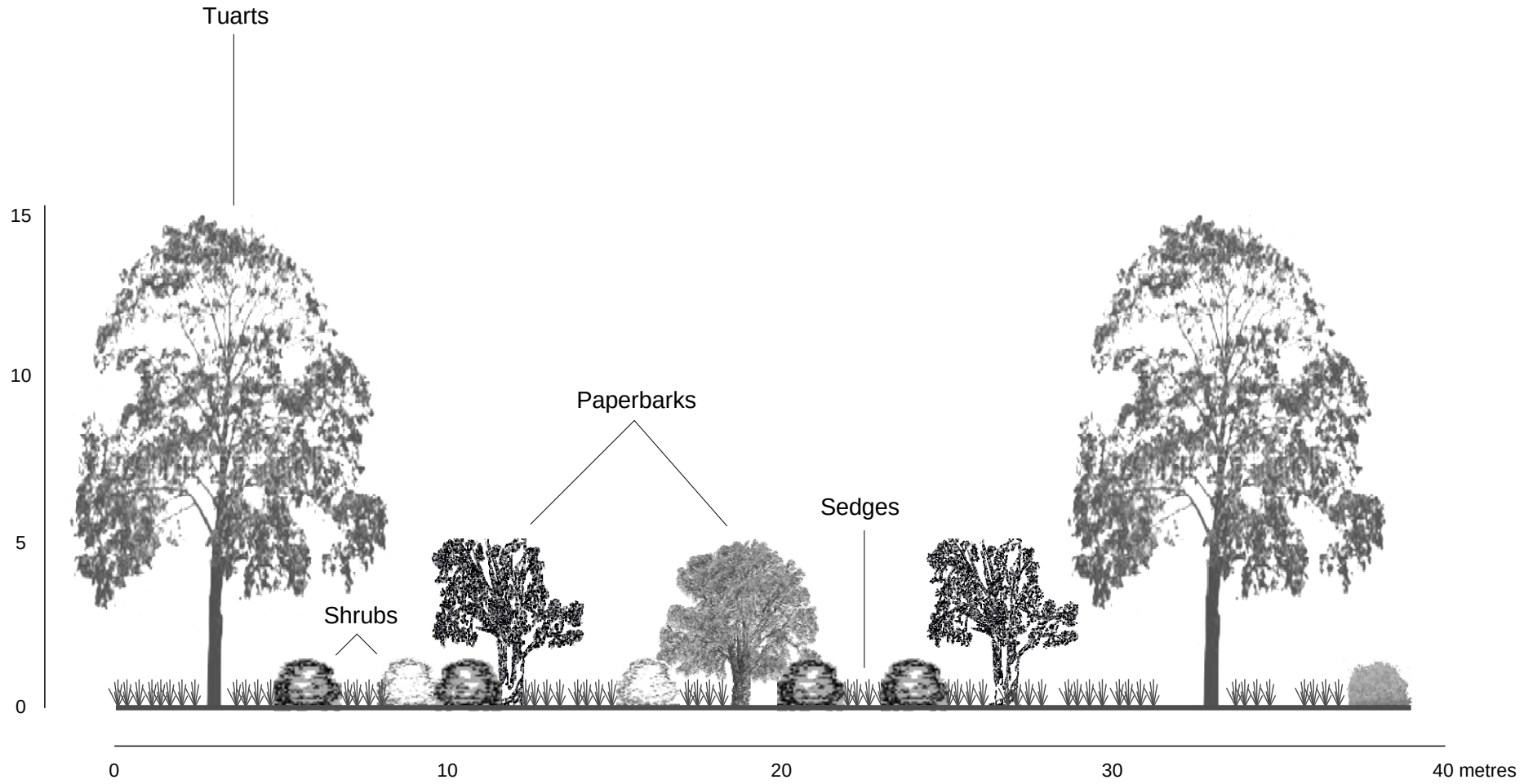


Figure 2

REHABILITATION ZONE
VEGETATION STRUCTURE

bayley environmental services

APPENDIX 3

Summary of Pre-Lodgement Consultation

From: Tiffany vander Linde
Sent: Monday, 4 May 2015 1:27 PM
To: 'Rachel Pleasant'
Subject: FW: Initial Comments - Structure Plan - Lots 23, 500, 102 & 7 Fawcett Road, Munster

Hi Rachel,

I understand you're handling the above LSP while Chris is away.

I have a query regarding one the WAPC comments on the list of modifications (below) which states: *"The WAPC (through the Department of Planning) will wish engagement with the City and the planning consultant on the land use merits of the plan."*

This seems to me an ambiguous statement and I was hoping to get some clarity from either yourself, or the WAPC officer who provided the comment, as to what is meant by the *"land use merits of the plan"* and whether this will have significant implications on the design of the LSP. Could you provide comment if you are able, or provide me with the contact details of the WAPC officer so I can forward this query?

Please do not hesitate to contact me to discuss.

Kind Regards,

Tiffany van der Linde
Planning Consultant

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From: Chris Hossen [mailto:chossen@cockburn.wa.gov.au]
Sent: Tuesday, 28 April 2015 3:40 PM
To: David Maiorana; Tiffany vander Linde

Cc: Rachel Pleasant
Subject: Initial Comments - Structure Plan - Lots 23, 500, 102 & 7 Fawcett Road, Munster

Hi David and Tiffany.

Please find below the City's and WAPC's initial comments to the above Structure Plan. Once you have had a chance to digest the comments and changes the City is happy to meet and discuss any points of contention. Once these matters are addressed we can move towards formal advertising of the proposal.

Please note that I will be away on annual leave until 4 June from the end of today, during my absence Rachel Pleasant will be handling the LSP. Rachel is cc'd into this email and her direct line is 9411 3448.

Should you wish to discuss these matter further please don't hesitate to contact Rachel or myself (once I return)

Regards,

Chris

Chris Hossen
Senior Strategic Planner
City of Cockburn
Tel: (08) 9411 3657
Fax: (08) 9411 3333

Comments of the City

Part 1 LSP Text

1. Part 6.1. Replace point 3 relating to mosquito breeding ground with the relevant clause from the City's Local Planning Policy relating to development in proximity to midge infested wetlands.
2. Add an additional Clause 7 , include two points in it:
    a. The standard Bushfire clause as outlined in the City's Structure Plan template
    b. A clause relating to the exclusion of residential development from land within the WPWWTP Buffer

Part 1 LSP Map

1. Remove the notification relating to development within the WPWWTP buffer and include in Part 1 text.
2. Remove the reference to areas requiring DAPS from the Map and legend. This is indicated in the Part 1 text
3. Remove the existing Road Reservation to be purchased from the LSP map and legend. Outline this arrangement in the Part 2 of the LSP

Part 2 LSP

1. Part 5.2.1 – Include reference to DCA 13
2. Part 5.2.6 – include this notification within the Part 1 of the LSP text
3. Part 2.9 – An Aboriginal Heritage Site search has been conducted which identifies a registered Aboriginal Site. There is no detail however in relation to how the site will be dealt with and whether advice has been obtained from DAA in relation to the development

Appendices
LWMS
Page 10 Section 2.2.4

MGS 3 is identified as having a high risk of Acid Sulphate Soils. Our own mapping indicates that there is a high probability of encountering ASS close to the wetland. The City will require that monitoring for ASS be undertaken when working close to the wetland. Should ASS be encountered there will be the requirement for an ASS Management Plan to be developed. This will be clearly articulated in the subdivision conditions.

Page 15 Section 2.6

AS identified within the LWMS a Preliminary Site investigation will be required to determine if any of the site is contaminated.

Page 16 Section 3.2.1

The City will require a Wetland Management and Revegetation Plan to be developed as a condition of subdivision. A species list will be required to be supplied as a component of the WMP.

Page 24 Section 7

Confirmation is required that the stormwater swales will not store water for more than 96 hours. Note that an additional approach to minimising the likelihood of nuisance midge is to minimise the amount of nutrients entering the wetland.

Page 26 Section 9.1.

Section 2.4 indicates that evapoconcentration occurs in the lake in summer. This is the most likely time to identify issues with water quality. I'd like to see monitoring of the water quality undertaken in early summer as well as the proposed winter monitoring.

Appendix C Landscape Management Plan

Fire Protection

Page 1 indicates that there will be a Bushfire Protection Zone of 15m for all houses. The Fire Management Plan (Page 28) indicates that the design standard for a BPZ is 20m. The LSP will need to be reviewed to allow for the standard 20m low fuel zone within the BPZ. This should be done without impacting on the existing or proposed revegetation within the wetland buffer. The BPZ is to be accommodated outside the buffer zone.

Wetland Buffer Rehabilitation

The City will require a Wetland Management and Revegetation Plan to be developed as a condition of subdivision. A species list will be required to be supplied as a component of the WMP. It is preferable the proposed paths are sealed and that they are a minimum width of 2.5 metres to offer access for fire fighting vehicles.

Parkland POS

The City's Parks department will need to be consulted on the proposed irrigation and bore. It is expected that the bore and reticulation will become the property of the City at handover and thus it is expected that the infrastructure will meet the City's minimum standard.
There will need to be some confirmation about the construction of the platform/hide when the WMP/Landscape Plan is developed
Fire Management Plan

It is noted that the FMP indicates that the Hazard Separation zone is to be accommodated between the wetland buffer and the BPZ and that this zone is to be maintained at a fuel load of not more than 8 tonne per hectare.

It is noted that the FMP does not require the HZP zone to include the existing wetland vegetation and that this area does not require the existing vegetation to be maintained at not more than 8 tonne per hectare. There is a requirement however to maintain a fuel load of 8 tonne per hectare within the revegetation zone. The WMP will need to consider this requirement and ensure that the revegetation proposed will not exceed 8 tonne per hectare even when fully mature while still providing the benefits to the wetland of a wetland buffer.

Comments of the WAPC

A preliminary assessment of the proposed SP has been undertaken. In this regard, please be advised that the WAPC is not prepared to endorse the proposed SP with or without modifications (at this time) for the following reasons:

The WAPC will wish to consider the advice of government agencies and any public submissions.

The Executive Summary (ES) regarding the Parks and Recreation area is not consistent with: - the area (amount) referenced in Part One section 5; that depicted on Plan 1 (as Parks and Recreation). This is to be reconciled.

In Part One:

- remove section 5.1 Public Open Space and 5. 2 Residential Density (already depicted on Plan 1, serves no purpose and is therefore unnecessary);
- 6.2 Detailed Area Plans Point 2 references Appendix 4 – there is no Appendix 4 in Appendix 5. This is to be reconciled.

Plan 1:

- The legend should distinguish the zones from the reserves (separate headings and correct terminology);
- Plan 1 should not identify the land within the "Woodman Point Waste Water Treatment Buffer" as "Residential" (this area is zoned Urban Deferred under the MRS);
- The WAPC (through the Department of Planning) will wish engagement with the City and the planning consultant on the land use merits of the plan.

In Part Two:

- Section 5.2.1 (and elsewhere in the document) incorrectly states that the entire LSP area is zoned "Urban" under the MRS. A small portion of the LSP area is zoned "Urban

Deferred" under the MRS. The documentation (throughout) is to be corrected accordingly;

- Insert a table overviewing consultation (when, with whom and outcomes) as referenced by WAPC's Structure Plan guidelines.

Appendix 5

- The RUIC Fire, Fire Management Plan (Appendix 5) will undergo separate review. It is likely that the overview under section 6.5 of Part Two will need to be revised for clarity and to remove inconsistency with the (final) FMP.

- In any event it is observed that various "subheadings" (for example 1.4.2.2) have been over written by or blend in with text. Section 1.4.1 has no text. The document should have been proof read before submission and will need to be resubmitted to correct these deficiencies.

The content of the "Disclaimer and Limitation" strikes at the veracity and acceptance of the FMP. References to "may not be relied upon by any other person" and the like. A more reasonable disclaimer will be required otherwise the FMP may not be accepted.

CITY OF COCKBURN – EMAIL DISCLAIMER This email and any attachments are confidential and intended solely for the use of the recipient(s) and therefore any disclosing, copying or distributing is prohibited. If you have received this email in error please notify the City of Cockburn and delete all copies. As the City of Cockburn uses virus-scanning software, the City accepts no liability for any loss or damage arising from the use of this email or attachments caused by any virus transmitted.

From: Tiffany vander Linde
Sent: Friday, 29 May 2015 8:49 AM
To: 'Page-Croft, Frances'; 'Rachel Pleasant'
Cc: Sewell, Paul; David Maiorana
Subject: RE: LSP Lots 7,23,102 and 500 Fawcett Road, Munster
Attachments: Environmental Protection (Swan Coastal Plain Lakes) Policy.pdf; EPP boundary check.pdf; Figure 6 - Wetland Boundaries.pdf

Hi Frances and Rachel,

Thanks for your prompt response to our letter dated 25 May.

Following our meeting and having regard to Frances' email below, we have sought advice from our environmental consultant regarding referral to the OEPA. He has advised in the first instance, that it is erroneous to refer to an EPP Wetland. Rather, an EPP Lake exists at the site as defined under *Environmental Protection (Swan Coastal Plain Lakes) Policy* (attached). Our environmental consultant has confirmed that the EPP Lake boundary as shown on Figure 1 of our letter from May 25 is correct. This is a statutory boundary and is not subject to modification or interpretation. I have attached our LSP with the statutory boundary of the EPP lake overlaid in blue linework (*EPP boundary check*). The EPP Lake boundary was sourced from SLIP Enabler WA Atlas mapping and the coordinates matched with those of the lot boundaries on the LSP to ensure an accurate depiction of the EPP boundary. Whilst noting the City's mapping depicts the EPP lake, our concern is that this mapping is not accurate.

The Lakes EPP prohibits certain activities, specifically mining, excavation, filling, effluent disposal and drainage, within lake boundaries gazetted under the EPP, unless authorised under the EP Act. The most usual means of gaining authorisation is to refer the proposal including the modification of the EPP Lake to the EPA, which can then either assess and approve or elect not to assess the proposal. Either constitutes "authorisation". The crucial point is that authorisation is only required for the above activities that directly affect the area inside the gazetted EPP Lake boundary. The proposed development at Fawcett Road does not affect the EPP Lake and therefore does not require authorisation from the EPA (although drainage from the site will go into the lake, it is not direct drainage and does not represent a change from the existing situation). We have consulted Liesl Rohl from the Office of the EPA for further clarification and she has also advised that unless the EPP lake is to be affected by any of the works stated above (and in point 7 of the attached Environmental Protection Policy), OEPA referral is not required.

The REW is a separate matter. As our letter stated, the DPAW has declined to alter the mapped REW boundary, even though they have acknowledged that the current mapping is incorrect. However, they have agreed to a 20-25m buffer from the edge of the wetland-dependent vegetation (**not** the current mapped wetland boundary) as shown on Figure 6 of the Wetland Boundary and Buffer Definition *(attached)* - which is in fact our recommended wetland boundary. Therefore, in effect, they have agreed to our request almost in full.

The only matter still at issue is the "finger" - this is the only thing on which all relevant parties have not yet agreed. The City have agreed that the road should run up against the finger, with the vegetation protected in the road reserve. The DPAW has requested that the 20-25m buffer extend around the finger despite this being entirely impractical in terms of providing a road linkage in a manner that avoids existing dwellings and connects to an existing road reserve. We will continue to consult with DPAW informally in relation to this matter and continue to discuss during referral of the Local Structure Plan in the event this issue has not been resolved.

Following receipt of the above advice from our environmental consultant, I responded with a further query as to whether referral to the OEPA would be necessary in relation to the REW. I received the following response:

"There's no reason to refer it. It's in an urban zone, it's a cleared site, it doesn't impinge on the EPP Lake and the DPAW has (almost) agreed to the wetland boundary and buffer. There are no policy triggers that would compel the council to refer it, and I can't imagine why they would want to."

Thus, in light of the above we do not consider referral to the EPA to be necessary in relation to either the EPP lake or REW and wish to progress the LSP to advertising following agreement from the City. Having regard to the above as well as our consultation with the environmental consultant and the OEPA we seek both the City's and the DoP's confirmation that there would be no need for the proposal to be referred to the OEPA prior to advertising.

Kind Regards,

Tiffany van der Linde
Planning Consultant

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From: Page-Croft, Frances [mailto:Frances.Page-Croft@planning.wa.gov.au]
Sent: Tuesday, 26 May 2015 1:10 PM
To: David Maiorana; Tiffany vander Linde
Cc: Sewell, Paul; Rachel Pleasant (rpleasant@cockburn.wa.gov.au)
Subject: LSP Lots 7,23,102 and 500 Fawcett Road, Munster

Hi David and Tiffany

Paul and I have discussed the content of your letter dated 25/5/15 and in particular your request for the Western Australian Planning Commission (WAPC), Department of Planning (DoP) to confirm essentially that the issue of the EPP Wetland as documented in your LSP has undergone sufficient consultation with both the City of Cockburn (the City) and the Department of Parks and Wildlife (DPaW), to confirm the status and land-use planning response to the EPP wetland as referenced in the LSP and therefore enable the LSP to be advertised. On this matter as you would appreciate DoP cannot give such confirmation that sufficient consultation has been had with the City and DPaW nor can it confirm that the land-use planning response to the EPP Wetland is satisfactory.

That said it is the City's responsibility to conclude on the merits of the LSP. It is within the purview of the City to seek further information from DPaW and the Office of the Environmental Protection Authority (OEPA) before concluding on consenting to advertise the LSP. In the alternative the City may advertise the LSP and then itself direct the proponent to seek further advice from DPaW or the OEPA on the land-use planning response to the EPP Wetland.

Upon the LSP being forwarded to the WAPC for endorsement (post advertising) the WAPC will wish to be satisfied that the land-use planning response to the EPP Wetland has regard to the considerations of a merit based assessment/outcome. If required, DoP on behalf of the WAPC may consult further with DPaW and the OEPA . DoP's general view is that any possible issues in relation to the EPP Wetland should be dealt with as soon as possible through engagement with the City , DPaW and the OEPA by the proponent and the City.

I trust this assists.

Best Regards

Frances Page-Croft | Senior Planning Officer | Perth and Peel Planning
Department of Planning | 140 William Street | Perth WA 6000
T (08) 65519290 | **F** (08) 6551 9001
E Frances.Page-Croft@planning.wa.gov.au | **W** www.planning.wa.gov.au



From: Tiffany vander Linde [mailto:Tiffanyv@HarleyDykstra.com.au]
Sent: Monday, 25 May 2015 1:02 PM
To: Sewell, Paul
Cc: Page-Croft, Frances; Rachel Pleasant; David Maiorana
Subject: LSP Fawcett Road, Munster

Hi Paul,

Following our meeting on Tuesday 12/05 in relation to the above, and the concerns expressed over the location of the proposed road reserve relative to the EPP wetland and REW Recommended Wetland Buffer, we have prepared the attached letter detailing our correspondence with the City and DPAW.

Subject to your response to the attached, we shall prepare a Development Concept which addresses the other matters raised at the meeting, including Fire Management Plan considerations, for your preliminary review and comment.

Please do not hesitate to contact myself or David to discuss.

Kind Regards,

Tiffany van der Linde
Planning Consultant

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[Extract from Government Gazette (No. 179) of Friday, 18 December, 1992]

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (SWAN COASTAL PLAIN LAKES) POLICY APPROVAL ORDER 1992

MADE by the Minister under section 31 (d).

Citation

1. This order may be cited as the *Environmental Protection (Swan Coastal Plain Lakes) Policy Approval Order 1992*.

Approval and commencement of environmental protection policy

2. The environmental protection policy set out in the Schedule —

(a) is approved; and

(b) shall have the force of law on and from the day on which this order is published in the *Gazette*.

SCHEDULE

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (SWAN COASTAL PLAIN LAKES) POLICY 1992

APPROVED by the Minister under section 31 (d).

PART 1 — PRELIMINARY

Citation

1. This policy may be cited as the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*.

Purpose of policy

2. The purpose of this policy is to protect the environmental values of lakes on the Swan Coastal Plain.

Interpretation

3. In this policy, unless the contrary intention appears —

"effluent" means liquid, either with or without particles of matter therein, that is discharged from premises and includes sludge;

"lake" means a lake to which this policy applies under clause 4 (1);

"land conservation district committee" means a land conservation district committee established under section 23 of the *Soil and Land Conservation Act 1945*;

"mining operations" has the meaning given to that expression in section 8 (1) of the *Mining Act 1978*;

"Swan Coastal Plain" means the area defined in Schedule 1;

"this policy" means this environmental protection policy.

Application

4. (1) This policy applies to those lakes on the Swan Coastal Plain that are shown coloured in green on Department of Land Administration Miscellaneous Plan No. 1815.

(2) The lakes referred to in subclause (1) have in most cases been selected for inclusion in this policy on the basis that they consisted of areas of standing water of 1 000 square metres or more as at 1 December 1991.

(3) The plan referred to in subclause (1) is available for public inspection during normal office hours at the head office of the Environmental Protection Authority in Perth.

PART 2 — BASIS ON WHICH LAKES ARE TO BE PROTECTED AND PROGRAMME FOR PROTECTION OF LAKES

Beneficial uses

5. The following uses of lakes are declared to be beneficial uses to be protected under this policy —

(a) use of lakes as a refuge for many rare and endangered species of flora and fauna including many birds which migrate from the northern hemisphere and which are protected under international treaties;

(b) use of lakes as a focus of cultural and heritage values for communities living in the Swan Coastal Plain before European settlement, having provided the basis for food gathering and spiritual life in those communities;

(c) use of lakes as an important aesthetic element of the natural landscape in the Swan Coastal Plain;

(d) use of lakes as an important resource in studying the natural environment;

(e) use of lakes as an intrinsic part of the natural as well as the modified surface drainage pattern of the Swan Coastal Plain;

(f) use of lakes as an important tool for monitoring groundwater levels and quality.

Degradation and destruction of lakes

6. Since European settlement more than two-thirds of lakes on the Swan Coastal Plain have been severely degraded or destroyed and the lakes that remain are in danger of being further degraded or destroyed.

Significant causes of the degradation or destruction of lakes

7. The following activities can cause lakes to be degraded or destroyed —

(a) the filling in of lakes with materials;

(b) the carrying out of excavation or mining operations in lakes;

(c) the discharge or disposal of effluent into lakes; and

(d) the drainage of water into or out of lakes.

Programme for protection of lakes

8. The protection of lakes is to be effected by —

(a) prohibiting the carrying out of activities which cause the destruction and degradation of lakes; and

(b) requiring persons who cause the destruction or degradation of lakes to undertake, in certain cases, the rehabilitation or re-establishment of those lakes.

PART 3 — CONTROL OF CERTAIN ACTIVITIES IN LAKES

Meaning of "authorized under the Act"

9. In this Part, "authorized under the Act" means authorized under a works approval, a licence, a requirement contained in a pollution abatement notice, section 40 (1) (a) of the Act (by being informed under that section that a proposal does not need to be assessed under Part IV of the Act), a condition under section 45 of the Act, a direction under section 73 of the Act or an exemption under section 75 of the Act.

Filling of lakes

10. A person shall not cause or permit any material to be placed in such a position that the whole or any part of a lake is filled in unless the person is authorized under the Act to do so, or has been authorized to do so under any other written law before the day on which this policy is approved, and is acting in accordance with that authorization.

Excavation and mining in lakes

11. A person shall not carry out any excavation or mining operations in, on or under a lake unless the person is authorized under the Act to do so, or has been authorized to do so under any other written law before the day on which this policy is approved, and is acting in accordance with that authorization.

Discharge or disposal of effluent into lakes

12. (1) A person shall not cause or permit the discharge or disposal of effluent into a lake unless the person is authorized under the Act to do so, or has been authorized to do so under any other written law before the day on which this policy is approved, and is acting in accordance with that authorization.

(2) Nothing in subclause (1) shall be taken as applying to, or in relation to, a substance that is applied to land for agricultural or forestry purposes and which enters a lake by a process of diffusion after having been applied to land for such a purpose.

Construction or alteration of drainage system in lakes

13. (1) A person shall not cause or permit the construction or alteration of any system for the drainage of water into or out of a lake unless —

(a) the person is authorized under the Act or subclause (2) to do so, or has been authorized to do so under any other written law before the day on which this policy is approved, and is acting in accordance with that authorization; or

(b) in the case of an alteration, the alteration is made in the course of and for the purpose of the general maintenance of an existing system for the drainage of water into or out of a lake.

(2) The Chief Executive Officer may, in the event of an emergency and, if there is a land conservation district committee established in the relevant district, upon the recommendation of that committee, authorize a person to construct a system for the drainage of water into or out of a lake subject to such conditions as the Chief Executive Officer thinks fit.

Penalties

14. A person who contravenes clause 10, 11, 12 (1) or 13 (1) commits an offence and is liable —

(a) in the case of an individual, to a penalty not exceeding $5 000 and if the offence is a continuing offence to a daily penalty not exceeding $1 000; and

(b) in the case of a body corporate to a penalty not exceeding $10 000 and if the offence is a continuing offence to a daily penalty not exceeding $2 000.

SCHEDULE 1

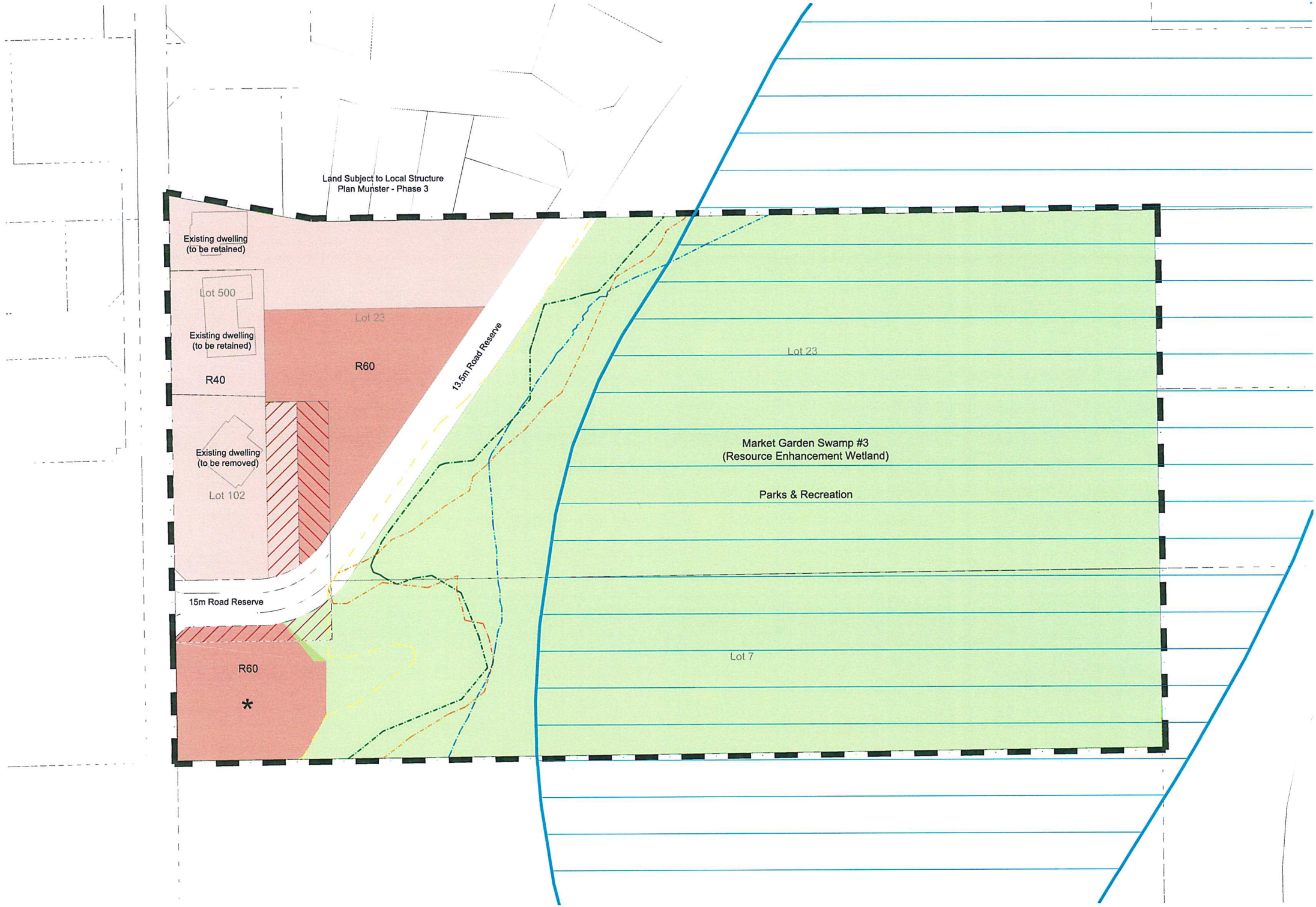
(Clause 3)

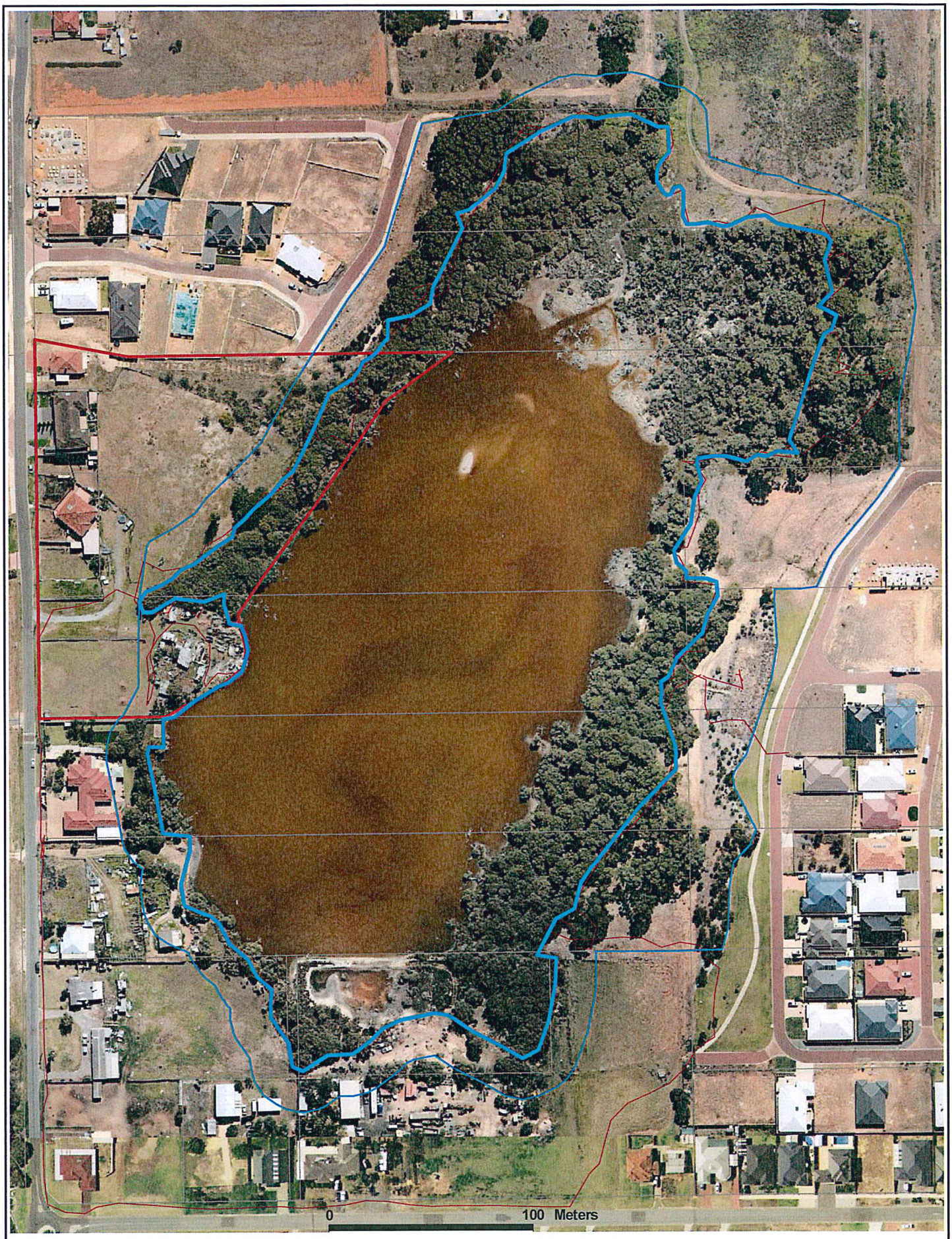
AREA OF SWAN COASTAL PLAIN

All that portion of land bounded by lines starting from the intersection of the High Water Mark of the Indian Ocean with the left bank of the Moore River and extending generally north-easterly upwards along that bank to its intersection with the summit line of the Gingin Scarp; thence generally south-easterly along that summit line to the summit line of the Darling Scarp; thence generally southerly along that summit line to the summit line of the Whicher Scarp; thence generally south-westerly, generally westerly and generally north-westerly along that line and onwards to the High Water Mark of the Indian Ocean aforesaid at Eagle Bay and thence generally easterly and generally northerly along that high water mark to the starting point, as delineated and shown bordered in black on Department of Land Administration Miscellaneous Plan 1815.

JIM McGINTY, Minister for the Environment.

By Authority: G. L. DUFFIELD, Government Printer


Land Subject to Local Structure Plan Munster - Phase 3
Existing dwelling (to be retained)
Lot 500
Existing dwelling (to be retained)
R40
Lot 23
R60
13.5m Road Reserve
Existing dwelling (to be removed)
Lot 102
15m Road Reserve
R60
*
Lot 23
Market Garden Swamp #3
(Resource Enhancement Wetland)
Parks & Recreation
Lot 7



Subject Lots
Cadastre
GPS Track 17/5/2013
Recommended Wetland Boundary
Recommended Wetland Buffer

Figure 6

RECOMMENDATIONS

bayley environmental services

Our Ref: *D10/757 20150518 WAPC Out*

Harley Dykstra
PLANNING & SURVEY SOLUTIONS

25 May 2015

Western Australian Planning Commission
Locked Bag 2506
140 Williams Street
PERTH WA 6001

Attention: Paul Sewell – Planning Manager Perth and Peel

Dear Paul

Proposed Local Structure Plan
Lots 7, 23 102 & 500 Fawcett Road, Munster

Following our meeting on Tuesday 12th May and the concerns expressed over the location of the proposed road reserve relative to the EPP wetland and REW Recommended Wetland Buffer we provide the following responses.

EPP Wetland

We have reviewed the EPP wetland boundary, and found it to be incorrectly mapped on the Local Structure Plan submitted previously. This results in the proposed road (an extension of Preston Drive) being some 35m from the EPP Wetland boundary. This setback is generally consistent with the setback of road reserves from the EPP wetland boundary, although at its closest point, the existing alignment of Preston Drive is approximately 20m setback as illustrated at **Figure 1**. Therefore, we don't consider this proposal will have any adverse impact on the EPP wetland.

REW inaccuracy and DPAW correspondence

As part of preparing the Local Structure Plan, ongoing consultation including a meeting with the City of Cockburn's planning, environmental and engineering officers, was undertaken to determine the preferred alignment of the extension to Preston Drive, having particular regard to management of the adjacent wetland area. During consultation with the City it was noted that the actual boundary of the REW was inaccurately shown within the Geomorphic Wetlands Swan Coastal Plain dataset, based on wetland vegetation, surface soils and evidence of surface water falling outside of the REW mapped area.

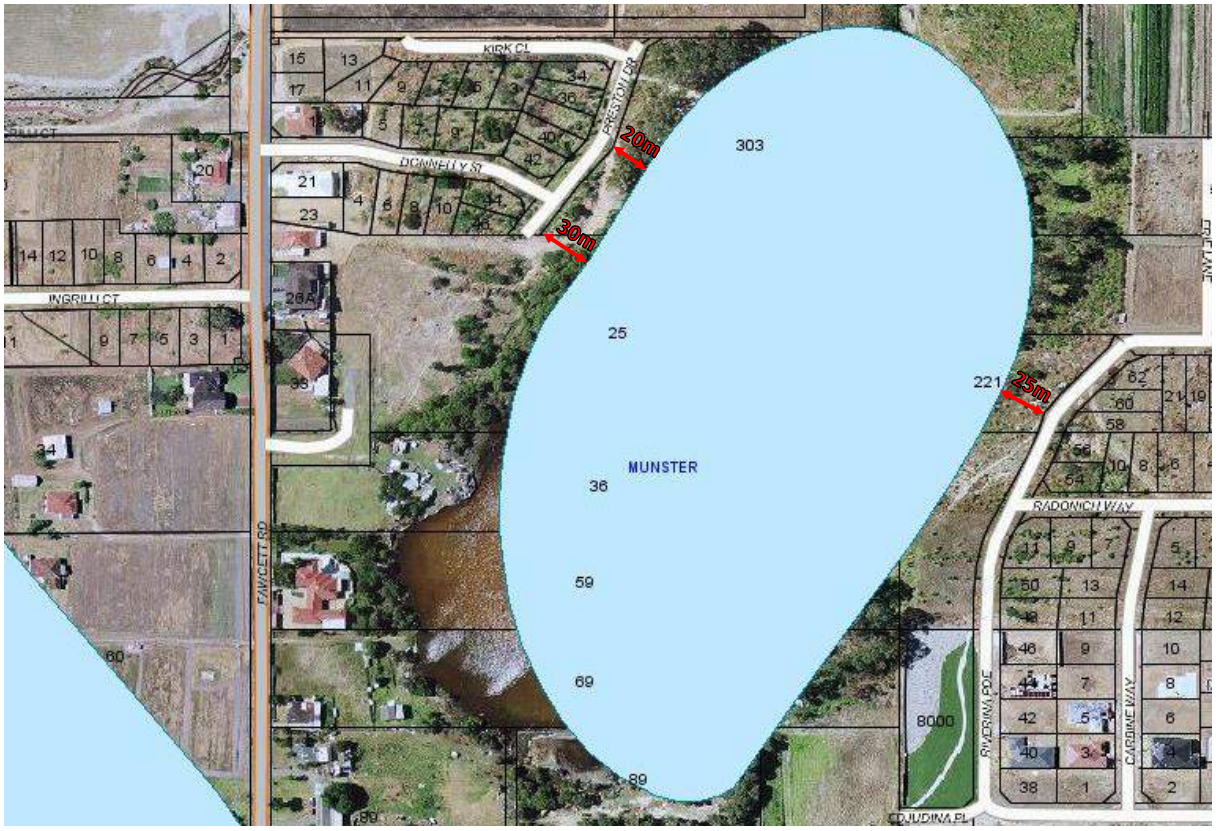


Figure 1 Location of EPP Wetland

The City staff indicated that the preferred alignment of the road is as it is currently shown on the Local Structure Plan and indicatively shown on the Munster Phase 3 LSP (**Appendix A**), previously endorsed by the City of Cockburn and the WAPC, subject to appropriate treatment of the REW and REW buffer. At the time, the City encouraged consultation with DPAW prior to submitting the Local Structure Plan.

Our environmental consultant from Bayley Environmental Services submitted a Wetland Boundary and Buffer Definition Assessment (**Appendix B**) to DPAW in January 2014 which proposed a realignment of the REW wetland. DPAW's response is included at **Appendix C** in which they resolved not to modify the REW mapped area despite agreeing that the wetland boundary is misaligned. DPAW thus recommended a 20m-25m buffer from the existing REW boundary. However, DPAW also recommended that the 'finger' of vegetation at the junction of Lots 7 and 23 should also be considered as part of the wetland and should be afforded a 20-25m buffer. Providing this advice, DPAW has seemingly not taken into account the effect of the 20-25m buffer from the 'finger' of wetland on the ability to connect Preston Drive through to Fawcett Road without the need to remove existing dwellings.

City of Cockburn correspondence

The Site Plan prepared by Bayley Environmental Services and included at **Appendix D** illustrates the proposed wetland boundary following DPAW advice and the proposed wetland buffer with the 20m setback from the vegetation 'finger'. Following further consultation with the City's Environmental Manager it was agreed that the interface with this 'finger' of vegetation could be managed in a way that protected the wetland without the additional 20m setback. In turn, this arrangement would allow the City's preferred road alignment to be achieved. These discussions

were summarised by Bayley Environmental Services in email correspondence to Chris Beaton, the City of Cockburn's Environmental Manager, in April and May 2014 which is included at **Appendix D** for your reference. The City's Environmental Manager responded via email on 23 May 2014 (**Appendix D**) confirming that he supported the elimination of an additional 20m buffer around the 'finger' of vegetation in order to retain the existing house as illustrated on the Site Plan.

Conclusion

Whilst DPAW has sought a buffer around the 'finger' of vegetation, it has not agreed to modification to the wetland boundaries. Hence the 'finger', according to the DPAW dataset is not part of the REW and would not even fall wholly within a 20m REW buffer. On this basis, could you confirm:

1. The correctly mapped EPP Wetland does not present a constraint to development given its western edge is some 35m away from the proposed road reserve. This separation distance is significantly less in other locations around Market Garden Swamp No. 3. Accordingly, no consultation with the Office of the EPA is warranted prior to the proposal being progressed to advertising.
2. Sufficient consultation has already occurred with both the City and DPAW in relation to the REW and its boundary, to enable the proposal to be progressed to advertising.

Subject to your response to the two points raised above, we shall prepare a Development Concept which addresses the other matters raised in your correspondence, including Fire Management Plan considerations, for your preliminary review and comment.

Yours faithfully



David Maiorana
Manager of Planning - Perth

APPENDIX 4

Bushfire Management Plan December 2017

(RUIC Fire)

Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address: Lots 71, 72, 73 & 500 Fawcett Road, Munster

Site visit: Yes ☑ No ☐

Date of site visit (if applicable): Day 22nd Month November Year 2017

Report author: Louisa Robertson

WA BPAD accreditation level (please circle):

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

If accredited please provide the following.

BPAD accreditation number: 36748 Accreditation expiry: Month February Year 2018

Bushfire management plan version number: 2.0

Bushfire management plan date: Day 14th Month December Year 2017

Client/business name: Joe & Vince Monastra, Petar Tolich, Tina Tolich & Kate Sillis and Sarina Scidone & Carmela Catalano

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

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

	Yes	No
Unavoidable development (in BAL-40 or BAL-FZ)		✔
Strategic planning proposal (including rezoning applications)	✔	
Minor development (in BAL-40 or BAL-FZ)		✔
High risk land-use		✔
Vulnerable land-use		✔

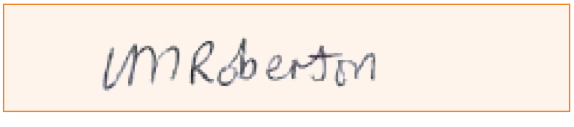
None of the above ☐

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

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

Local Structure Plan

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

Signature of report author  Date 14th December 2017

BAL ASSESSMENTS | BUSHFIRE MANAGEMENT PLANS | CONSULTANCY

RUIC FIRE

BUSHFIRE MANAGEMENT PLAN

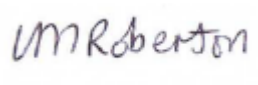
Strategic Planning Proposal

Lots 71, 72, 73 & 500 Fawcett Road, Munster

Version: 2.0 Reference: 5577 Date: December 2017



Project Number:	5577
Project Name:	Lots 71, 72, 73 and 500 Fawcett Road, Munster
Author:	Louisa Robertson, MSc, BPAD36748 Level 1
Reviewed by:	Darrel Krammer, Grad Cert Bushfire Protection, BPAD33412 Level 2
Version:	2.0
Date of issue:	14th December 2017



Author: Louisa Robertson
Date: 14th December 2017



Reviewed by: Darrel Krammer
Date: 14th December 2017

In the signing the above, the author declares that this Bushfire Management Plan meets the requirements of State Planning Policy 3.7. This report supersedes all previous Bushfire Management Plans for the site.

DISCLAIMER AND LIMITATION

This report is prepared solely for **Joe & Vince Monastra, Petar Tolich, Tina Tolich & Kate Sillis and Sarina Scidone & Carmela Catalano** (the 'proponent') and any future landowners of the subject lot(s)and is not for the benefit of any other person and may not be relied upon by any other person.

The mitigation strategies contained in this Bushfire Management Plan are considered to be prudent minimum standards only, based on the writer's experience as well as standards prescribed by relevant authorities. It is expressly stated that RUIC Fire and the writer do not guarantee that if such standards are complied with or if a property owner exercises prudence, that a building or property will not be damaged or that lives will not be lost in a bush fire.

Fire is an extremely unpredictable force of nature. Changing climatic factors (whether predictable or otherwise) either before or at the time of a fire can also significantly affect the nature of a fire and in a bushfire prone area it is not possible to completely guard against bushfire.

Further, the growth, planting or removal of vegetation; poor maintenance of any fire prevention measures; addition of structures not included in this report; or other activity can and will change the bushfire threat to all properties detailed in the report. Further, the achievement of the level of implementation of fire precautions will depend on the actions of the landowner or occupiers of the land, over which RUIC Fire has no control. If the proponent becomes concerned about changing factors then a new Fire Risk Management Plan should be requested.

To the maximum extent permitted by the law, RUIC Fire, its employees, officers, agents and the writer ("RUIC Fire") excludes all liability whatsoever for:

1. claim, damage, loss or injury to any property and any person caused by fire or as a result of fire or indeed howsoever caused;
2. errors or omissions in this report except where grossly negligent; and
3. the proponent expressly acknowledges that they have been made aware of this exclusion and that such exclusion of liability is reasonable in all the circumstances.

If despite the provisions of the above disclaimer RUIC Fire is found liable then RUIC Fire limits its liability to the lesser of the maximum extent permitted by the law and the proceeds paid out by RUIC Fire's professional or public liability insurance following the making of a successful claim against such insurer.

RUIC Fire accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report and its supporting material by any third party.

This report is valid for a period of three years only from the date of its issue. All BAL ratings identified in this report are indicative and are required to be verified at the time of construction of individual buildings to ensure appropriate setbacks identified in the proposed development have been achieved.

RUIC Fire is a trading name of

Rural Fire Risk Consultancy Pty Ltd

ABN: 48 151 451 713

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1.0 Introduction

1.1 Subject Site

The site the subject of this Bushfire Management Plan (BMP) is Lots 71, 72, 73 and 500 Fawcett Road, Munster. The site is located within the municipality of the City of Cockburn. Figure 1A illustrates the subject site and its immediate surrounds.

The site is identified as being Bushfire Prone on the *Map of Bush Fire Prone Areas 2017* (OBRM, 2017).

1.2 Environmental Considerations

Environmental Considerations relevant to the proposed development are shown in Figures 1B and 1C.

The site contains a large portion of Market Garden Swamp No. 3 which is classified as a Resource Enhancement Wetland (REW). The vegetation fringing the swamp is located within Bush Forever Site 429. A REW buffer extends around the wetland boundary as shown in Figures 1A and 1B.

An Environmental Management Plan was prepared for the Market Garden Swamps by GHD in 2009. Major findings of the report were:

- *Market Garden Swamp 3 is part of Bush Forever Site 429. The wetlands of Market Garden Swamp have been entered on the Interim List of the Register of the National Estate Location for JAMBA/CAMBA species subject to protection under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.*
- *The wetlands are no longer pristine; however, they do contain significant areas of high conservation value including important nesting and feeding habitats and a number of vegetation types for wildlife utilising the park. Management for conservation and ongoing conservation works have significantly improved the ecological values of the wetlands over the past decade.*
- *No Significant Flora species were located within the Market Garden Swamps.*
- *A fauna search identified the potential presence of seven amphibians, fifty-three birds, thirty-three reptiles and seven mammals. Eleven of the one hundred species identified are considered significant under the Western Australian Wildlife Conservation Act 1950 and the EPBC Act.*

The proponent has not identified any other relevant environmental considerations located within the site or being affected by the development.

1.3 Development Description

The Local Structure Plan over Lots 71, 72, 73 and 500 Fawcett Road (Figure 1D) proposes a residential development area within the western portion of the site with R40 and R60 zoned lots as well as the extension of Preston Drive through the site to join with Fawcett Road. The eastern portion of the site is proposed to be zoned Parks and Recreation (the development).

The Urban Design Principles Plan (Figure 1E) shows the conceptual layout for the LSP area, that includes two private internal roads with a linking pedestrian access way (PAW) between them.

Also included in the development is a rehabilitation area adjacent to the western boundary of the REW (within the REW buffer) along with a parkland public open space area and drainage swales as illustrated in Figure 1A and in the Landscape Concept Plan at Figure 1F.

1.4 Previous Bushfire Assessments

A Fire Management Plan was prepared for the site in 2015 (RUIC Fire, 2015) in accordance with the superseded *Planning for Bushfire Protection Guidelines* and *draft Planning for Bushfire Protection Guidelines*.

The current BMP has been prepared in accordance with the now current *State Planning Policy 3.7* (SPP 3.7) (WAPC, 2015) and *Guidelines for Planning in Bushfire Prone Areas Version 1.2* (WAPC, 2017a, b).

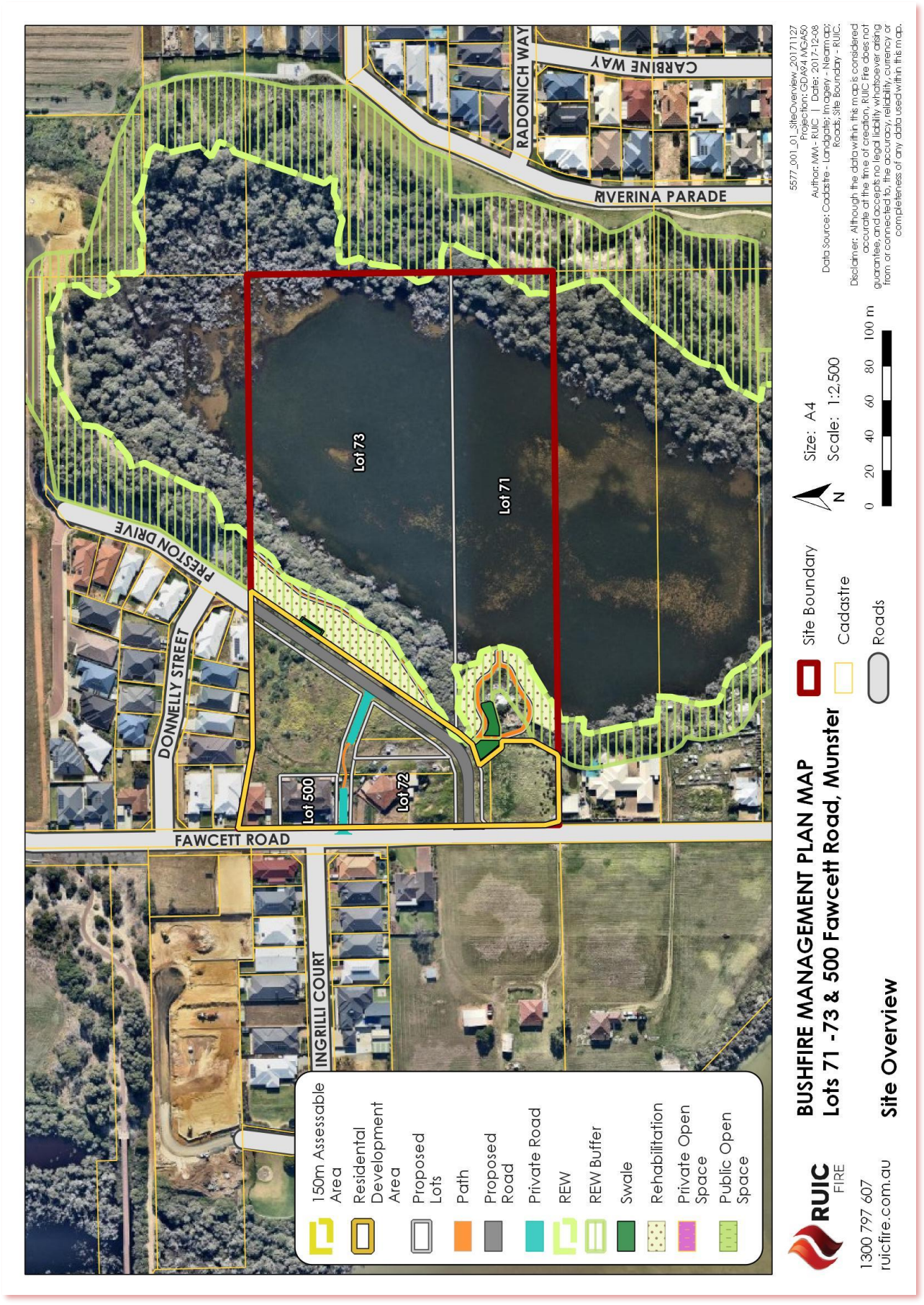


Figure 1A: *Site Overview*



Figure 1B: *Opportunities and Constraints Plan*

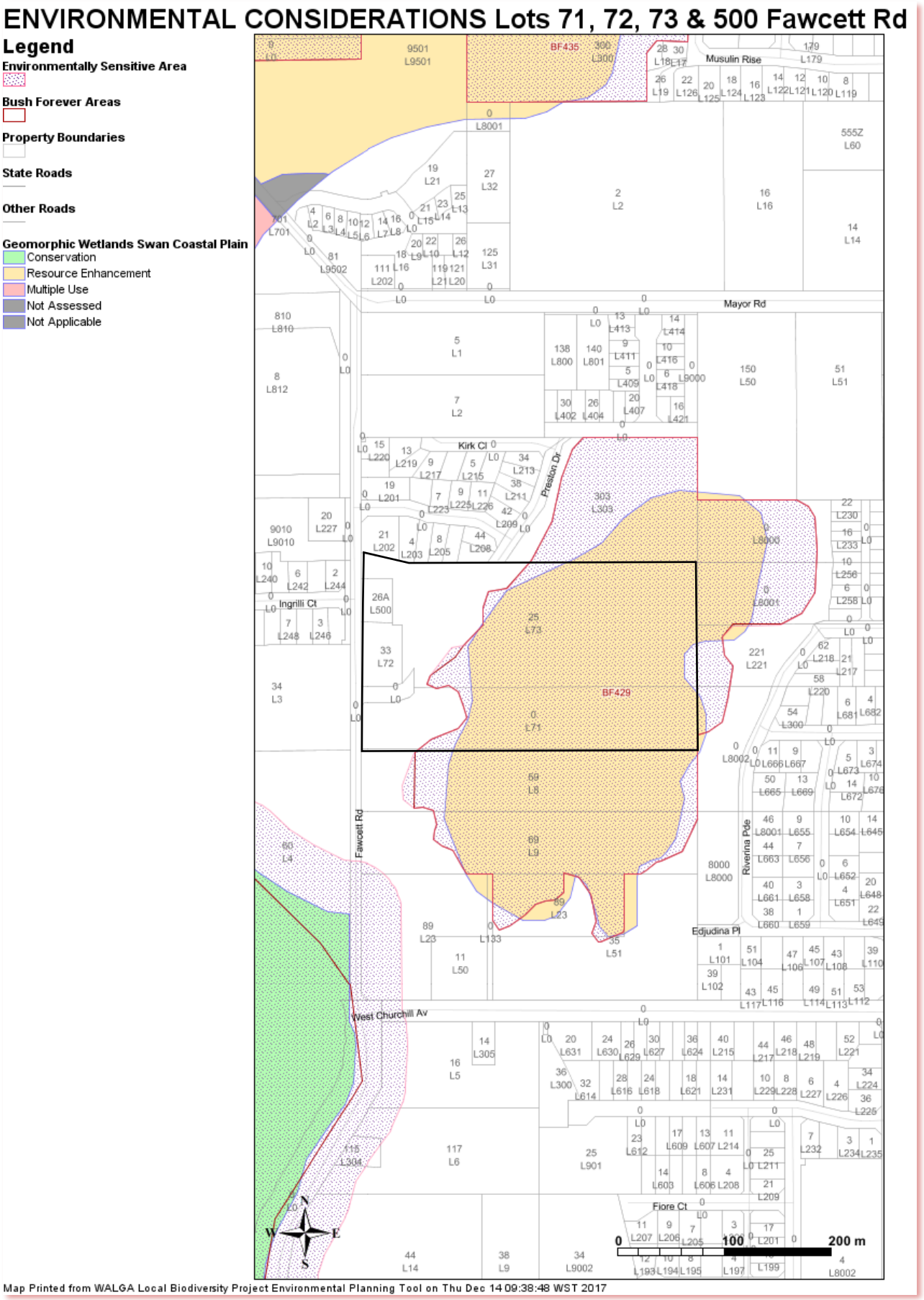


Figure 1C: *Environmental Considerations*



Figure 1D: *Structure Plan Map (Revision J)*



Figure 1E: *Urban Design Principles (Revision K)*

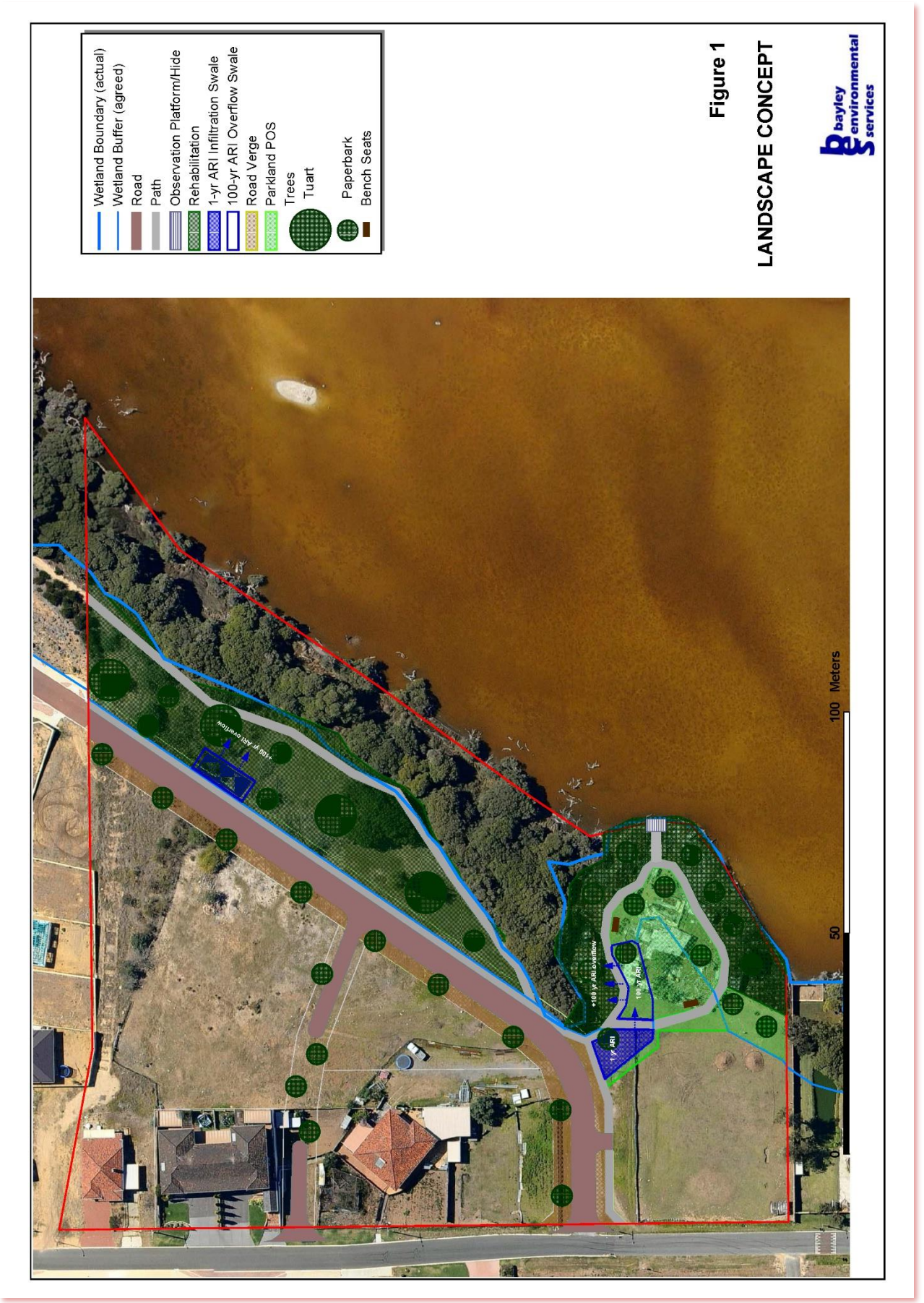


Figure 1F: *Landscape Concept Plan*

2.0 Spatial Consideration of Bushfire Threat

2.1 Effective Slope

Effective slope under each vegetation plot was assessed in accordance with the methodology detailed in *AS 3959-2009 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia, 2009). Slope data was measured on site and cross referenced with Landgate elevation data.

The effective slope of each vegetation plot is listed in the tables provided in Section 2.2.3 below.

2.2 Bushfire Fuels

The location and extent of AS 3959 vegetation structures, including Clause 2.2.3.2 exclusions, within 150 metres of the proposed residential development area are mapped in Figure 2A and illustrated in the photos below.

Bushfire fuel loads are identified as consistent with AS 3959 Table B2 for radiant heat flux modelling purposes. All bushfire structures and fuel loads are assessed in their mature states (including revegetation and rehabilitation areas) unless otherwise identified.

2.2.1 Landscaping within the Residential Development Area

All existing vegetation within the residential development area will be removed as part of future development works.

If the development construction is staged, all vegetation within the residential development area that is located within 100m of any lots being constructed in that stage is to be reduced to and maintained as low threat vegetation in accordance with AS 3959 Exclusion 2.2.3.2(f) and Acceptable Solution A2.1 (Asset Protection Zone).

The Landscape Concept Plan (Appendix 1) details that the following areas of the site will be landscaped and maintained as low threat vegetation:

- Parkland Public Open Space Area – planted with irrigated turf, paperbarks and Tuarts included as feature trees.
- Southern Infiltration Swale – Irrigated turf, regularly mown.

Maintenance of these areas in a low threat state will be the responsibility of the developer for two summers following completion of the development and thereafter the City of Cockburn.

2.2.2 Revegetation within the REW Buffer

The REW buffer is to be rehabilitated as detailed in the Landscape Concept Plan (Appendix 1). The buffer will be vegetated with upland trees, shrubs and sedges. The canopy species (e.g. Tuart) will be spaced at least 28m apart to have a canopy cover of <10%. The understorey species of shrubs, sedges and scrub will have a typically continuous vertical and horizontal structure at maturity as illustrated in Figure 2 of the Landscape Concept Plan. The vegetation is considered to meet the classification of Class B Open Woodland with Class D Scrub understorey as described in AS 3959 Table 2.3 (Note 2) and the *Visual Guide to Bushfire Risk Assessment in Western Australia First Edition* (Department of Planning, 2016).

The Landscape Concept Plan (Appendix 1) details that the Northern Infiltration Swale located within the REW is to be revegetated with dense drought tolerant sedges and low shrubs and once established after the first summer, will be left unmanaged. For the purposes of the BAL assessment, the swale has been incorporated into the same vegetation plot as the REW buffer as it may revert to the surrounding vegetation type of Class D Scrub in the absence of active management.

2.2.3 Vegetation Plots

Plot 1	
Existing	Class G Grassland Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated area Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 1 covers the proposed residential development area. Existing vegetation consists of unmanaged grassland as well as maintained lawns and gardens within existing residential properties.

On completion of the development, the plot will comprise non-vegetated areas (e.g. roads and footpaths) and low threat vegetation (cultivated gardens and lawns) within the residential development area. Vegetation within the parkland public open space and infiltration swales will be managed as low threat vegetation in accordance with the Landscape Concept Plan. On completion of the development, management of these public areas will be the responsibility of the City of Cockburn. Maintenance of the lots in a low threat state is enforceable under the City of Cockburn Firebreak Order (Appendix 2) that states "All flammable materials such as long dry grass and weeds must be slashed, mown or trimmed down to a maximum height of 50mm across the entire property and all dead vegetation must be removed".



Photo ID: 1a



Photo ID: 1b



Photo ID: 1c



Photo ID: 1d

Plot 1	
Plot 2	
Existing	Class G Grassland Class D Scrub
Post Development	Class D Scrub (Open Woodland)
Effective Slope	Downslope 2°

Plot 2 comprises the portion of the REW buffer that lies directly east of the proposed Preston Drive extension. Existing vegetation consists of unmanaged grassland and scrub and shrub species.

The REW buffer is to be rehabilitated as detailed in the Landscape Concept Plan (Appendix 1). The buffer will be vegetated with upland trees, shrubs and sedges. The canopy species (e.g. Tuart) will be spaced at least 28m apart to have a canopy cover of <10%. The understorey species of shrubs, sedges and scrub will have a typically continuous vertical and horizontal structure at maturity.

The vegetation is considered to meet the classification of Class B Open Woodland with Class D Scrub understorey as described in AS 3959 Table 2.3 (Note 2) and the *Visual Guide to Bushfire Risk Assessment in Western Australia First Edition* (Department of Planning, 2016).



Photo ID: 2a



Photo ID: 2b

Plot 3	
Existing	Class G Grassland
Post Development	Class D Scrub
Effective Slope	Flat/ Upslope

Plot 3 comprises the portion of the REW buffer that lies directly east of the proposed parkland Public Open Space area in the south east of the site. Existing vegetation consists of unmanaged grassland and scrub and shrub species.

The REW buffer is to be rehabilitated as detailed in the Landscape Concept Plan (Appendix 1). The buffer will be vegetated with upland trees, shrubs and sedges. The canopy species (e.g. Tuart) will be spaced at least 28m apart to have a canopy cover of <10%. The understorey species of shrubs, sedges and scrub will have a typically continuous vertical and horizontal structure at maturity.

The vegetation is considered to meet the classification of Class B Open Woodland with Class D Scrub understorey as described in AS 3959 Table 2.3 (Note 2) and the *Visual Guide to Bushfire Risk Assessment in Western Australia First Edition* (Department of Planning, 2016).



Photo ID: 3a



Photo ID: 3b

Plot 4	
Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Downslope 2°

Plot 4 comprises the existing vegetation within the Resource Enhancement Wetland area (Market Garden Swamp No. 3) located within the bounds of the site. The vegetation is to be retained as part of the development. The vegetation consists predominantly of paperbarks greater than 2m in height with a continuous vertical and horizontal structure.



Photo ID: 4a



Photo ID: 4b



Photo ID: 4c



Photo ID: 4d

Plot 5	
Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Downslope 3°
Plot 5 comprises vegetation within Lots 55 and 812 Fawcett Road. The vegetation is greater than 2m in height with a predominantly continuous vertical and horizontal structure.	



Photo ID: 5a



Photo ID: 5b

Plot 6	
Existing	Exclusion 2.2.3.2 (e) non-vegetated area Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated area Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 6 covers the existing residential development located directly north, south and west of the site. The majority of this plot comprises established residential properties with low threat cultivated gardens and maintained lawns. Non- vegetated areas include existing roads, footpaths and driveways.

Plot 6 also includes a maintained area of the REW buffer that lies directly north of the subject site. The vegetation is shown in Photo 6g and consists of low groundcover and shrub species with coarse mulch. It is understood that this vegetation is maintained as low threat vegetation by the City of Cockburn.



Photo ID: 6a



Photo ID: 6b



Photo ID: 6c



Photo ID: 6d

Plot 6



Photo ID: 6e



Photo ID: 6f



Photo ID: 6g



Photo ID: 6h

Plot 7	
Existing	Class A Forest
Post Development	Class A Forest
Effective Slope	Flat/ Upslope

Plot 7 comprises existing forest vegetation within the REW buffer directly north of the site. The vegetation comprises tall Eucalypts up to 20m in height with scrubby understorey species. Canopy cover is approximately 70% as shown in the image below.



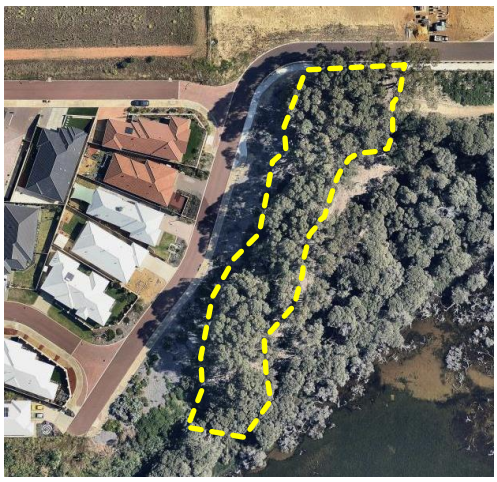
Photo ID: 7a



Photo ID: 7b



Photo ID: 7c



Canopy Cover: Nearmap 30 October 2017

Plot 8	
Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/ Upslope

Plot 8 comprises the existing vegetation within the Resource Enhancement Wetland area (Market Garden Swamp No. 3) located directly south of the site. The vegetation consists predominantly of paperbarks greater than 2m in height with a continuous vertical and horizontal structure.



Photo ID: 8a



Photo ID: 8b

Plot 9	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Flat/ Upslope

Plot 9 comprises unmanaged grassland within Lots 69 and 89 Fawcett Road, south of the site.

Management of the grassland is not enforceable under the *City of Cockburn Fire Control Order* (Appendix 2) as it only requires grassland to be kept to a maximum height of 50mm on properties that are 2032m^2 or less.



Photo ID: 9a



Photo ID: 9b

Plot 10	
Existing	Exclusion 2.2.3.2 (e) non-vegetated area
Post Development	Exclusion 2.2.3.2 (e) non-vegetated area
Effective Slope	N/A
Plot 10 comprises Market Garden Swamp No. 3, which is a non-vegetated waterbody.	



Photo ID: 10a



Photo ID: 10b

Plot 11	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Flat/ Upslope

Plot 11 comprises unmanaged grassland within Lot 2 Fawcett Road, north of the site and greater than 50m from the site.

Management of the grassland is not enforceable under the *City of Cockburn Fire Control Order* (Appendix 2) as it only requires grassland to be kept to a maximum height of 500mm on properties that are 2032m^2 or less.



Photo ID: 11a



Photo ID: 11b



Photo ID: 11c

Plot 12	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Downslope 3°

Plot 12 comprises unmanaged grassland within Lot 812 Fawcett Road, north west and greater than 50m of the site.

Management of the grassland is not enforceable under the *City of Cockburn Fire Control Order* (Appendix 2) as it only requires grassland to be kept to a maximum height of 50mm on properties that are 2032m^2 or less.



Photo ID: 12a

Plot 13	
Existing	Exclusion 2.2.3.2 (e) non-vegetated area Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated area Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 13 comprises residential lots that are currently being developed on Ingrilli Court, to the north west of the site. The plot currently comprises bare earth and managed grassland (<10cm). Management of the grassland is enforceable under the *City of Cockburn Fire Control Order* (Appendix 2) that requires grassland to be kept to a maximum height of 50mm on properties that are 2032m^2 or less.

Once these lots have been developed, the plot will comprise non-vegetated areas including building footprints and driveways and low threat vegetation such as cultivated gardens and maintained lawns.



Photo ID: 13a



Photo ID: 13b



Photo ID: 13c

Plot 14	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Downslope 2°

Plot 14 comprises unmanaged grassland within Lots 34 and 60 Fawcett Road, south west of the site.

Although the grass has been recently slashed, it's management of the grassland is not enforceable under the *City of Cockburn Fire Control Order* (Appendix 2) as it only requires grassland to be kept to a maximum height of 50mm on properties that are 2032m^2 or less.



Photo ID: 14a



Photo ID: 14b



Photo ID: 14c



Photo ID: 14d

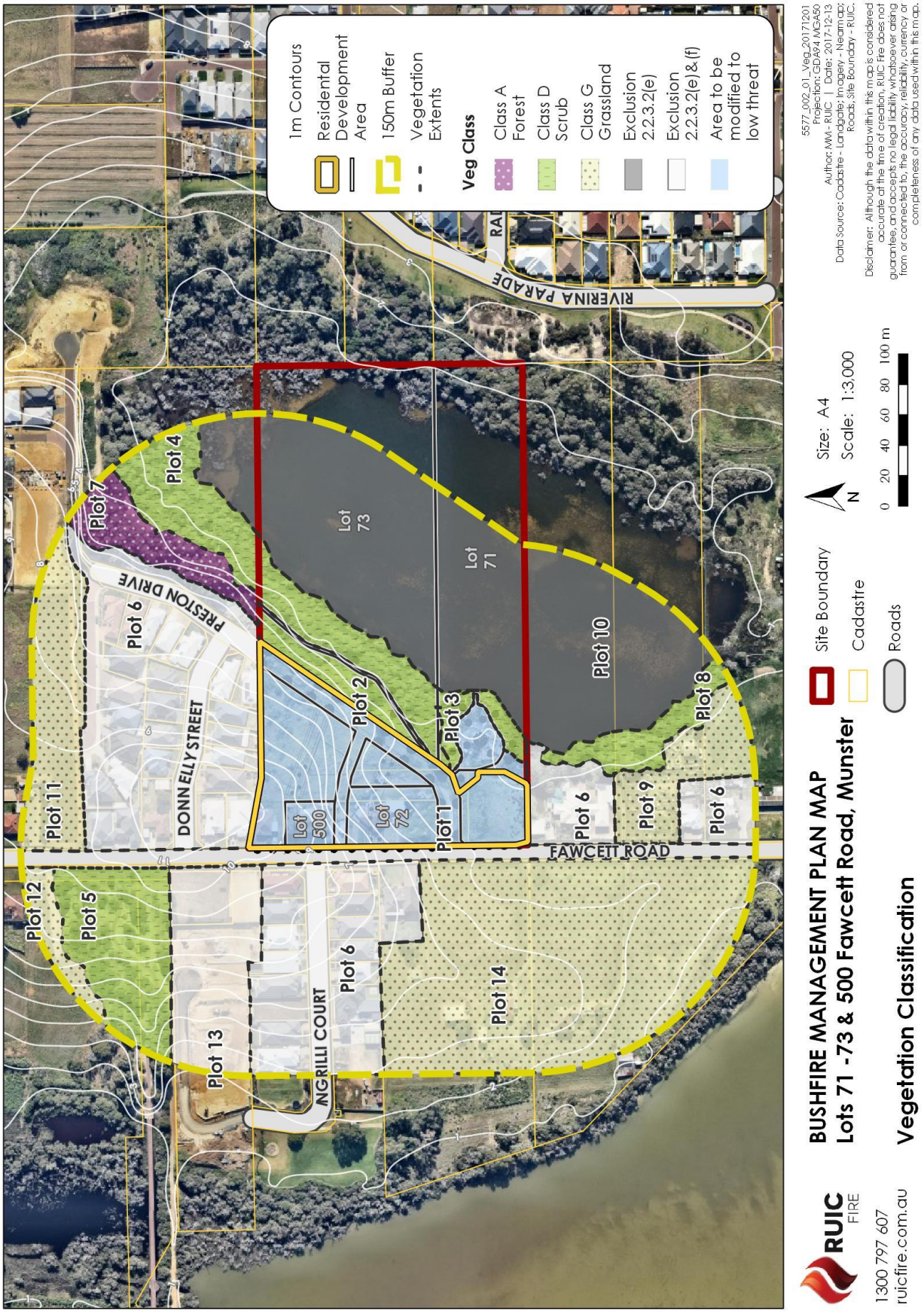


Figure 2A: *Post Development Vegetation Classifications (Total Site)*

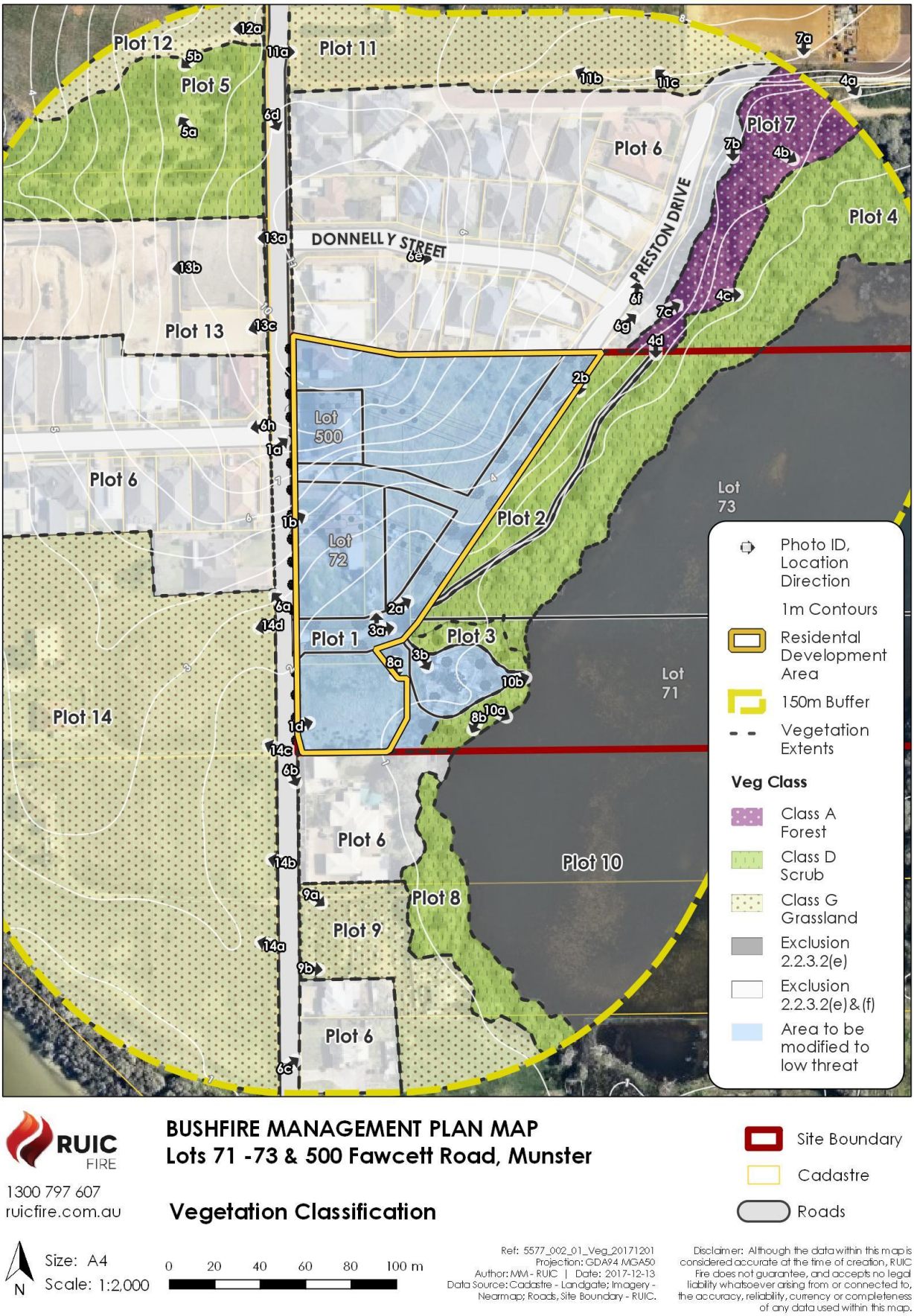


Figure 2B: *Post Development Vegetation Classifications (Detailed View)*

2.3 Potential Bushfire Impact

Potential bushfire impact analysis was undertaken in accordance with AS 3959 Methodology 1 to determine the potential worst case scenario radiant heat impact on proposed residential development area of the site.

In accordance with SPP 3.7, a BAL Contour Map has been prepared to illustrate the potential radiant heat impacts and associated BAL ratings for the assessment area after the development is completed (see Figures 2C and 2D).

The following table (Table 2A) outlines the worst case BAL for each of the Vegetation Plots based on separation distance to the residential development area. The worst case BAL applicable to the residential development area is BAL-40.

Table 2A: *Worst case BAL that applies to the residential development area*

Vegetation Plot	Vegetation Classification	Effective Slope	Separation	BAL
Plot 1	Exclusion 2.2.3.2 (e) & (f)	N/A	N/A	N/A
Plot 2	Class D Scrub	Downslope 2°	13m	BAL-40
Plot 3	Class D Scrub	Flat/ Upslope	11m	BAL-29
Plot 4	Class D Scrub	Downslope 2°	13m	BAL-40
Plot 5	Exclusion 2.2.3.2 (e) & (f)	N/A	N/A	BAL-LOW
Plot 6	Exclusion 2.2.3.2 (e) & (f)	N/A	N/A	BAL-LOW
Plot 7	Class A Forest	Flat/ Upslope	25m	BAL-29
Plot 8	Class D Scrub	Flat/ Upslope	5m	BAL-29
Plot 9	Class G Grassland	Flat/ Upslope	57m	BAL-LOW
Plot 10	Exclusion 2.2.3.2 (e)	N/A	N/A	BAL-LOW
Plot 11	Class G Grassland	Flat/ Upslope	107m	BAL-LOW
Plot 12	Class G Grassland	Downslope 3°	128m	BAL-LOW
Plot 13	Exclusion 2.2.3.2 (e) & (f)	N/A	N/A	BAL-LOW
Plot 14	Class G Grassland	Downslope 2°	9m	BAL-29
			Worst case BAL	**BAL-40**

2.3.1 Mandatory building setbacks required to achieve BAL-29

The LSP has been designed to provide for a road interface with the majority of the internal and external bushfire hazards. Where the perimeter roads are not of a sufficient width to achieve BAL-29 or where a direct lot interface exists, a mandatory setback area for any future built form is to be established. Both the perimeter roads and the mandatory setback areas would form Asset Protection Zones (APZs).

The areas of the LSP that would require mandatory setbacks are:

- The residential R60 coded lots adjacent to Plots 2, 3 and 4 (internal bushfire hazards).

Table 2B details the APZs that would be required for residential areas of the LSP adjacent to Plots 2, 3 and 4 to ensure a maximum radiant heat level of 29kW/m² is achieved for any developable portion of land.

The Residential Design Codes (R-Codes) require a 2m primary street setback for lots coded R-60. These mandatory setbacks will ensure that all habitable buildings within the northern and central blocks would achieve BAL-29 (see Figure 2E below).

With regard to the southern block, the Structure Plan requires a Local Development Plan (LDP) to be prepared as a condition of subdivision approval. The Local Development Plan shall specify that a minimum 2m setback from the eastern lot boundary is required for future habitable buildings to achieve BAL-29.

Table 2B: *Mandatory setbacks required to ensure developable land is subject to worst case BAL of BAL-29.*

Area	Initial BAL	Asset Protection Zone/ Setback	Revised BAL
Northern and Central blocks	BAL-40	15m APZ required to achieve BAL-29 • Road reserve width is 13m. • Setback of 2m required for habitable buildings sited along the eastern boundary of residential development area (see Figure 2E). • Primary street setback for R60 coded lots is 2m. • Total setback from Plots 2, 3 and 4 = 15m.	BAL-29
Southern block	BAL-40	15m APZ required to achieve BAL-29 • Parkland POS maintained by City of Cockburn forms part of the APZ – to a distance of 13m from lot boundary. • Setback of 2m required for habitable buildings sited along the eastern boundary of residential development area (see Figure 2F). • The Structure Plan requires a LDP to be prepared as a condition of subdivision approval to specify the required 2m setback. • Total setback from Plots 2, 3 and 4 = 15m.	BAL-29
		Worst case BAL (revised)	**BAL-29**

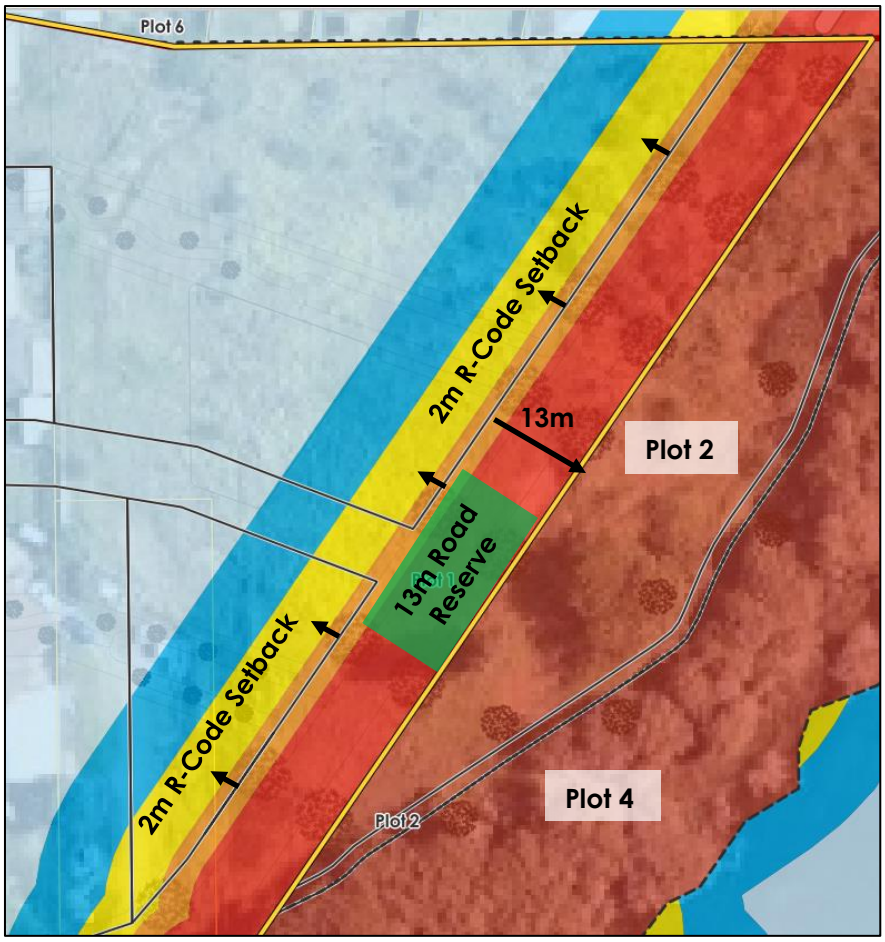


Figure 2E: *Setbacks required for northern and central blocks to achieve BAL-29*

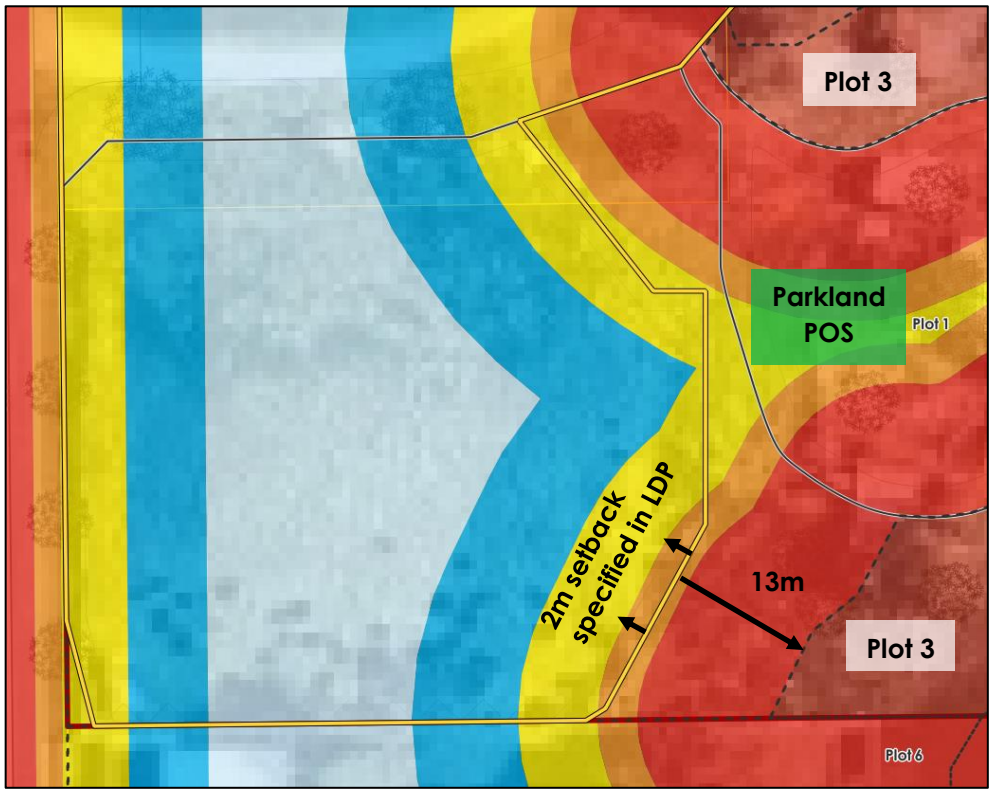


Figure 2F: *Setbacks required for southern block to achieve BAL-29*

2.4 Bushfire Context

In terms of threats to the site from a wider context, the greatest risk is from the bushland reserve north east of the site that is contiguous with scrub vegetation within and south of the site.

2.5 Bushfire Hazard Issues

From the BAL Contour Map, the following bushfire hazard issues have been identified.

- The external boundary of lots sited along the eastern boundary of all three blocks in the residential development area are subject to an initial BAL of BAL-40. Mandatory setbacks, forming APZs,are to be installed for future habitable buildings to reduce the BAL to BAL-29 as detailed in Table 2B.
    - For the northern and southern blocks, the Residential Design Codes (R-Codes) require a 2m primary street setback for lots coded R-60. These mandatory setbacks will ensure that all habitable buildings within the northern and central blocks would achieve BAL-29.
    - With regard to the southern block, the Structure Plan requires a Local Development Plan (LDP) to be prepared as a condition of subdivision approval. The Local Development Plan shall specify that a minimum 2m setback from the eastern lot boundary is required for future habitable buildings to achieve BAL-29.
- As part of the staging of development of the LSP area, all vegetation within the residential development area that is located within 100m (or 50m for unmanaged grassland) of any lots being constructed in that stage is to be reduced to and maintained as low threat vegetation in accordance with AS 3959 Exclusion 2.2.3.2(f) and Acceptable Solution A2.1 (Asset Protection Zone). This will be addressed at the subdivision stage of planning.
- The BAL ratings provided in the BAL Contour map and Table 2A are indicative only and are for the purposes of demonstrating compliance with the bushfire protection criteria of SPP 3.7 for the purposes of the LSP Application. An individual BAL assessment may be completed prior to applying for a Building Permit.
- Future BCA Class 1, 2, 3 and associated Class 10a buildings are to be constructed to the applicable construction standard of AS 3959.
- The proposed residential development area is subject to a BAL above BAL-LOW. The bushfire protection criteria relevant to the development are addressed in Section 4 of this report.

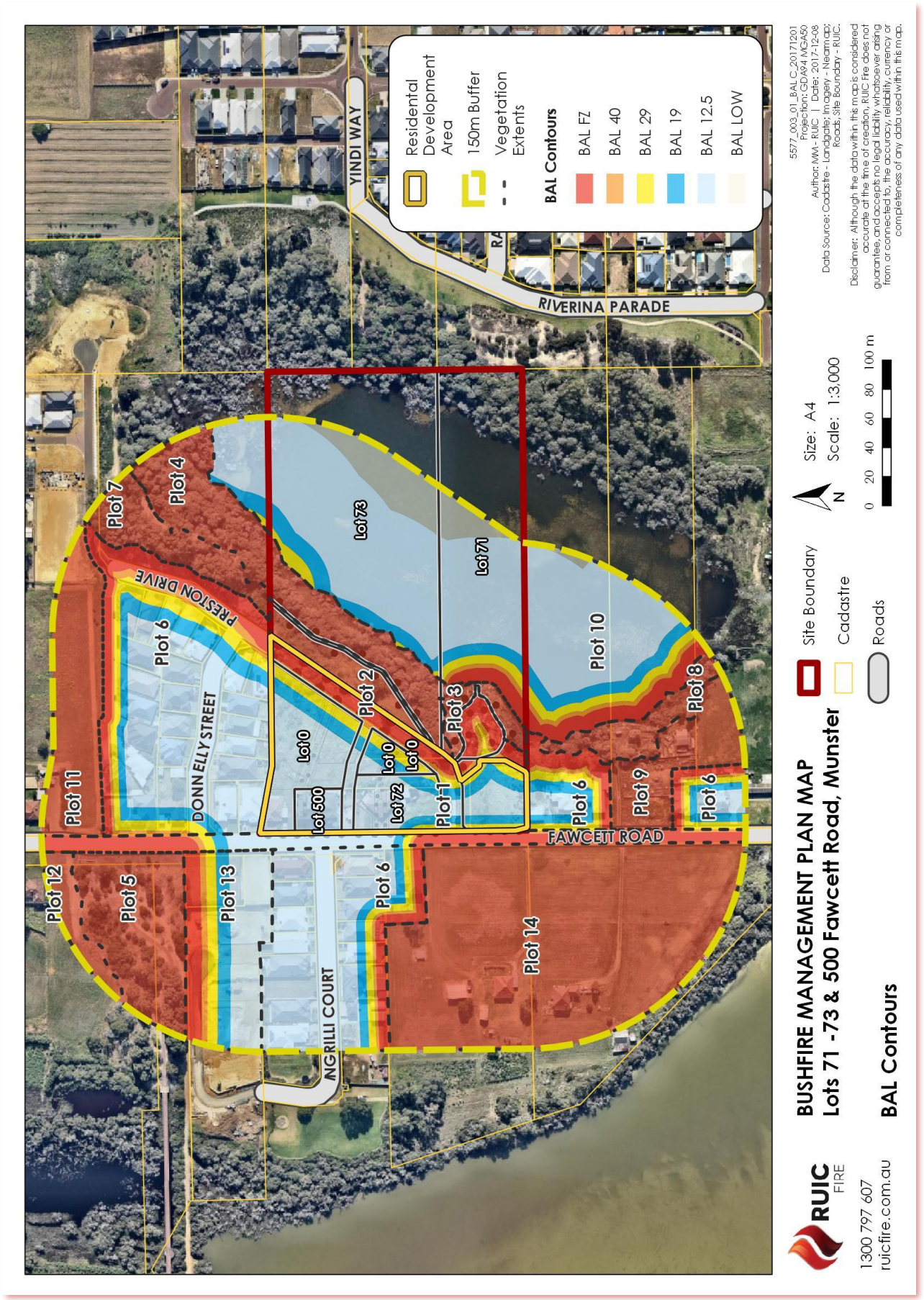


Figure 2C: *BAL Contour Map (overall view)*

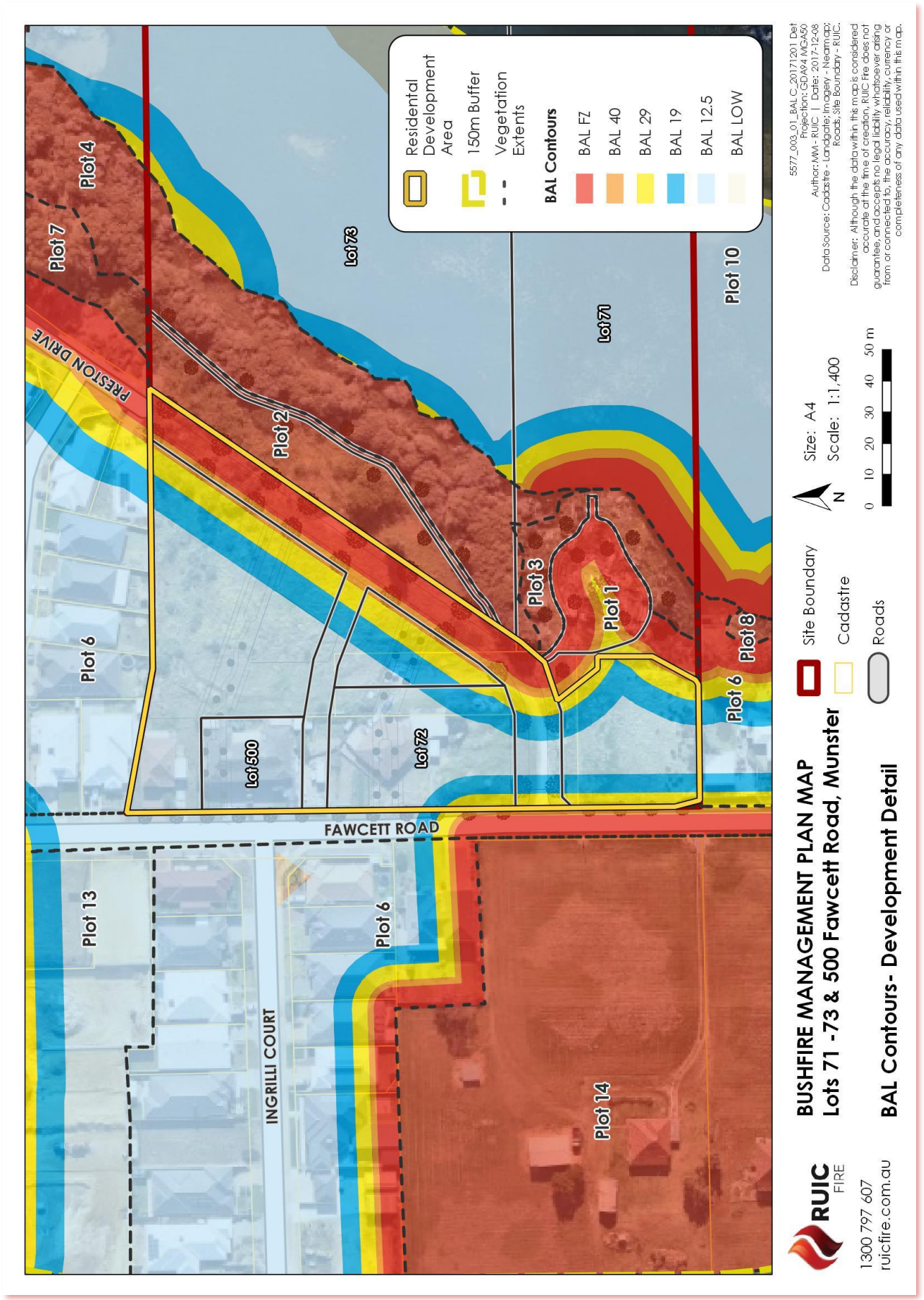


Figure 2C: *BAL Contour Map (detailed view)*

3.0 Proposal Compliance and Justification

3.1 State Planning Policy 3.7 – Planning in Bushfire Prone Areas (SPP 3.7)

SPP3.7 applies to all development applications in designated bushfire prone areas.

3.1.1 Objectives

Policy Measure 5 contains the objectives of SPP 3.7. The following demonstrates how the proposed development meets each of the objectives.

Objective 1: ***Avoid any increase in the threat of bushfire to people, property, and infrastructure. The preservation of life and management of bushfire impact is paramount.***

Development Response

Objective 1 is satisfied through the compliance of the proposed development with all required Policy Principles as detailed below and all Performance Principles of the Guidelines as detailed in Section 4 of this report.

Objective 2: ***Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making at all stages of the planning and development process.***

Development Response

Objective 2 is satisfied through the appropriate identification and assessment of all relevant bushfire hazards as detailed in Section 2 of this report, specifically the BAL Contour Mapping.

Objective 3: ***Ensure that higher order strategic planning documents, strategic planning proposals, subdivision and development applications take into account bushfire protection requirements and include specified bushfire protection measures.***

Development Response

Objective 3 is satisfied through the compliance of the proposed development with all required Policy Principles as detailed below and all Performance Principles of the Guidelines as detailed in Section 4 of this report.

Objective 4: ***Achieve an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management and landscape amenity, with consideration of the potential impacts of climate change.***

Development Response

Objective 4 is satisfied through the appropriate consideration of all biodiversity and environmental assets as detailed in Section 1 of this report in the development of bushfire related risk mitigation strategies detailed in Section 4 of this report.

3.1.2 Policy Measures

3.1.2.1 Strategic Planning Proposals

Policy Measure 6.2 requires that strategic planning proposals within designated bushfire prone areas and that have a BAL above BAL-LOW are to comply with Policy Measure 6.3.

3.1.2.2 Information to Accompany Strategic Planning Proposals

Policy Measure 6.3 applies to Strategic Planning Proposals. It requires certain information to be provided with such applications. The following outlines where the required information has been provided.

Table 3A: *Compliance of the proposed development with the Policy Measures of SPP 3.7*

Policy Measure	Description	Development Response
a	(i) the results of a BHL assessment determining the applicable hazard level(s) across the subject land, in accordance with the methodology set out in the Guidelines. BHL assessments should be prepared by an accredited Bushfire Planning Practitioner; or (ii) where the lot layout of the proposal is known, a BAL Contour Map to determine the indicative acceptable BAL ratings across the subject site, in accordance with the Guidelines. The BAL Contour Map should be prepared by an accredited Bushfire Planning Practitioner; and	Figures 2B and 2C provide the BAL Contour Map
b	The identification of any bushfire hazard issues arising from the relevant assessment; and	Section 2.5 addresses the bushfire hazard issues
c	Clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages.	Section 4 provides an assessment of the development against the bushfire protection criteria

3.1.2.3 Vulnerable or High Risk Land Uses

The proposed development does not contain any vulnerable or high risk land uses.

3.1.2.4 Applications in BAL-40/BAL-FZ Areas

On completion of development, the developable land would not be subject to BAL-40 or BAL-FZ as outlined in Section 2.1.

3.1.2.5 Advice of State/Relevant Authority/s for Emergency Services to be Sought

The proposed development:

- Complies with the SPP3.7 Policy measures;
- Is a **strategic planning proposal**;
- Does not propose any additional/alternative measures; and
- Does not contain unavoidable development, vulnerable or high risk land uses.

Therefore, the advice of State/Relevant Authorities for Emergency Services **is required** to be sought for this application.

3.1.2.6 Advice of State/Relevant Agencies/Authorities for Environmental Protection to be Sought

The proposed development:

- Is not known to propose clearing of vegetation within environmentally sensitive areas protected under State or Federal legislation;
- Is not known to propose clearing of locally significant native vegetation; and
- **Abuts vegetated land managed by that authority**.

Therefore, the advice of State/Relevant Agencies/Authorities for Environmental Protection **is required** to be sought for this application.

3.2 Guidelines for Planning in Bushfire Prone Areas Version 1.2 (the Guidelines)

The Guidelines apply to strategic planning proposals located within designated bushfire prone areas. The Guidelines provide supporting information for implementation of SPP 3.7. Specifically, they provide the Bushfire Protection Criteria to be addressed for all applications.

This report has also been developed in order to comply with the requirements of all referenced and applicable documents.

No non-compliances have been identified.

4.0 Bushfire Risk Management Measures

The bush fire risk mitigation strategies detailed in this report are designed to comply with the Bushfire Protection Criteria detailed in *Guidelines for Planning in Bushfire Prone Areas* (the Guidelines) Appendix 4 (2015).

i. The notation (P3) refers to Performance Principle 3 of the Guidelines Appendix 4.

ii. The notation (A3.1) refers to Acceptable Solution 3.1 of the Guidelines Appendix 4.

iii. The notation (E3.1) refers to Explanatory Note 3.1 of the Guidelines Appendix 4.

iv. Where discrepancy occurs between State and Local bushfire planning provisions the higher standard of mitigation has been selected.

4.1 Element 1 - Location

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

> **Performance Principle (P1):** The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low, or a BAL–29 or below, and the risk can be managed. For unavoidable development in areas where BAL–40 or BAL–FZ applies, demonstrating that the risk can be managed to the satisfaction of the Department of Fire and Emergency Services and the decision-maker.

The following table outlines the Acceptable Solutions (AS) that are relevant to the proposal; identifies where a Performance Solution (PS) has been used instead of an AS; and states, where applicable, the reason why the AS is not relevant to the proposal.

Solution	AS	PS	N/A	Comment
A1.1 Development location	☒	☐	☐	Mandatory setbacks required

> **Acceptable Solution A1.1 Development location**
>
> The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL–29 or below.

Development Response/Recommendations

As outlined in Tables 2A and 2B the development would ensure all future habitable buildings are, upon completion of development, located in an area subject to BAL-29 or lower.

The external boundary of lots sited along the eastern boundary of all three blocks in the residential development area are subject to an initial BAL of BAL-40. Mandatory setbacks, forming APZs ,are to be installed for future habitable buildings to reduce the BAL to BAL-29 as detailed in Table 2B.

For the northern and southern blocks, the Residential Design Codes (R-Codes) require a 2m primary street setback for lots coded R-60. These mandatory setbacks will ensure that all habitable buildings within the northern and central blocks would achieve BAL-29.

With regard to the southern block, the Structure Plan requires a Local Development Plan (LDP) to be prepared as a condition of subdivision approval. The Local Development Plan shall specify that a minimum 2m setback from the eastern lot boundary is required for future habitable buildings to achieve BAL-29.

4.2 Element 2 – Siting and Design of Development

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

Performance Principle (P2): The siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire threat that applies to the site. That it incorporates a defendable space and significantly reduces the heat intensities at the building surface thereby minimising the bushfire risk to people, property and infrastructure, including compliance with AS 3959 if appropriate.

The following table outlines the Acceptable Solutions (AS) that are relevant to the proposal; identifies where a Performance Solution (PS) has been used instead of an AS; and states, where applicable, the reason why the AS is not relevant to the proposal.

Solution	AS	PS	N/A	Comment
A2.1 Asset Protection Zone	☒	☐	☐	

Acceptable Solution A2.1 Asset Protection Zone (APZ)

Every building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements:

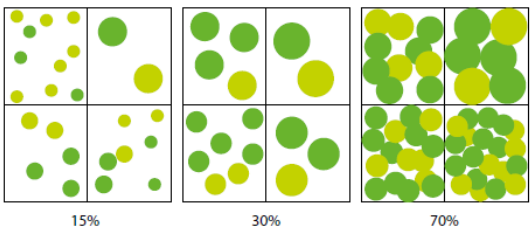
a. **Width**: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m² (BAL-29) in all circumstances.

b. **Location**: the APZ should be contained solely within the boundaries of the lot on which a building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes).

c. **Management**: the APZ is managed in accordance with the requirements of '*Standards for Asset Protection Zones' (below):*

- **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.

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



Source: *The Guidelines (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.

Explanatory Notes:
An APZ is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level. The width of the required APZ varies with slope and vegetation. The APZ should at a minimum be of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m² (BAL-29). It should be lot specific. Hazard separation in the form of using subdivision design elements (refer to E2) or excluded and low threat vegetation adjacent to the lot may be used to reduce the dimensions of the APZ within the lot.

The APZ includes a defendable space which is an area adjoining the asset within which firefighting operations can be undertaken to defend the structure. Vegetation within the defendable space should be kept at an absolute minimum and the area should be free from combustible items and obstructions. The width of the defendable space is dependent on the space which is available on the property, but as a minimum should be 3 metres.

The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity. The APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context, but does not include grassland or vegetation on a neighbouring rural lot, farmland, wetland reserves and unmanaged public reserves.

Development Response/Recommendations

The APZ(s) proposed as part of this development are illustrated in Figure 4A. The proposed residential lots are to be managed entirely as APZs.

Implementation

i. APZs to be implemented prior to the clearance of subdivision for affected lots in accordance with Figure 4A and provisions a-c above.

ii. It is the responsibility of the individual landowner to ensure the APZ standard is established.

iii. It is the responsibility of the individual property owner to ensure the APZ standard continues to be achieved post completion of the construction.

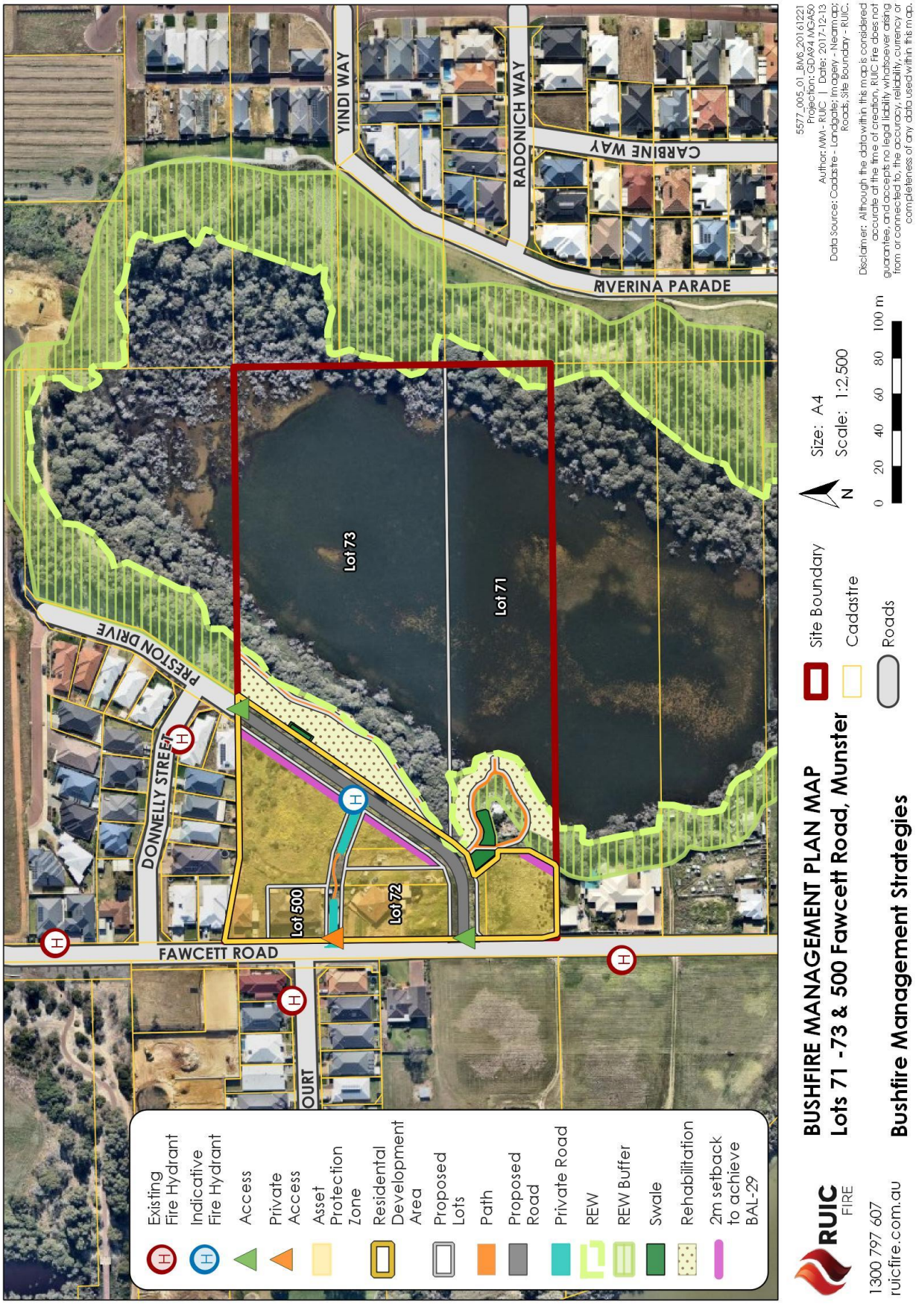


Figure 4A: *Bushfire Management Strategies Map*

4.3 Element 3 - Vehicular Access

Intent: To ensure that the vehicular access serving a subdivision/ development is safe in the event of a bush fire occurring.

> **Performance Principle (P3):** The internal layout, design and construction of public and private vehicular access in the subdivision/development allows emergency and other vehicles to move through it easily and safely at all times.

The following table outlines the Acceptable Solutions (AS) that are relevant to the proposal; identifies where a Performance Solution (PS) has been used instead of an AS; and states, where applicable, the reason why the AS is not relevant to the proposal.

Solution	AS	PS	N/A	Comment
A3.1 Two access routes	☒	☐	☐	
A3.2 Public road	☒	☐	☐	
A3.3 Cul-de-sac (including a dead-end road)	☐	☐	☒	Not included in development
A3.4 Battle-axe	☐	☐	☒	Not included in development
A3.5 Private driveway longer than 50 metres	☒	☐	☐	
A3.6 Emergency access way	☐	☐	☒	Not included in development
A3.7 Fire service access routes	☐	☐	☒	Not included in development
A3.8 Firebreak width	☐	☐	☐	

Table 4A: *Vehicular access technical requirements*

Technical Requirement	Public road	Cul-de-sac	Private driveway	Emergency access way	Fire service access routes
Minimum trafficable surface (m)	6	6	4	6	6
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4	N/A	4.5	4.5	4.5
Maximum grade over <50m	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

Acceptable Solution A3.1 Two access routes

Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents/the public at all times and under all weather conditions.

Development Response/Recommendations

Figures 4A and 4B illustrate access available to the site. On completion of the development, the site will be directly accessed from the north by Preston Drive which connects the site to Fawcett Road via Donnelley Road approximately 175m north west of the site. Preston Drive will be extended south through the site to join with Fawcett Road adjacent to the south west boundary of the site.

Two access routes are to be provided during staging of the development.

The development therefore achieves at least two different vehicular access routes, both connecting to the public road network to provide egress to two different destinations at all times, including during staging of the development.

Acceptable Solution A3.2 Public road

A public road is to meet the requirements in Table 4A, Column 1.

Development Response/Recommendations

The extension of Preston Drive south through the site is to be designed and constructed to comply with A3.2.

Implementation

i. Public roads are to be constructed prior to the clearance of subdivision for affected lots serviced by the public road.

ii. It is the responsibility of the developer to ensure the public road standard is established in accordance with Table 4A.

iii. It is the responsibility of Local and State Government (as appropriate) to ensure the maintenance of public roads vested within their jurisdiction.

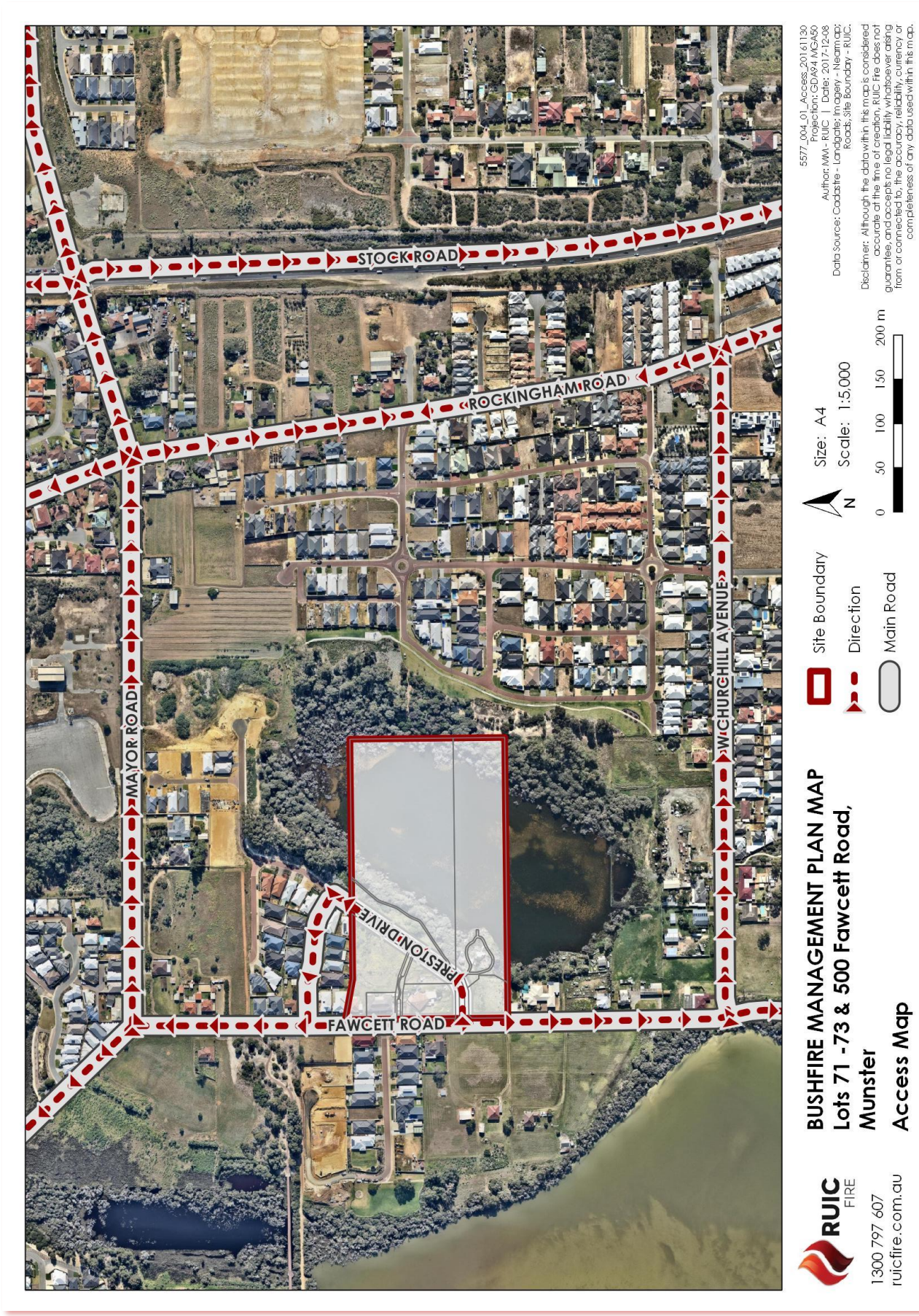


Figure 4B: *Site Access*

Acceptable Solution A3.3 Cul-de-sac (including a dead-end road)

Development Response/Recommendations

The proposed development does not include any cul-de-sacs and is not serviced by an existing cul-de-sac. Therefore, A3.3 is not applicable to this development.

Acceptable Solution A3.4 Battle-axe

Development Response/Recommendations

The proposed development does not include any battle-axe lots. Therefore, A3.4 is not applicable to this development.

Acceptable Solution 3.5 Private driveway longer than 50 metres

A private driveway is to meet all of the following requirements:

a. Requirements in Table 4A, Column 3;

b. Required where a house site is more than 50 metres from a public road;

c. Passing bays: every 200 metres with a minimum length of 20 metres and a minimum width of two metres (i.e. the combined width of the passing bay and constructed private driveway to be a minimum six metres);

d. Turn-around areas designed to accommodate type 3.4 fire appliances and to enable them to turn around safely every 500 metres (i.e. kerb to kerb 17.5 metres) and within 50 metres of a house; and

e. Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes.

f. All-weather surface (i.e. compacted gravel, limestone or sealed).

Development Response/Recommendations

Where future habitable buildings are located more than 50 metre from a public road, private driveways are required to comply with A3.5. This will be addressed at the development application stage of planning.

The Urban Design Principles Plan shows two central roads, linked by a pedestrian access way located within the residential development area. Depending on the form of development or subdivision (single, grouped or multiple dwellings) the pedestrian link/ vehicle link may be within common property (with an easement for pedestrian access), a Right of Way (RoW) or Pedestrian Access Way (PAW). These roads are private roads and are to comply with A3.5. This will be addressed at the subdivision and/ or development application stage of planning.

<u>Implementation</u>

i. To be implemented prior to occupation of the first habitable building serviced by the private driveway.

ii. Pedestrian link/ vehicle link:

a. It is the responsibility of the developer to ensure the private driveway meets the required standard in accordance with Table 4A and provisions b-f above.

b. In the event access is via common property, maintenance would be the responsibility of the body corporate, in the event it is within a RoW or PAW, maintenance would be the responsibility of the local authority.

iii. Other private driveways:

a. It is the responsibility of the individual landowner to ensure the private driveway meets the required standard in accordance with Table 4A and provisions b-f above.

b. It is the responsibility of the individual landowner to ensure the private driveway continues to meets the required standard.

Acceptable Solution 3.6 Emergency access way

Development Response/Recommendations

The proposed development does not include emergency access ways. Therefore, A3.6 is not applicable to this development.

Acceptable Solution 3.7 Fire service access routes (perimeter roads)

Development Response/Recommendations

The proposed development does not include fire service access routes. Therefore, A3.7 is not applicable to this development.

Acceptable Solution A3.8 Firebreak width

Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level as prescribed in the local firebreak notice issued by the local government.

Development Response/Recommendations

Lots greater than 2032m^2 in area and any balance title lots are required to have a 3 metre wide internal perimeter firebreak installed in accordance with the annual City of Cockburn Fire Control Order as amended.

The current Fire Control Order (City of Cockburn, 2015) is included at Appendix 2 and summarised below:

All property (vacant or developed) – less than 2032m^2

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

- Have all flammable materials such as long dry grass and weeds slashed, mown or trimmed down by other means to a maximum height of 50mm across the entire property for the duration of this Firebreak Time; and
- Remove all dead vegetation

All property (vacant or developed) – 2032m^2 or greater

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

- Construct a Firebreak (as defined within section 3 of this order) immediately inside all external property boundaries, including those adjacent to roads, drains, rail reserves and any public open space reserves; and
- Remove all dead vegetation surrounding and over all habitable buildings to a radius of 3 metres except living trees, shrubs, maintained green lawns and gardens under cultivation.

Implementation

i. To be implemented prior to 1st November in each year as required by the City of Cockburn.

ii. It is the responsibility of the developer to ensure the firebreaks and fuel reduction works meet the required standard in accordance with A3.8 and the annual firebreak notice issued by the City of Cockburn.

iii. It is the responsibility of the individual landowner to ensure the firebreaks continue to meet the required standard.

4.4 Element 4 – Water

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

Performance Principle (P4): The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for firefighting purposes.

The following table outlines the Acceptable Solutions (AS) that are relevant to the proposal; identifies where a Performance Solution (PS) has been used instead of an AS; and states, where applicable, the reason why the AS is not relevant to the proposal.

Solution	AS	PS	N/A	Comment
A4.1 Reticulated areas	☒	☐	☐	
A4.2 Non-reticulated areas	☐	☐	☒	Reticulated area
A4.3 Individual lots within non-reticulated areas	☐	☐	☒	Reticulated area

Acceptable Solution A4.1 Reticulated areas

The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.

Development Response/Recommendations

The site will be serviced by reticulated scheme water and existing and future firefighting hydrants, satisfying Acceptable Solution A4.1. The locations of existing and the indicative location of proposed fire hydrants are shown in Figure 4A.

Implementation

i. New fire hydrants to be implemented prior to occupation of the buildings serviced by the firefighting hydrants.

ii. It is the responsibility of the developer to ensure the firefighting hydrants meet the required standard.

iii. It is the responsibility of the Water Corporation to ensure the firefighting hydrants continue to meet the required standard.

Acceptable Solution A4.2 Non-reticulated areas

Development Response/Recommendations

The site will be serviced by reticulated scheme water and firefighting hydrants. Therefore, A4.2 is not applicable to this development.

Acceptable Solution A4.3 Individual lots within non-reticulated areas (Only for use if creating one additional lot and cannot be applied cumulatively)

Development Response/Recommendations

The site will be serviced by reticulated scheme water and firefighting hydrants. Therefore, A4.3 is not applicable to this development.

5.0 Implementation and Enforcement

Table 5A: *Schedule of Works*

Strategy	Implementation		Maintenance	
	Responsible	Time Frame	Responsible	Time Frame
Amendments to BMP	Any amendments to this BMP shall be approved by the relevant Jurisdiction Having Authority			
Asset protection zone	Developer	Prior to clearance of subdivision	Individual land owner	Ongoing
Construction to AS 3959	Individual land owner & Local Government	On construction of all habitable buildings	Individual land owner	Ongoing
Public roads	Developer	Prior to clearance of subdivision	State and/ or Local Government	Ongoing
Cul-de-sacs	N/A	N/A	N/A	N/A
Battle-axes	N/A	N/A	N/A	N/A
Private driveways longer than 50m	Developer	Prior to occupation of first habitable building	Individual land owner	Ongoing
Emergency access ways	N/A	N/A	N/A	N/A
Fire service access routes	N/A	N/A	N/A	N/A
Firebreaks	Developer	Prior to 1st November in each year	Individual land owner	Ongoing
Firefighting water (hydrants - existing)	Existing	Existing	Water Corporation	Ongoing
Firefighting water (hydrants - proposed)	Developer	Prior to occupation of all habitable buildings	Water Corporation	Ongoing
Firefighting water (private tanks)	N/A	N/A	N/A	N/A
Public Open Space and swales	Developer	Prior to clearance of subdivision	Local Government	Ongoing
Local Development Plan to enforce rear setbacks	Developer	Prior to clearance of subdivision	N/A	N/A

Strategy	Implementation		Maintenance	
	Responsible	Time Frame	Responsible	Time Frame
Firefighting services and response	DFES and Local Government	Ongoing	DFES and Local Government	Ongoing
Fuel load reduction and firebreak notice works	Developer	In accordance with firebreak notice	Individual Landowner	Ongoing
Fuel load reduction and firebreak notice works	Local Government	In accordance with firebreak notice	Local Government	In accordance with firebreak notice
Inspection and issue of works orders or fines	Local Government	Ongoing	Local Government	Ongoing

6.0 References

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OBRM. (2017). Map of Bush Fire Prone Areas 2017. Office of Bushfire Risk Management, WA.

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Standards Australia. (2009). AS 3959:2009 Construction of buildings in bushfire prone areas: SAI Global.

WAPC. (2015). State Planning Policy 3.7 Planning in Bushfire Prone Areas. Western Australian Planning Commission & Department of Planning.

WAPC. (2016). Planning Bulletin 111/2016 Planning in Bushfire Prone Areas. Western Australian Planning Commission.

WAPC. (2017a). Guidelines for Planning in Bushfire Prone Areas Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.

WAPC. (2017b). Guidelines for Planning in Bushfire Prone Areas Appendices Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.

7.0 Appendix 1

Landscape Concept Plan

FAWCETT ROAD LANDSCAPE CONCEPT PLAN

- Gross Subdivisible Area 1.89 ha
- POS Area required (5%) 945 m^2
- POS comprises: Paths 983 m^2 (5.2%)
  Park 1,000 m^2 (5.3%)
  Rehabilitation 3,836 m^2 (20.3%)

Fire Protection

- Entirety of each residential lot is to maintained as an Asset Protection Zone (APZ).
- For lots abutting Preston Drive, APZ comprises minimum 2m front building setback and 13m road reserve (total 15m).
- For lots in the south of site directly abutting the wetland buffer, APZ includes infiltration swale, path, grassed parkland and 3m minimum building setback from eastern boundary.

Road Verges

- Area (approx.) 730 m^2.
- Low-threat vegetation in accordance with AS 3959-2009 Clause 2.2.3.2(f) and *Guidelines for Planning in Bushfire Prone Areas* A2.1.
- Trees (paperbarks) every ~20m.
- Irrigate by tanker or subsurface drip during first summer as required.
- Concrete path on south/east side of Preston Drive.
- Residents/lot developers responsible for grass planting & irrigation.

Infiltration Swales

- Area (approx.) - Primary swales (1-year ARI): 162 m^2
  - Overflow swales (100-year ARI): 160 m^2.
- Amended soil (e.g. crushed laterite, limesand) with PRI > 15.
- Northern swale: Planted with dense drought-tolerant sedges and low (<2m) shrubs at 0.5–1 m spacing. Irrigated by tanker or subsurface drip for first summer as required; thereafter unirrigated.
- Southern swales: Irrigated turf; regularly mown.

Wetland Buffer Rehabilitation

- Area (approx.) 3,836 m^2.
- Remove rubble and unclean fill from south-east corner; backfill with clean sand.
- Remove *Juncus acutus* infestation.
- Construct unsealed (gravel/limestone) path on edge, following existing alignment from north.
- Plant with upland trees, shrubs & sedges e.g. Tuart (at >28m spacing), paperbarks, understorey species.

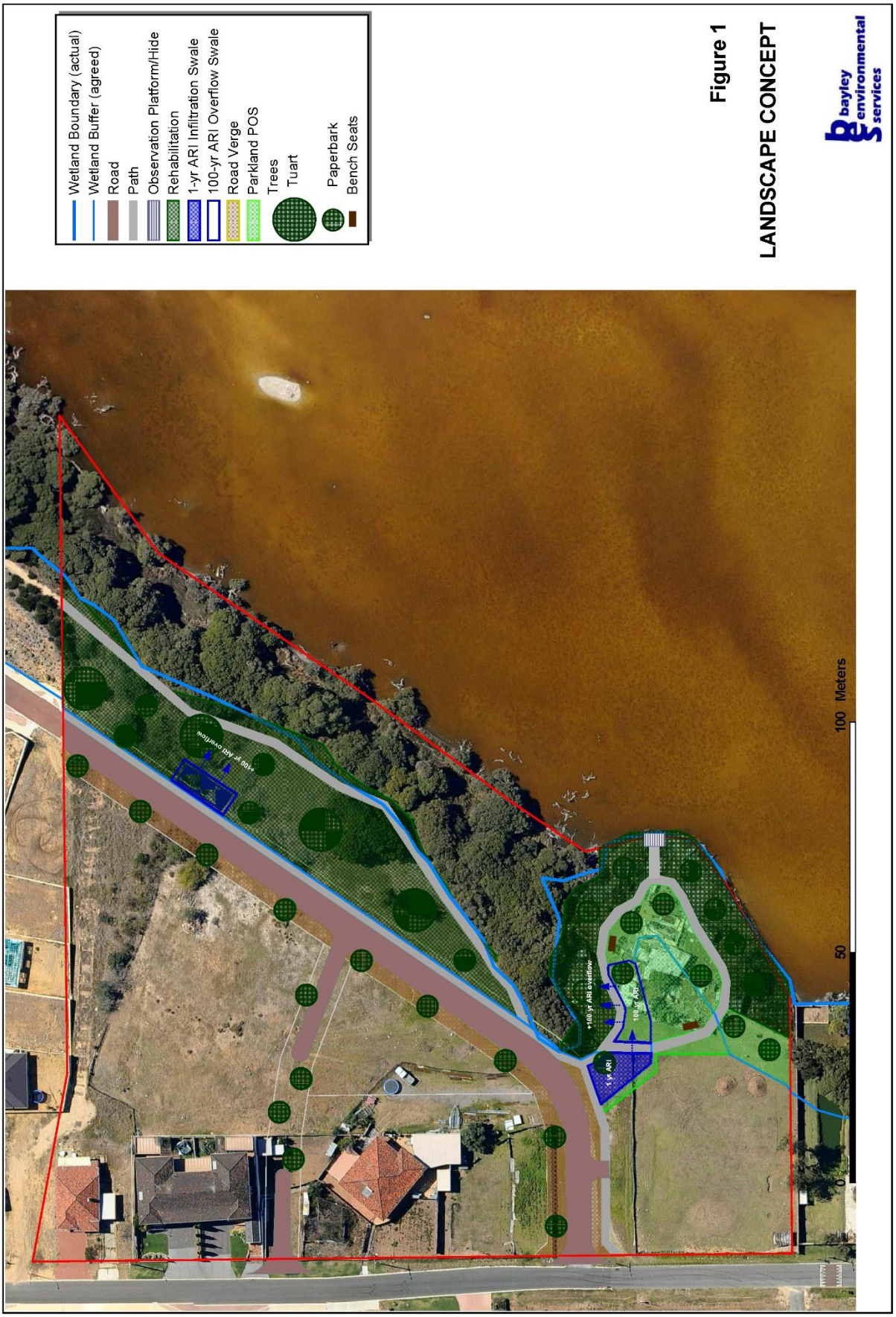
- Ultimate state will be a continuous horizontal and vertical vegetation structure with scattered emergent Tuarts (see Figure 2).
- Irrigated by tanker or subsurface drip for first summer as required; thereafter unirrigated.

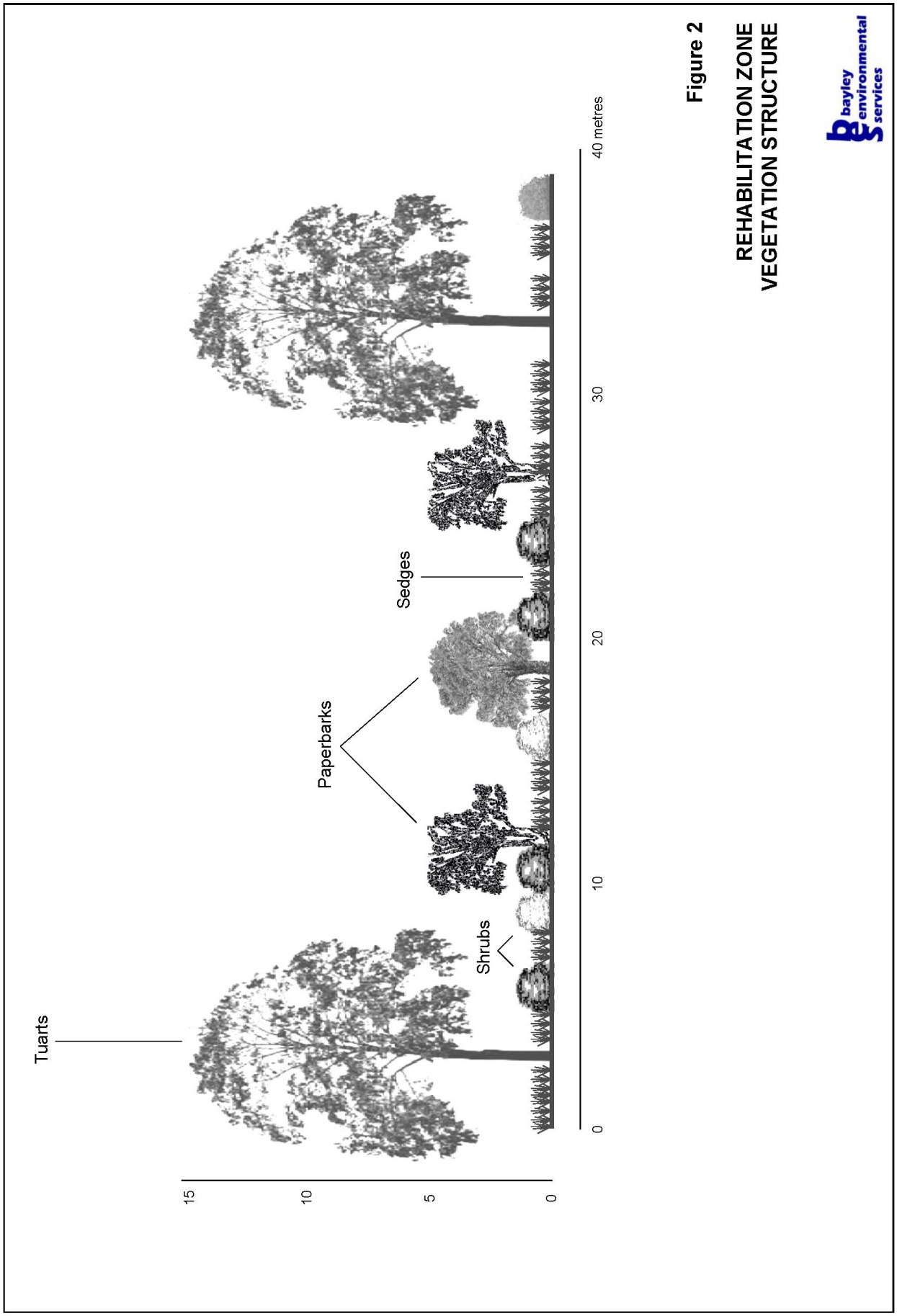
Parkland POS

- Area (approx.) 1,000 m^2
- Remove rubble and unclean fill from south-east corner; backfill with clean sand.
- Loop concrete path around grassed area.
- Plant with irrigated turf.
- Pop-up sprinklers fed by bore.
- Possible observation platform/hide on edge of lake.
- Feature trees: Paperbarks.
- Bench seats.

Water Supply

- Water for short-term irrigation of new plantings in the rehabilitation zone, road verges and northern swale will be supplied by subsurface drip lines or tanker truck, filled from either scheme supply or bore water via an off-site standpipe.
- If supplied by tanker, the water source will be the responsibility of the contractor engaged to carry out the watering.
- Ongoing irrigation of lawn in the parkland will be by groundwater supplied from an on-site bore.
- The ongoing water requirement for POS irrigation will be about 745 kL/yr.
- The maximum water requirement (assuming all irrigation is supplied from onsite) is 2,581 kL in the first year.
- The subject land is located in the Kogolup sub-area of the Cockburn groundwater area.
- The Department of Water advised in June 2011 that the Kogolup sub-area had approximately 716,000 kL/yr available for allocation.
- DoW records (wir.water.wa.gov.au) show several existing or previous bores west of MGS3 within 300m of the POS that have yielded water with salinities of 990 – 1500 mg/L TDS from depths of 6.5 - 20m. Shallow bore sampling within the subject site has shown groundwater salinities of 840 – 1080 mg/L within 100m of MGS3.
- Test drilling will be required to confirm the availability of groundwater suitable for irrigation within the site. However, the very small quantity required (maximum 2,581 kL/yr for first year, equivalent to 600 litres/hr over 180 day irrigation period) suggests that sufficient water should be readily available from a domestic-scale bore.


Figure 1
LANDSCAPE CONCEPT
bayley environmental services
Wetland Boundary (actual)
Wetland Buffer (agreed)
Road
Path
Observation Platform/Hide
Rehabilitation
1-yr ARI Infiltration Swale
100-yr ARI Overflow Swale
Road Verge
Parkland POS
Trees
Tuart
Paperbark
Bench Seats
100 Meters
50
0


Figure 2
REHABILITATION ZONE
VEGETATION STRUCTURE
bayley environmental services
Tuarts
Shrubs
Paperbarks
Sedges
0
10
20
30
40 metres
0
5
10
15

8.0 Appendix 2

City of Cockburn Fire Control Order (effective from 9 July 2015)

City of Cockburn Fire Control Order
Effective from 9 July 2015
First and Final Notice

Pursuant to *Section 33* of the *Bush Fires Act 1954* owners or occupiers of land situated within the City of Cockburn are required by law to comply with the prescribed Fire Control Order here within.

Definitions:

Authorised Officer	An officer appointed as a City of Cockburn Fire Control Officer.
Flammable Material	Any dead or dry grass, vegetable, substance, object, thing or material (except living flora including live and/ or habitat standing trees) that may or is likely to catch fire and burn or any other thing deemed by an Authorised Officer to be capable of combustion.
Prohibited Burning Time	The time period of each year where it is unlawful to set fire to the bush at any time. This time is normally from 1 December of each year until and including 31 March of the following year. This time may be amended, subject to prevailing seasonal conditions.
Restricted Burning Time	The time period of each year where it is unlawful to set fire to the bush without a valid Permit to Set Fire To The Bush issued by an Authorised Officer. This period normally is from 1 April until and including 31 May and from 1 October until and including 30 November of any year. This time may be amended, subject to the prevailing seasonal conditions.
Unrestricted Burning Time	The time period of each year where it is lawful to set fire to the bush at any time, in areas zoned rural under the City of Cockburn Town Planning Scheme. This time normally is from 1 June until and including 30 September. This time may be amended, subject to the prevailing seasonal conditions.
Firebreak Time	The time of each year where fire hazard reduction works must be maintained as specified in this Fire Control Order. This time is 1 November of each year until and including 15 April of the following year.

1 All property (vacant or developed) –less than 2032m2

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

1.1 Have all flammable materials such as long dry grass and weeds slashed, mown or trimmed down by other means to a maximum height of 50mm across the entire property for the duration of this Firebreak Time; and

1.2 Remove all dead vegetation.

2 All property (vacant or developed) – 2032m2 or greater

To reduce the fire hazard on your land and to comply with the requirements of this Fire Control Order you are required to;

2.1 Construct a Firebreak (as defined within section 3 of this order) immediately inside all external property boundaries, including those adjacent to roads, drains, rail reserves and any public open space reserves; and

2.2 Remove all dead vegetation surrounding and over all habitable buildings to a radius of 3 metres except living trees, shrubs, maintained green lawns and gardens under cultivation.

3 Firebreak Specifications

A Firebreak is an area of land cleared of flammable material, installed to minimise the spread or extension of a bush fire and to provide suitable access for fire fighting vehicles. The standards of a compliant Firebreak are as follows;

3.1 A Firebreak must be constructed of bare earth, stone, or sealed surfaces and be clear of all flammable materials to create a 3 metre wide trafficable surface;

3.2 Maintained lawn may occupy a Firebreak, providing it does not exceed 50mm in height during the Firebreak Time;

3.3 Overhanging branches must be pruned to provide a 4 metre vertical clearance above the full width of the Firebreak surface; and

3.4 A Firebreak must be a continuous trafficable path for a fire fighting vehicle, clear of any obstructions and must not terminate in a cul-de-sac (dead end).

4 Additional Works

Regardless of land size and location, the City of Cockburn or its Authorised Officer may require you to undertake additional works on your property to improve access and/or undertake further works where in the opinion of that Authorised Officer, these works would be conducive to preventing the outbreak and/or the spread or extension of a bush fire.

5 Fire Control Order Variations

A variation will be considered where the owner and/or occupiers believe it is impractical to meet the compliance requirements of this Fire Control Order. A firebreak variation application must be submitted in writing to the City of Cockburn for consideration before 1 October of each year. If approved, variations will be valid for three (3) years, unless a new variation has been approved or the property changes ownership during this time.

The City of Cockburn reserves the right to review, amend or revoke an existing variation in writing at any time. Should a request to vary the Fire Control Order requirements on your property not be approved in writing, this Fire Control Order must be complied with as applicable in its entirety.

6 Hazard Reduction Burning

During the declared Prohibited Burning Time owners and/or occupiers cannot undertake any bush or garden refuse burning activities.

During the declared Restricted Burning Time only, owners and/or occupiers may:

6.1 Apply for a permit to burn the bush for bush fire risk mitigation purposes, by following the conditions imposed on a permit to burn as issued by an Authorised Officer.

6.2 In areas zoned rural by the City's Town Planning Scheme, you may undertake burning of leaves, tree branches, and other dry vegetation in piles no larger than 1.0m^3 in size, without a permit to burn, subject to the following conditions:

6.2.1 No Flammable Material (other than that being burned) is to be within 5 m of the fire at any time while the fire is burning;
6.2.2 the fire is lit between 6 p.m. and 11pm and is completely extinguished before midnight on the same day;
6.2.3 at least one person is present at the site of the fire at all times until it is completely extinguished; and
6.2.4 When the fire is no longer required, the person ensures that the fire is completely extinguished by the application of water or earth.

During the Unrestricted Burning Time, owners and/or occupiers in areas zoned rural under the City's Town Scheme may burn garden refuse and set fire to bush on their land without a permit 'To Set Fire To The Bush'. Burning of the bush must be in accordance with all relevant State legislative requirements.

Burning of garden refuse in areas not zoned rural shall not be undertaken within the City of Cockburn.

Burning of household waste is prohibited in all areas of the City of Cockburn.

7 Penalties

Failing to comply with this Fire Control Order will result in a penalty of up to $5,000. A person in default is also liable whether prosecuted or not to pay the costs of performing the work directed by a City's Authorised Officer.

Any owner and/or occupier who engages a contractor to undertake works on their behalf is responsible to ensure that the works completed meet the requirements of this Fire Control Order.

Any Fire Control Order previously published by the City of Cockburn in the Government Gazette or in any Western Australian newsprint is hereby revoked.

By Order of Council

APPENDIX 5

Department of Aboriginal Affairs Site Search



Source: Department of Indigenous Affairs

APPENDIX 6

Opportunities and Constraints Plan



OPPORTUNITIES & CONSTRAINTS PLAN

Lots 71 - 73 & 500
Fawcett Rd, MUNSTER

Plan No.	10757-OppsCons-04B	
Date	04/09/17	
Drawn	JPW	
Checked	DM	
Revision	B	
Scale	1:1000@A3	

PERTH & FORRESTDALE:
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PERTH WA 6000
1/2 Hensbrook Loop,
FORRESTDALE WA 6112
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ALBANY | BUNBURY | BUSSELTON | FORRESTDALE | PERTH

0 10m 20m 30m

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NOTE: This plan has been prepared for planning purposes. Areas, Contours and Dimensions shown are subject to survey

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PLANNING & SURVEY SOLUTIONS

APPENDIX 7

Urban Design Principles to Inform Local Development Plan



URBAN DESIGN PRINCIPLES

1. Local Development Plans should ensure context sensitive interfaces are achieved with existing residential land use to the North, South and West of the development site as well as to Market Garden Swamp #3. Context sensitive responses should consider building height and scale, setbacks, visual privacy, overshadowing, articulation, landscaping and earth working requirements, and visual connectivity between Fawcett Road and the Wetland.
2. A Pedestrian link is to be provided between Fawcett Road and Market Garden Swamp #3 wetlands to facilitate connectivity, views to the wetlands and achieve breaks in the built form fronting roads.
3. Primary dwelling orientation should encourage passive surveillance of public roads, pedestrian links and private and public open space areas.
4. Should the dwelling on Lot 500 be retained, an LDP shall consider how surrounding built form will contribute to a consistent streetscape.
5. Carparking areas should be internally located and achieve good levels of passive surveillance.

LEGEND

- Public Realm Interface (refer to Urban Design Principles 1 - 3)
- Existing Development Interface (refer to Urban Design Principle 1)
- Primary Dwelling Orientation
- Indicative Pedestrian Link / Vehicle Access

NOTE
This plan is for illustrative purposes only. The siting of buildings, parking areas, crossovers and landscaping would be subject to further detailed design and approval by the City of Cockburn.

URBAN DESIGN PRINCIPLES
(To Inform Local Development Plan)
Lots 71 - 73 & 500
Fawcett Rd, MUNSTER

Plan No.	10757-UDP-170904-K	
Date	04/09/17	
Drawn	JPW	
Checked	DM	
Revision	K	
Scale	1:1000@A3	0 10m 20m 30m

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Busselton and Kelmscott

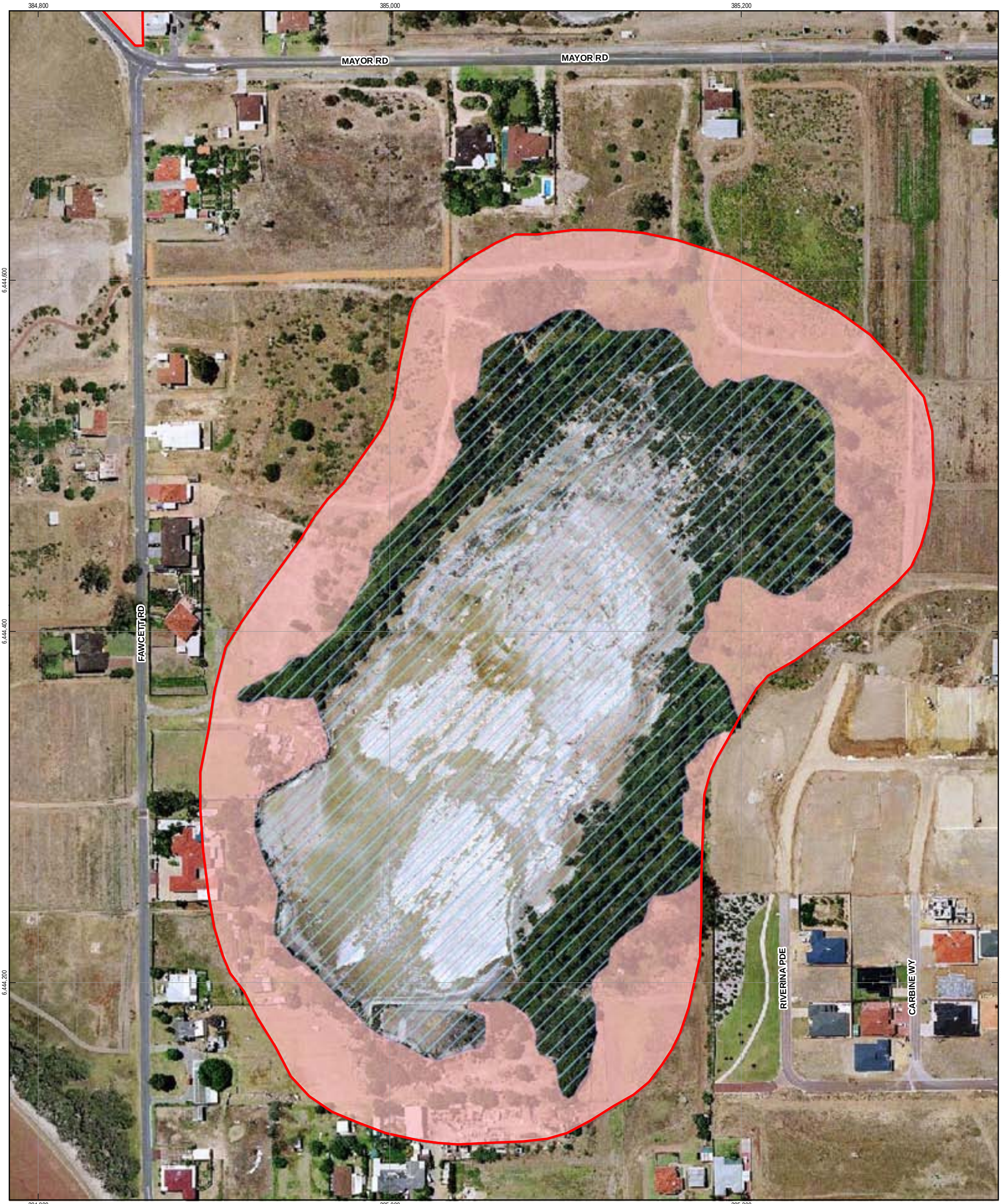
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APPENDIX 8

Market Garden Swamp Environmental Management Plan Extract



LEGEND

- Study Area - GHD - 20080222
- Cadastre - Landgate - 20080418

Management Zones - GHD - 20080508

- Conservation and Protection
- Nature Focus Zone
- Recreation

1:2,000 (at A3)

0 10 20 40 60 80 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 50

N

Locality Map

INDIAN OCEAN

City Of Cockburn
Update of Market Garden
Swamp Management Plan

Management Zones Map D

Job Number	6121888
Revision	0
Date	12 June 2008

Figure 6

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Dataset names include published date where available. Aerial photography dated Dec 2006 Metro Central Mosaic 2007 sourced from SLIP - Mar 2008. Created by: K Iralu

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