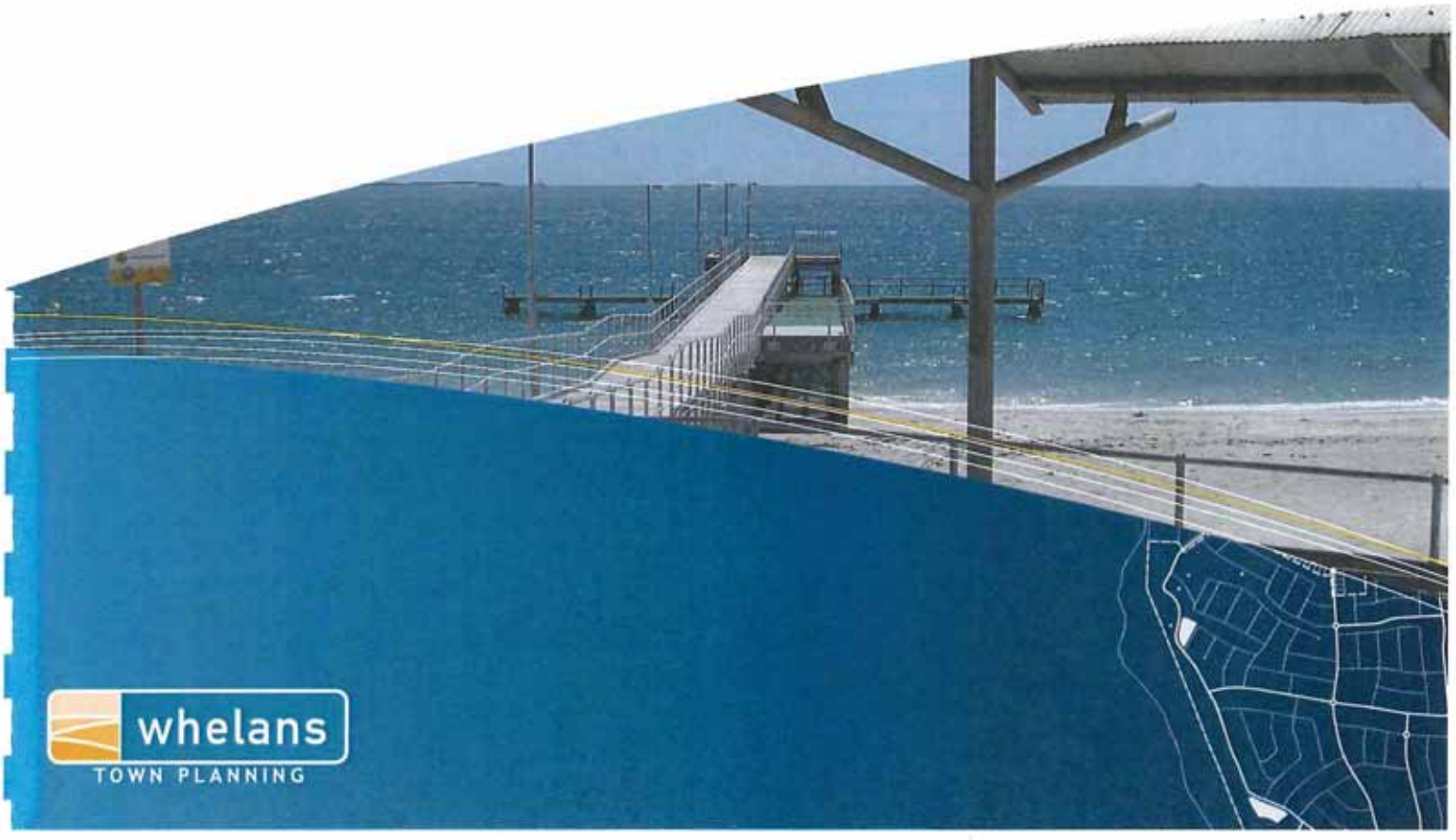
LOTS 14 – 18, 41 & 500 OCEAN ROAD, COOGEE
LOCAL STRUCTURE PLAN



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LOCAL STRUCTURE PLAN

LOTS 14 – 18, 41 & 500 OCEAN ROAD, COOGEE

CITY OF COCKBURN

PREPARED FOR
TERRANOVIS PTY LTD

Revision 3.0

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:

23 April 2013

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry: **19 October 2035**

EXECUTIVE SUMMARY

Purpose

This Local Structure Plan (LSP) has been prepared for the various landholdings being Lots 14 – 18, 41 & 500 Ocean Road, Coogee. The land the subject of this LSP comprises (7) lots located approximately 19 kilometres south-east of Perth Central Business District and approximately 0.5 kilometres to the east of the new Port Coogee marina development. The LSP area is within the Metropolitan South-West Corridor and is situated within the municipality of the City of Cockburn and the locality of Coogee.

This LSP provides the planning framework to guide and facilitate the development of 4.047 hectares of land for urban purposes and has been prepared in accordance with the provisions of the City of Cockburn Town Planning Scheme No. 3.

The LSP forms part of the Packham North District Structure Plan and is adjacent to the Local Structure Plan for Lots 1 – 8, 132, 300 & 301 Hamilton Road and Lot 9 Entrance Road, Coogee/Spearwood. The LSP also is situated opposite the Local Structure Plan prepared for Lots 23 – 28, 500 & 501 Ocean/Hamilton Roads and Lots 1, 2, 5, 6, 8, 26, 305, 310, 311 & 482 Mell Road, Coogee/Spearwood. Both these local structure plans for neighbouring and surrounding land have been endorsed by the local authority and WAPC. The LSP design provides for integration with the adjoining approved local structure plan areas.

Structure Plan Summary Table

Item	
Total area covered by the structure plan	4.047 hectares
List of land uses proposed by structure plan - Residential - Parks & Recreation	 2.8350 hectares 0.4047 hectares
Estimated Lot Yield	63
Estimated number of dwellings	68
Estimated population	156
Number of high schools	Nil
Number of primary schools	Nil
Estimated retail floor space (if appropriate)	Nil
Estimated employment provided (no. of jobs)	Nil
Number and area of public opens space	
- District open space	Nil
- Neighbourhood Park (1)	0.4047 hectares

TABLE OF CONTENTS

TECHNICAL APPENDICES INDEX

Appendix No.	Document Title	Approval Required or Supporting Document only	Approval Status	Approval Agency
1	Fire Management Plan (Bio Diverse Solutions, June 2012)	Approval Required (Subdivision Stage)	Preliminarily Approved	City of Cockburn FESA
2	Engineering Servicing Report	Supporting Document	N/A	N/A

PART ONE (STATUTORY SECTION)

Element of Structure Plan	Statutory Provision to be Applied
1. Structure Plan Area	This Structure Plan applies to Lots 14 – 18, 41 & 500 Ocean Road, Coogee and being all the land contained within the inner edge of the line denoting the Local Structure Plan boundary on the Structure Plan Map dated xxx.
2. Structure Plan Map	The Local Structure Plan map dated xxx sets out the zones and reserves applicable within the Structure Plan area. The zones and reserves designated under the Structure Plan Map apply to the land within it as if the zones and reserves were part of the Scheme. Subdivision and development within residential areas shall comply with the relevant 'Residential' zone and R-Code density of the City of Cockburn Town Planning Scheme No. 3 and Residential Design Codes of Western Australia.
3. Use Class Permissibility	Unless otherwise specified in this Part, the words and expressions used in this Local Structure Plan shall have the same meanings given to them in the City of Cockburn Town Planning Scheme No. 3 ("the Scheme"). Where not defined in the Scheme, the definition and meaning shall be as set out in the Structure Plan. Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under the Scheme.
4. Residential Development Standards	The Structure Plan Map sets out the Residential Density that applies to areas specified in the Structure Plan Map. Subdivision and development for residential use is to be in accordance with the corresponding Residential Design Code, with the exception of the following: - Variations to the R-Codes requiring a minimum 4.0 metre front setback for those R30 lots facing east as set out in the LSP and requiring preparation and approval of a Detailed Area Plan.

5. Development Contribution Arrangements	The Structure Plan Area is within Development Contribution Area 12 (DCA12) as identified in Local Scheme Amendment No. 87 of the City of Cockburn Town Planning Scheme No. 3 (TPS 3). Under TPS 3 a Development Contribution Plan applies to the Structure Plan Area and should be read in conjunction with this Structure Plan. The owner is to contribute towards key service and community infrastructure within an approved Development Contribution Plan for DCA12. Each landowner will be required to make a cost contribution payment based on the area that they develop in accordance with the contribution rate in the DCP in DCA12. When liable payment by a landowner (or otherwise) is made to the satisfaction of the local authority pursuant to TPS 3 and the DCP, the local authority shall provide certification in writing to the landowner of such discharge, or partial discharge where applicable, as requested by the landowner.
6. Limitations or restrictions affecting subdivision and/or development	<u>Fire Management</u> A Fire Management Plan will be required to be prepared and approved by the local authority and Fire & Emergency Services (FESA) as a condition of subdivision approval as deemed necessary. This will also recommend the registration of a Section 70A (Transfer of Land Act 1983) notification on titles advising prospective purchasers of the Fire Management Plan. <u>Midge Buffer</u> Pursuant to the City's Policy APD6 – 'Residential Rezoning And Subdivision adjoining Midge Infested Lakes and Wetlands', it is recommended that a notification be placed on the titles of those lots affected by the midge buffer under Section 165 of the *Planning and Development Act 2005*.
7. Detailed Area Plan/s Requirements	Prior to any subdivision and/or development for all areas shown in the Structure Plan Area as 'DAP Requirement', a Detailed Area Plan is to be prepared in accordance with TPS 3.

8. Public Open Space Provision	The Structure Plan identifies areas to be provided for Public Open Space (POS). The final accreditation of POS is to be finalised in accordance with WAPC requirements. The function and usability of the POS for active and passive recreational purposes will be subject to further detailed design to the satisfaction of the local authority.

Plan No. : 15539-2
Revision : REV 3C
Scale :1:1500@A3

LEGEND
- Pathway - Dual Use Path
- Pathway - Pedestrian
- Lots that require Area Specific Plans (or DAPs)
- Development subject to dwelling construction under AS3959-2009
- Indicative planning over land outside of structure plan subject to futureinvestigation
- Structure Plan Boundary

ZONES/RESERVES
- Parks and Recreation
- R25 Residential
- R30 Residential

LOCAL STRUCTURE PLAN
LOTS 14-18, 41 & 500 OCEAN PLAN
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PART TWO (EXPLANATORY SECTION)

1.0 INTRODUCTION

1.1 Purpose

This report provides justification for the Local Structure Plan (LSP) prepared for the various landholdings being Lots 14 – 18, 41 & 500 Ocean Road, Coogee (herein referred as the "LSP landholdings"). **Figure 1 – Location Plan** shows the location of the LSP landholdings in the context of the locality of Coogee and the Port Coogee marina development to the west of Cockburn Road. An LSP is required to be prepared and approved prior to subdivision and development of the land in a 'Development' zone under the City of Cockburn Town Planning Scheme No. 3.

The LSP has been prepared taking into consideration the planning framework of the City of Cockburn Packham North District Structure Plan (DSP) and local structure planning that has occurred to the north, south and west of the LSP landholdings. The proposed LSP will integrate with the local structure planning that has already taken place within the DSP area. This will be discussed in further detail in the report.

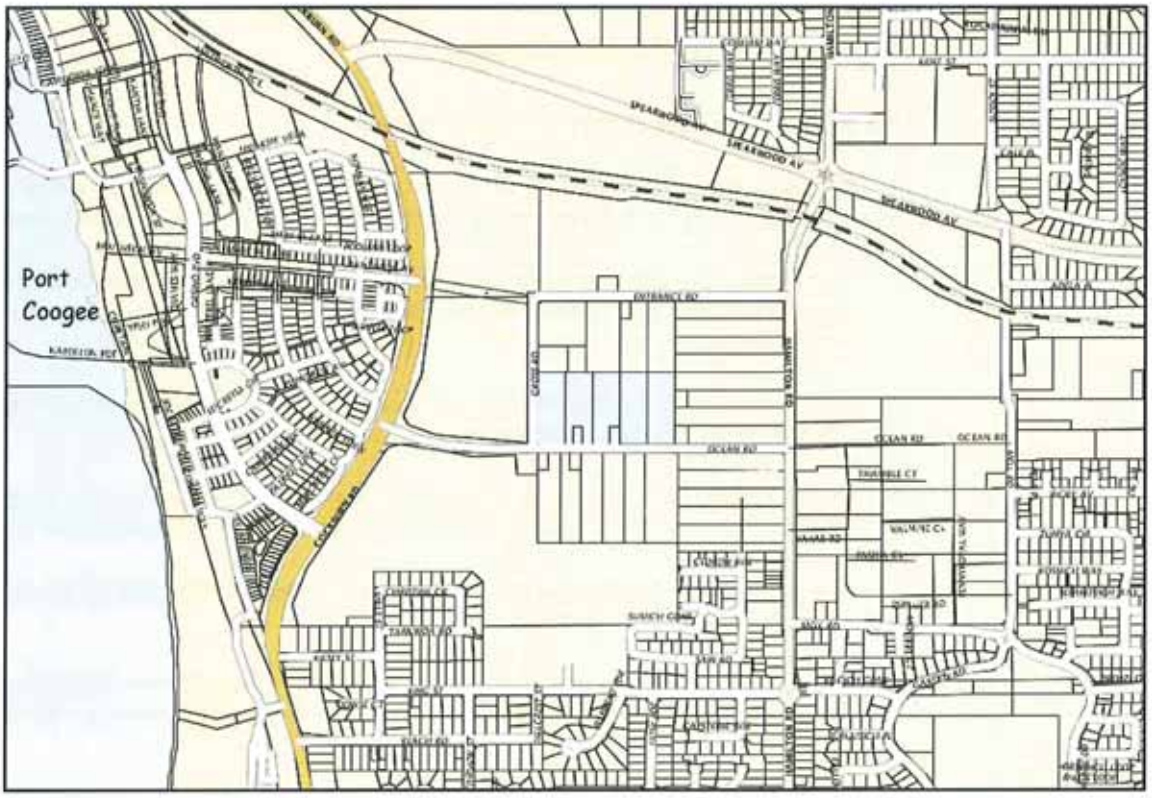


Figure 1. Location Plan of LSP area [blue] (Source: Landgate, 2012 - *modified*)

1.2 Background

The area within the LSP was previously affected by the Watsons food processing plant odour buffer, which was one of the main reasons that the area could not be rezoned to 'Development' for urban land use under the City of Cockburn Town Planning Scheme No. 3 (TPS 3). With the closure of the food plant in April 2009, Council at its meeting held on 12 February 2009 resolved to initiate a Scheme Amendment (Amendment No. 70) to rezone the special use food plant site and surrounding rural zoned land (previously affected by the odour buffer), for residential development. Local Scheme Amendment No. 70 was gazetted on 10 November 2010.

The approved Packham North District Structure Plan and District Water Management Strategy for Amendment No. 70 'Development' zoned area provides the foundational planning framework for consideration of this LSP. In addition, the Council has prepared Scheme Amendment No. 87 by including the Packham North District Structure Plan area as DCA 12 – Packham North. This will provide a guide for development contributions from the respective landowners within the DSP.

Once approved, this LSP will provide guidance for development of the LSP landholdings and establish a context for the consideration and eventual approval of subdivision applications for each of the various lots.

1.3 LSP Update Objectives

The general objectives of the LSP Update are to:

- Provide a statutory framework which will serve to guide the land use, subdivision and development of the subject land to facilitate creation of a high quality urban environment;
- As far as practicable, retain the general landform and natural features of the subject land through appropriate distribution and allocation of land uses, the design of the road network and future built form;
- Create a range of lot sizes for the provision of a mix of housing typologies and a range of affordability to provide for the demographic spectrum;
- Create a safe, convenient and efficient transport network suitable for a range of alternative modes of transport to encourage public transport, cycling and pedestrian movement;
- Design to make effective use of the landscape amenity by capitalising on aspects such as views and proximity to wetland area;
- Incorporate best practice principles of sustainability through water sensitive urban design, energy efficiency and conservation of areas containing environmental significance.

2.0 LAND DESCRIPTION

2.1 Location

The land the subject of this Local Structure Plan (LSP) comprises 7 lots located approximately 19 kilometres south-east of Perth Central Business District and approximately 0.5 kilometres to the east of the new Port Coogee marina development. The LSP area is within the Metropolitan South-West Corridor and is situated within the municipality of the City of Cockburn and the locality of Coogee.

2.2 Landownership

The LSP area contains 7 land parcels in various ownership as set out in Table 1 below.

Table 1. Land description and area of lots comprising subject site

Lot	Plan/Diagram	Volume	Folio
14	4097	61	41A
15	4097	2055	189
16	4097	1664	150
17	4097	1678	829
18	4097	1678	830
41	87995	2032	302
500	61099	1664	149

Figure 2 – Aerial/Cadastral View shows the boundaries of the lots that form the LSP area.

2.3 Existing Land Use

Most of the LSP area has been previously cleared for residential development and small scale agriculture, including semi-rural and market gardens. Pastures of exotic grasses, weeds and remnants of existing crops, lupin and large spice plants have mostly replaced the original vegetation. With the exception of Lots 14, 41 and 500, existing development on all of the LSP landholdings comprise of two dwellings with outbuildings on a large lot with the rear area cleared. There is only one dwelling on Lot 14 and Lots 41 and 500 are smaller residential lots approximately 581m^2 and 760m^2 respectively each with a single dwelling.

Most of the existing dwellings are original dwellings constructed circa 1950s to early 1970s. Many of the dwellings are in good condition with all existing dwellings (except Lot 14) to be retained by landowners as part of the subdivision and development of the land. The decision to retain or demolish buildings and improvements on the land can be made by the various individual landowners at any time in the future. Some existing dwellings are proposed to be retained on larger superlots until such time as landowners may wish to demolish them to make way for further subdivision. Market gardening has occurred on some of the lots in the past which ceased operation approximately 15 years ago.

Figure 2 Aerial & Cadastral Plan of the LSP landholdings (Source: Landgate, 2012 – *modified*)

2.4 Surrounding Context

The LSP area is within the locality of Coogee. **Figure 3 – Surrounding Land Use Context** provides an overview of the LSP in relation to surrounding land use and environment. The LSP area is adjacent to similar established residential properties to the north. To the east is the former site of the food processing plant with buildings now demolished. There is also surrounding vacant [buffer] land, which is also proposed to be developed for future residential use. Directly adjacent on the eastern boundary of the LSP area is a wetland area which is proposed to be retained under the Packham North DSP. On the opposite side of Ocean Road to the south are large semi-rural residential lots which are also subject to local structure planning for future urban development. To the west, the LSP development site is adjacent to reserved land owned by the Western Australian Planning Commission (and managed by the City of Cockburn), with the coast approximately 650 metres further west.

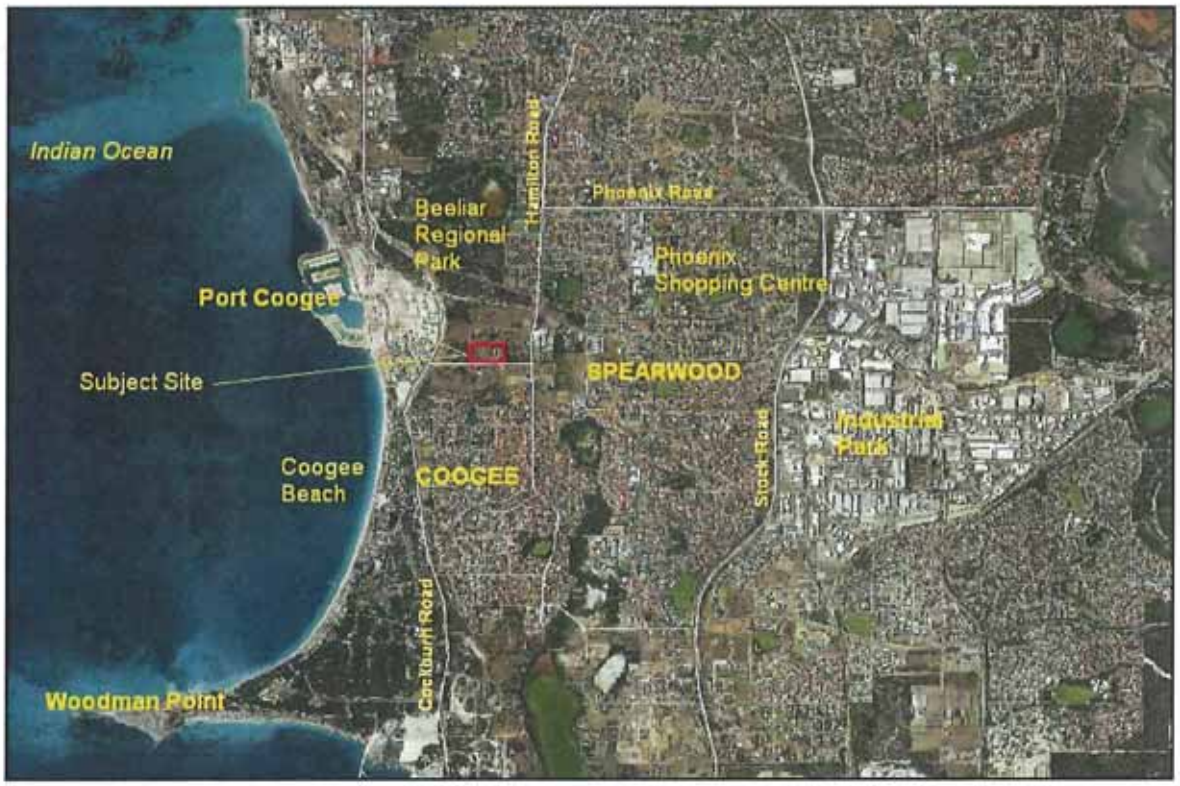


Figure 3 Surrounding Land Use Context

3.0 PLANNING FRAMEWORK

STATE & REGIONAL PLANNING

3.1 Directions 2031

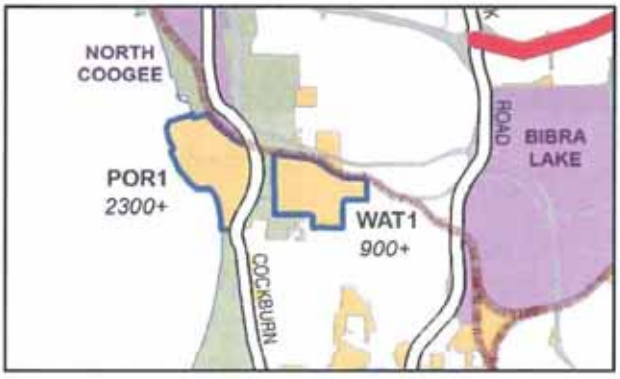
Directions 2031 establishes the vision for the future growth of Perth and Peel regions. It provides a framework in which population growth is to be accommodated. Directions 2031 seeks a 50% increase in the current average residential density 10 dwellings per gross urban zoned hectare; and has set a target of 15 dwellings per gross urban zoned hectare of land in new development areas. This proposed local structure plan achieves the targets set by Directions 2031 and this will be discussed in further detail under 4.2 'Residential Densities and Yield'.

3.2 Metropolitan Region Scheme

The LSP area is zoned 'Urban' under the Metropolitan Region Scheme (MRS). Land owned by the WAPC adjoins the LSP to the west. The WAPC land is reserved as 'Parks and Recreation' and is managed by the City of Cockburn. Land surrounding the LSP to the north, south and east is also zoned 'Urban' under the MRS.

3.3 Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy

The Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy identifies the LSP development site as part of the "WAT1" precinct with an estimated potential for future 900+ lots [see below extract]. It should be noted that this is an indicative estimate based on 75% of the land being able to be developed.



Extract from Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy [p.93]

3.4 Cockburn Coast District Structure Plan

Cockburn Coast District Structure Plan area and Improvement Plan No. 33 area refers to land bounded by Port Coogee, South Beach and land reserved under the MRS for 'Parks and Recreation'. The structure plan identifies new areas for living, employment and recreation and aims to create a significant coastal node around the historic power station and Port Coogee marina. The proposed LSP will not have an adverse impact on the Cockburn Coast District Structure Plan and will compliment its vision by providing the framework for transition from current semi-rural land use to urban development.

3.5 Packham North District Structure Plan

The LSP has been prepared within the framework of the City of Cockburn Packham North District Structure Plan. The purpose of the District Structure Plan is to guide development of the former food processing plant and surrounding land that was included in the odour buffer for residential development. The structure plan sets out an overall strategic planning framework providing the direction for preparation of local structure plans and future applications for subdivision and development. The LSP has been prepared in accordance with the planning objectives set out in the structure plan, which includes allocation of public open space, access, interfacing with adjoining land uses, movement linkages and areas for residential use (refer to **Figure 7 Packham North District Structure Plan**).

Figure 7 Packham North District Structure Plan (Source: City of Cockburn, 2012)

3.6 *Liveable Neighbourhoods*

Liveable Neighbourhoods has been prepared to guide the sustainable development of communities. It addresses both strategic and operational aspects of structure planning and subdivision for both 'greenfield' and urban infill sites.

The LSP has been designed in accordance with the principles of Liveable Neighbourhoods, in particular, the layout of roads and public open space. Consistent with Liveable Neighbourhoods, the LSP provides a high level of connectivity with good external linkages to cycle, pedestrian and public transport networks. The road design in the LSP is legible and reduces car travel distances by creating alternative routes and minimising use of cul-de-sacs where possible. These aspects are further addressed in Section 5.3 'Road Network' and Section 5.6 'Bicycle & Pedestrian Movement'.

Liveable Neighbourhoods encourages walkable access to activity nodes and public open space. Within the LSP, all lots are within 400 metres walking distance from POS areas. This provides residents in the LSP with opportunities for active lifestyle and recreation within 5 minutes walking distance from residences. This is further addressed in Section 5.5 'Public Open Space'.

According to Liveable Neigbhourhoods it is important for the LSP design to respond to site characteristics and site context. The LSP design has taken into consideration the natural topography, vegetation, surrounding land uses, solar orientation and existing developments. Ninety five percent of proposed lots have a N-S orientation, with four lots having an E-W orientation.

Consistent with Liveable Neighbourhoods, within the LSP, lots that face parkland increase opportunity for passive surveillance and interaction with public spaces. Roads have also been designed to provide opportunities to array lots to maximise building design potential for solar orientation (north-south and east-west) and energy efficiency.

Lot shape and proportion of width to depth is considered important in Liveable Neighbourhoods. Lots in the LSP have been designed to be rectangular in shape with a greater depth than width. This ensures ability to develop the lots with high quality housing and builtform and conformity with the Residential Design Codes of Western Australia. Other aspects of Liveable Neighbourhoods principles, such as local water management and, diversity of lot sizes and target residential density are addressed further in the LSP report under Section 5.0.

3.7 City of Cockburn Town Planning Scheme No. 3

The LSP area is zoned 'Development' under the City of Cockburn TPS 3. The provisions of TPS 3 require preparation and approval of a local structure plan prior to any subdivision and development. Amendment No. 87 to TPS 3 will provide for development contributions and will include the LSP area within a Development Contribution Area.

3.8 City of Cockburn Local Planning Strategy

The City of Cockburn Local Planning Strategy (LPS) promotes, amongst other things, urban development to include a range of housing densities and opportunities and strategies to reduce car use and encourage walking, cycling and public transport use. The proposed LSP is consistent with this philosophy in that it provides for a range of dwelling types, public open spaces that are within walking distance and a permeable road network.

3.9 'Watson' Local Structure Plan

A local structure plan has been prepared for the former food processing plant and surrounding land that has previously been affected by the food processing plant odour buffer. Preliminary discussions have taken place with the landowner of the [Watson] land as to an appropriate interface with the proposed LSP landholdings. The interface, particularly with the wetland and the land to the NW of the LSP landholdings, will be further discussed in this report. The proposed LSP and its context with other local structure plans in the Packham North District Structure Plan development area is shown in **Figure 8 – Combined Structure Plans.**

3.10 Ocean Road Estate Local Structure Plan

A local structure plan has been prepared for the land to the south of the LSP landholdings. No direct interface is necessary with the Ocean Road Local Structure Plan as existing Ocean Road provides separation between the two developments. It is noted however that the proposed LSP reflects a similar R-Code density (R25) as that proposed in the Ocean Road LSP. This provides opportunity for a consistent streetscape.

3.11 City of Cockburn Scheme Amendment No. 87

This Local Scheme Amendment proposes to apply DCA provisions by including the Packham North District Structure Plan area as DCA 12 – Packham North. This aims to ensure, through the provisions of TPS 3 that all landowners equitably contribute to associated infrastructure development costs that are necessary to coordinate the orderly planning for the multiple landholdings within the Packham North area. DCA 12 costs include drainage, servicing, engineering and environmental studies prefunded by Council and other common costs that arise through the structure plan process.

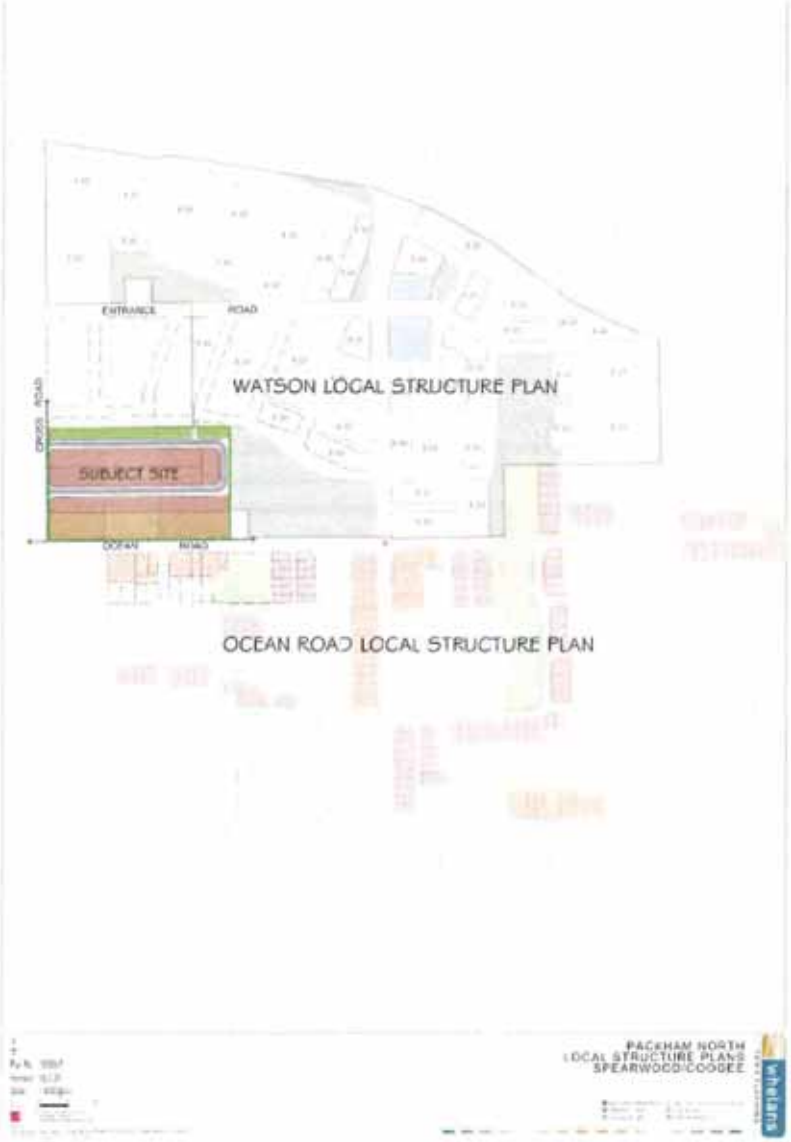


Figure 8 Combined Local Structure Plans showing context of the proposed LSP with the Watson Local Structure Plan and Ocean Road Local Structure Plan

4.0 SITE CONDITIONS & ENVIRONMENT

4.1 Topography

The topography of the LSP varies in the range of 3.0 AHD at the NE boundary of the LSP area rising up to 19.0 AHD at the SW boundary of the LSP area. The LSP development site generally slopes downhill from west to east (refer to **Figure 4 – Contour Plan**)

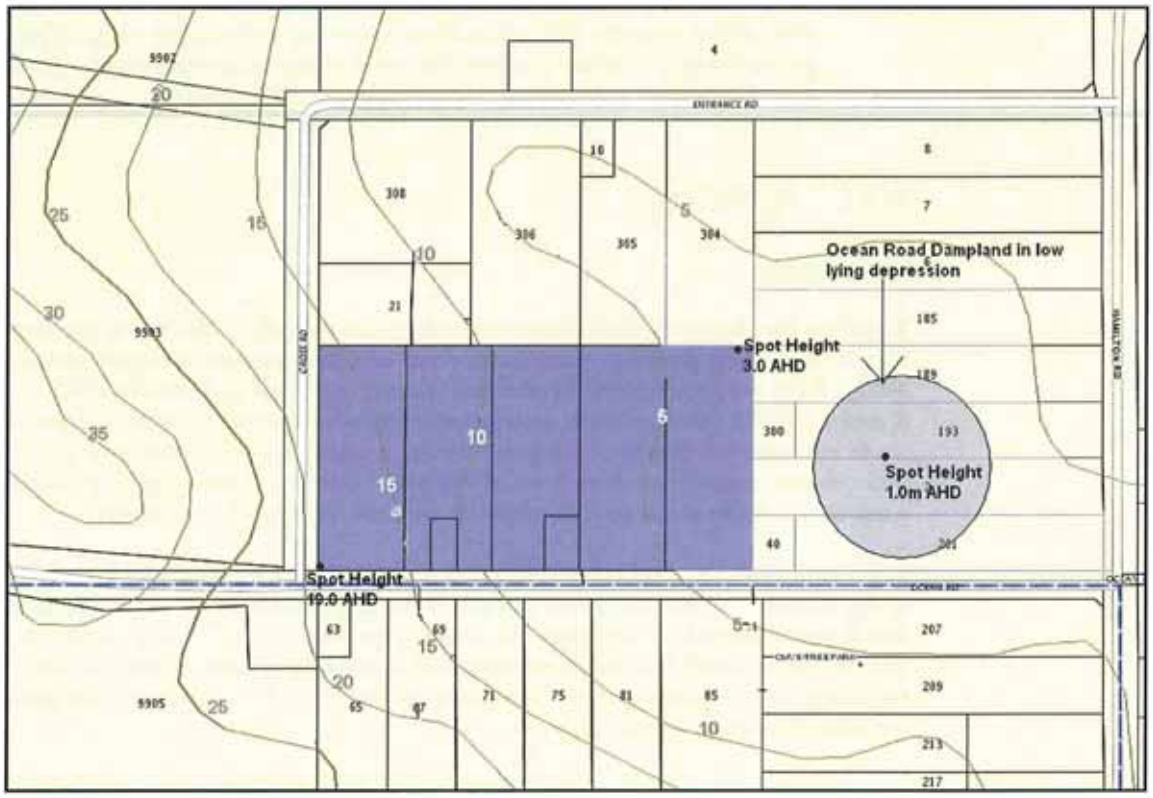


Figure 4 Contour Plan - LSP area with indicative spot heights (Source: Landgate, 2012 *modified*)

4.2 Geology and Soils

The LSP development site is located on the Swan Coastal Plain within the Aeolian Deposits of the Cottesloe Dune System. This System is generally described as low hilly landscape with shallow brown sands over limestone with exposed limestone outcropping (Department of Agriculture, 2003).

Geomorphologic classification for the structure plan area reported in the *Perth Metropolitan Region 1:50,000 Environmental Geology Series, Rockingham (Part of Sheets 2033 I and 2033 IV)* (Gozzard 1983) indicates that the general geology of the area consists primarily of the following soil types:

(i) Spearwood Sand formed during the Pleistocene era. This sand is described as a pale yellowish brown, medium to coarse-grained, sub-angular quartz, trace of feldspar, moderately sorted and of residual origin (Gozzard 1983). Tamala limestone (quartz) is the potential origin of the sand. The Spearwood Sand is considered to have high permeability, with a low to moderate load bearing capacity (Gozzard 1983); and

(ii) Limestone soil types also formed during the Pleistocene era described as pale yellowish brown, fine to coarse grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar and of aeolian origin (Gozzard 1983). The permeability of limestone generally found in the immediate area is described as high, with a variable load bearing capacity (Cardno BSD, 2009).

4.3 Hydrology

Groundwater

Based on the Department of Water *Perth Groundwater Atlas* (2003), the groundwater generally flows in a westerly direction towards the coast and the groundwater table contours are at 1.0m AHD. Regional groundwater levels having been recorded from 0.03m AHD – 1.62m AHD (Cardno, 2008). Groundwater testing undertaken for the local structure planning to the west and south indicates the quality of the groundwater is poor due to saline encroachment. Unless the groundwater undergoes some form of treatment (such as "shandying"), groundwater from the superficial aquifer is not considered to be suitable for irrigation purposes.

In the lower lying area of the LSP development site (i.e. 3.0m AHD) the groundwater level is closer to the surface. In 2008 Cardno measured the groundwater level at the site to be 0.6m AHD. This is approximately 1.9m below the lowest part of the land. Subject to detailed engineering design, the required 1.2 metre minimum separation distance between the finished lot levels and the highest known groundwater table level can be met. At Cross Road, the depth to groundwater is generally an average of 18m.

As part of the preparation of the City of Cockburn draft Packham North District Structure Plan, groundwater monitoring has been undertaken and the report *Packham North Groundwater Monitoring Report* (Cardno, 2010) provides a basis as to pre-development hydrological studies, which can be utilised to assist in future planning of proposed development. A Local Water Management Strategy has also been prepared for the Packham North District Structure Plan, which is included as an Appendix to the District Structure Plan report.

Surface Water

There are no permanent surface water bodies within the LSP area. Sheet drainage across the development site from west to east is limited due to the high permeability and infiltration at source which is characteristic of sandy Spearwood soils.

Wetlands

There are no wetlands within the LSP area. To the east, a small dampland exists on Lots 1, 2, 4, 300 & 301 Hamilton Road adjacent the LSP development site (**Figure 5 – Ocean Road Dampland**). This dampland is not identified in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain*. However, the wetland is listed in the City of Cockburn Municipal Heritage Inventory as a place of heritage significance. Under the Packham North DSP and [Watson Local Structure Plan], this wetland is proposed to be protected within public open space. The 'Landscape Strategy Report & Ocean Road Public Open Space Management Plan' (RPS, 2011) outlines a management plan for the wetland to address drainage, access, fire management, weed control and rehabilitation.

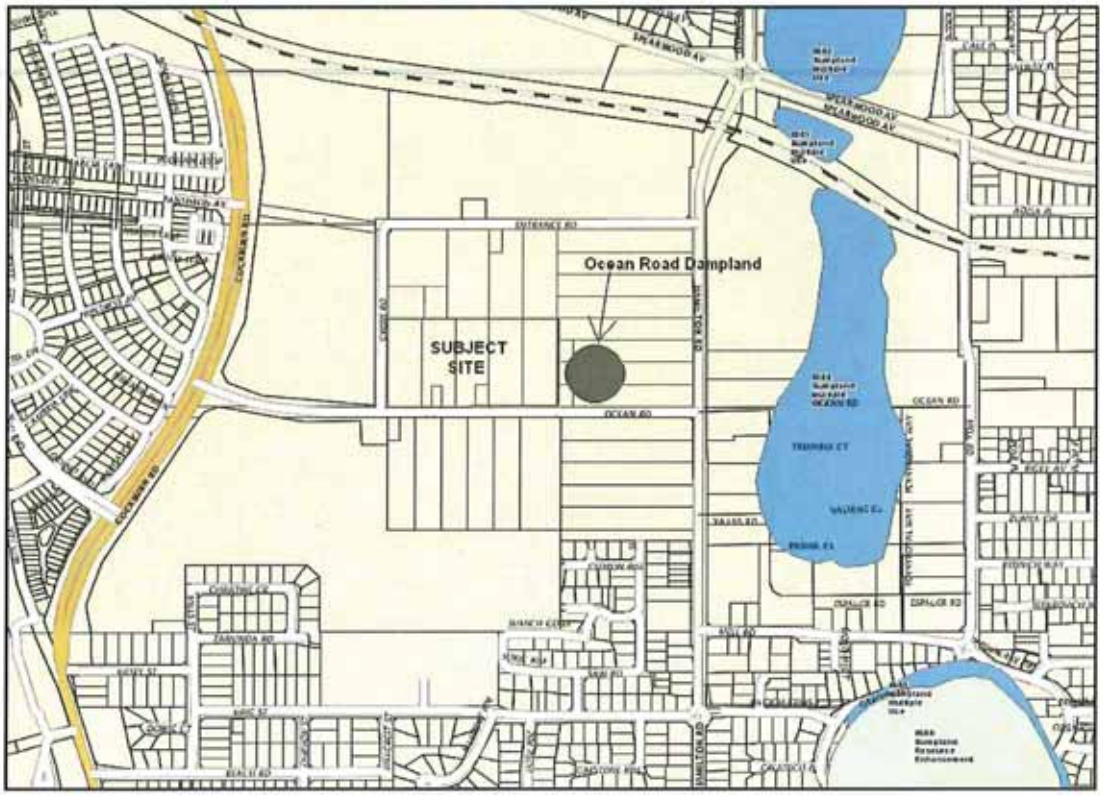


Figure 5 Ocean Road Dampland adjacent to LSP. Wetlands contained in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain* are also shown. (Source: WA Atlas, 2012 – *modified*)

4.4 Acid Sulphate Soils

A desktop assessment to determine the presence of Acid Sulphate Soils (ASS) indicates an unlikelihood of there being any ASS affecting the LSP development site. Notwithstanding the ASS mapping contained in **Figure 6 – Acid Sulphate Soils**, within the core lower lying area of the Ocean Road dampland, there maybe localised peaty or clayey materials with potential ASS.

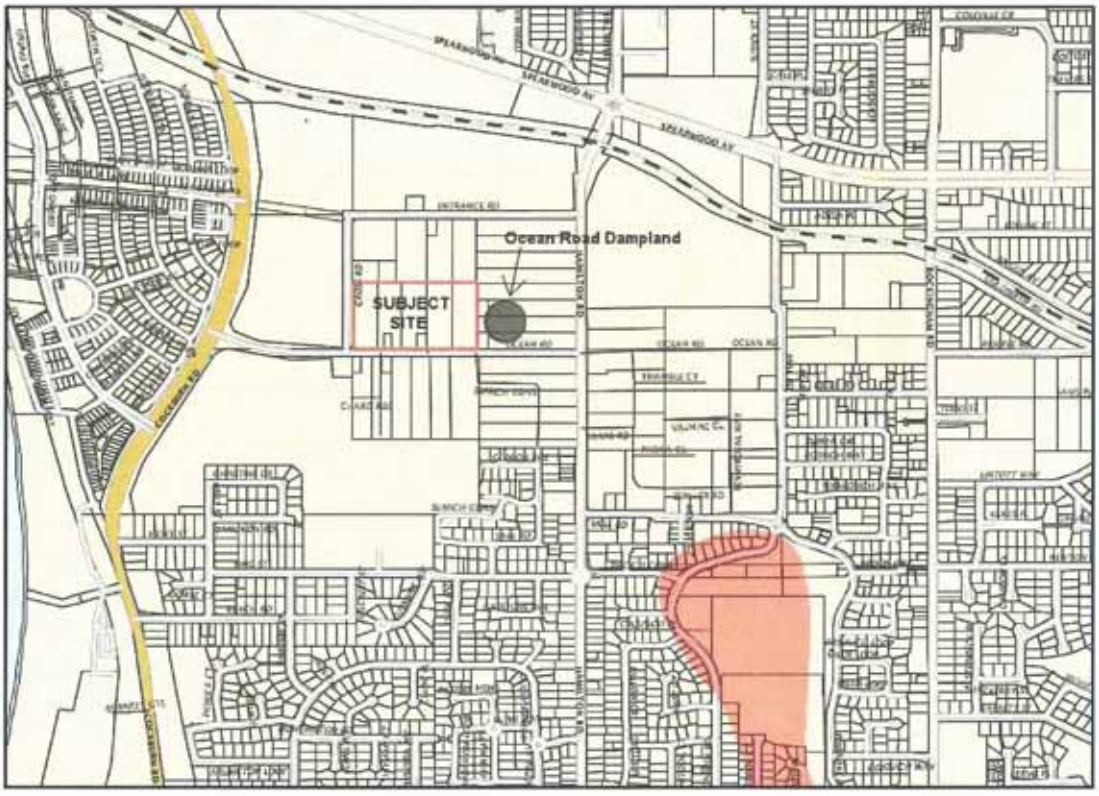


Figure 6 Acid Sulphate Soils desktop mapping indicating the LSP area has a low risk of Acid Sulphate Soils (Source: WA Atlas, 2012 – *modified*)

It should be noted that the Ocean Road dampland does not extend into the LSP area. The LSP proposes development up to the eastern boundary of the LSP and in this area detailed geotechnical investigations will need to be undertaken prior to any subdivision and or development. It is unlikely that ASS will affect development within the LSP area as the core areas of the dampland are further to the east (approx. 20m – 30m) from the LSP boundary. Acid sulphate soils pose no unacceptable risks to development if left undisturbed. Should any road upgrading, servicing or drainage infrastructure be planned within areas potentially containing ASS, an acid sulphate soils investigation would be carried out to inform any required acid sulphate soils management plan prior to works being undertaken.

4.5 Vegetation, Flora & Fauna

All lots within the LSP development site have been 'parkland cleared' to provide for residential development and semi-rural agricultural use. As a result, the vegetation condition of the pre-development vegetation community has been significantly disturbed by human activity.

Vegetation condition assessed to the following criteria (Keighery, 1993):

Classification	Vegetation Condition
Pristine	Pristine or nearly so, no obvious signs of disturbance
Excellent	Vegetation structure intact, disturbance affecting individual species and weds are non-aggressive species
Very Good	Vegetation structure altered, obvious signs of disturbance
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to it
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as being 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs

Keighery, B (1994) *Bushland Plant Survey, Guide to Community Survey for the Community, Wildflower Society WA*

In classifying the existing vegetation condition using Keighery (1993), the vegetation within the subject site is classified as being "Completely Degraded". A Flora & Fauna Survey is not considered necessary due to the land being 'Completely Degraded' as a result of extensive clearing for residential development and semi-agricultural use.

(*Left*) Southerly view of development site

4.6 Indigenous & European Heritage

Indigenous Heritage

A search of the Department of Indigeneous Affairs Aboriginal Heritage Inquiry System indicates that there are no recorded sites in the LSP area. It is important to note that the database of heritage sites held by the DIA is not comprehensive and there exists the potential for unknown sites of Indigeneous heritage significance to be located inside or within close proximity to the subject land. Due to the level of disturbance to the subject land as a result of development activities and clearing over the past years, an archaeological survey is not considered necessary, however, archaeological monitoring is recommended for any eventual excavation works as part of subdivision and development. The process for protecting Indigeneous heritage sites and considering proposals that may impact a known site is set out under the *Aboriginal Heritage Act 1972*. The Act protects all Aboriginal sites in WA whether they are known to the DIA or not. The Act provides for a clear process for addressing these issues as they relate to the proposed structure planning.

European Heritage

There are no places or sites of cultural significance within the LSP area under the City of Cockburn Municipal Heritage Inventory and State Heritage Register.

5.0 LOCAL STRUCTURE PLAN

5.1 LSP Community Design Rationale

The LSP provides for two land uses being residential (with mixed densities) and local parks and recreation. The LSP has been prepared to provide a comprehensive strategic plan to guide the future subdivision and development of the fragmented landholdings, which until the closure of the former food processing plant, had limited potential for urban development. The LSP seeks to create an urban environment that is based on a logical and permeable movement network system that combines to create a pleasant walking/cycling environment.

Cohesion of the LSP with the [Watson Local Structure Plan] was considered important to enable linkages between the two developments, particularly as a local neighbourhood centre is proposed to the NE of the LSP development site. Another key element is the linear extension of the Ocean Road wetland POS system providing a corridor connection with the MRS 'Parks and Recreation' reserve to the west. This is consistent with the Packham North DSP. The corridor also enables landowners within the LSP landholdings to set aside the required 10% POS area at the rear of the lots. The design elements of the LSP will be discussed in more detail in this report.

5.2 Residential Densities and Yield

The LSP ultimately provides for approximately 68 dwellings with a density coding ranging from R25 – R30. Proposed development as provided by the LSP could accommodate up to approximately 156 people based on an average household of 2.3 persons.

The range in residential density provides opportunity for a diversity of lot sizes and housing types, responsive to the site's location. Opportunities for medium density housing have been placed to take advantage of and overlook public open space. Orientation of lots towards public open space increases passive surveillance of public open space, including the wetland to the east.

The R25 density fronting Ocean Road provides for efficient sized residential lots (i.e. 350m2 – 450m^2), which also provides opportunity, in some instances, for retention of existing dwellings on larger lots (i.e. 700m^2 – 800m^2), which could at some point in the future be further subdivided into two lots subject to dwelling demolition. Table 1 provides an estimate of the residential dwelling yield across the varying residential densities based on the **Subdivision Concept Plan**. Table 2 provides development statistics which can be used to measure the performance of the LSP and conceptual subdivision design against the key target outcomes of *Directions 2031* and *Liveable Neighbourhoods*.

Table 1. Estimate of the residential dwelling yield of the LSP

RESIDENTIAL LOT TYPE	DENSITY	YIELD	HOUSING TYPES
Low density residential	R25 R25 ('Duplex' Lots)*	10 10	Single Dwellings Single/Grouped Dwellings
Medium density residential	R30	48	Single Dwellings
LSP Estimated Potential Dwelling Yield		**68**	

* Larger (R25) lots with potential for two dwellings subject to demolition of existing dwelling

Table 2 Development Statistics (based on Subdivision Concept Plan)

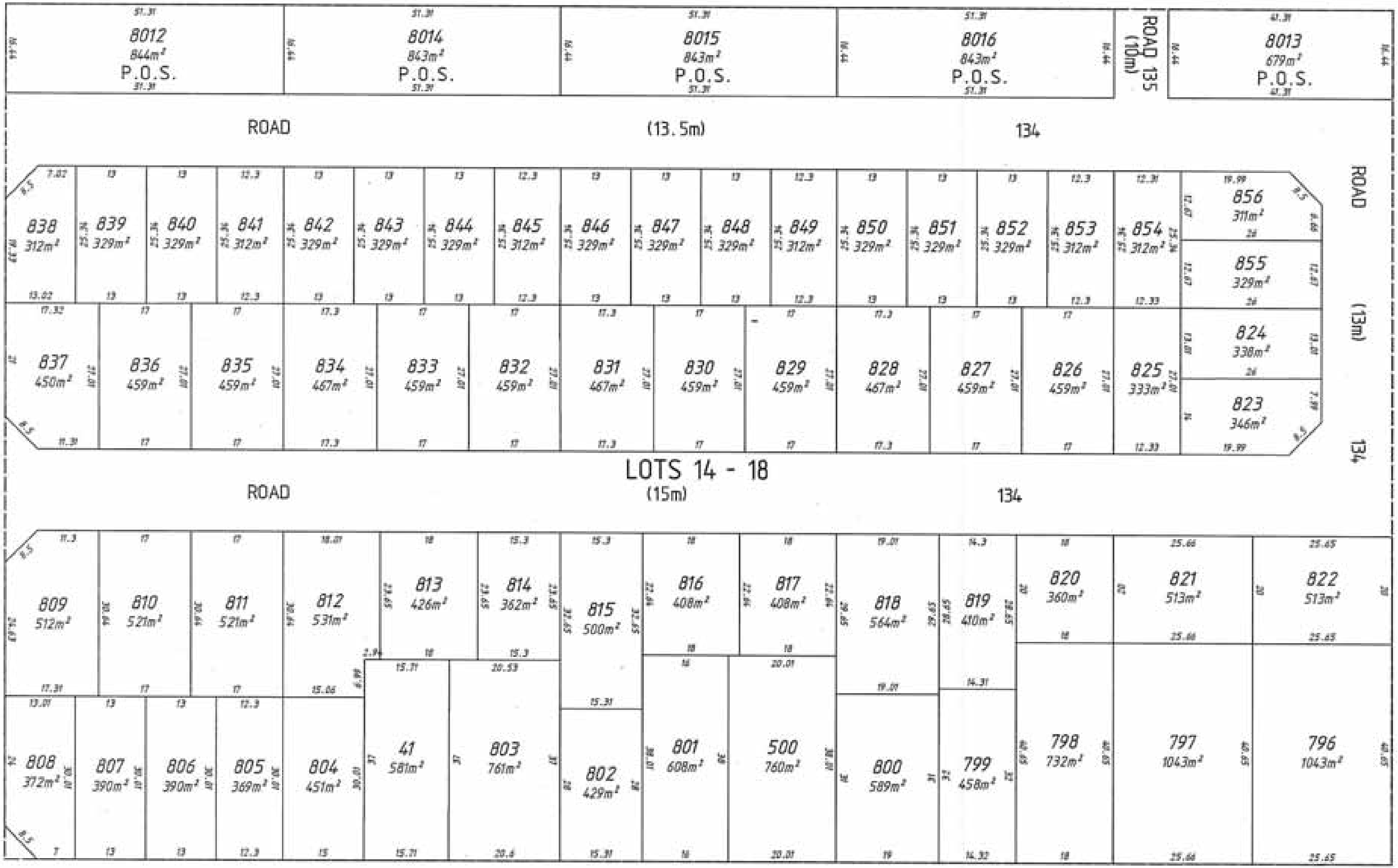
	Site Outcomes	Target Density
Total LSP Landholdings Area	40, 470m^2	-
Area set aside for roads, drainage & POS	12,119m^2 (30% total site area)	-
Balance area for residential development	28,351m^2	-
Estimate ultimate number of dwellings	68 dwellings[3]	-
Estimated number dwellings per *site hectare*[1]	24 dwellings/ha	**Liveable Neighbourhoods** 12 – 20 dwellings per site hectare for lots not within 400m of commercial centre
LSP target density per *gross urban hectare*[2]	17 dwellings/site ha	**Directions 2031** 15 dwellings per gross urban hectare

1 Liveable Neighbourhoods definition of *site hectare* is the area available for residential development excluding roads, non-residential uses, public open space and drainage areas.

2 Directions 2031 definition of *gross urban hectare* is the gross area available for urban development

3 63 lots actually proposed in the Subdivision Concept Plan with retention of existing dwellings

LAND USE / STATISTICS				
LOTS 14 - 18		WAPC Ref:-		
PARCEL TYPE	MAP SYMBOL	NUMBER OF PARCELS	TOTAL DWELLINGS	AREA (ha)
Public Open Space	P.O.S.	5		0.4053
Roads (inc. truncations)				0.8265
STAGE TOTAL		68	68	4.0519



Lots 14 - 18 Ocean Road
Spearwood
Coogee

Terranovis Pty Ltd

McMULLENNOLAN GROUP
Surveying Excellence

97554 - 002 - C

Ver.	Description	Drawn	Date	Checked

The LSP delivers approximately 24 dwellings per *site hectare*, which meets the Liveable Neighbourhoods minimum requirement of 12 - 20 dwellings per site hectare. Similarly, the LSP delivers approximately 17 dwellings per gross urban hectare, which meets the target density of 15 dwellings per gross urban hectare under Directions 2031.

5.3 LSP Proposed Land Uses

The proposed land uses are identified in the LSP Plan under 'Zones/Reserves' and will guide future subdivision and development of the land pursuant to the provisions of Clause 6.2.3.2 of the City of Cockburn Town Planning Scheme No. 3 (LPS 5), which states:

6.2.3.2 *"The subdivision and development of land within a Structure Planning area is generally to be in accordance with any structure plan that applies to that land."*

Once the LSP is adopted the provisions of TPS 3 Clause 6.2.6.3 apply, which provides that where any reserves, zones and Residential Density Codes are imposed in the local structure plan, these shall have the same effect as if they were part of the Scheme. The general land uses proposed in the LSP are set out in Table 3.

Table 3. Proposed land uses in the LSP Update

Land Use	Description
Residential	Land uses permitted as per TPS 3 for 'Residential' zone with R-Code densities ranging R25 – R30.
Public Open Space	Areas to be ceded as Crown Reserve for Local 'Parks and Recreation' reservation with a Management Order to the local authority

5.4 Integration with Surrounding Land Uses

The LSP has been designed to connect into existing and proposed development. To the north a 10.0m wide access road (from Lot 18) is proposed to connect into the proposed road network within the [Watson Local Structure Plan] refer to Figure 8. This local access road will provide residents within the LSP better access to the proposed future neighbourhood centre to the NE on Hamilton Road. The access road will also provide an alternative emergency access route should the loop road to Cross Road be blocked by fire or other emergency/hazard.

The linear public open space 'parkway' connecting the Ocean Road wetland POS area and MRS 'Parks and Recreation' reserve on the western side of Cross Road is consistent with the Packham North District Structure Plan. The linear POS corridor also forms part of a much wider corridor that is to be provided in future when the landowners to the north undertake structure planning. In the interim, the POS corridor provides a buffer to existing residential lots to the north.

To the west and south the LSP adjoins the existing constructed roads of Cross Road and Ocean Road respectively. The proposed internal road provides an interface with the adjacent Ocean Road wetland area to the east of the LSP development site. The proposed road network and its rationale is further discussed under 5.1 'Street Layout'.

In the context of the surrounding existing and proposed development, the LSP provides for a sense of place through its legible and responsive design to the development site context and opportunities for views and interface with natural assets. The LSP landholdings can also be developed independently utilising the existing road infrastructure and without relying on access through other private lots.

5.5 Population & Employment

Based on an average household size of 2.3 persons per dwelling, the LSP would result in a residential population of approximately 156 people for the proposed 68 dwellings indicatively shown in the Subdivision Concept Plan.

The LSP is not in a new growth area and therefore the expectation for the LSP to provide for opportunities for significant local employment [promoting concepts of self-sufficiency as those stated in Liveable Neighbourhoods] is reduced. No commercial or mixed use land is proposed in the LSP as this has not been provided for in the Packham North District Structure Plan northern local neighbourhood centre.

In terms of local employment opportunities (i.e. within 400m – 800m walking distance) there are areas provided in the proposed Packham North DSP, such as the mixed business precinct to the east on Rockingham Road and the local neighbourhood centres to the NE and SE on Hamilton Road. Further out to within 2km to the east there is the Phoenix District Centre and nearby Spearwood Industrial Park. Approximately 4km to the north is the Fremantle business district and 7km to the south is the Henderson industrial and ship building precinct. Opportunities for home-based employment within the LSP would exist under the provisions of TPS 3 in a 'Residential' zone.

5.6 Education & Community Infrastructure

No community purpose sites, for land uses such as community centres, child day care centres, meeting halls and kindergartens have been provided for in the LSP. The primary reason for this is because there is already adequate established community infrastructure in the locality to cater for demand.

Similarly, no public or private primary or high school sites have been provided for in the LSP. There is already considered to be sufficient education facilities in the surrounding established localities to accommodate the increase population resulting from the LSP. This is consistent with the Packham North DSP.

5.7 Street Layout

The LSP proposes a site responsive street network that provides access from existing road infrastructure to create good internal connectivity with external linkages for local vehicle, pedestrian and bicycle modes of transport. The proposed local internal 'loop road' is consistent with the local road hierarchy and reinforces legibility. It also provides for traffic management aimed at restricting vehicle speed, limit the negative impact of through traffic and create safe conditions for all street users. It is intended that the proposed 'loop road' will provide a multi-purpose public space, designed to accommodate and balance traffic management with other functions such as community space, safe pedestrian environment, vehicle parking and as an entrance into the residential environment.

A 10.0m wide local access road will form part of the public street network and is proposed to connect with the proposed local centre on Hamilton Road within the Watson Local Structure Plan. This will increase the permeability of the road network. It will also serve as an alternative emergency access route. It is envisaged that this access road will not be created until the land to the north owned by the Watson Group is developed and a road constructed so that a link between the developments can be established.

The location of the access road has been identified in the NE corner of the LSP area (specifically on Lot 18) due to (i) the landowners directly to the north (Lots 2, 20 & 21) have indicated their unwillingness at present to develop their lands, and (ii) negotiations have been held with Council and Watson Group (landowner of Lot 9) which supports connection of the access road with the proposed future road as shown in the [Watson Local Structure Plan]. For this reason, the access road is required in the NE corner of the LSP development site. However, the access road cannot be located on the eastern boundary of Lot 18 as the land is lower lying and presents drainage issues.

The internal local access road has been designed to enable development to front all streets, public open space and the wetland area to the east. This will promote surveillance, activity and visual interest which contribute towards making streets and public spaces a safe place for social interaction.

Neighbourhood permeability is provided through the provision of the 10.0m wide local access road connection to the north. A road connection between the internal access loop road and Ocean Road is not possible without demolition of existing dwellings. The Subdivision Concept Plan provides for the retention of dwellings due to their current value and significance to the landowners. The length of the internal residential block is 243.5m. Liveable Neighbourhoods recommends a maximum neighbourhood block length of 230m.

In this case it is suggested that the proposed length of the neighbourhood block could be supported based on the following reasons:

1) The row of existing dwellings along Ocean Road (which are to be retained) limits the ability to provide an effective location for a through road, in order to increase permeability without demolition of existing structures.

2) Ocean Road and the linear POS parkway (required under the Packham North DSP) limits the ability to design north-south orientated neighbourhood blocks similar to that proposed in the [Watson Local Structure Plan]. The space is simply too confined.

3) Ultimately, the provision of a 10.0m wide local access road in the NE corner of the LSP development site will increase the permeability of the internal loop road to enable access/egress other than from Cross Road.

4) The LSP has already provided approximately 30% in land set aside for roads and public open space, which is higher than the expected 25% baseline provision for 'greenfield' developments. This is primarily attributed to the length of internal road having lots on only one side so as to provide an interface with POS areas. From a developer's view, having lots on only one side of a road is generally undesirable, principally as the costs to create the road are recouped from sale of lots on one side only. Subsequently, any further land that is required to be set aside for roads would have a negative impact on the landowners.

5) Further loss of (2) lots in the LSP in order to provide increased permeability is not seen as being critically necessary to achieve residential amenity or significant gains in sustainability.

5.8 *Housing Typologies*

The LSP provides opportunity for a diverse mix of lot and housing typologies. For instance, this can be achieved through a combination of developer house & land packages and land sales. Level sites that are terraced reflect the ideal building site to reduce housing cost and create more affordable housing. For this reason, retaining walls will be used where necessary without significantly altering the natural topography and landform.

The use of retaining walls within development will allow for the general landform to be retained, whilst also providing quality homesites and lot sizes consistent with optimal and viable lot yield. Table 4 is a brief summary of the types of dwellings that could potentially be delivered in the LSP.

Table 4. Housing typologies for Local Structure Plan

Lots & Housing Types	Typical Width	Typical Depth	Typical Area	R-Code	Typical Built Form	Estimated Yield (Lots)
Residential 'Front Loaded' Lots	15m - 17m	27m - 30m	450m² to 520m2	R30	Single Dwellings	30
Residential 'Front Loaded' Lots	12m - 13m	26m - 30m	340m²	R30	Single Dwellings	26
Residential 'Front Loaded' Lots	13m	27m – 30m	360m² to 420m²	R25	Single Dwellings	22
ESTIMATED DWELLING YIELD						**68**

5.9 Use of Detailed Area Plans

A Detailed Area Plan (DAP) or Area Specific Plan (ASP) will be required for certain lots within the LSP in order to work towards achievement of a better residential built form outcome. DAPs will provide the mechanism to enable lot design to be linked to a future dwelling, without building development plan/s being submitted at subdivision. This has particular application for small/narrower lots and lots abutting public open space, where design coordination is required to ensure that buildings are suitable for the occupier and the streetscape amenity.

DAPs for the LSP will be prepared and approved at subdivision stage, when lots are created and the DAPs will be used as the basis for subdivision and development. The areas where DAPs are envisaged to be required in future subdivision/s are shown on the LSP plan.

DAPs will be required for certain lots in the LSP, these include:

- Variation of the R-Code front setback requirement for R30 lots fronting the Ocean Road wetland area to the east to provide for a minimum front setback of 4.0 metres. This is also covered in Part One (Statutory Section).

- For all R30 lots, a five percent (5%) variation to minimum open space requirements (in addition to that described in the Open Space definition of the Codes) shall be permitted for single storey dwellings.

The variation to the open space provisions of the R-Codes is justified given that the R30 lots are opposite and/or within 100m – 150m of public open space and therefore the need to provide open space on individual lots is reduced.

The **Indicative Detailed Area Plan for R-Code Variations** (*overleaf*) for the R30 lots show conceptually the detailed area planning required to achieve desired built form outcomes.

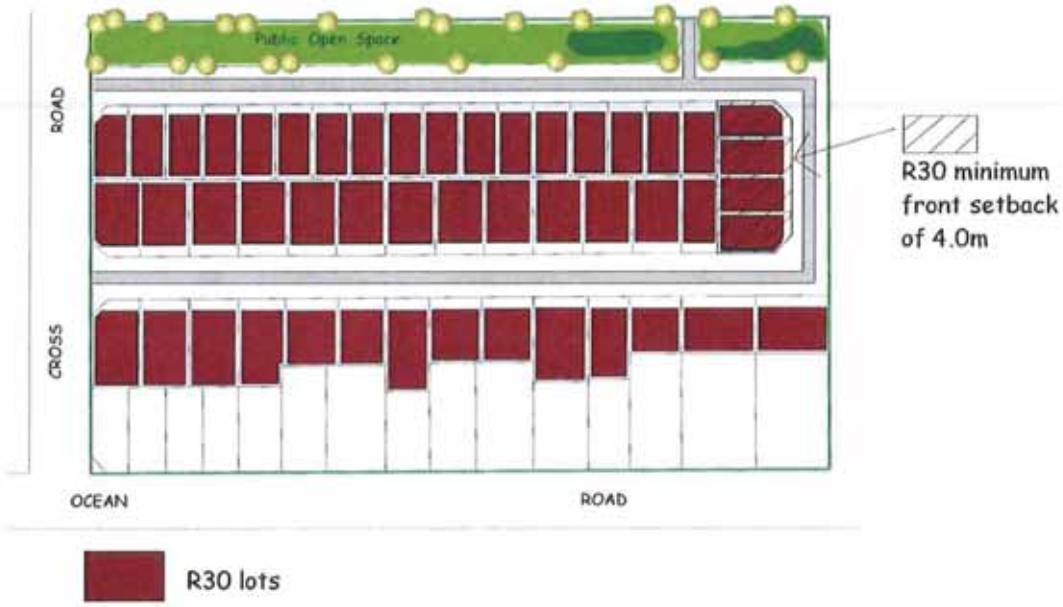
5.10 Proximity to Market Garden Swamp - Midge Buffer

City of Cockburn Policy APD6 – 'Residential Rezoning And Subdivision adjoining Midge Infested Lakes and Wetlands', at Clause (2), requires notification on titles advising prospective purchasers living between 500m – 800m of a [specified] lake or wetland edge, of potential midge infestation. Notice of Notification, pursuant to Section 165 of the Planning and Development Act 2005 on titles of each new residential lot, is required 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*

Figure 8a shows a portion of the local structure plan area ("subject site") is within the 800 metre midge buffer. The requirement for notification on titles shall be enforced at the subdivision stage as a condition of subdivision.

INDICATIVE DETAILED AREA PLAN FOR R-CODE VARIATIONS



The City of Cockburn Town Planning Scheme No. 3 and the Residential Design Codes are varied in the following manner:

1) For all R30 lots, a five percent (5%) variation to minimum open space requirements (in addition to that described in the Open Space definition of the Codes) shall be permitted for single storey dwellings. Open space shall be calculated in accordance with the provisions of the 2008 R-Codes.

2) For those R30 lots facing east as shown on the DAP, the absolute minimum front setback for development shall be 4.0m.

3) All other setbacks on this DAP shall be in accordance with the R-Codes.

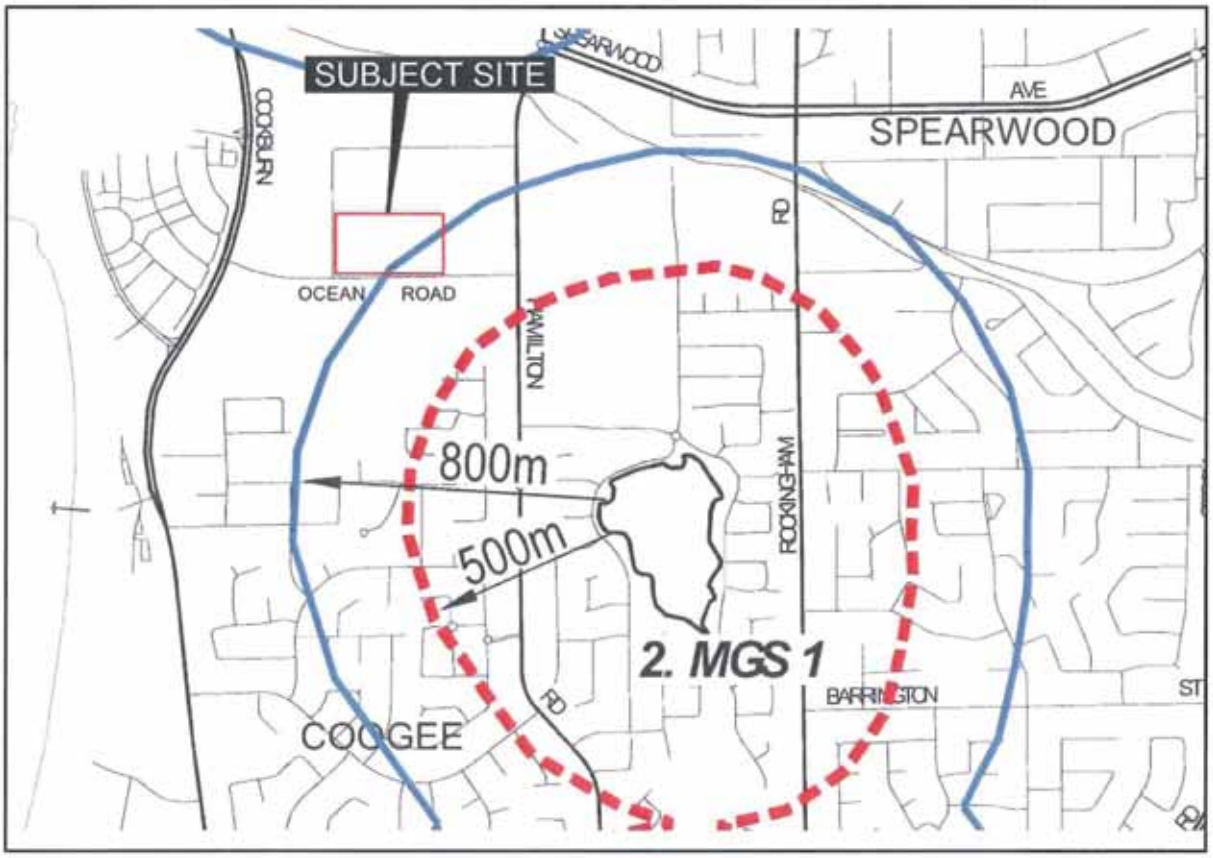


Figure 8a. Extent of midge buffer from Market Garden Swamp – MGS1 (Source: City of Cockburn Policy APD6, 2013)

6.0 SUSTAINABLE DESIGN

6.1 *Energy Conservation*

For urban residential design, there are three main areas of sustainable and climate-sensitive design. In general, these are to reduce energy consumption, optimise on-site solar access and protect solar access for neighbouring properties. The LSP design assists in reducing energy consumption through orientating the neighbourhood blocks E-W to create lots that are orientated north-south. A north-south orientation of lots maximises solar access and cooling breezes. This will be discussed further in 6.2. The provision of street blocks to create regular shaped lots in the LSP is important for also providing micro-planning opportunities to design more energy efficient dwellings.

6.2 *Lot Design for Climate Responsive Dwellings*

Contemporary structure planning should provide greater site responsive lot design to allow opportunity for climate-responsive dwelling design. This can be achieved through orientation of roads and street blocks, which is advocated in Liveable Neighbourhoods.

The climate of Perth can be summarised as follows:

> "Perth experiences a Mediterranean-type climate, characterised by hot, dry summers and mild, wet winters. Perth experiences seasonal extremes in weather, from hot summer days when southeasterly winds arrive, to cold wet, windy winter days as cold fronts from the Indian Ocean move in ....south to southwesterly afternoon seas breezes are common in spring and summer ....Regular sea breezes moderate the climate in the warmer months. Hot days are usually followed by a cool change with fresh to strong southerly sea breezes." (Bureau of Meteorology, 2011)

Residents living in Perth experience the frequent afternoon sea breezes during the warmer and hot months of the year, which allow opportunity for the cooling of dwellings. The proposed LSP road and street block layout create opportunities for lot building design to maximise the micro-climate benefits of southerly cooling breezes. Approximately 95% of the proposed lots in the Subdivision Concept Plan can achieve a true north-south orientation.

A north-south orientation also enables solar access opportunity for dwelling design to capture winter sun. The LSP allows lots to be designed to enable dwellings to have sunny outdoor space, to be energy efficient, to have the main living areas facing north and to have shade on the main living windows in summer. The majority of lots within the LSP will have a true north-south orientation, which provides opportunity for solar passive design.

6.3 Surface and Ground Water Management

As part of the Packham North District Structure Plan, a District Water Management Strategy has been prepared to set the framework for urban water management. To ensure that the quantity and quality of surface and ground water is maintained, an Urban Water Management Strategy (UWMS) will be prepared and implemented at the subdivision stage. This will include measures to address appropriate treatment and disposal of stormwater runoff and groundwater recharge.

7.0 MOVEMENT NETWORK

7.1 *Existing Movement Network*

Regional & District Road Network

The LSP development site is within 300m of Cockburn Road to the west, which is a north-south 'Primary Regional Road' under the Metropolitan Region Scheme. Cockburn Road is directly accessible via Ocean Road, which intersects at a "T" junction. To the east approximately 2kms, Stock Road is also classified as a north-south 'Primary Regional Road' and is accessible via Spearwood Avenue or the local road network. Spearwood Avenue, which runs east-west and is within 800m of the LSP landholdings, is identified as 'Other Regional Roads' under the MRS. There is good accessibility to the subject site via these regional and district level roads.

Local Road Network

In general, the LSP landholdings can be accessed via Hamilton Road, Ocean Road and Cross Road. Cross Road is a local road that provides separation between residential lots and the MRS 'Parks and Recreation' reserve to the west. Cross Road is a poorly constructed bitumen road without kerbs or drainage. This road will need to be upgraded as part of development.

Hamiton Road is a 'Neighbourhood Connector' road that runs north-south through the Packham North District Structure Plan area. Hamilton Road is an important road route linking the localities of Spearwood and Coogee.

Ocean Road is the main east-west road connecting Hamilton Road with Cockburn Road to the west and is expected to carry approximately 3,500 vehicles per day. The section of Ocean Road adjacent the LSP is not part of the 'Primary Regional Road' section of Ocean Road. This balance section is a 'Neighbourhood Connector B' road connecting with Hamilton Road.

The MRS reservation [**Figure 9 – Ocean Road MRS reservation**] refers to the future intersection realignment with Cockburn Road. This future realignment of Ocean Road is under the planning and control of Main Roads WA. MRS reservation of the remainder of Ocean Road, that section connecting with Hamilton Road, for inclusion in the 'Primary Regional Road' reservation, is not required.

7.2 *Proposed Movement Network - Roads*

Hamilton Road

The Packham North District Structure Plan proposes a roundabout intersection at Hamilton Road and Ocean Road. The Ocean Road Local Structure Plan proposes a 15m wide subdivision road being an extension of Ocean Road east of Hamilton Road. This will result in a cross intersection at Hamilton Road/Ocean Road with a controlled roundabout.

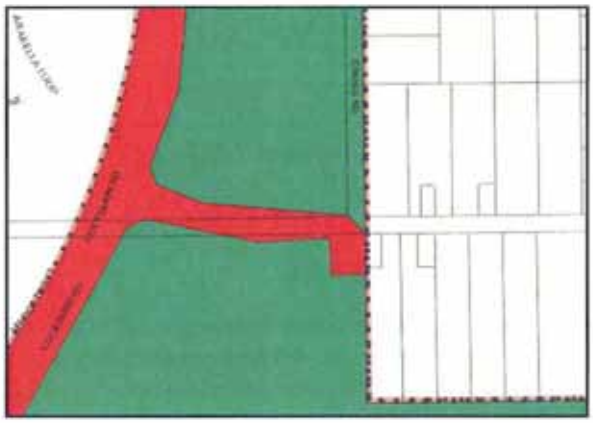


Figure 9. Ocean Road MRS reservation refers mainly to a future realignment to provide for a new intersection with Cockburn Road and land required for drainage.

Liveable Neighbourhoods specifies 'Neighbourhood Connector' roads as having maximum traffic volumes of 7,000 vehicles per day. Hamilton Road already carries over 8,000 vehicles per day (MRWA 2007/08) and is expected to increase to between 11,000 – 13,000 vehicles per day in the future. As part of the Watson Local Structure Plan and Ocean Road Local Structure Plan, it is proposed that the Hamilton Road pavement be increased to provide for 4.5m traffic/cycle lanes on either side of a 2m painted medium. The increase in width to the pavement would only occur on the eastern side of Hamilton Road due to the existing power transmission line infrastructure.

Ocean Road

Some of the lots within the LSP are proposed to front Ocean Road. As part of subdivision, it is likely that the Ocean Road pavement will be required to be upgraded from its current 6 metre pavement width to a pavement width of 7.0 metres (500mm pavement widening either side). This would be consistent with the recently upgraded Ocean Road pavement to the west at 7.0 metres in width. The details of the widening of the road pavement and upgrading of drainage infrastructure would be undertaken at the subdivision stage in consultation with the local authority.

(*Left*) View of Ocean Rd looking north

The MRS 'Primary Regional Roads' reservation over the western-most portion of Ocean Road has been taken into consideration. Any plans to realign the portion of Ocean Road forming the "T" intersection with Cockburn Road is subject to planning by Main Roads WA. As part of the preparation and approval of the North Packham District Structure Plan, there are no requirements for Ocean Road other than general upgrading and widening as mentioned above. It is noted that the upgrading/widening of Ocean Road is also a requirement of the development of the Ocean Road Estate (opposite side of Ocean Road to the LSP). The sharing of costs for the upgrading/widening of Ocean Road is provided for under s.159 of the *Planning & Development Act 2005*.

Local Access Roads

The proposed internal loop road varies in width from 13.0m – 15.0m. Council's standard width for new local access roads is for a 15.0m wide road reserve to accommodate pavement, kerbing, servicing & drainage infrastructure, paths and landscaping. This road reserve width may be reduced to 13.5m where the local access road provides separation between residential lots and public open space. In this instance, a road reserve width of 13.0m has been accepted on the basis that it is for a short length (i.e. 53m), it provides a connection between minor sections of local access road and widening to 13.5m would compromise the area of land available for building on R30 lots.

The road reserve widths in the LSP provides for more land efficient street reserves, including narrower pavement that concurrently promote reduced vehicle speeds, reduced kerb radii and provision for pathways, landscaping, verge treatments, street parking and street trees. Wherever possible, common trenching of services will be provided for, subject to approval by the utility service providers. This can enable the width of road verges to be narrowed by reducing the width of the utilities corridor.

Intersection Treatments

No intersection treatments are proposed as the new subdivision loop road intersections with Cross Road will be "T" junctions and Cross Road is only a local access road with development only on the eastern side. It is not expected to carry significant volumes of traffic.

Similarly the intersection with Cross Road and Ocean Road is not required to be upgraded as a result of the LSP or under the Packham North DSP. Considerations may be given to providing a raised crossover for the 10.0m wide local access road connecting the LSP development site with future development to the north-east. The raised crossing through public open space would assist in calming traffic and place making by denoting a transition through the development.

7.3 Proposed Movement Network – Pedestrian/Cyclists

Vehicle speeds on local access streets will be limited through detailed road design measures including reduced pavement width appropriate to traffic volume. Within the LSP there is no use of cul-de-sacs enabling more permeable and safe pedestrian and bicycle access.

Paths are proposed along the section of Cross Road adjoining the LSP development site and within the local access road. The LSP map shows the conceptual location for proposed paths linking with the existing and proposed surrounding pathway network. The exact location of pathways will be determined in liaison with the local authority at the subdivision stage. Footpaths are to be provided on all streets in accordance with the requirements of Liveable Neighbourhoods.

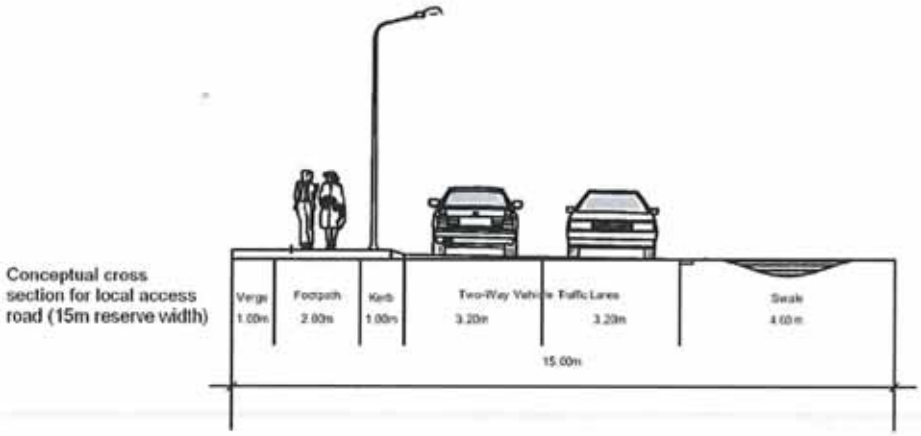
7.4 Proposed Movement Network – Public Transport

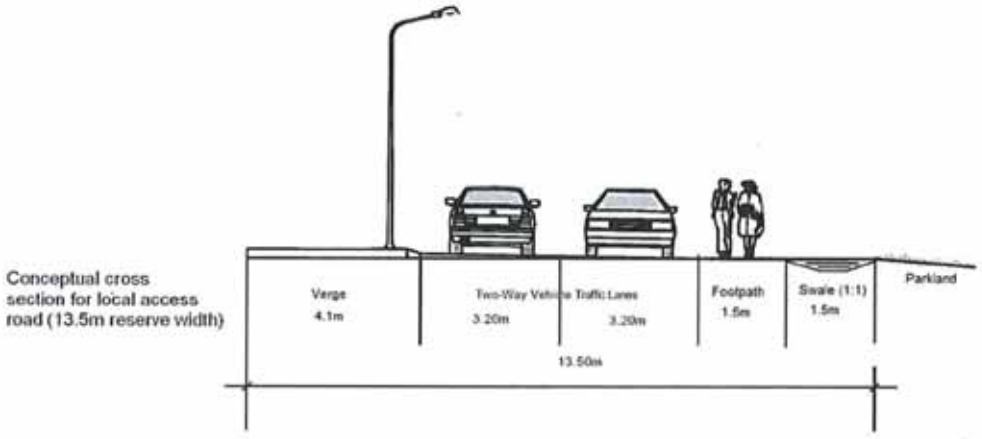
Transperth has bus routes along Cockburn Road and Hamilton Road. The nearest bus stops on either side of Cockburn Road are approximately within 300m west of the LSP landholdings and are situated at the SE termination of Newark Turn (Port Coogee Marina). The nearest bus stops on either side of Hamilton Road are within 250m east of the LSP landholdings around the intersection of Ocean and Hamilton Roads.

Ocean Road provides a reasonable direct access route to these bus services which are located on a 'Primary Regional Road' and 'Integrator Aerial B' level road respectively. Pathways are currently provided along both pedestrian routes to these bus services. The LSP development site is within 400m (5 minute walking distance) of public transport bus services than operate along major transport routes.

7.5 Street Parking

No specific provision of on-street parking embayments are proposed within the LSP, however, the standard pavement width of local access roads could allow for localised on-street parking, whereby vehicles must pass around parked vehicles. This has been found to assist in traffic calming of streets and is generally acceptable in most residential neighbourhoods where speed limits are between 40 – 50km/hr (refer to **Indicative Cross Section** for proposed internal access road).





(Above) Indicative cross sections for proposed local access roads

8.0 PUBLIC OPEN SPACE

8.1 *Public Open Space Provision*

The LSP provides for 4,047m² or 10.0% of the development site as Public Open Space (POS). The 0.4047 hectares of POS required includes the 10% POS requirement for Lots 41 & 500 Ocean Road. Consistent with the Packham North District Structure Plan, the POS for the proposed LSP has been provided as a linear parkway which will serve to form part of an ultimate connection between the MRS 'Parks and Recreation' reserve to the west and the Ocean Road wetland POS area to the east. In this instance, a total 10% POS land contribution is required consistent with the DSP.

The advantage of each landholding (except for Lots 41 & 500) in the LSP providing POS at the rear of the lot is that at the time of subdivision, each landowner can respectively cede POS as part of subdivision. It is envisaged that as and when each landowner subdivides, the respective portion of POS will be set aside as a Crown Reserve for public recreation. This will be further discussed under 13.0 *'Implementation & Staging'*.

8.2 *Public Open Space Typologies*

The LSP provides for a 4,047m² area (10% POS) to be set aside for a neighbourhood park utilised for active and passive recreation. Some of this land is proposed to be developed for parkland in combination with 1:1 yr average recurrence interval (ARI) drainage infrastructure (i.e. roadside linear swale). The POS area is not proposed to be fenced with restricted public access. Rather it will be developed as open parkland with the final design to be determined in liaison with the local authority at subdivision stage.

The POS parkway is proposed with an east-west orientation as per the Packham North DSP. The parkway concept is effective in providing a linear 'greenbelt' through the development site, which will contribute towards pedestrian/cyclist movement, visual amenity and *place making*. In addition, the parkways will also assist in urban water management.

The parkway will not specifically serve as an ecological corridor for native fauna movement, due to it being narrow and "parkland cleared". However, it may serve this function in a minor capacity.

The width of the proposed parkway will ultimately become wider once the landowners to the north develop their land for urban use in line with the Packham North District Structure Plan. Typically, the parkway may contain a shared use path, seated resting furniture, appropriate species of tree plantings and mulched dry landscaping using native and drought tolerant shrub species that are adapted to the local environment.

8.3 *Public Open Space Schedule*

Table 5 comprises the POS Schedule for the LSP as follows:

LSP Site Area Less			4.0470 ha
Foreshore Reserve Environmental protection policy areas Wetlands to be ceded Protected bushland site Unrestricted POS sites not included in POS contribution	Nil Nil Nil Nil		
Total Net site area			**4.0470 ha**
Deductions (LN Element 4 – R43) Primary School Town centres and commercial Dedicated drainage reserve Transmission corridors Other approved contingencies	 Nil Nil Nil Nil Nil		 0 ha
Gross Subdivisible area (GSA)			4.0470 ha
Public open space @ 10 per cent required			**0.4047 ha**
Public open space contribution			
May comprise: - minimum 80 per cent unrestricted POS - Maximum 20 per cent restricted use POS	 0.3237 ha 0.0810 ha		 0.4047 ha
Unrestricted POS area (Non-Drainage Areas > 5yr ARI)			
Linear Parkway		0.4047 ha	0.4047 ha
Restricted use POS area (1:5 yr ARI)	Nil	Nil	0.0 ha
Public open space provision provided			**0.4047 ha (10.0%)**

Notes

(1) 1:1 yr drainage infrastructure will be contained within the Linear Parkway POS as roadside drainage swales

(2) Final POS calculations will be subject to detailed survey and approval of an urban water management plan. A 10% POS land contribution will be provided at subdivision stage, with there being no cash in lieu contribution so as to provide for the linear parkway under the Packham North DSP.

9.0 LOCAL WATER MANAGEMENT

9.1 Local Stormwater Drainage

The LSP development site has highly permeable sandy soils and adequate separation to ground water. In this instance, the development site is highly suitable for urban development and on-site infiltration to maximise groundwater recharge.

The proposed development will have the potential to increase the proportion of impervious areas across the site. This in turn will lead to an increase in the volume of stormwater runoff during rainfall events, thereby altering the natural hydrological behaviour of the site. Urban development of the site will also have the potential to cause nutrients and pollutants (i.e. hydrocarbons and metals) being discharged via runoff to infiltrate into the soil profile and groundwater. If unmanaged, urban stormwater runoff can impact groundwater quality and groundwater levels. Urban stormwater will therefore need to be managed through carefully designed and appropriate treatment measures.

The proposed loop road in the LSP has been designed to assist in providing for effective urban water management by facilitating overflow paths. Street verges and median swales will be used to infiltrate drainage as close to source as possible. All future residential development will be required to contain stormwater on-site. This can be undertaken using standard soak wells and other stormwater disposal techniques, such as directing water run-off to garden beds.

A District/Local Water Management Strategy has been prepared by Cardno for the Packham North District Structure Plan area. The proposed LSP development site forms part of the DWMS catchment area and the proposed road layout and configuration of POS is consistent with the principles of the DWMS. At subdivision stage an Urban Water Management Strategy will be prepared as part of subdivision approval.

9.2 1 year, 5 year and 100 year ARI events

Table 6 outlines the specific local water management principles for the 1 year, 5 year and 100 year Average Recurrence Interval (ARI) events.

9.3 Groundwater Management

Given the characteristics of the development site (i.e. soil type, hydrology, depth to groundwater etc) the proposed development will not result in any specific requirement for groundwater level controls, such as sub surface drainage and/or fill to be imported, to achieve minimum separation distances to groundwater levels where reticulated sewerage is provided. The relatively deep groundwater level below the natural sandy surface of the land provides for direct infiltration of stormwater, as close as source as possible. Notwithstanding, as part of the Urban Water Management Plan, adequate pretreatment measures prior to infiltration to groundwater will be provided to protect groundwater quality.

Table 6 1yr, 5yr & 100yr ARI stormwater management

ARI Event	Local Water Management Principles
1 Year	Retention and treatment onsite of 1 hour duration 1 year ARI event with grooves connected to soak wells; Stormwater contained within each lot prior to discharge/infiltration to groundwater; Road runoff infiltration as close to source as possible using water sensitive urban design measures (i.e. roadside swales)
5 Year	Bioretention structures (i.e. soakwells within the road reserve) to treat and infiltrate stormwater to groundwater;
100 Year	Accommodated via overland flow paths to enable conveyance of runoff to infiltration dam/sump (unfenced) at the base of Lot 18 in designated 1:100 yr low lying detention area as per DWMS;

10.0 FIRE MANAGEMENT PLAN

A Fire Management Plan (FMP) has been prepared to inform the LSP design and recommend fire management (refer to **Appendix 1 – Fire Management Plan**). The general aim of the FMP is to minimise the impact of bushfire for the protection of people, property and the environment. The LSP area is rated as 'Low' fire risk due to there being minimal fuel loading as a result of previous vegetation clearing. However areas adjacent to the LSP area are classified as 'Moderate' fire risk due to more substantial vegetation. In particular, this refers to the bushland to the west of Cross Road and the wetland area on the eastern boundary of the LSP. These vegetated areas in proximity to the LSP development site pose a potential bushfire threat to future residential development. The proposed linear public open space parkway is not considered to present a significant fire risk as the POS will be developed and maintained as parkland with a low fuel loading. In accordance with the WAPC *Planning for Bush Fire Protection Guidelines,* the risk of bushfire can be managed in terms of the following:

- A detailed FMP being prepared and implemented by the developer at the subdivision stage;
- Fire hydrants being installed by the developer in accordance with Australian Standards;
- Proposed residential dwellings on individual lots at the interface of the adjacent vegetated areas being constructed to Bushfire Attack Level (BAL) 12.5, 19 or 29 and AS3959-2009 construction standards as applicable to the external fire hazards;
- Proposed residential dwellings within the 100m Hazard Separation Zone being constructed in accordance with BAL 12.5 AS3959-2009. Detailed assessment for changes to the BAL Assessment can be undertaken by individual owners due to changes in the landscape, for instance, introduction of housing which thereby increases opportunities for 'shielding'. This may be undertaken at construction stage by an accredited Fire Management Consultant with approval from the local authority;
- Recommended Section 70A notifications on title advising prospective purchasers of the FMP;
- A building protection zone (i.e. low fuel loading) of 20 metres is recommended wherever possible from any external housing walls to external vegetated areas with moderate - high fire risk.

(*Left*) Example of 3m wide firebreak adjacent to new housing which would be similar to the LSP eastern interface with wetland area. Recommended dwelling construction standard BAL 29.

11.0 LANDSCAPING

The underlining concepts guiding future landscape design within the proposed LSP roads and public open space areas of the LSP are:

- Provision of public facilities which cater primarily for recreational activities to suit the predicted demographic for the locality, including but not limited to active uses and passive uses such as picnics, nature observation, passive contemplation, walking exercise etc;
- Bio retention swales to collect stormwater runoff, planted with fringing vegetation to provide a nutrient stripping function;
- Integrated path systems to link and create areas suitable for walking, dog walking, cycling, skating and similar;
- Planting in POS and street verges and swales will consist of a mixture of turf, native and exotic species, with an emphasis wherever possible on using indigenous plantings;
- Diversity of street tree plantings to form strong avenue and high amenity streetscapes.

A more detailed landscaping design and management plan will be provided as a condition of subdivision approval. Landscape design will minimise water use, with shrub planting to be native or similar (*above left*). Water harvesting from direct urban stormwater runoff or other sources (i.e. swales, weirs and drainage channels) will be used where possible for passive irrigation purposes. The use of organic mulches and 'amended earth' techniques will assist in water conservation and reduced irrigation dependency. Landscaping of public open space may also consider 'edible landscaping' such as use of fruit trees (*above right*).

12.0 INFRASTRUCTURE & SERVICING

The *Lots 14 – 18 Ocean Road Engineering Services Report* (DEC, 2012) has been prepared following preliminary investigation and planning for infrastructure and servicing of the LSP. The following is a general summary of the report. For further details refer to **Engineering Servicing Report – Appendix 2**.

12.1 Wastewater

Servicing investigations as part of the preparation of the Packham North District Structure Plan and other local structure plans mentioned indicates the availability of the area being able to be serviced by Water Corporation reticulated sewerage. Wastewater is proposed to be disposed through a reticulated pipe network gravity fed to the proposed Spearwood Pumping Station (Type 40 Spearwood J-066 wastewater pumping station).

The proposed Spearwood Pumping Station will be developed adjacent to the Fremantle Mount Pleasant Diversion Pressure Main within the central spinal POS land (portion of Lot 6 Mell Road) as shown in the Ocean Road Local Structure Plan. Wastewater gravity fed to the Spearwood Pumping Station will then be pumped to an existing DN915 collector sewer to the east in Reserve Road.

The proposed pumping station would be constructed under a prefunded private arrangement between the two major developers of the Watson Local Structure Plan and Ocean Road Local Structure Plan and the Water Corporation. The pump station is not proposed as a DCA item.

12.2 Water Supply

Preliminary investigations indicate that the LSP area is located within the boundary of the Water Corporation's Water Supply Scheme. There is an existing 150mm water main along Ocean Road fronting the development and a 100mm main in Cross Road.

To service the Packham North District Structure Plan area, the Water Corporation advises that a 300mm trunk water main will need to be extended from Port Coogee along Ocean Road to the development area. It is likely that this infrastructure extension will be ushered in by the other two developers undertaking larger structure planning projects in the Packham North DSP.

12.3 Power

Western Power has indicated that there is sufficient capacity in the grid for the residential development as part of the proposed LSP. There is an existing dual circuit 132kV overhead powerline located within the road reserves on the northern side of Entrance Road and the western side of Hamilton Road.

There is an existing 22kV overhead powerline located within the road reserve on the northern side of Ocean Road. This existing overhead 22kV line will need to be removed and replaced with new underground cable at subdivision/development stage. Maintenance of power to occupied homes will be a priority during subdivision construction. This can be accomplished through staging of works, however, at some point there would be a temporary (i.e. half day) disconnection of power to existing homes in order to transition to underground power.

12.4 Telecommunications

The LSP area can be serviced by the existing telecommunications infrastructure within Ocean Road and Cross Road. This infrastructure will need to be extended to service the proposed development, with some upgrading likely to be required. The developer will also likely be required to install National Broadband Network (NBN) 'pipe and pit' to allow for future installation of cables for the NBN. This can be accommodated within common telecommunications trenching.

12.5 Gas

Alinta Gas indicates that the Packham North DSP area can be supplied with reticulated gas via extensions from existing reticulated gas mains in Hamilton Road, Ocean Road and Mell Road. To service the proposed LSP area, the developer will need to extend the existing gas mains infrastructure on the south verge of Ocean Road.

12.6 Earthworks

Earthworking of the site will be required in areas to create level lots for dwelling construction and provision of roads and services. Siteworks will generally comprise of clearing the land, removal of unwanted materials and localised cut to fill.

Due to its coastal location, there may be isolated pockets of limestone found, particularly in the western part of the LSP area. If any limestone is encountered, it will be broken up prior to use as potential structural fill and replaced with sand. Sand will be used to fill other required areas.

Changes in elevation will be provided for by construction of either retaining walls or batters. The height of retaining walls will vary due to natural ground level differences and wherever possible, the natural topography will remain, though benched.

Level sites that are terraced reflect the ideal building site to reduce housing cost and create more affordable housing. Retaining walls will be used to provide terraced lots and absorb level differences. Wherever possible, the height of retaining walls will be kept to a minimum and may vary due to natural ground level differences. Wherever possible, the natural topography will remain, though benched. It is not envisaged that retaining walls will be significantly high, with most walls less than 1.0 metre.

(*Left*) Example of terraced style retaining to create level building sites.

12.7 Roads & Drainage

In accordance with City of Cockburn engineering standards, the roadways will generally be constructed in the conventional manner, with asphalt wearing coarse on a granular base coarse and cast-in-situ concrete kerbing with piped drainage and provision of footpaths. Roads will not exceed a 10% gradient (1:10) and will generally consist of two way single carriageways, with widths of 3.2m. Further geotechnical investigations can confirm the exact design of the roads and drainage infrastructure.

A District Water Management Strategy (DWMS) for the Packham North District Structure Plan was prepared by Cardno for the City of Cockburn. The DWMS aims to put in place strategies for water management that will protect water resources and minimise environmental impacts. The DWMS covers the LSP area and has provided sufficient information to determine the location of drainage infrastructure (i.e. swales) within public open space. The LSP has been prepared consistent with the DWMS and Packham North DSP and reflects the areas required for public open space, which can also accommodate drainage infrastructure.

Stormwater from Ocean Road will drain to the existing gully pits at the low point east of the development site. Stormwater from Cross Road will be directed to verge drainage swales. Stormwater from the proposed internal subdivision road will be contained within the development using underground storage (i.e. soakwells) and swales within the northern proposed POS area. In accordance with the DWMS the low lying area to the east of Lot 18 is designated as a 1:100 year drainage inundation area. The details for stormwater drainage Urban Water Management flows for the proposed residential development of the LSP area will be undertaken at the subdivision and development stage.

13.0 STAGING

13.1 Staging and Anticipated Timeframes

Subdivision and development is likely to be influenced by market demand. However, it is envisaged that subdivision is likely to occur as soon as practicable once the local structure plan has been approved. Conditional subdivision approval for a single subdivision application lodged to cover the LSP could be obtained as early as July 2013. Construction of lots could commence with some lots being constructed by the middle of 2014. However, this would be subject to construction and commissioning of the required sewer pump station to meet with Water Corporation standards. This will be undertaken by the other two major land developers, who are currently progressing subdivision approvals.

Notwithstanding the fragmented landholdings, it is anticipated that the development will be undertaken in a single stage as agreed by the landowners. Due to the requirement for each landowner to provide land for the construction of the internal loop road, landowners in the LSP have indicated a willingness to construct this road immediately upon LSP and subdivision conditional approval.

13.2 Development Contributions

Local Scheme Amendment No. 87 will provide for DCA 12 for the multiple landholdings within the Packham North District Structure Plan area. DCA 12 costs include, but not limited to drainage, servicing, engineering and environmental studies prefunded by Council and other common costs that arise through the structure plan process.

Wherever possible, lots have been designed to allow development by respective landowners to be undertaken independently. Where this cannot be achieved, landowners will coordinate sharing of costs for provision of infrastructure (i.e. POS, drainage, roads etc) and servicing under a cost sharing agreement. This agreement will be entered into by each landowner and managed by the landowners' project manager as part of the land subdivision process.

14.0 REFERENCES

Soils and Landforms of the Perth Area, Department of Agriculture, 2003

Acid Sulphate Soil Desktop Assessment, Cardno BSD, May 2009

Perth Metropolitan Region 1:50,000 Environmental Geology Series, Rockingham (Part of Sheets 2033 I and 2033 IV, Geological Survey of Western Australia) (Gozzard J.R 1983)

Perth Groundwater Atlas, Department of Water,2003

Hamilton Road/Mell Road Coogee Servicing Report, Cardno BSD, 2008

APPENDIX 1 – FIRE MANAGEMENT PLAN

Lots 14-18 Ocean Road
Coogee, WA

Fire Management Plan

BIO DIVERSE SOLUTIONS

05/03/2013

Kathryn Kinnear

Bio Diverse Solutions

DOCUMENT CONTROL

TITLE

Lots 14-18 Ocean Road, Coogee Fire Management Plan

Author (s) : Kathryn Kinnear

Reviewer (s) : Lorraine Spencer

Job No. : WHEL017

Client : Terranovis Pty Ltd

REVISION RECORD

Revision	Summary	Revised By	Date
Draft	Client review	Terranovis	30/2/2012
Draft	FESA Review	Don Johnston	6/6/2012
FINAL	Issued to client	Terranovis	13/6/2012
Final	Issued	WAPC	05/03/2013

DISCLAIMER

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

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APPENDICES

1. Introduction

Terranovis Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to undertake a fire hazard assessment and prepare a Fire Management Plan to guide all future fire management for the proposed subdivision development of Lots 14-18 Ocean Road Coogee.

The basic requirements of any Fire Management Plan (FMP) is to identify potential issues or problems relating to environmental fire threats and recommend specific actions by certain persons, agencies, authorities and developers to ensure, as much as practical, that the lives and assets of the location are not put at undue threat from any unplanned fire event. A FMP takes into account various physical attributes of the land, including topographical and vegetation properties, local climatic impacts, biodiversity, past and current land use, past fire history and management practices, local authority fire management obligations, road access, water supplies, adjacent property and tenure, and future obligations by various parties should the subdivision application be successful.

Such planning takes into consideration standards and requirements specified in various documents such as Australian Standard (AS) 3959-2009 and WA Planning for Bushfire Protection Edition 2 (2010) which have been developed to ensure uniformity with interpretation of onsite vegetation types, site design, and building standards.

The subject area is described as Lots 14-18 Ocean Road Coogee and is shown in Appendix A and Appendix B.

1.1. Statutory Conditions

This Fire Management Plan has been prepared for Lots 14-18 Ocean Road Coogee to address fire management issues associated with the proposed Local Structure Plan, consistent with State and Local Government planning instruments, in particular the FESA and Western Australia Planning Commission (WAPC) Planning for Bushfire Protection (2010) The Plan aims to resolve any conflicts and provide planning information and guidance for the City of Cockburn, FESA, present and future owners. This document and the recommendations contained are aligned to the following policy and guidelines:

- AS 3959-2009 "Construction of Buildings in Bushfire Prone Areas";
- "Planning for Bushfire Protection Edition 2" WAPC (2010);
- *Bushfires Act 1954*;
- City of Cockburn Weed Management Strategy; and
- City of Cockburn 2011/2012 Fire Break Notice.

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

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

- Ground Controller.

Kathryn Kinnear currently has the following Tertiary Qualifications:

- BAS Technology Studies & Environmental Management;
- Diploma Business Studies; and
- Progression towards Masters of Environmental Management (current).

1.2. Other documents relating to this plan

Other documents that have been prepared for this subdivision proposal which should be consulted when reading this plan include:

- Landscape Strategy Report and Ocean Road Public Open Space Management Plan, George Weston Foods; and
- Vegetation Survey and Rare and Priority Flora Search Ocean Road Wetland, Spearwood, City of Cockburn.

2. Aims of this Plan

The aim of this Plan is to reduce the occurrence of, and minimise the impact of bushfires, thereby reducing the threat to life, property and the environment. This Plan has been prepared by Bio Diverse Solutions (Environmental Consultants) for "Ocean Road Estate" with the "subject site" being Lots 14-18 Ocean Road Coogee.

To ensure that every aspect of the proposed subdivision meets the planning requirements as set in Planning for Bushfire Protection Ed. 2 (2010), a site inspection was undertaken on the 12th April 2012 by Kathryn Kinnear (Bio Diverse Solutions) to assess the vegetation and the site conditions.

The site was assessed as having a **"Moderate"** bush fire hazard rating, with the following "Performance criteria" and "Acceptable solutions" which are requiring to be met:

- Location;
- Vehicular access;
- Water;
- Siting of development; and
- Design of development

The Fire Management Plan applies to the proposed subdivision at Lots 14-18 Ocean Road Coogee.

3. Description of the area

3.1. Location

The subject site is located 6.5km from Fremantle and is situated north along Ocean Road, in the northern extent of Coogee locality and the western extent of Spearwood within the municipality of the City of Cockburn. The subject site is a 4.1ha made up of 5 existing lots which have been used primarily for annual horticulture and have existing residential housing. Please refer to Figure 1 below - Locality Map, and Site Location Mapping Appendix A.

Figure 1 – Subject site locality

3.2. Development proposal

The applicant is seeking to rezone the subject area from Development to R25 and R30 Residential areas with Public Open Space (POS). The "Fire Management Plan" has been prepared during WAPC assessment for rezoning, to verify the hazard rating, document control mechanisms to reduce the risk of fire to residences and give recommendations to the current and future owners and the developer of the site.

The development proposal includes the creation of 65 Residential Lots and POS. Please refer to the Subdivision Guide Plan as provided by Whelans, Appendix B.

4. Desktop Assessment – Regional Setting

4.1. Current site land use

The site is currently 5 rural lots of predominantly cleared paddocks with grasslands and residential housing facing onto Ocean Road. Historically the subject area has been used for annual horticultural pursuits. . Please refer to Photographs 1 and 2 below.

Photograph 1 – View of Ocean Road and existing housing infrastructure.

Photograph 2 – View of lots where horticultural pursuits occurred historically.

4.2. Climate

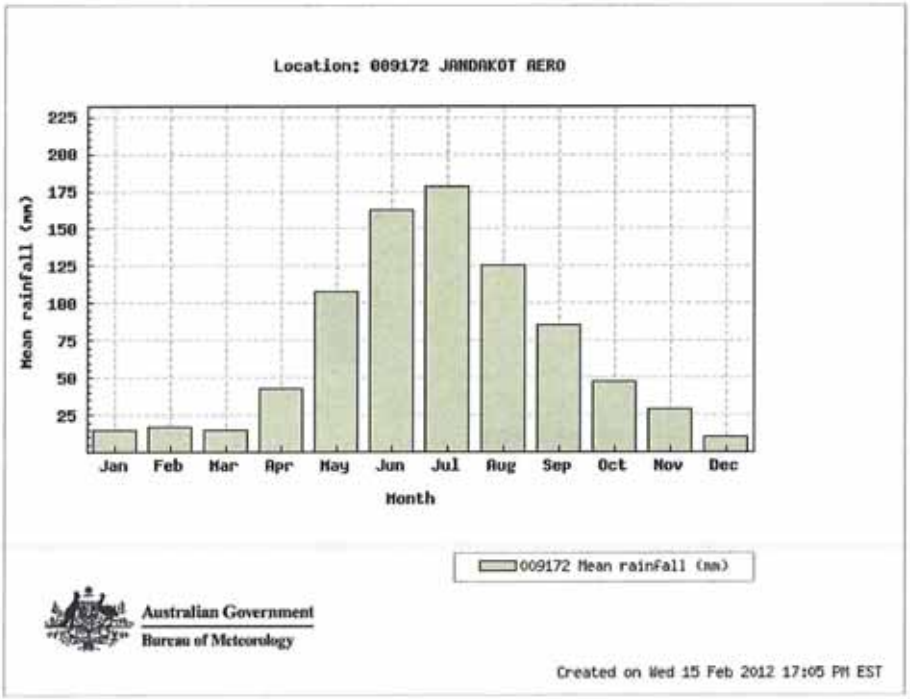
Perth experiences a Mediterranean climate, characterised by hot, dry summers and mild, wet winters. These seasons extend into the autumn and spring months, which are transitional periods between the main seasons.

The climate of the region is strongly influenced by the position of the axis of the band of high pressure known as the sub-tropical ridge, and in the warmer months by the development in the easterlies to the north of the ridge of a trough of low pressure near the West Coast. For much of the year the ridge is located to the south allowing the east or southeasterly winds to prevail. During the cooler months the ridge periodically moves to the north allowing cold fronts to pass over the west coast and deliver much of the annual rainfall. Sometimes these fronts interact with tropical cloud bands from the northwest and this can enhance the amount of rainfall produced.

4.2.1. Rainfall

Long term climate statistics from Jandakot Bureau of Meteorology (BOM) station indicates an annual mean rainfall of 825.5 mm, which occurs on 84 rain days, approximately 80% usually falls between May and September. Rain occurs on four days out of every seven on average during winter. Flooding is rare to the region, however heavy rain may be produced by strong winter cold fronts or, less frequently, by summer storms or, more rarely, by decaying tropical cyclones. The highest mean monthly rainfall is 178.3mm recorded in July, with the driest month being March with 15.3mm mean rainfall. It is not unusual for there to be extended dry periods during the warmer months. Please refer to Jandakot (10km away from subject site) Annual Rainfall graph over the page (Figure 2).

Figure 2 – BoM Rainfall for Jandakot Station



4.2.2. Temperature

Mean monthly air temperatures range from 31.5°C in February to 17.8°C in July. Summer maximum temperatures are strongly dependent upon the arrival time of the reliable sea breezes. On some days the difference between the maximum temperatures on the coast and the eastern suburbs may exceed 10°C. Heatwaves are associated with strong easterly winds and the late arrival or absence of the sea breeze. The highest temperature ever recorded is 46.2°C, however, the temperature exceeds 40°C on only three days per year on average. The average minimum temperature ranges from just 6.8°C in July to 17°C in February. Please refer to average temperatures over the page for Jandakot (10km away), Figure 3 and Figure 4 below.

Figure 3 – Mean Max Temperatures

Figure 4 – Mean Min Temperatures

4.2.3. Wind

Winds are mainly easterly but varied in the warmer months by reliable afternoon sea breezes from the south west and in the cooler months by the westerlies that are associated with the bulk of the annual rainfall. Despite the occurrence of strong winds or gales, average wind speeds in winter are considerably lighter than in summer. Please refer to Figure 5 and 6 below.

Figure 5 – Summer (Jan) wind rose BoM

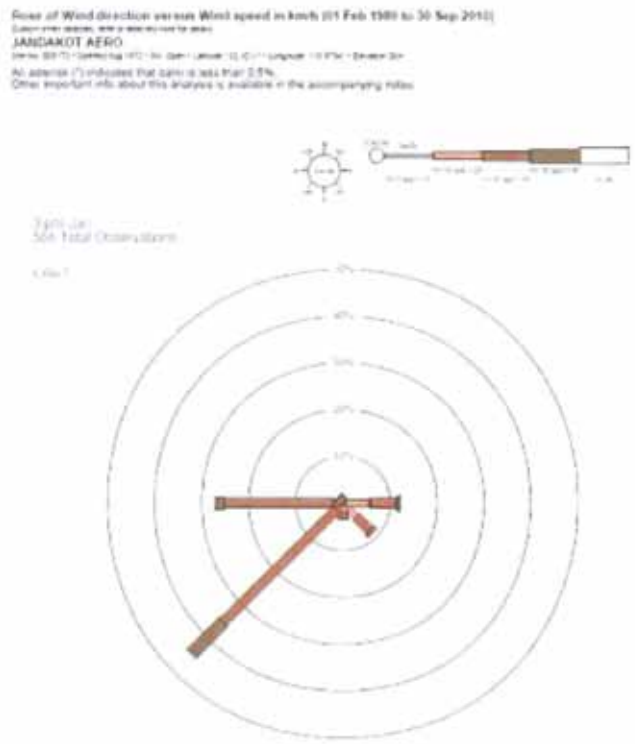
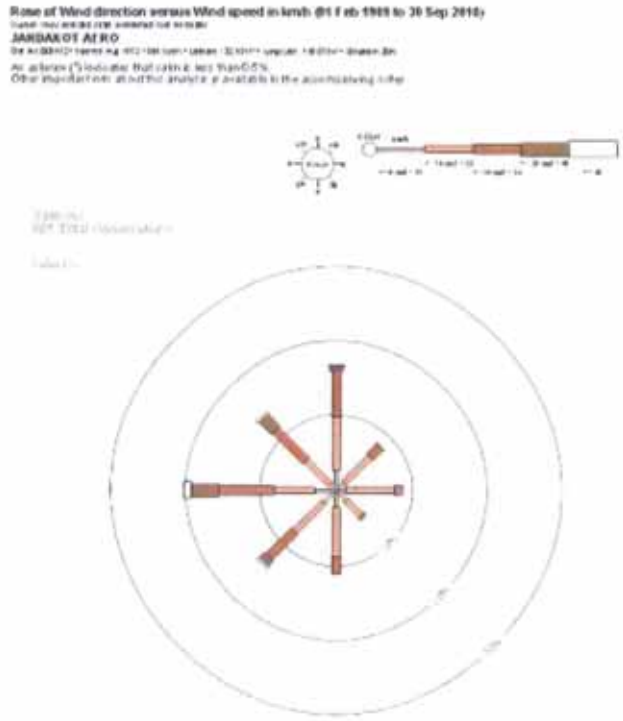


Figure 6– Winter (July) wind rose BoM



4.3. Prevalent Fire Weather

Fire weather is characterised by mid-level disturbances across the south west of Western Australia, bringing unstable atmospheric conditions (thunder and lightning) from the north or north-west wind directions. This is characteristic of "Extreme" Fire Weather conditions to the area with hot dry conditions prior to storm events. Risk of lightning strikes, spark ignition, arson and other causes of fire give rise to wild fires under these conditions.

Prevalent winds which most wildfire events occur in the region are from the north-west, east and north-east direction. Conditions tend to be dry with low relative humidity. High winds and excess fuels can lead to hazardous conditions for residents. Strong westerly and south westerly winds exist at the subject site during dry summer periods (Figure 5). These circumstances place residential housing under the most risk from wildfire events.

4.3.1. Climate Change

Climate change is expected to impact on the future rainfall pattern of the area. It is recognised that the average rainfall has already declined by 20%-30% over the past few decades and that the long term impact of climate change may lead to a shift in rainfall, as well as dryer climatic conditions for

the region. The long term changes are predicted to impact on the flora, fauna and water availability for the region. (Climate Commission 2010)

The Climate Commission (Climate Commission 2010) estimates that
"...Rainfall patterns in Western Australia have changed over the last 40 years. There is significant evidence that climate change has contributed to the marked drying trend in the southwest of the state."

The construction of the proposed development is not predicted to be affected by sea-level rise, however could be affected from increased intensity rainfall events or extended drying periods. Increased extreme weather from climate change could affect fire frequency and behaviour in Western Australia (DEC, 2012), this Fire Management Plan has been prepared to reduce the risk of fire on the proposed residential dwellings in the newly created subdivision.

4.4. Topography

The subject site is located on a northerly facing slope in an undulating landscape on the Swan Coastal Plain with the average slope for the site as 5.6 ° (assessed as an average over 3 slopes/100m) and ranges between 2.6 (majority of internal slopes) and 8.5° (western slopes). Please refer to Vegetation Mapping Appendix C.

4.5. Bushfire fuels – Vegetation

The subject lies within the Swan IBRA bioregion. This bioregion is comprised of "*low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils.*" The area is located within the *SWA1- Dandaragan Plateau. The plateau is bordered by Derby and Dandaragan Faults. Cretaceous marine sediments are mantled by sands and laterites. Characterised by Banksia low woodland, Jarrah - Marri woodland, Marri woodland, and by scrub-heaths on laterite pavement and on gravelly sandplains.* (Hearn *et al.*, 2002).

The majority of the vegetation across the subject site is predominantly weed infested and in a "Completely Degraded" vegetation condition with no native vegetation cover present (pers obs K.Kinnear 2012). The vegetation on site was noted as remnants of maket gardening actvitiy, being weeds such as dill, cape lilac, cane, cactus, ornamental plants, paddock grasses and fruit trees. Please refer to Photographs 3 and 4 below, and Vegetation Mapping Appendix C.

Photograph 3 – View of predominant vegetation types, isolated fruit trees, weeds and grasslands.

Photograph 4 – The majority of the subject site is cleared and devoid of vegetation.

Adjacent to the site to the west is City of Cockburn (CoC) Reserve 9903. Cross Road and a CoC managed firebreak boarders the reserve and provides a 20m+ separation distance from the proposed subdivision. The majority of the vegetation adjacent to the subject site in this area is predominantly weed infested and in a "Completely Degraded" vegetation condition with shrubs of *Acacia cyclops* and *Leptospermum laevigatum*, (Coastal Tea Tree) (Environmental Weeds (DEC 1999), a number of paddock grasses forming the dominant understorey. Please refer to Photographs 5 and 6 below, and Vegetation Mapping Appendix C.

Photograph 5 – View from firebreak of predominant vegetation in CoC Reserve 9903 to the west of the subdivision

Photograph 6 – View from Cross Road the Reserve is upslope of the subdivision.

Adjacent to the Subdivision to the east and downslope of the subject site is a wetland located on land owned by George Weston Foods. The lots are known as Lot 1, 2, 301, 4 and 300 Hamilton Road, with the predominant species identified by RPS (2011) in the wetland shown in Table 1 below.

Table 1 – Plant species identified in wetland by RPS (2011)

	Family	Scientific Name	Common Name
1	Apiaceae	*Centella asiatica*	Pennywort, Gotu Kula
2	Cyperaceae	*Baumea juncea*	Jointed Twig-Rush
3		*Bolboschoenus caldwellii*	Marsh Club-Rush
4		*Gahnia trifida*	Coast Saw Edge
5	Fabaceae	*Acacia cyclops*	Red-Eyed Wattle
6		*Acacia rostellifera*	Summer-Scented Wattle
7		*Acacia saligna*	Golden Wreath Wattle
8	Juncaceae	*Juncus kraussii*	Sea Rush
9	Myrtaceae	*Melaleuca rhaphiophylla*	Swamp Paperbark
10		*Melaleuca teretifolia*	Banbar

(Source: RPS Environmental Planning Pty Ltd, 2011)

The wetland vegetation is a Woodland structure (WAPC, 2010) as shown in Photographs 7 and 8 below.

Photograph 7 – View along boundary of lot 18 and George Weston Foods Lots 1, 2 and 300.

Photograph 8 – View of wetland vegetation – *Melaleuca* (paperbark) species.

The Vegetation type for the subject site (internal) has been classified as per the Planning for Bushfire Protection criteria as:

- **Grassland (Type G)** – *Open paddock areas, overstorey foliage <10%.* (WAPC 2010), located internal to the site.

The Vegetation type adjacent to the subject site has been classified as per the Planning for Bushfire Protection criteria as:

- **Shrubland (Type E)** –*Tall Shrubland: Vegetation is dominated by shrubs (especially eucalypts and acacias) with a multi-stemmed habit, usually greater than 2 metres in height <30% foliage cover. Understorey of widespread to dense low shrubs (Acacia) or sparse grasses.* (WAPC 2010); predominantly to the west of the site (external); and

- **Woodland (Type B)** – *Trees 10 -30 m in high; 10-30% foliage cover dominated by Eucalypts; understorey low trees to tall shrubs dominated by Acacia, Callitris or Casuarinas* (WAPC 2010); adjacent to the site in the south east corner (external to the site).

These assessments are based on dominant tree heights and vegetaton structure according to Figure 1 (Page 22) Planning for Bushfire Protection Edition 2 (WAPC 2010).

4.6. Assets

The subject site is predominantly cleared of remnant vegetation, the site is valued for its proximity to the expanding residential areas of Spearwood and Coogee. Once developed, the values which will be potentially affected by fire include:

- ***Human lives:*** It is likely that more than 160 people could be resident at the newly created subdivision;
- ***Assets:*** The development will contain dwellings and valuable infrastructure; and
- ***Environmental Conservation Values:*** Internal POS areas and adjacent to the site in the City of Cockburn Reserve and Wetland area to the east.

4.7. Access

Vehicle access to the subject site is from Ocean Road (north), Cross Road (West) and in the future from Entrance Road to the north. Further internal roads are proposed, with Cross Road are already constructed which connects Ocean Road to Entrance Road in the north.

4.8. Water Supply

Water supply is presently from scheme mains resources.

5. Potential Fire Issues and Fire Risk

The hazard assessment provides a measure of the fire intensity and likelihood of fire attack measures on a subdivision or residential area (Planning for Bushfire Protection, Edition 2 2010). This measure can provide an assessment of the land for suitability for residential construction and takes into account:

1. Vegetation Assessment – type and class in each direction;
2. Distance - between the predominant vegetation class and proposed building;
3. Topography and slope – with reference to accessibility; and
4. Land use – surrounding and internal to the proposal.

(Refer to Planning for Bushfire Protection, Edition 2, 2010)

The Vegetation type for the subject site has been classified as per the Planning for Bushfire Protection criteria as Grassland (Type G), with external adjacent vegetation Shrubland (Type E) and Woodland (Type B).

Internal Fire Risks

The subject site has sustained vegetation clearing and is a cleared landscape. Internal fire risks are low, with the proposed built form (residences) presenting a low internal risk of fire. The Proposed POS area in the north of the Subject site is to be landscaped lawns and and stormwater drainage areas.

The Fire Hazard within the proposed subdivision has low shrubs with slopes <10°, or suburban areas with some native tree cover. The majority of the subdivision would be rated as "Low" as there is substantial areas of low grassland and urban housing.

The overall rating of the internal fire risks for the site is **"Low"** rating due to the absence of internal vegetation and low slopes across the site.

External Fire Risks

Surrounding the subject site to the west and east there is remnant bushland with cleared areas. The predominant fire risk associated with the site is the adjacent Shrublands to the west and the wetland to the east with Woodland type vegetation.

The Fire Hazard adjacent to the proposed subdivision to the west is dominated by **introduced vegetation** such as *Leptospermum laevigatum*, (Coastal Tea Tree) (Environmental Weeds (DEC 1999). The fire risk of the shrubland vegetation to the west is upslope of the development and has isolated patches of grassland interspersing Shrubs 1.5-3m. Cross Road forms a 20m road reserve giving separation from this hazard. The intensity of a fire downslope is largely reduced in wildfire conditions.

The south and north areas are predominantly housing or proposed housing development with landscaped POS areas. These areas pose a low threat of fire.

The wetland vegetation to the east is paperbarks (*Melaleuca* spp) surrounded by weeds including cape lilac trees, dill, cane, cactus, ornamental plants, paddock grasses and fruit trees. The adjacent (wetland) vegetated woodland areas are **Moderate Risks,** which with slope and under hot conditions, can give rise to hot and intense fires in north (Summer mid-level disturbances) and south eastern (prevailing summer) wind conditions.

Areas of extreme fire hazard ratings in adjacent properties are not the responsibility of the developer.

Proposed Subdivision Fire Risk Rating

The fire risk for this subdivision has been rated at **Moderate risk** due to the site being predominantly a cleared landscape with the presence of adjacent external patches of Shrubland and Woodland areas. The overall slope for the residential areas are low, however setback distances of over 100m can not be achieved in most instances. Where 100m cannot be achieved, Planning for Bushfire Protection 2010 states that building to Bushfire Attack Levels (BAL) and AS3959-2009 will apply.

The subdivision will be required to meet the minimum "Performance Criteria" and "Acceptable Solutions" as per Planning for Bushfire Protection Edition 2, 2010, and are outlined in **Section 6 – Fire Management Plan.**

6. Fire Management Plan

6.1. Element 1: Location- Performance Criteria

The subdivision is located in an area where the bushfire hazard level is manageable and where the bushfire hazard does not present an unreasonable level of risk to life and property.

The subdivision is located on land that will not require construction standards to greater than BAL 29. The subdivision has a **Moderate** rating due to the presence of adjacent remnant woodland areas. The bushfire hazard level is manageable and adequate setbacks can be achieved, after construction development of dwellings, internal to the subject site is deemed to have a Low fire risk. Adjacent areas are predominantly cleared areas with shrubs to 3m in the west and an isolated patch of woodland (contained in a wetland) to the east.

6.2. Element 2: Vehicle Access - Performance Criteria

The internal layout, design and construction of public and private vehicular access in the subdivision allows emergency and other vehicles to move through it easily and safely at all times.

Performance Criteria Solutions

The internal layout of roads and fire access allows emergency vehicles and other vehicles to move through the subdivision. Vehicle access standards as outlined in Table 2 (below) shall apply to this development; these standards are the minimum requirements from Planning for Bushfire Protection Edition 2 (2010) and acceptable from FESA for implementation. These standards shall be included in the engineering design of the subdivision.

Table 2 – Vehicular Access Standards

Standard	Public Roads	Fire Service Access Ways	Emergency Access Ways
Minimum trafficable surface	6 metres	4 metres	6 metres
Horizontal clearance	6 metres	6 metres	6 metres
Vertical clearance	4 metres	4 metres	4 metres
Maximum grades	1 in 8	1 in 8	1 in 8
Maximum grade over <50	1 in 5	1 in 4	1 in 5
Maximum average grade	1 in 7	1 in 7	1 in 7
Minimum weight capacity	15 tonnes	15 tonnes	15 tonnes
Maximum crossfall	1 in 33	1 in 33	1 in 33
Curves minimum inner radius	12 metres	12 metres	12 metres
Cul de sacs	N/A	N/A	N/A
Battle Axes	N/A	N/A	N/A
Signage	Not required	N/A	N/A
Gates	Not required	N/A	N/A
Design and construction	Approved by relevant local government	Approved by relevant local government	Approved by relevant local government
Turn around areas	Not required	Not required	Not required

From Planning for Bushfire Protection Edition 2, 2010.

6.2.1. Public roads

All internal public roads shall be constructed to acceptable standards (Refer to Table 2 – Vehicle Access Standards) and shall be detailed in Civil Engineering Designs. The Subdivision design allows for two way traffic and safe egress from the subdivision via a road network linking from

Ocean Road to Entrance Road in the north with 15m internal road reserves. Please refer to Local Structure Plan and Subdivision Guide Plan- Appendix B.

6.2.2. Fire Service Access Ways

Fire Service Access Ways is proposed along the internal roads, with a separate dedicated Fire Service Access not required. At the completion of the internal proposed road reserves through the subdivision, light unit fire appliance and heavy unit (truck appliances) will have suitable access in an emergency throughout the subdivision. The minimum running surface and standards of Fire Service Access is as per Planning for Bushfire Protection Edition 2 (2010), please refer to Table 2.

Fire Service Access routes (Road network) for this subdivision will:

- Link the road network;
- Allow for two-way traffic (as per Table 2);
- Have a hardened surface (as per Table 2 standards); and
- Have erosion control measures in place such as culverts, stormwater contours/diversions, and native vegetation remediation/stabilisation at gully crossings.

If the subdivision is staged, the Fire Service Access Way will be required to link through to Entrance road. At present here is a bitumen road (Cross Road) linking Ocean Road to Entrance Road, this will be the link to the north if the subdivision is staged. Please refer to Fire Management Plan - Appendix D.

6.2.3. Emergency Access Ways

Emergency Access Ways will be along the established internal roads, with a separate dedicated Emergency Access Way not required. The Emergency access shall be via the formed road reserves, linking north and south from Ocean Road via Cross Road to entrance Road. At present here is a bitumen road (Cross Road) linking Ocean Road to Entrance Road, this will be the link to the north if the subdivision is staged.

6.2.4. Cul de Sacs

Cul-de-sacs will not be constructed as part of this subdivision design.

6.2.5. Battle Axes

Battle Axes will not be constructed as part of this subdivision design

6.2.6. Signage

Fire Service Access Ways are along the Road network and therefore do not require further signage to demarcate the access ways.

6.2.7. Gates

Gates are not proposed for this subdivision.

6.2.8. Individual Fire breaks

Internal fire breaks are not required in an urban landscape. If the subdivision is staged it will be the responsibility of the developer to maintain firebreaks until the site is developed or changes ownership. Please refer to Appendix E - Fire Break order from the City of Cockburn website:

http://www.cockburn.wa.gov.au/news/community_news/2445-fire_break_notice__6_sept_2011.pdf

6.3. Element 3 Water – Performance Criteria

The development is provided with a permanent and secure water supply that is sufficient for fire fighting purposes.

Scheme water will be provided to the subdivision. Fire Hydrants are to be installed by the developer every 400m in the road reserve, these must be to the following standards:

- Australian Standards approved underground fire hydrants are required; and
- Fire hydrants outlets must be installed to Water Corporation standards installed in accordance with the Water Corporation's *No 63 Water Reticulation Standard* and are to be identified by standard pole and/or road markings by the Developer.

6.4. Element 4: Siting of development – Performance Criteria

The siting (including paths and landscaping) of the development minimises the bush fire risk to life and property.

As the subject site has minimal internal hazards with adjacent Bushfire Hazards in the south and western portion of the subject area. The site has been classified as having BAL (Bushfire Attack Level) applied to some individual lots at the interface of the adjacent remnant vegetation. It is recommended that they are built to **BAL 12.5, 19 or 29** and AS3959-2009 construction standards as it applies to their property.

This will apply to the subdivision as shown in the Fire Management Plan - Appendix D. Detailed assessment for changes to the BAL Assessment as described in this document can be undertaken by individual owners due to changes in the landscape at construction stage by an accredited Fire Management Consultant with approval from the City of Cockburn.

6.4.1. Hazard Separation Zones

Hazard Separation Zones (HSZ) are defined (as per Planning for Bushfire Protection Edition 2, 2010) as the area surrounding a building which is maintained in a fuel reduced state. This can be achieved at subdivision stage during the construction of roads by clearing for formation of roads, grazing of stock and slashing of understorey species. The internal road network can assist housing to achieve HSZ.

An example of achieving 100m HSZ is shown below in Figure 7.

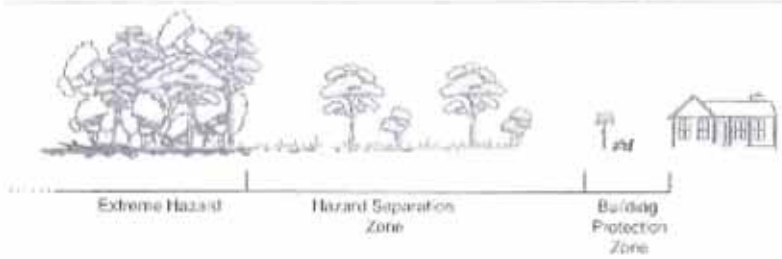


Figure 7- Separation distances from buildings – Building protection Zones and Hazard Separation Zones, Western Australian Planning Commission, (2010).

All lots developed for residential use at the interface of the remnant vegetation will be required to meet Hazard Separation Zones (HSZ) as per the Planning for Bushfire Protection Edition 2 (2010) and Bushfire Attack Levels (BAL).

A Hazard Separation Zone of 80 metres (100m combined with Building Protection Zone (BPZ)) is recommended in all areas where housing is sited adjacent to woodland areas, measured from the

outer edge of the BPZ. Where hazard separation cannot be achieved to 80m (100m combined with BPZ) adjacent to woodland areas, the site will require building requirements of BAL with AS3959-2009 to be implemented by the owners of the property and approved by the City of Cockburn. Please refer to more detail in Table 4, information on long term maintenance of HSZ for the homeowner is provided in Appendix E.

6.4.2. Building Protection Zones

The aim of the Building Protection Zone (BPZ) is to reduce bush fire intensity close to dwellings and to minimise the likelihood of flame contact with buildings (Planning for Bushfire Protection Edition 2, 2010). BPZ will minimise the risk of the building igniting, (thus protecting the occupants), and with the reduced fuel quantities, allow safer and more effective conditions for fire-fighters to contain wildfires. Roads, pathways, lawns, and other low hazard items should be placed within this zone to improve the effectiveness of the zone.

It is recommended that a 20 metre wide BPZ as the minimum width to be constructed around all buildings. Activity within the BPZ must include:

- Width: 20 metres measured from any external wall of the building;
- Location: within the boundaries of the lot on which the building is situated;
- Fuel load: reduced to and maintained at 2 tonnes per hectare;
- Trees (crowns) are a minimum of 10 metres apart;
- Trees are low pruned at least to a height of 2 metres;
- No tall shrub or tree is located within 2 metres of a building (including windows);
- There are no tree crowns overhanging the building;
- Fences and sheds within the BPZ are constructed using non-combustible materials (e.g. colour bond iron, brick, limestone);
- Shrubs in the BPZ have no dead material within the plant;
- Tall shrubs in the BPZ are not planted in clumps close to the building i.e. within 3 metres; and
- Trees in the building protection zone have no dead material within the plant's crown or on the bole.

An example of BPZ from the "Planning for Bushfire Protection Edition 2" is shown below in Figure 8.

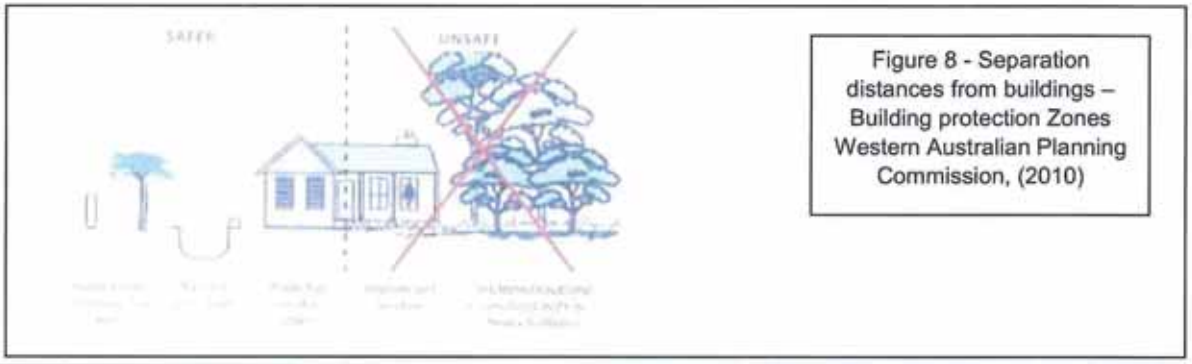


Figure 8 - Separation distances from buildings – Building protection Zones Western Australian Planning Commission, (2010)

All residences within the proposed subdivision can achieve the required 20m BPZ. The lots along the eastern boundary achieve this through a 4m road frontage building setback, 13m road reserve and a 3m firebreak along the wetland boundary (4m+13m+3m =20m BPZ). Please refer to the Example of achieving BPZ in and the Landscaping Concept Plan supplied by George Weston Foods in Appendix D.

Information on long term maintenance of BPZ for the homeowner is provided in Appendix E.

6.4.3. Dwelling construction

Bushfire Attack Level (BAL) is the determination of the construction requirements for a building site, with the threat or risk of bushfire attack assessed by a qualified Fire Consultant. BAL rating determinations are of 6 levels BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40, BAL FZ. Building is generally not recommended in BAL-40 or BAL-FZ areas. The BAL rating is determined by the distance of the building to vegetation, slope and vegetation type adjacent to the dwelling.

The proposed subdivision will require some houses to be built to BAL 12.5, 19 and 29 and AS3959-2009 will apply. Minimum setbacks (inclusive of BPZ) will be required from vegetative areas >0.25 ha. The standards outlined in AS 3959-2009 provide reference to specific items of building and it is recommended that individual prospective home owners discuss these in detail with their builder. Table 3 outlines some of the construction consideration to AS3959-2009 when building in bushfire prone areas. Construction standards are to be approved by the City of Cockburn prior to construction.

Table 3 – AS3959-2009 Construction Requirement (Example)

Construction requirement AS3959-2009
Flooring systems
Supporting posts, columns, stumps, piers and poles
External Walls
Windows
External Doors
Vents and weep holes
Roof
Eaves
Fascias
Gutters and downpipes
Veranda and decks
Service Pipes (water and gas)

The construction standard that shall apply to the dwellings adjacent to the remnant vegetation is shown over the page in Table 4 – Minimum Setback Distances and Construction Standards.

A minimum of 20m BPZ must apply to all dwellings, an additional HSZ is required and dictates the BAL construction standard depending on the distance as shown in Table 4.

Table 4 – Minimum Setback Distances and Construction Standards

Distance to Vegetation	Vegetation Type	BAL Rating	Construction
17-<100 metres Vegetation is upslope and flat land (0°),	Shrubland Type E	BAL 12.5	AS3959-2009 to apply
43-<100m Vegetation is downslope and >5 to 10 Degrees	Woodland Type B	BAL 12.5	AS3959-2009 to apply
31-<43m Vegetation is downslope and >5 to 10 Degrees	Woodland Type B	BAL 19	AS3959-2009 to apply
22-<31m Vegetation is downslope and >5 to 10 Degrees	Woodland Type B	BAL 29	AS3959-2009 to apply
>100 metres	All Vegetation	No BAL Rating Required	No construction standards required

(Planning for Bushfire Protection Edition 2, 2010)

Building to AS3959-2009 is not retrospective and does not apply to existing buildings within the proposed subdivision.

- A minimum BAL setback distance of >17-100m is required from Shrubland native vegetation this will ensure all dwellings are consistent with the **BAL 12.5** setback requirements. Please refer to mapping in the Fire Management Plan - Appendix D.

- A minimum BAL setback distance of >43-<100m for **BAL 12.5, >31-43M for BAL 19 and >22-<31m for BAL 29** is required from Woodland native vegetation this will ensure all dwellings are consistent with the BAL setback requirements. Please refer to mapping in the Fire Management Plan - Appendix D.

- If buildings are located >100m (all vegetation types) then AS3959-2009 and construction to BAL requirements will not apply. Please refer to mapping Fire Management Plan - Appendix D.

Note: *the allocation of BAL (AS3959-2009) to dwellings will be subject to detailed feature survey and the Fire Management Plan Appendix D is a guide, with accuracy to within 5m.*

BAL setback distances are measured from the edge of existing vegetation at time of feature survey and building construction approvals stages.

Detailed assessment for changes to the BAL Assessment as described in this document can be undertaken at individual building (home) construction stages by an accredited Fire Management Consultant with approval from the City of Cockburn.

It is recommended that a notification be placed on the titles of those lots affected by the implementation of the FMP under Section 70A of the *Transfer of Land Act 1983.*

6.4.4. Shielding

Some houses/dwellings within the subdivision are setback from 'Shrubland Vegetation' (>100m) and are able to be constructed **without** building to AS3959-2009. Further dwellings could be individually assessed as being "Shielded" from the frontage buildings, this would need to be assessed by an accredited Fire Management Consultant on a case by case basis at building approval stage with approval required from the City of Cockburn.

"Shielding" can be achieved for intensive residential areas (i.e. R40 areas) through careful design and placement of roads, infrastructure (pools, tennis courts, fences) to give separation or barriers to fire.

6.5. Landscaping/Streetscaping Areas

Landscaping and Streetscaping areas subject to similar standards that apply to the HSZ and the following minimum standards shall apply:

- Trees (crowns) a minimum of 10m apart (no continuous crowns);
- Trees should have no dead material within the plant's crown or on the bole;
- Fuel reduced to <8t/ha; and
- Shrubs should be no higher than 0.5 m.

The landscaping of the subdivision will be via the approved Landscaping and POS management Plan as approved by the COC, please refer to this document for more detail (RPS, 2011).

7. City of Cockburn Fire Protection Plan

The City of Cockburn has the assistance of the Fire and Rescue Services which is made up of emergency trained personnel. It has fire fighting units and incident support teams. Training and induction courses are held regularly and land owners are encouraged to attend these. For more information refer to the City of Cockburn and FESA website:

http://www.fesa.wa.gov.au/pages/default.aspx

http://www.cockburn.wa.gov.au/

7.1. Fire Fighting Facilities

The subject area is in the City of Cockburn. FESA has helicopters for fire fighting purposes based at Perth Airport. The response time for these aircraft to the subject site is approximately 10-15 minutes, but can vary depending on commitments of the aircraft across the metropolitan area.

Response times can vary depending on commitments of volunteers, fire events current at time and priority of the fire services in the south west of Western Australia during summer periods. FESA recommend that homeowners take care to prepare their individual dwellings for fire season and take precautions against fire as per the **"Bushfire Preparedness – Prepare. Act. Survive."**

It is generally acknowledged that during large wildfire events, local resources may not be able to respond to every dwelling due to strategic deployments of services, priorities within the area or state and/or present commitments of volunteers and resources.

The Fire Services in the area have 3.4 and 2.4 heavy duty tankers (3000L and 2000L) and light tankers (fast attack 400L capacity). These are typical of units for fire fighting services within Western Australia.

Fire and Rescue Services provide local fire services and have:

- Fire stations;
- Volunteer members;
- A communications and call out system;
- Protective clothing issue to volunteers; and
- FESA approved fire appliances.

7.2. Homeowner Protection

It is the responsibility of homeowners to protect their property from fire. FESA have readily available information online which can assist homeowners in their preparedness during fire season (October to May). The FESA website **"Bushfire Preparedness – Prepare. Act. Survive."** should be accessed by all owners in bushfire prone areas. A hard copy of the A4 book "Prepare. Act. Survive" can be found at local City of Cockburn Offices or FESA offices, or downloaded off the above web address:

http://www.fesa.wa.gov.au/safetyinformation/fire/bushfire/Pages/default.aspx

*"Before summer starts you need to decide what you will do if a bushfire threatens. If you live or work in a bushland area you need to **prepare** your home, family or business and have a plan so you can **act** to make sure you **survive**."* (FESA 2010)

8. Clearing Native Vegetation for Fire Management

The *Environmental Protection (Clearing Native Vegetation) Regulations Section 51C* allows for exemptions of clearing vegetation other than riparian vegetation for the purposes of:

- Clearing to construct a building (<1 ha across whole of property);
- Clearing for fire hazard reduction;
- Clearing to maintain existing cleared areas for pasture (existing clearing must be within 10 years); and
- Clearing to maintain existing cleared areas around infrastructure etc. (existing clearing must be within 10 years)

Native vegetation may be cleared for fire hazard reduction and/or protection and firebreaks, any vegetation cleared outside of this, will require a Clearing Native Vegetation Permit from the Department of Environment and Conservation under the *Environmental Protection Act 1984.*

10. Summary

10.1. Overall Fire Threat

Terranovis Pty Ltd commissioned Bio Diverse Solutions (Environmental Consultants) to undertake a fire hazard assessment and prepare a Fire Management Plan to guide all future fire management for the proposed subdivision development of Lots 14-18 Ocean Road Coogee. The subdivision proposal is for approximately 65 Residential lots with Public Open Space (POS).

The subject site is predominantly cleared paddock areas (Type G)with some adjacent Shrubland (Type E) and Woodland (Type B) remnant vegetation patches to the west and east (respectively). The majority of the site has have been disturbed from previous land activities (clearing and horticultural pursuits). The subdivision has been rated as having a **Moderate** Bushfire Hazard as defined by Planning for Bushfire Protection Edition 2, 2010. This requires "Performance Criteria" and "Acceptable Solutions" (as set out in Planning for Bushfire Protection Edition 2, 2010) to be met.

The "Performance Criteria" and "Acceptable Solutions" which can be met for this subdivision include:

- Location;
- Vehicular access;
- Water;
- Siting of development; and
- Design of development.

This Plan has identified a number of ways fire risk can be mitigated and managed across the lots to ensure there is protection to life and property and biodiversity assets. To mitigate fire risks this report outlines the implementation of linking road network, community water facilities, location of building envelopes and some Building Construction to AS3959-2009 BAL.

This report provides details of the fire management strategies proposed to be implemented across the site as it is subdivided and developed to ensure adequate protection of life, property and biodiversity assets.

10.2. Owners Responsibility

It is recommended the Future Property Owners shall be responsible for the following:

- To take measures to protect their own assets on their property;
- Implement this document, Fire Management Plan of Lots 14-18 Ocean Road Coogee as it applies to their individual property;
- Ensure that BPZ's are maintained to a minimum of 20 metres around all buildings (see Appendix E).
- Ensure that HSZ's are maintained from the vegetation (fire) risks (See Appendix E);
- Ensure that their property is built to BAL AS3959-2009 Building Standards (if it applies to their property);
- Each property owner is to be made aware of:
    - Fire Management Plan,

- A hard copy of the A4 book "Prepare. Act. Survive",
- Fire Control Information supplied by the City of Cockburn (Appendix E); and

- It is the responsibility of the individual property owner to maintain in good order and condition BPZ, HSZ and driveway standards. Future modifications other than requirements as set out in this Fire Management Plan can only be done with written agreement from the City of Cockburn.

10.3. Developers Responsibility

Prior to development being given final approval by the City of Cockburn, the Developer shall be required to carry out works that include the following but in respect to individual stages of development. Subsequent to the issue of final approval, the Developer shall have no further responsibilities to the provision of fire fighting facilities and fire management on individual lots that pass from their ownership.

It is recommended that the Property Developer shall be responsible for the following:

- Implement this document, Fire Management Plan of Lots 14-18 Ocean Road Coogee as it applies to their development;
- Comply with standards as outlined by the City of Cockburn and WAPC conditions of subdivision;
- Ensure that potential property owners are aware of this Fire Management Plan;
- Comply with minimum construction standards as outlined by this Fire Management Plan;
- Maintain fire protection measures in public areas (access, landscaped areas etc) until the Developer has relinquished construction/maintenance responsibility of public use areas to the City of Cockburn.
- Construct access to the following standards as outlined in Table (2) below.

Table 2 – Vehicular Access Standards

Standard	Public Roads	Fire Service Access Ways	Emergency Access Ways
Minimum trafficable surface	6 metres	4 metres	6 metres
Horizontal clearance	6 metres	6 metres	6 metres
Vertical clearance	4 metres	4 metres	4 metres
Maximum grades	1 in 8	1 in 8	1 in 8
Maximum grade over <50	1 in 5	1 in 4	1 in 5
Maximum average grade	1 in 7	1 in 7	1 in 7
Minimum weight capacity	15 tonnes	15 tonnes	15 tonnes
Maximum crossfall	1 in 33	1 in 33	1 in 33
Curves minimum inner radius	12 metres	12 metres	12 metres
Cul de sacs	N/A	N/A	N/A
Battle Axes	N/A	N/A	N/A
Signage	Not required	N/A	N/A
Gates	Not required	N/A	N/A
Design and construction	Approved by relevant local government	Approved by relevant local government	Approved by relevant local government
Turn around areas	Not required	Not required	Not required

(As per "Planning for Bushfire Protection" Edition 2, WAPC 2010)

- Recommended placement of a Section 70A notification on titles advising prospective purchasers of the FMP;
- Provide each prospective owner with:
    - Fire Management Plan,
    - A hard copy of the A4 book "*Prepare. Act. Survive*"; and
    - Fire Control Information supplied by the City of Cockburn (Yearly advice Brochure updated annually - example provided in Appendix E).

10.4. City of Cockburn Responsibility

At approval and endorsement of this Fire Management Plan, the City of Cockburn has statutory control and responsibility to ensure that aspects of the Plan and community fire safety are maintained.

It is recommended the City of Cockburn be responsible for the following:

- Provide advice on standards and methods to achieve community fire protection to owners/occupiers of land.
- Ensure individual Property Owners maintain in good order and condition Emergency Access/Fire Access Ways building protection zones, hazard reduction zone and driveway standards.
- Maintain district Fire Fighting Facilities.
- Undertake Prescribed Burning (if required) and fuel reduction strategies to ensure a maximum of 8T/ha ground fuels on any public remnant vegetation.
- Ongoing management of any public areas will be the responsibility of the City of Cockburn after the Developer has relinquished construction/maintenance responsibility.
- Maintain condition and working order of district water supplies and equipment for fire fighting purposes.

11. Conclusions

This Fire Management Plan has been developed to meet "Performance Criteria" and the "Acceptable Solutions" as outlined in Planning for Bushfire (2010) Edition 2 with specific recommendations for:

- The layout of the subdivision and the facilities proposed have been designed to reduce the fire threat to persons and property within the development (i.e. Internal road design, setbacks and building envelopes);
- Accessible "Fire Service Access" and "Emergency Access Ways" in opposing directions through the subdivision for access and egress in fire events along the proposed and existing road reserves;
- Building to **BAL 12.5, 19 and 29** and AS3959-2009 where setbacks of 100m from external remnant vegetation areas cannot be achieved.

A copy of FESA's Compliance Checklist for "Performance Criteria" and "Acceptable Solutions" is provided in Appendix F.

In summary it is recommended to the Developers that in building the proposed subdivision at Lots 14-18 Ocean Road Coogee, the Developer:

- Implements the fire protection standards as outlined in this document and by Planning for Bushfire Protection Edition 2 (WAPC 2010);
- Adheres to subdivision conditions;
- If any changes to detailed designs occur, that this Fire Management Plan is updated to reflect these changes, with approval from the City of Cockburn and FESA; and
- Implement this document, Fire Management Plan of Lots 14-18 Ocean Road Coogee standards of construction and recommendations.

12. References

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Western Australian Planning Commission (WAPC) (2010) *Planning for Bushfire Protection Edition 2* Fire and Emergency Services Authority of Western Australia and Department for Planinng and Infrastructure Western Australia.

Appendices

Appendix A – Location

Appendix B – Local Structure Plan

Appendix C - Vegetation Mapping

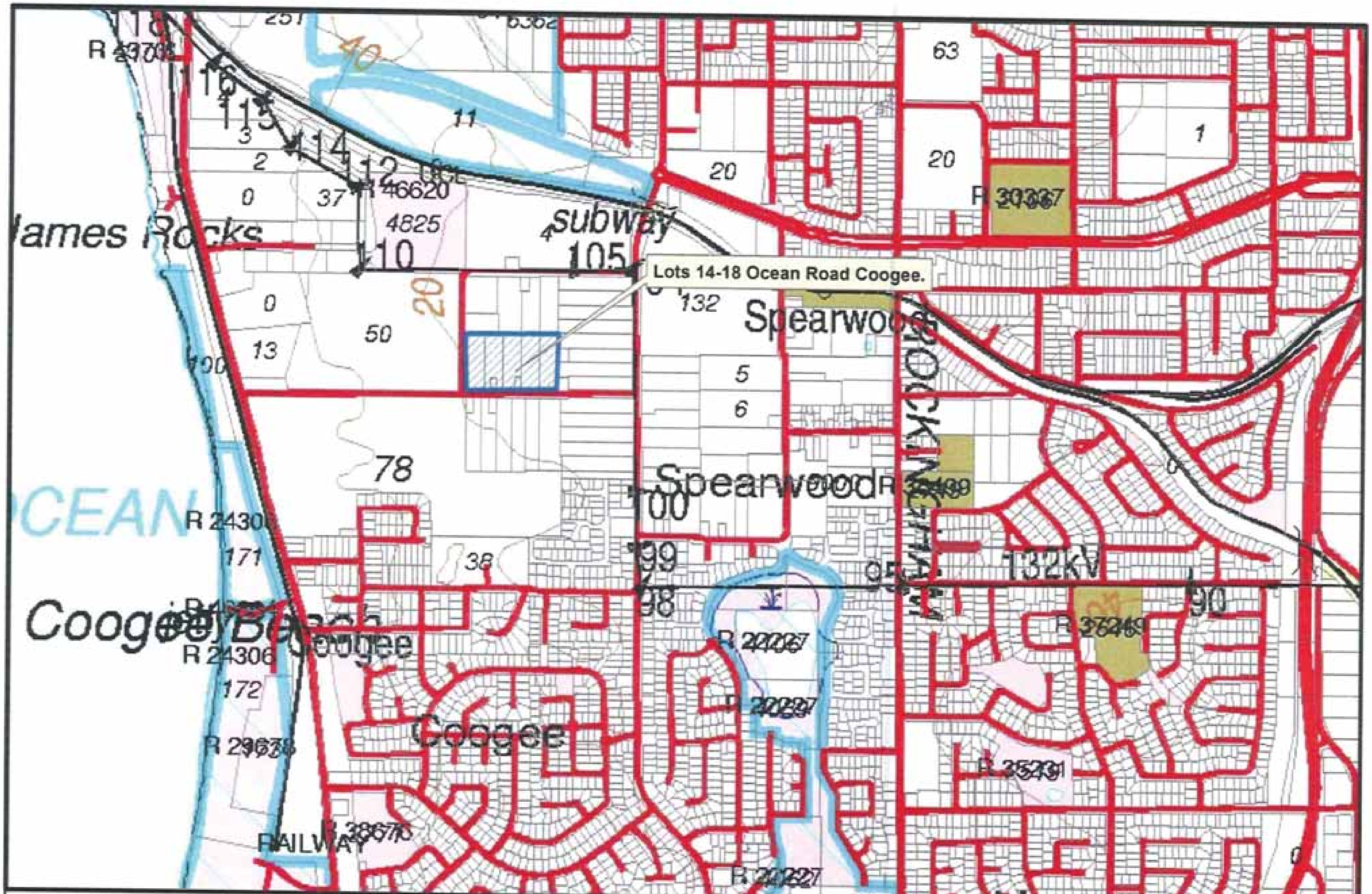
Appendix D – Fire Management Plan, and Landscaping concept Plan George Weston Foods

Appendix E –City of Cockburn Annual Fire Break Order

Appendix F – FESA Checklist

Appendix A

Location Mapping



Legend

Subject Area

Scale
1:10,000 @ A3

0 100 200 400 600 800 Meters

BIO DIVERSE SOLUTIONS

55 Peppermint Drive
Albany, WA 6330
Australia
Tel: 08 9841 3936
Fax: 08 9841 3936
Mob: 0447 555 516

CLIENT Terranovis Pty Ltd
52 Kishorn Road
Applecross WA 6153

Location Mapping

STATUS	FILE	DATE
FINAL	WHEL017	20/04/2012

Appendix B

Draft Subdivision Guide Plan & Local Structure Plan

Plan No : 15539-1
Revision : REV 1
Scale : 1:4000@A3

PACKHAM NORTH
LOCAL STRUCTURE PLANS
SPEARWOOD/COOGEE

whelans
TOWN PLANNING

NOTES
(1) Detailed fire management plan required at subdivision stage to address bush fire risk
(2) Footpaths are to be provided on all streets in accordance with the requirements of Liveable Neighbourhoods.
(3) Retention of existing houses to be considered at subdivision stage
(4) Laneway access with some threshold treatment (splinter island and brick paving) to link intofuture development to the north and for fire emergency access
(5) DAP for internal R25 lots to provide for R-Codes variation to front setback and location of garages

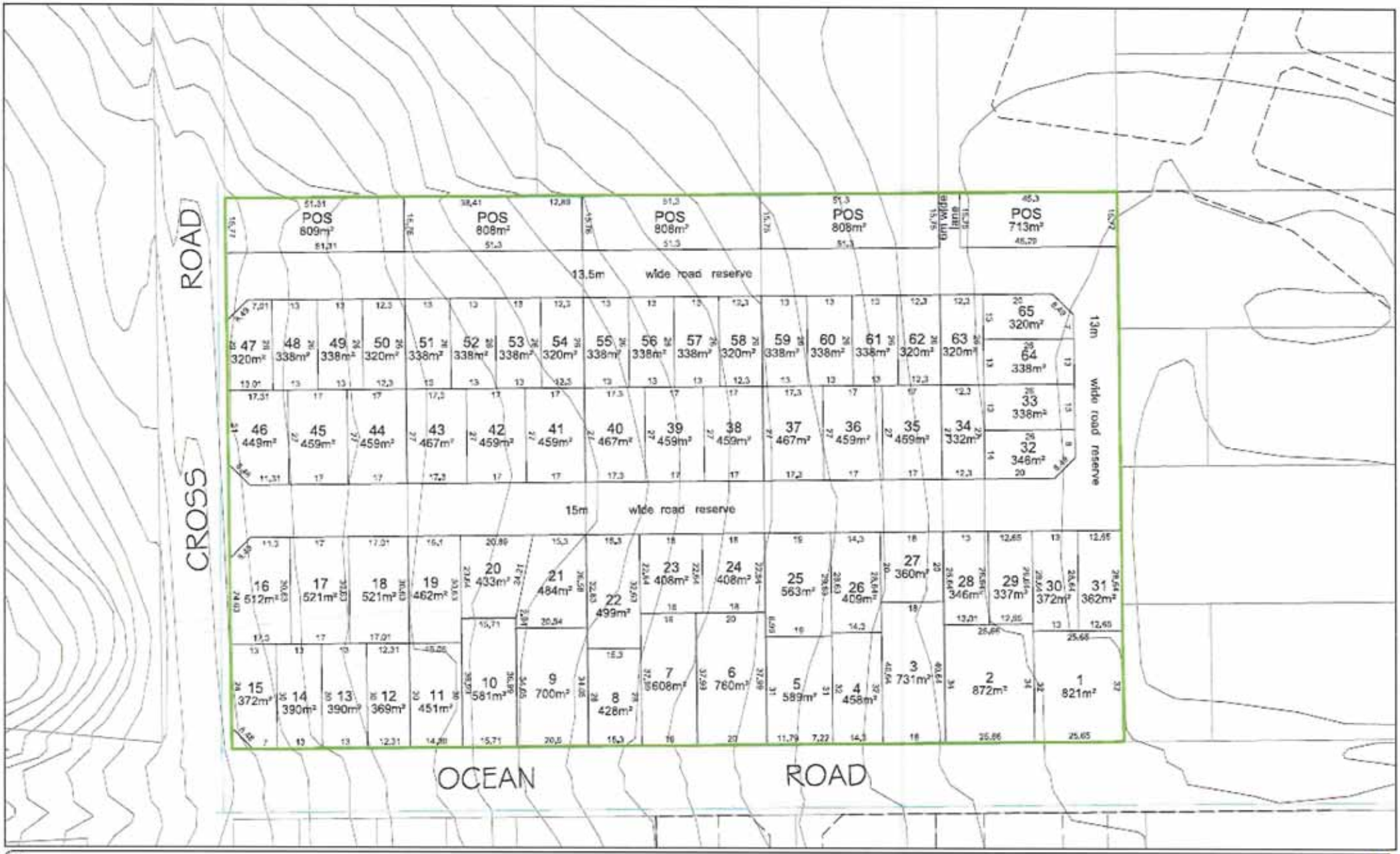
Plan No : 15539-2
Revision : REV 2
Scale : 1:1500@A3

LEGEND
- Pedestrian access
- Lots that require Area Specific Plans (or DAPs)
- Area subject to fire management and further consultations
- Indicative planning over land outside of structure plan subject to future investigation

ZONES/RESERVES
- Public Open Space (Unrestricted Use)
- R25 Residential
- R30 Residential

LOCAL STRUCTURE PLAN
LOTS 14-18, 41 & 500 OCEAN PLAN COOGEE

whelans TOWN PLANNING



Plan No.: 15539r3
Revision: REV.2
Scale: 1:1000@A3

LEGEND
Water Mains
Sewer Mains
Power Lines
Contours
Existing Boundary
Proposed Boundary
Application Area

SUBDIVISION CONCEPT PLAN
LOTS 14-18 OCEAN PLAN
COOGEE

Whelans
TOWN PLANNING

Appendix C

Vegetation Mapping

Legend

- Slope Degrees
- Woodland Type B
- Shrubland Type E
- Cleared paddock Type G
- Subject Area

Scale 1:1,500 @ A3

0 15 30 60 90 120 Meters

BIO DIVERSE SOLUTIONS
55 Peppermint Drive
Albany, WA 6330
Australia
Tel: 08 9841 3936
Fax: 08 9841 3936
Mob: 0447 555 518

CLIENT Terranovis Pty Ltd
52 Kishorn Road
Applecross WA 6153

Vegetation Mapping

STATUS	FILE	DATE
FINAL	WHEL017	30/04/2012

Appendix D

Fire Management Plan

Legend

- BAL 12.5
- BAL 19
- BAL 29
- Firebreak to 3m
- Subject Area

Scale
1:1,000 @ A3

0 10 20 40 60 80 Meters

BIO DIVERSE SOLUTIONS
55 Peppermint Drive
Albany, WA 6330
Australia
Tel: 08 9841 3936
Fax: 08 9841 3936
Mob: 0447 555 516

CLIENT Terranovis Pty Ltd
52 Kishorn Road
Applecross WA 6153

Fire Mapping

STATUS	FILE	DATE
FINAL	WHEL017	30/05/2012

Legend

- BAL 12.5
- 20m BPZ
- BAL 19
- BAL 29
- Firebreak to 3m
- Subject Area

Scale 1:400 @ A3

0 5 10 20 30 40 Meters

BIO DIVERSE SOLUTIONS
55 Peppermint Drive
Albany, WA 6330
Australia
Tel: 08 9841 3936
Fax: 08 9841 3936
Mob: 0447 555 516

CLIENT Terranovis Pty Ltd
52 Kishorn Road
Applecross WA 6153

Example of achieving BPZ

STATUS	FILE	DATE
FINAL	WHEL017	30/08/2013

RPS

Figure 13

Concept Design

Appendix E

City of Cockburn

2011/2012 Fire Break Notice

& FESA Information

City of Cockburn - FIRE CONTROL ORDER 2011 - 2012

Fire Control Regulations

NOTICE TO ALL OWNERS AND/OR OCCUPIERS OF LAND IN THE CITY OF COCKBURN. PLEASE READ THIS NOTICE CAREFULLY.

Construction of Firebreaks

2A.2. All owners and occupiers of land within the district shall clear flammable matter from the land in accordance with the following requirements —

(1) As to land which is 2032m2 or less is area, or which is zoned "**Residential**" under the town planning scheme, the owner or occupier is to remove all the flammable matter from the whole of the property, except living trees, shrubs, plants under cultivation and lawns, by slashing or mowing the matter to a height of not more than 50 millimetres, or otherwise to the satisfaction of Council or an authorised person, and the property is to be maintained to the standard so stated in this subsection for the duration of the period 1 October to 31 May each year.

(2) As to land, which is greater than 2032m2 in area, shall have a trafficable firebreak three (3) metres in width cleared to mineral earth and the property is to be maintained to the standard so stated for the duration of the period 30 November to 31 March of each year; subject to the following requirements

(a) immediately inside all external boundaries of the land; and

(b) immediately surrounding all buildings (if any) situated on the land; and

(c) immediately surrounding all fuel dumps and ramps (if any) on the land.

"**Trafficable firebreak**" means ground from which all flammable material (which includes vegetation and with all overhanging branches, trees, limbs, etc to be trimmed back clear of the firebreak area to height of at least 4m) has been removed and on which no flammable material (which includes vegetation) is permitted during the fire period. The area of the firebreak MUST be able to be traversed by a fire unit or truck carrying fire crew on the back so as not to cause them injury.

Variation to Fire Prevention Measures

2A.3.

(1) If for any reason an owner or occupier considers it impractical to clear firebreaks in accordance with subsection (2) of section 2A.2, the owner or occupier may apply in writing to Council or an authorised person no later than 31 October in any year for approval to construct a firebreak in an alternative position on his or her land.

(2) If permission is not granted in writing by Council or an authorised person, the owner or occupier must comply with the requirements of this Local Law.

(3) An exemption or partial exemption granted by Council or an authorised person shall only remain in force until a change of ownership of the land immediately following the date of grant of the exemption or partial exemption.

(4) In reference to subsection (3) Council reserves the right, at any time, to revoke, alter or add to the provisions of a variation order.

Change of Land Ownership

2A.4.

If a person becomes an owner or occupier of land within the firebreak period the owner or occupier must within fourteen (14) days of becoming the owner or occupier of land comply with this Part of the Local Law.

Enforcement of this Part

2A.6.

A person who fails to comply with any provisions of this Part commits an offence and any fine or penalty shall be as prescribed by the Bush Fires Act 1954.

Where an owner or occupier of land fails or neglects to comply with any requirements of this Fire Control Order within the time specified, Council's Authorised Fire Control Officers with such employees and/or contractors, vehicles and machinery as the officer deems necessary, enter upon the land and do all such things as necessary pursuant to this Fire Control Order and may recover costs and expenses of doing so in the relevant court from the owner or occupier of the land in accordance with the Bushfires Act 1954 (as amended) in addition to any penalty imposed.

ON THE SPOT INFRINGEMENTS OF $250.00 PER PROPERTY CAN BE ISSUED FOR NON COMPLIANCE. NO EXTENSION OF TIME TO COMPLY WITH THIS ORDER WILL BE GIVEN. THIS PROCEDURE WILL APPLY REGARDLESS OF WHETHER YOUR CONTRACTOR HAS BEEN ENGAGED OR NOT.

ALL RESIDENTIAL & INDUSTRIAL AREA'S NO BURNING ALLOWED

AREAS ZONED RURAL AND OTHER AREAS

PROHIBITED BURNING PERIOD

1 December to 31 March (No burning permitted)

RESTRICTED BURNING PERIOD

1 April – 30 November (permit required)

NOTE: These periods can be varied at the discretion of Council because of weather conditions. Permit holders are responsible to verify the current dates with the Council.

WITHOUT ANY EXCEPTION. NO FIRE may be lit on a day when the fire danger is declared as **VERY HIGH, EXTREME or CATASTROPHIC**

PERMITS Ensure you have a PERMIT.

The City usually issues up to 3 three fire permits per year for up to 14 days each, but if there is vegetation that cannot be reasonably burnt within a one square metre pile further permits may be issued.

Persons wishing to obtain more information on Council's Fire Control Order or to obtain a Permit should contact Rangers on: 9411 3444

FESA bushfire safety poster

Prepare your home and property for the 2011/12 season

IT'S EVERYONE'S RESPONSIBILITY

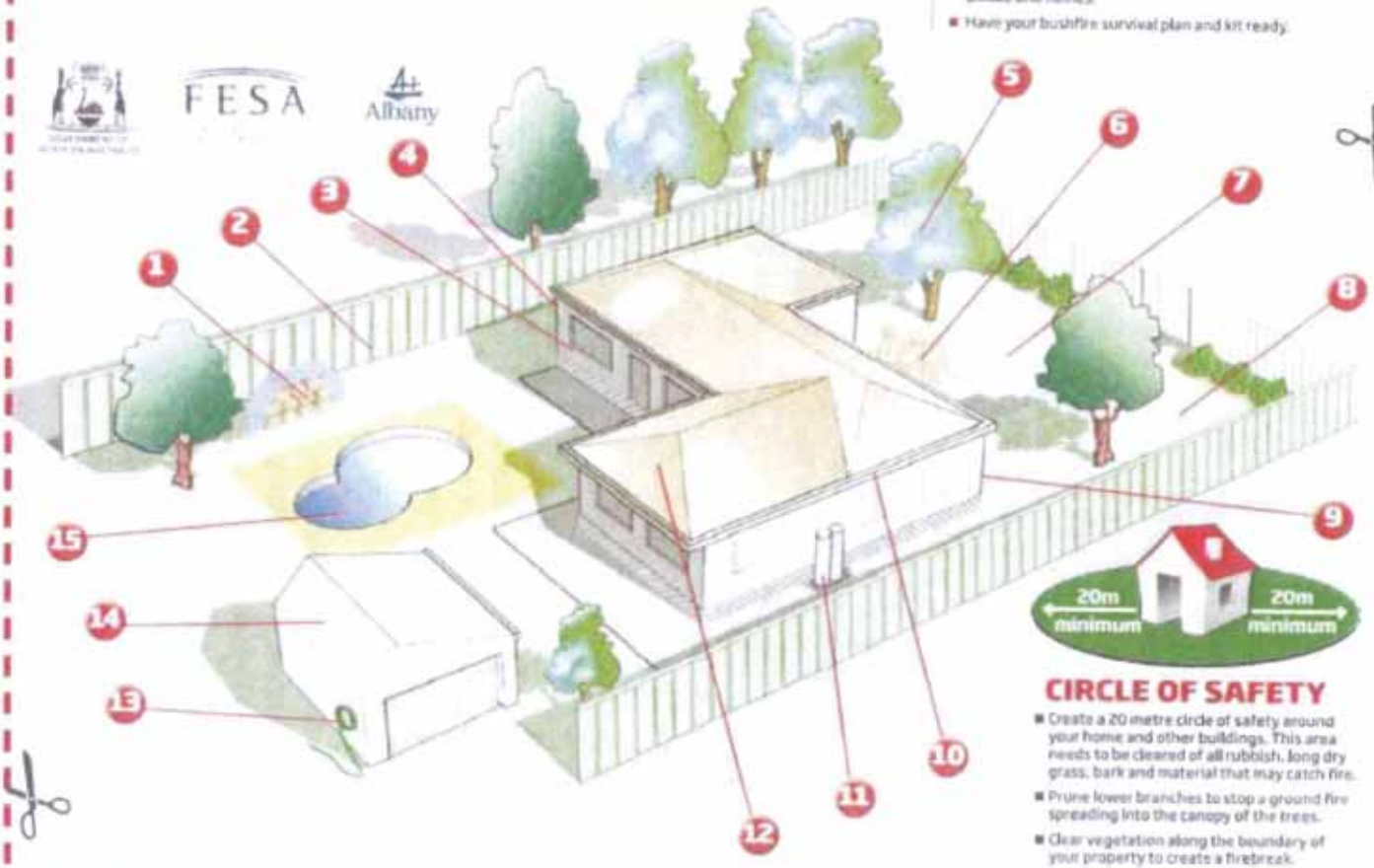
If you live in or near bushland, bushfire is a real risk to you and your family. Bushfires happen every summer, they can start suddenly and often without warning.

IF A BUSHFIRE STARTS

- Put your preparations into action, do not 'wait and see' as this can be deadly.
- Act decisively the moment you know there is danger. Your bushfire survival plan will help you do this.
- Know what level of warning your area is on.
- Look and listen for information.
- Stay alert and watch for signs of a bushfire, especially smoke and flames.
- Have your bushfire survival plan and kit ready.

FESA

Albany



CIRCLE OF SAFETY

- Create a 20 metre circle of safety around your home and other buildings. This area needs to be cleared of all rubbish, long dry grass, bark and material that may catch fire.
- Prune lower branches to stop a ground fire spreading into the canopy of the trees.
- Clear vegetation along the boundary of your property to create a firebreak.

CHECKLIST FOR PREPARING YOUR PROPERTY

1. Do not pile wood against or near the house ☐
2. Install a fire or heat radiation shield such as a solid fence ☐
3. Place metal fly wire mesh on all windows, vents and evaporative air conditioners to keep sparks and embers out ☐
4. Block any gaps under floor spaces, in the roof space, under eaves, external vents, skylights, chimneys and wall cladding ☐
5. Create and maintain a minimum two metre gap between your house and tree branches ☐
6. Rake up leaf litter and twigs under trees ☐
7. Remove shrubs and small trees under and between larger trees ☐
8. Ensure garden mulch is kept away from the house and grass is kept short ☐
9. Ensure all gaps in external wall claddings are sealed ☐
10. Keep roof gutters and valleys clear of leaves and bark ☐
11. Keep gas cylinders on the side of the house furthest away from the likely direction of a fire (where the bush is). Ensure the pressure relief valve is directed away from the house. ☐
12. Block any gaps in the roof space ☐
13. Hoses must be long enough to reach all parts of your house. Use metal hose fittings for taps as they are less likely to melt ☐
14. Remove flammable materials and store them away from the house ☐
15. Have a sufficient independent water supply of at least 20,000 litres and a petrol, diesel or generator powered pump capable of pumping 400 litres per minute. ☐

BUSHFIRE WARNING SYSTEM

During a bushfire emergency services will provide as much information to you as possible.

Look and listen for information on television, radio, the internet, information lines and by speaking to your neighbours.

There are three levels of warning. These change to reflect the increasing risk to your life and the decreasing amount of time you have until the fire arrives.

ADVICE: a fire has started but there is no immediate danger, this is general information to keep you informed and up to date with developments.

WATCH AND ACT: a fire is approaching and conditions are changing, you need to start taking action now to protect you and your family.

EMERGENCY WARNING: you are in danger and you need to take immediate action to survive as you will be impacted by fire. This message may start with a siren sound called the Standard Emergency Warning Signal (SEWS).

TOTAL FIRE BANS

A Total Fire Ban (TFB) is declared because of extreme weather conditions or when widespread fires are seriously stretching firefighting resources.

They are declared on days where fires are most likely to threaten lives and property.

When a TFB is declared, it is illegal to do anything that could or is likely to start a fire. The ban will be in place from 12.01am to 11.59pm.

The ban includes all open fires, incinerators, welding, grinding, soldering or gas cutting.

WHAT ARE THE PENALTIES?

You could be fined up to $25,000 and/or jailed for 12 months, if you ignore a TFB.

WATER SUPPLY AND PUMPS

During a bushfire, it is likely you will lose power and water.

Mains water pressure may drop or fail and as a result, if you are planning to actively defend, you will need to have an independent water supply. This should be a concrete or steel tank with a 20,000 litre capacity.

Exposed PVC pipes and fittings will melt in the heat of a fire so metal pipe fittings should be used for above ground applications.

In order to have a water supply for actively defending your home, you will need a generator with more than 1.5 Kva capacity.

Pumps and generators should be able to pump 400 litres per minute (lpm).

EMERGENCY CONTACT NUMBERS
Police, Fire, Ambulance (for life threatening emergencies) 000

WHERE TO FIND MORE INFORMATION
www.fesa.wa.gov.au
FESA information line 1300 657 209
For bushfires in national parks or information on prescribed burns - Department of Environment and Conservation (DEC) www.dec.wa.gov.au

If you notice any suspicious activities, call Crimestoppers 1800 333 000

FESA
Fire & Emergency Services Authority of Western Australia

Information Note

28/5/08– Version Control 1

What is a building protection zone?

Key Points

⇒ Fuel loads influence bush fire intensity.

⇒ The lower the fire's intensity the less impact it will have on the building.

⇒ Create a minimum 20 metre circle of reduced fuel around a building to increase its chance of survival.

Definitions

⇒ Surface fire is when the fire is burning grass and leaves on the ground.

⇒ A mineral earth firebreak is a firebreak without vegetation.

The aim of a building protection zone is to ensure there will be no direct flame contact on the building from a bush fire and to increase its chance of survival. This is done by managing and reducing the amount of fuel for a minimum of 20 metres around a building.

If there is little or nothing to burn then the fire's impact will be reduced.

This can be achieved by:

⇒ Maintain a minimum two metre gap between trees and the building.

⇒ Trim trees so there are no branches overhanging the house.

⇒ Keep the grass short and prune shrubs to thin them out and remove dead leaves and branches.

⇒ Rake up leaf litter and twigs under trees and remove bark.

⇒ Prune lower branches so they are at least two metres off the ground to stop a surface fire spreading into the trees.

⇒ Create a mineral earth firebreak.

⇒ Do not clump shrubs or trees, have a gap between them.

⇒ Have paths next to buildings and the driveway placed so they provide protection to the house.

⇒ Keep firewood away from buildings.

⇒ Fences that are flammable need to be far enough away from the building so that if they burn, they will not break a window or door and compromise the integrity of the building.

⇒ Keep gutters free of leaves and branches.

⇒ Ensure the valve on gas bottles face away from the building.

⇒ Ember proof your home by blocking all gaps around eaves, under the house, roof space, ledges and wall cavity.

What is a building protection zone?

The 20 metre area of low cut green grass increases the survival of the house in a bush fire.

Grazed paddocks can provide protection to buildings.

Over hanging tree branches and flammable material near buildings will increase the chance of a fire spreading.

For more information contact the Bush Fire and Environmental Protection Branch on 9323 9300 or visit www.fesa.wa.gov.au

Bushfire Season 2011–12

Bushfires happen every summer. It's important you make decisions now on what you will do if a bushfire starts.

This Prepare. Act. Survive. guide has been developed to help you plan and prepare your home and family for the bushfire season. If you live near bushland or in a bushfire risk area you need to have a bushfire survival plan.

Please read this guide, use the templates and prepare your bushfire survival plan to ensure you, your family, home and property survive the bushfire season.

Remember:

- Prepare your home and property. If it is well prepared and constructed it is more likely to survive a bushfire, even if you aren't there.
- Fires can threaten suddenly and without warning, you should be prepared to act without receiving any official warning.
- In a bushfire it is likely you will lose power and water. You must plan ahead. Without power you may not be able to open your garage door or operate your home telephone Without water you cannot stay and actively defend. You need to have an independent water supply of at least 20,000 litres if you are planning on actively defending your home.
- Firefighting resources, including water bombing aircrafts, will not be there to help you defend your home. It is your responsibility to reduce the risks and take action to survive a bushfire.
- Firefighters will prioritise saving life over property and will evacuate areas to do so. Once you have left your property you may not be allowed back for several days.

WHERE TO GET INFORMATION DURING A BUSHFIRE:

- Keep up to date via radio, television and the internet. ABC Radio issues updates at quarter to and quarter past the hour.
- Call the FESA Information Line on **1300 657 209** or visit the FESA website at **www.fesa.wa.gov.au**
- To report a fire or life threatening emergency call **000**
- For further information on how to prepare for a bushfire visit **www.fesa.wa.gov.au**

GOVERNMENT OF WESTERN AUSTRALIA

FESA

PREPARE. ACT. SURVIVE.

Appendix F

FESA Checklist

Appendix E Fire Management Plan – Compliance Checklist

Element 1: Location

Does the proposal comply with the performance criteria by applying acceptable solution **A1.1**?

Yes [√] No [ ]

Not in an area where the bushfire hazard does not present an unreasonable level of risk to life and property. Requires some construction standards to BAL 12.5, 19 and 29 due to adjacent risks.

Element 2: Vehicular access

Does the proposal comply with the performance criteria by applying acceptable solution **A2.1?**

Yes [√] No [ ]

Two different vehicular access points from Ocean Road via Cross Road and proposed internal roads to Entrance road in the north.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.2?**

Yes [√] No [ ]

Public Roads proposed to meet minimum grades.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.3?**

Yes [√] No [ ]

Cul de sacs not proposed.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.4?**

Yes [√] No [ ]

Battle axes not proposed

Does the proposal comply with the performance criteria by applying acceptable solution **A2.5?**

Yes [√] No [ ]

Will be constructed to FESA standards.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.6?**

Yes [√] No [ ]

Will be constructed to FESA standards

Does the proposal comply with the performance criteria by applying acceptable solution **A2.7?**

Yes ☑ No ☐

Will be constructed to FESA standards.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.8?**

Yes ☑ No ☐

Gates not required

Does the proposal comply with the performance criteria by applying acceptable solution **A2.9?**

Yes ☑ No ☐

All internal firebreaks to City of Cockburn Standards and can be achieved, only required prior to urban infill.

Does the proposal comply with the performance criteria by applying acceptable solution **A2.10?**

Yes ☑ No ☐

Signage not required along the road reserves.

Element 3: Water

Does the proposal comply with the performance criteria by applying acceptable solution **A3.1?**

Yes ☑ No ☐

Yes reticulated scheme water.

Does the proposal comply with the performance criteria by applying acceptable solution **A3.2?**

Yes ☑ No ☐

Yes reticulated scheme water.

Does the proposal comply with the performance criteria by applying acceptable solution **A3.3?**

Yes ☑ No ☐

Yes reticulated scheme water.

Element 4: Siting of development

Does the proposal comply with the performance criteria by applying acceptable solution **A4.1?**

Yes ☑ No ☐

HSZ achieved, where 100m cannot be achieved to be built to BAL and AS3959-2009.

Does the proposal comply with the performance criteria by applying acceptable solution **A4.2?**

Yes ☑ No ☐

Every building sited >20m from vegetation.

Does the proposal comply with the performance criteria by applying acceptable solution **A4.3?**

Yes ☑ No ☐

BPZ to FESA and City of Cockburn standards, HSZ achieved, where 100m cannot be achieved to be built to BAL and AS3959-2009.

Does the proposal comply with the performance criteria by applying acceptable solution **A4.4?**

Yes ☑ No ☐

HSZ achieved on most Lots, where 100m cannot be achieved houses to be built to BAL andAS3959-2009.

Does the proposal comply with the performance criteria by applying acceptable solution **A4.5?**

Yes ☑ ☐No

Shielding could be applied, the Fire Management Plan does not rely on this.

Application Declaration

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

Full name: Lorraine Anne Spencer for.

Agency/Corporation: Terranovis Pty Ltd

Applicant signature: L A Spencer.

Date: 13/6/12

APPENDIX 2 – ENGINEERING SERVICING REPORT

DEVELOPMENT
ENGINEERING
CONSULTANTS

Telephone: (08) 9481 1900
Facsimile: (08) 9481 1700
Ground Floor "The Atrium"
Suite 3/123A Colin Street
West Perth WA 6005
Our Ref: CgeServREport
June 7, 2012

TERRANOVIS PTY LTD - LOTS 14 – 18 OCEAN ROAD, COOGEE.

ENGINEERING SERVICES REPORT.

1. General:

The above lots are to be developed into 65 residential lots. This report covers existing and proposed services plus proposals for earthworks, retaining walls, roads, drainage, groundwater, water supply, power supply, gas, telecommunications and sewerage as required for current urban development standards.

2. Executive Summary.

The land the subject of this report is located on Ocean Road immediately east of Cross Road and generally 200 metres west of Hamilton Road in the City of Cockburn.

The land has previously been used as market gardens, and is fully cleared and vacant except for the landowners' houses on each lot adjacent to Ocean Road.

The basic land form is free draining undulating sand over limestone at depth.

The Environmental Geology map of the Geological Survey of Western Australia classifies this site as generally "S7" Sand derived from Tamala Limestone on lots 15 to 18, and "LS1" Tamala Limestone on lot 14, the highest land, both of which soils are considered suitable for urbanization. Their current process is listed as "ground water recharge".

The land can be connected to all services, either by extension and upgrading from existing infrastructure, or by provision of new infrastructure as set out below. Power, telephone, gas and water services already pass along the site frontage. Both Ocean Road and Cross Road are constructed as sealed roads, although Cross Road is currently closed to traffic in front of Lot 14.

The Water Corporation has given advice that installation of new sewer and water infrastructure is required for this area. Such infrastructure is largely "pre-funded" items such as a 300mm trunk water main plus construction of a new permanent sewer pump station and pressure main to serve the whole local catchment. A combination of 300mm and 225mm reticulation sewers are required to be extended to Ocean Road from the proposed pump station to enable this land to be developed.

A LWMS for the area was prepared by Cardno in 2011 for the City of Cockburn to support the Local Structure Plan for the area. As a small digression from the LWMS, all stormwater discharging from the development for storms up to the 5 year ARI will be contained on site in soakwells. For the larger ARI storms, excess stormwater will be conveyed to the existing swamp area immediately east of the site as documented in the

LWMS. This basin will contain the 1 in 100 year storm runoff from the subdivision roads.

3. Site

Lots 14 to 18 Ocean Road are located on the north side of Ocean Road some 200 metres west of Hamilton Road. Cross Road abuts Lot 14 on the western boundary. Each existing lot contains at least one residential building, which are proposed to be retained as part of the current development proposal.

Ocean Road is a well-constructed urban road in good condition, some 6 metres wide pavement, with kerbing on both sides. It has minimal formal drainage, and generally drains from Cross Road to the East to a low point some 50 metres east of Lot 18, where stormwater is collected by gully drainage pits.

Ocean Road immediately west of the site has been recently constructed to a high standard with a 7m wide pavement with drainage pits immediately west of Cross Road, draining to a new drainage basin on the south side of Ocean Road opposite Cross Road. This basin is under the control of Main Roads WA.

Cross Road is a poorly constructed bitumen road without kerbs or drainage, and will need to be reconstructed.

The land is generally the eastern side of a hill, with a high point at RL20mAHD at the corner of Ocean Road and Cross Road (Lot 14), falling west to a low point at RL2.5mAHD on the eastern boundary of Lot 18. East of Lot 18 is a low area appearing to be swamp vegetation due to a shallow water table.

The geology of the land is described by the Environmental Geology Map of the Geological Survey of WA, as being the most part "S7 being sand derived from Tamala Limestone on Lots 15 to 18, and "LS1" Tamala Limestone on the higher western half, Lot 14 and Cross Road. Both soil types are described as being suitable for urbanization.

The site is connected to scheme water, telephone, gas and power. No sewer service is in the area and residences are serviced with septic tanks for waste water disposal.

Each lot appears to have an irrigation bore for the purpose of watering market gardening activities formerly occupying the site. The whole site was cleared and cultivated in the as part of these earlier land use activities.

4. Development Proposal

It is proposed to develop the land as a 65 lot residential subdivision, with all normal services, with links to abutting developments (existing and proposed) for sewer, water, power, roads, gas and telephony services with all drainage to be retained on site, using best management practices.

The Water Corporation has advised on the requirement to extend water and sewer infrastructure into the development area.

The development will entail earthworks to provide level, free draining building blocks with extensive low height retaining walls, given the sloping site. Most of the existing residences will be retained, and connected to new services as required.

Drainage will be effected by site soakage in a series of soakwells, with stormwater from larger ARI storms overflowing to the swampy area adjacent to the eastern boundary of Lot 18. This was designated as a 1 in 1 year to 1 in 100 year drainage inundation area in the District Water Management Strategy/Local Water Management Strategy (DWMS/LWMS) prepared by Cardno in 2011.

The existing roads will be upgraded to the requirements of the City of Cockburn, namely widening of Ocean road to a 7m carriageway with formal piped drainage, and Cross Road being rebuilt along with formal drainage. All internal roads will be designed and constructed to current Council standards.

5. Earthworks & Retaining Walls.

Because of the sloping nature of the site, overall earthworks will be required to provide level building blocks, thus necessitating extensive low height retaining walls

All retaining walls will be subject to Council building approval.

There is an earthworks embargo for this site during the months of November to March.

Earthworks on site will entail removal of topsoil, cut and fill, and possible importation of sand fill to enable reasonable road design off Cross Road, as Lot 14 drops away sharply from Cross Road.

6. Roads

All roads will be constructed to City of Cockburn standards and approval, including kerbing and piped drainage plus provision of footpaths as required.

It is a requirement of the Council that Ocean Road be widened from its present width of 6m to a final width of 7m, entailing a 500mm pavement widening on both sides. Formal piped drainage is to be installed, and the pavement surface is to be re-sheeted with a wearing layer of bituminous concrete.

Cross Road is proposed to be completely rebuilt to a form 6 metre wide pavement with kerbing and formal drainage.

A DUP is required along Ocean Road, possibly replacing the existing footpath on the northern verge. It is envisaged footpaths will also be constructed along Cross Road and also on the subdivision roads.

7. Drainage

The site will be self-contained as far as storm water drainage is concerned. Ocean Road will be drained to soakwells at spacings to ensure that water can be captured and disposed with minimal bypass. Cross Road and all new internal roads will be treated the same, containing the 5 year ARI on site without overflow. For larger ARI storms water will overflow to designated drainage storage areas as per the DWMS/LWMS prepared by Cardno Consultants in 2011.

The soil characteristics of the site will allow site soakage, based on the geology and the depth to groundwater.

The Water Corporation has advised that the land is within a Water Corporation declared catchment area; the "Lake Coogee Drainage Catchment". This means that Drainage Headworks will be levied on the development.

8. Groundwater

The groundwater level at the site has been measured at RL0.6mAHD by Cardno in 2008, some 1.9m below the lowest part of the land. Their DWMS states this to be Maximum Groundwater Level. At Cross Road, the depth to groundwater is therefore an average of 18m, as Cross Road falls from RL20mAHD to RL18mAHD at the northern boundary of the subject land.

On the eastern boundary of the land, the level of the groundwater is approximately 0.7mAHD and the site level is just above RL2.0mAHD meaning there is a depth to groundwater of approximately 1.3m. Some filling will be required to facilitate sewer and 100 year ARI storage.

9. Power

It appears that sufficient power supply exists in the area to supply the development. High and low voltage aerial power lines are located on both Ocean Road and Cross Road.

A high and low voltage aerial line is located on the northern verge of Ocean Road along the frontage of the site. The high and low voltage line in Cross Road is located on the eastern verge along the frontage of the site. This line contains a pole top transformer. Both these lines will be relocated underground as part of the development.

The existing aerial service lines inside the lots will be removed as part of the development. Maintenance of power to occupied homes will be a priority during subdivision construction.

All internal power reticulation lines and transformer installations will be constructed at the cost of the developer. Transformer sites will be determined at the detailed subdivision design stage.

10. Water Supply

At present there is a 150mm water main along Ocean Road fronting the development, and a 100mm main along Cross Road.

The Water Corporation has advised that a 300mm trunk water main is required to be extended through the development from Port Coogee west of the site, along Ocean Road to boost supply to the area. This size main is normally a pre-funded item, built by the developer with re-imbursement being made by the Water Authority on an agreed program. It is likely the main will be brought into the area by other developers.

11. Sewer

The site is not currently connected to sewer.

The Water Corporation has previously advised other developers within this development area that "the (development) proposal is able to be serviced and integrated into the existing water and wastewater schemes".

The site currently falls within the catchment for the proposed Type 40 permanent wastewater pumping station to be located some 250 metres east of Hamilton Street. The site for this station has yet to be finalized.

A 300mm main is to be extended to Hamilton Street from the pumping station and thence a 225mm sewer west along Ocean Road to a point approximately at the eastern boundary of Lot 18. It is assumed at this stage that this main will be extended to the site by other developers.

12. Telephone & NBN

Telstra services exist in the area along both Ocean Road and Cross Road. These are most likely to be able to be extended to service this proposed development. Some upgrading may be required.

If Telstra is to be the servicing authority, Telstra normally requires twelve months' notice of development starting to ascertain any upgrading requirements.

In accordance with recent requirements, the developer is required to install NBN "pipe and pit" to allow for future installation of cables for the NBN. The design of the "pipe & pit" is the responsibility of the developer, and will be designed in conjunction with the underground power network, and installed during the construction phase of the development. We note that this only applies where developments consist of 100 lots or greater and given the fragmentation of land ownership in this area, it may not be possible to convince NBN to take this over.

13. Gas

Gas mains are installed in Ocean Road on the south verge, and will be extended to this development.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

THIS REPORT IS DATED 25TH MAY 2012.

LOTS 14 – 18, 41 & 500 OCEAN ROAD, COOGEE

LOCAL STRUCTURE PLAN

whelans
TOWN PLANNING

LOCAL STRUCTURE PLAN

LOTS 14 – 18, 41 & 500 OCEAN ROAD, COOGEE

CITY OF COCKBURN

PREPARED FOR
TERRANOVIS PTY LTD

Revision 1.0

CERTIFICATION – LOCAL STRUCTURE PLAN

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

Approved by resolution of the Council of the City of Cockburn on _____ and the seal of the City of Cockburn was pursuant to the Council's resolution hereto affixed in the presence of:

_____
MAYOR

_____
CHIEF EXECUTIVE OFFICER

Adopted by the Western Australian Planning Commission on _____

_____

being an officer of the Commission duly authorized by the Commission pursuant to section 57 of the *Western Australian Planning Commission Act 1985*.

EXECUTIVE SUMMARY

Purpose

This Local Structure Plan (LSP) has been prepared for the various landholdings being Lots 14 – 18, 41 & 500 Ocean Road, Coogee. The land the subject of this LSP comprises (7) lots located approximately 19 kilometres south-east of Perth Central Business District and approximately 0.5 kilometres to the east of the new Port Coogee marina development. The LSP area is within the Metropolitan South-West Corridor and is situated within the municipality of the City of Cockburn and the locality of Coogee.

This LSP provides the planning framework to guide and facilitate the development of 4.047 hectares of land for urban purposes and has been prepared in accordance with the provisions of the City of Cockburn Town Planning Scheme No. 3.

The LSP forms part of the Packham North District Structure Plan and is adjacent to the Local Structure Plan for Lots 1 – 8, 132, 300 & 301 Hamilton Road and Lot 9 Entrance Road, Coogee/Spearwood. The LSP also is situated opposite the Local Structure Plan prepared for Lots 23 – 28, 500 & 501 Ocean/Hamilton Roads and Lots 1, 2, 5, 6, 8, 26, 305, 310, 311 & 482 Mell Road, Coogee/Spearwood. Both these local structure plans for neighbouring and surrounding land have been endorsed by the local authority and WAPC. The LSP design provides for integration with the adjoining approved local structure plan areas.

Structure Plan Summary Table

Item	
Total area covered by the structure plan	4.047 hectares
List of land uses proposed by structure plan - Residential - Parks & Recreation	 2.835 hectares 0.394 hectares
Estimated Lot Yield	63
Estimated number of dwellings	68
Estimated population	156
Number of high schools	Nil
Number of primary schools	Nil
Estimated retail floor space (if appropriate)	Nil
Estimated employment provided (no. of jobs)	Nil
Number and area of public opens space	
- District open space	Nil
- Neighbourhood Park (1)	0.394 hectares

PART ONE (STATUTORY SECTION)

1.0 STRUCTURE PLAN AREA

This Part applies to Lots 14 – 18, 41 & 500 Ocean Road, Coogee and being all the land contained within the inner edge of the line denoting the Local Structure Plan boundary on the Structure Plan Map.

2.0 STRUCTURE PLAN CONTEXT

This Local Structure Plan (LSP) comprises the following:

Part One – Statutory Section
Part Two – Explanatory Information
Appendices – Technical Reports

Part One includes the Structure Plan Map and the provisions and requirements that need statutory effect under the City of Cockburn Town Planning Scheme No. 3.

Part Two of the Structure Plan provides justification and rationale as to the provisions in Part One and is a reference guide to interpret and implement Part One.

3.0 INTERPRETATIONS AND USE CLASS PERMISSIBILITY

Unless otherwise specified in this Part, the words and expressions used in this Local Structure Plan shall have the same meanings given to them in the City of Cockburn Town Planning Scheme No. 3 ("the Scheme"). Where not defined in the Scheme, the definition and meaning shall be as set out in the Structure Plan.

Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under the Scheme.

4.0 OPERATION DATE

In accordance with Clause 6.2.12.1 of the Scheme, this Structure Plan is operational as of xxx [insert date], being the date when the Structure Plan was adopted by the Western Australian Planning Commission.

5.0 RELATIONSHIP TO THE CITY OF COCKBURN TOWN PLANNING SCHEME NO. 3

This Local Structure Plan has been prepared to satisfy the requirements of the Scheme for the preparation and approval of a structure plan to facilitate subdivision and development of the land within the 'Development' zone. The LSP has been prepared in accordance with the requirements of Clause 6.2.6 of the Scheme. Where there are any inconsistencies between the Scheme and the LSP, the provisions of the Scheme shall prevail, unless otherwise specifically stated in the LSP.

6.0 OPEN SPACE

The LSP sets out the location of public open space (POS) to be provided. Consistent with the approved Packham North District Structure Plan, no regional, foreshore or district open space is provided for in the LSP.

The LSP provides for a Neighbourhood Park in accordance with the Packham North District Structure Plan, with an area of 0.394 hectares.

Part Two of the Structure Plan provides a plan which indicates the location of the POS and a POS schedule to demonstrate the provision of public open space as required by Liveable Neighbourhoods.

7.0 RESIDENTIAL DENSITY

The Structure Plan Map sets out the Residential Density that applies to areas specified in the Structure Plan Map. Subdivision and development for residential use is to be in accordance with the corresponding Residential Design Code, with the exception of the following:

- Variations to the R-Codes allowing for reduced front setback to a minimum of 2.0 metres with an average of 4.0 metres for R25 lots as set out on an approved Detailed Area Plan.

- Variations to the R-Codes requiring a minimum 4.0 metre front setback for R30 lots as set out on an approved Detailed Area Plan.

Part Two provides further detail on the above variations and for the requirement of Detailed Area Plan/s to implement R-Code variations.

8.0 GENERAL SUBDIVISION AND DEVELOPMENT REQUIREMENTS

In accordance with Clauses 6.2.3 & 6.2.4 of the Scheme, subdivision and development shall generally be in accordance with the approved Structure Plan Map.

9.0 DETAILED AREA PLAN REQUIREMENTS

Prior to any subdivision and/or development being supported, the local authority will require the preparation of Detailed Area Plan/s to support any R-Code variations specified in 7.0. Detailed Area Plans shall be prepared in accordance with Clause 6.2.15 of the Scheme.

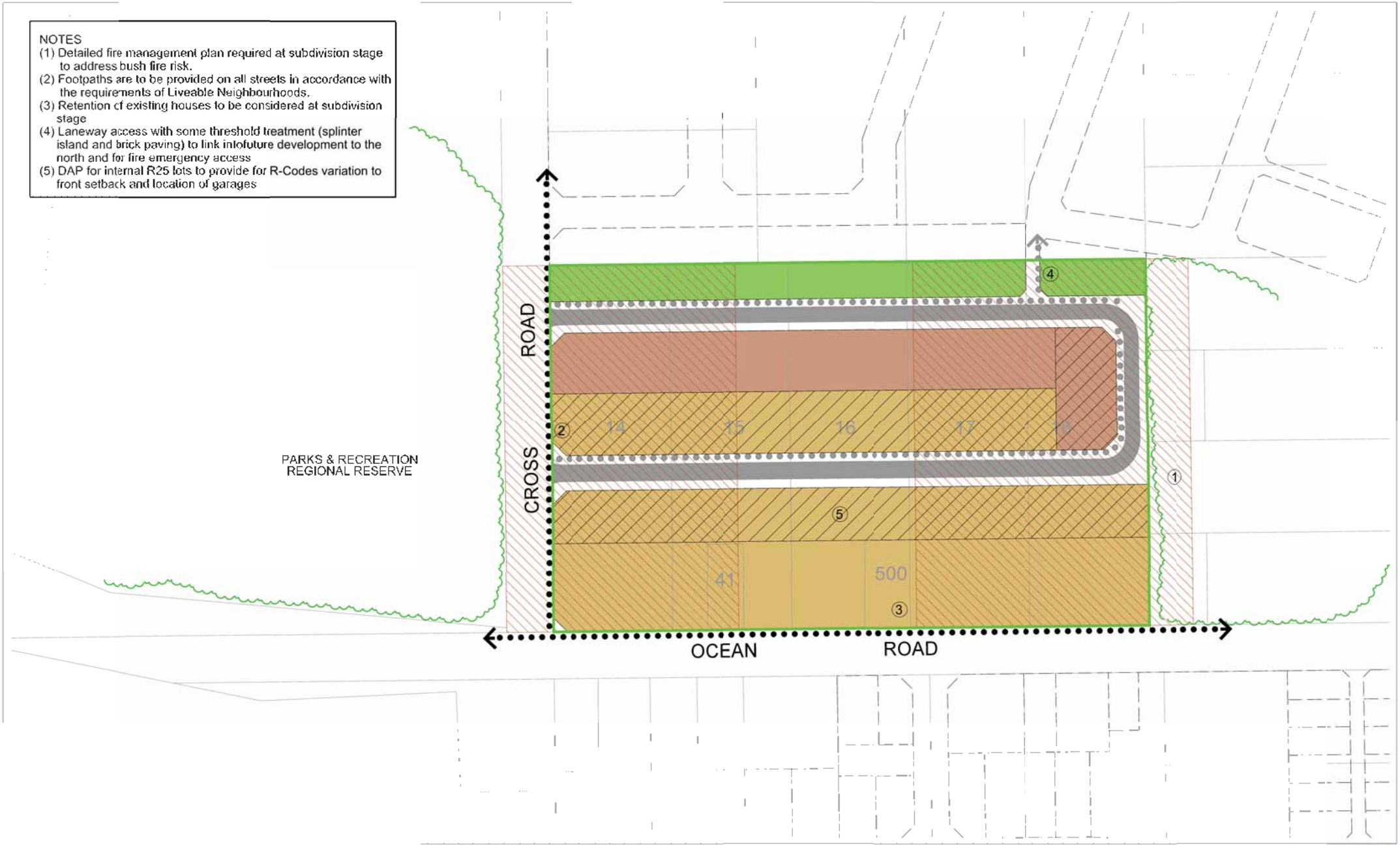
10.0 OPERATION AN IMPLEMENTATION

Prior to any subdivision and/or development, the following documentation is required to be prepared and approved by the local authority and Western Australian Planning Commission:

- Fire Management Plan
- Urban Water Management Plan

The above will need to be completed as conditions of subdivision approval.

NOTES
(1) Detailed fire management plan required at subdivision stage to address bush fire risk.
(2) Footpaths are to be provided on all streets in accordance with the requirements of Liveable Neighbourhoods.
(3) Retention of existing houses to be considered at subdivision stage
(4) Laneway access with some threshold treatment (splinter island and brick paving) to link intofuture development to the north and for fire emergency access
(5) DAP for internal R25 lots to provide for R-Codes variation to front setback and location of garages



Plan No. : 15539-2
Revision : REV 3
Scale : 1:1500@A3

LEGEND
- Pathway - Dual Use Path
- Pathway - Pedestrian
- Lots that require Area Specific Plans for DAPs
- Development subject to dwelling construction under AS1953-2009
- Indicative planning overland across de of structure plan subject to future investigation
- Structure Plan Boundary

ZONES/RESERVES
- Parks and Recreation
- R25 Residential
- R30 Residential

LOCAL STRUCTURE PLAN
LOTS 14-18, 41 & 500 OCEAN PLAN COOGEE

DATE DRAWN: 30/4/2012
DRAWN BY: JEP
CHECKED BY: SJF
FILE: 120709 local structureplan.dgn
V DATUM: AHD
H DATUM: MGA84 (50)

whelans TOWN PLANNING

TABLE OF CONTENTS

TECHNICAL APPENDICES INDEX

Appendix No.	Document Title	Approval Required or Supporting Document only	Approval Status	Approval Agency
1	Fire Management Plan (Bio Diverse Solutions, June 2012)	Approval Required (Subdivision Stage)	Unapproved	City of Cockburn FESA
2	Engineering Servicing Report	Supporting Document	N/A	N/A

PART TWO (EXPLANATORY SECTION)

1.0 INTRODUCTION

1.1 Purpose

This report provides justification for the Local Structure Plan (LSP) prepared for the various landholdings being Lots 14 – 18, 41 & 500 Ocean Road, Coogee (herein referred as the "LSP landholdings"). **Figure 1 – Location Plan** shows the location of the LSP landholdings in the context of the locality of Coogee and the Port Coogee marina development to the west of Cockburn Road. An LSP is required to be prepared and approved prior to subdivision and development of the land in a 'Development' zone under the City of Cockburn Town Planning Scheme No. 3.

The LSP has been prepared taking into consideration the planning framework of the City of Cockburn Packham North District Structure Plan (DSP) and local structure planning that has occurred to the north, south and west of the LSP landholdings. The proposed LSP will integrate with the local structure planning that has already taken place within the DSP area. This will be discussed in further detail in the report.

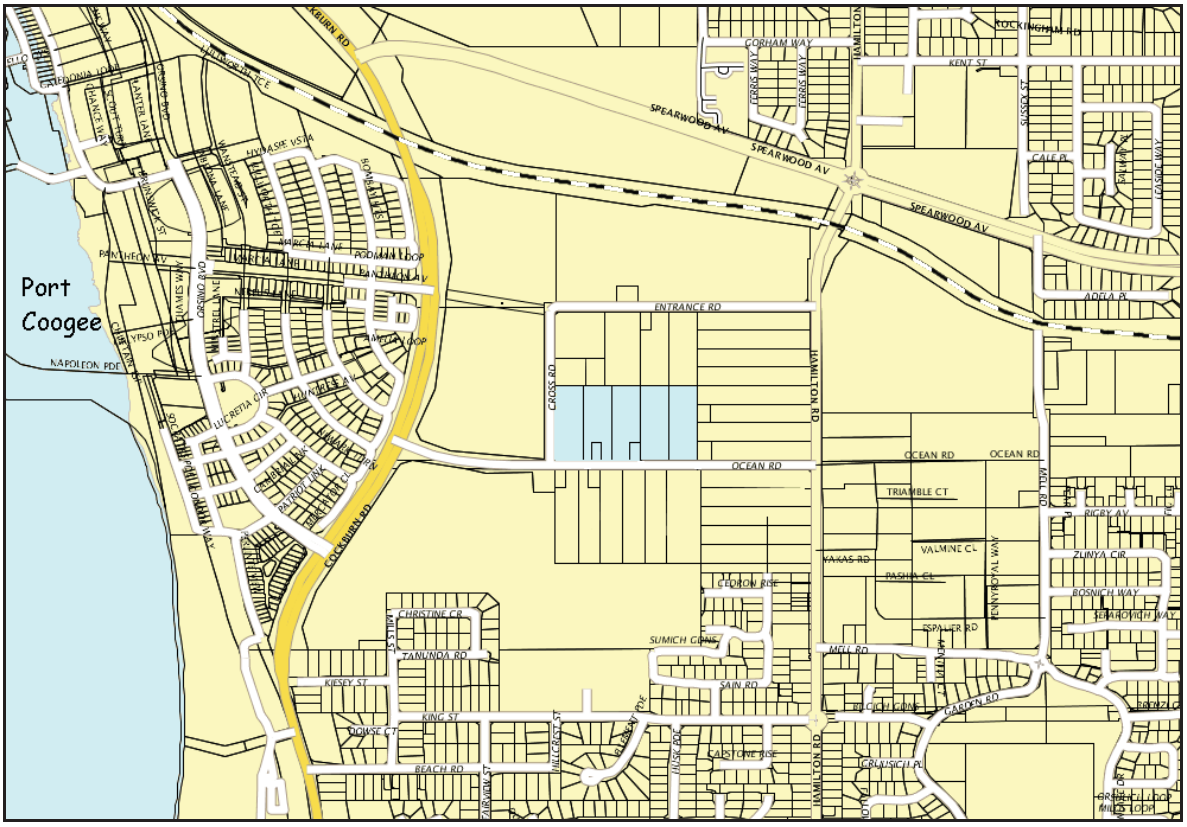


Figure 1. Location Plan of LSP area [blue] (Source: Landgate, 2012 - *modified*)

1.2 Background

The area within the LSP was previously affected by the Watsons food processing plant odour buffer, which was one of the main reasons that the area could not be rezoned to 'Development' for urban land use under the City of Cockburn Town Planning Scheme No. 3 (TPS 3). With the closure of the food plant in April 2009, Council at its meeting held on 12 February 2009 resolved to initiate a Scheme Amendment (Amendment No. 70) to rezone the special use food plant site and surrounding rural zoned land (previously affected by the odour buffer), for residential development. Local Scheme Amendment No. 70 was gazetted on 10 November 2010.

The approved Packham North District Structure Plan and District Water Management Strategy for Amendment No. 70 'Development' zoned area provides the foundational planning framework for consideration of this LSP. In addition, the Council has prepared Scheme Amendment No. 87 by including the Packham North District Structure Plan area as DCA 12 – Packham North. This will provide a guide for development contributions from the respective landowners within the DSP.

Once approved, this LSP will provide guidance for development of the LSP landholdings and establish a context for the consideration and eventual approval of subdivision applications for each of the various lots.

1.3 LSP Update Objectives

The general objectives of the LSP Update are to:

- Provide a statutory framework which will serve to guide the land use, subdivision and development of the subject land to facilitate creation of a high quality urban environment;
- As far as practicable, retain the general landform and natural features of the subject land through appropriate distribution and allocation of land uses, the design of the road network and future built form;
- Create a range of lot sizes for the provision of a mix of housing typologies and a range of affordability to provide for the demographic spectrum;
- Create a safe, convenient and efficient transport network suitable for a range of alternative modes of transport to encourage public transport, cycling and pedestrian movement;
- Design to make effective use of the landscape amenity by capitalising on aspects such as views and proximity to wetland area;
- Incorporate best practice principles of sustainability through water sensitive urban design, energy efficiency and conservation of areas containing environmental significance.

2.0 LAND DESCRIPTION

2.1 Location

The land the subject of this Local Structure Plan (LSP) comprises 7 lots located approximately 19 kilometres south-east of Perth Central Business District and approximately 0.5 kilometres to the east of the new Port Coogee marina development. The LSP area is within the Metropolitan South-West Corridor and is situated within the municipality of the City of Cockburn and the locality of Coogee.

2.2 Landownership

The LSP area contains 7 land parcels in various ownership as set out in Table 1 below.

Table 1. Land description and area of lots comprising subject site

Lot	Plan/Diagram	Volume	Folio
14	4097	61	41A
15	4097	2055	189
16	4097	1664	150
17	4097	1678	829
18	4097	1678	830
41	87995	2032	302
500	61099	1664	149

Figure 2 – Aerial/Cadastral View shows the boundaries of the lots that form the LSP area.

2.3 Existing Land Use

Most of the LSP area has been previously cleared for residential development and small scale agriculture, including semi-rural and market gardens. Pastures of exotic grasses, weeds and remnants of existing crops, lupin and large spice plants have mostly replaced the original vegetation. With the exception of Lots 14, 41 and 500, existing development on all of the LSP landholdings comprise of two dwellings with outbuildings on a large lot with the rear area cleared. There is only one dwelling on Lot 14 and Lots 41 and 500 are smaller residential lots approximately 581m^2 and 760m^2 respectively each with a single dwelling.

Most of the existing dwellings are original dwellings constructed circa 1950s to early 1970s. Many of the dwellings are in good condition with all existing dwellings (except Lot 14) to be retained by landowners as part of the subdivision and development of the land. The decision to retain or demolish buildings and improvements on the land can be made by the various individual landowners at any time in the future. Some existing dwellings are proposed to be retained on larger superlots until such time as landowners may wish to demolish them to make way for further subdivision. Market gardening has occurred on some of the lots in the past which ceased operation approximately 15 years ago.

Figure 2 Aerial & Cadastral Plan of the LSP landholdings (Source: Landgate, 2012 – *modified*)

2.4 Surrounding Context

The LSP area is within the locality of Coogee. **Figure 3 – Surrounding Land Use Context** provides an overview of the LSP in relation to surrounding land use and environment. The LSP area is adjacent to similar established residential properties to the north. To the east is the former site of the food processing plant with buildings now demolished. There is also surrounding vacant [buffer] land, which is also proposed to be developed for future residential use. Directly adjacent on the eastern boundary of the LSP area is a wetland area which is proposed to be retained under the Packham North DSP. On the opposite side of Ocean Road to the south are large semi-rural residential lots which are also subject to local structure planning for future urban development. To the west, the LSP development site is adjacent to reserved land owned by the Western Australian Planning Commission (and managed by the City of Cockburn), with the coast approximately 650 metres further west.

Figure 3 Surrounding Land Use Context

3.0 PLANNING FRAMEWORK

STATE & REGIONAL PLANNING

3.1 Directions 2031

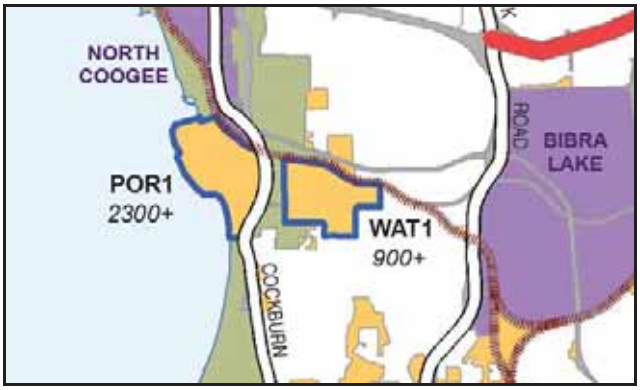
Directions 2031 establishes the vision for the future growth of Perth and Peel regions. It provides a framework in which population growth is to be accommodated. Directions 2031 seeks a 50% increase in the current average residential density 10 dwellings per gross urban zoned hectare; and has set a target of 15 dwellings per gross urban zoned hectare of land in new development areas. This proposed local structure plan achieves the targets set by Directions 2031 and this will be discussed in further detail under 4.2 'Residential Densities and Yield'.

3.2 Metropolitan Region Scheme

The LSP area is zoned 'Urban' under the Metropolitan Region Scheme (MRS). Land owned by the WAPC adjoins the LSP to the west. The WAPC land is reserved as 'Parks and Recreation' and is managed by the City of Cockburn. Land surrounding the LSP to the north, south and east is also zoned 'Urban' under the MRS.

3.3 Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy

The Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy identifies the LSP development site as part of the "WAT1" precinct with an estimated potential for future 900+ lots [see below extract]. It should be noted that this is an indicative estimate based on 75% of the land being able to be developed.



Extract from Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy [p.93]

3.4 Cockburn Coast District Structure Plan

Cockburn Coast District Structure Plan area and Improvement Plan No. 33 area refers to land bounded by Port Coogee, South Beach and land reserved under the MRS for 'Parks and Recreation'. The structure plan identifies new areas for living, employment and recreation and aims to create a significant coastal node around the historic power station and Port Coogee marina. The proposed LSP will not have an adverse impact on the Cockburn Coast District Structure Plan and will compliment its vision by providing the framework for transition from current semi-rural land use to urban development.

3.5 Packham North District Structure Plan

The LSP has been prepared within the framework of the City of Cockburn Packham North District Structure Plan. The purpose of the District Structure Plan is to guide development of the former food processing plant and surrounding land that was included in the odour buffer for residential development. The structure plan sets out an overall strategic planning framework providing the direction for preparation of local structure plans and future applications for subdivision and development. The LSP has been prepared in accordance with the planning objectives set out in the structure plan, which includes allocation of public open space, access, interfacing with adjoining land uses, movement linkages and areas for residential use (refer to **Figure 7 Packham North District Structure Plan**).

Figure 7 Packham North District Structure Plan (Source: City of Cockburn, 2012)

3.6 Liveable Neighbourhoods

Liveable Neighbourhoods has been prepared to guide the sustainable development of communities. It addresses both strategic and operational aspects of structure planning and subdivision for both 'greenfield' and urban infill sites.

The LSP has been designed in accordance with the principles of Liveable Neighbourhoods, in particular, the layout of roads and public open space. Consistent with Liveable Neighbourhoods, the LSP provides a high level of connectivity with good external linkages to cycle, pedestrian and public transport networks. The road design in the LSP is legible and reduces car travel distances by creating alternative routes and minimising use of cul-de-sacs where possible. These aspects are further addressed in Section 5.3 'Road Network' and Section 5.6 'Bicycle & Pedestrian Movement'.

Liveable Neighbourhoods encourages walkable access to activity nodes and public open space. Within the LSP, all lots are within 400 metres walking distance from POS areas. This provides residents in the LSP with opportunities for active lifestyle and recreation within 5 minutes walking distance from residences. This is further addressed in Section 5.5 'Public Open Space'.

According to Liveable Neigbhourhoods it is important for the LSP design to respond to site characteristics and site context. The LSP design has taken into consideration the natural topography, vegetation, surrounding land uses, solar orientation and existing developments. Ninety five percent of proposed lots have a N-S orientation, with four lots having an E-W orientation.

Consistent with Liveable Neighbourhoods, within the LSP, lots that face parkland increase opportunity for passive surveillance and interaction with public spaces. Roads have also been designed to provide opportunities to array lots to maximise building design potential for solar orientation (north-south and east-west) and energy efficiency.

Lot shape and proportion of width to depth is considered important in Liveable Neighbourhoods. Lots in the LSP have been designed to be rectangular in shape with a greater depth than width. This ensures ability to develop the lots with high quality housing and builtform and conformity with the Residential Design Codes of Western Australia. Other aspects of Liveable Neighbourhoods principles, such as local water management and, diversity of lot sizes and target residential density are addressed further in the LSP report under Section 5.0.

3.7 City of Cockburn Town Planning Scheme No. 3

The LSP area is zoned 'Development' under the City of Cockburn TPS 3. The provisions of TPS 3 require preparation and approval of a local structure plan prior to any subdivision and development. Amendment No. 87 to TPS 3 will provide for development contributions and will include the LSP area within a Development Contribution Area.

3.8 City of Cockburn Local Planning Strategy

The City of Cockburn Local Planning Strategy (LPS) promotes, amongst other things, urban development to include a range of housing densities and opportunities and strategies to reduce car use and encourage walking, cycling and public transport use. The proposed LSP is consistent with this philosophy in that it provides for a range of dwelling types, public open spaces that are within walking distance and a permeable road network.

3.9 'Watson' Local Structure Plan

A local structure plan has been prepared for the former food processing plant and surrounding land that has previously been affected by the food processing plant odour buffer. Preliminary discussions have taken place with the landowner of the [Watson] land as to an appropriate interface with the proposed LSP landholdings. The interface, particularly with the wetland and the land to the NW of the LSP landholdings, will be further discussed in this report. The proposed LSP and its context with other local structure plans in the Packham North District Structure Plan development area is shown in **Figure 8 – Combined Structure Plans.**

3.10 Ocean Road Estate Local Structure Plan

A local structure plan has been prepared for the land to the south of the LSP landholdings. No direct interface is necessary with the Ocean Road Local Structure Plan as existing Ocean Road provides separation between the two developments. It is noted however that the proposed LSP reflects a similar R-Code density (R25) as that proposed in the Ocean Road LSP. This provides opportunity for a consistent streetscape.

3.11 City of Cockburn Scheme Amendment No. 87

This Local Scheme Amendment proposes to apply DCA provisions by including the Packham North District Structure Plan area as DCA 12 – Packham North. This aims to ensure, through the provisions of TPS 3 that all landowners equitably contribute to associated infrastructure development costs that are necessary to coordinate the orderly planning for the multiple landholdings within the Packham North area. DCA 12 costs include drainage, servicing, engineering and environmental studies prefunded by Council and other common costs that arise through the structure plan process.

Figure 8 Combined Local Structure Plans showing context of the proposed LSP with the Watson Local Structure Plan and Ocean Road Local Structure Plan

4.0 SITE CONDITIONS & ENVIRONMENT

4.1 Topography

The topography of the LSP varies in the range of 3.0 AHD at the NE boundary of the LSP area rising up to 19.0 AHD at the SW boundary of the LSP area. The LSP development site generally slopes downhill from west to east (refer to **Figure 4 – Contour Plan**)

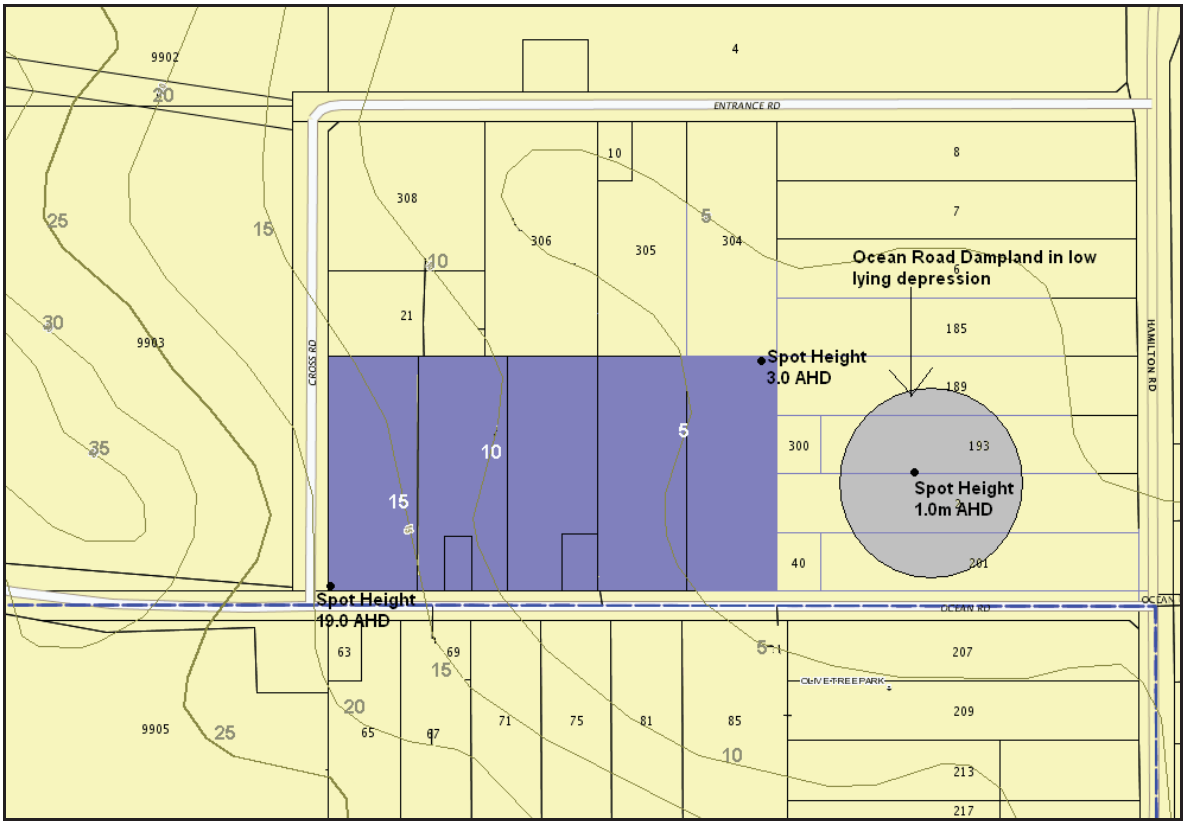


Figure 4 Contour Plan - LSP area with indicative spot heights (Source: Landgate, 2012 *modified*)

4.2 Geology and Soils

The LSP development site is located on the Swan Coastal Plain within the Aeolian Deposits of the Cottesloe Dune System. This System is generally described as low hilly landscape with shallow brown sands over limestone with exposed limestone outcropping (Department of Agriculture, 2003).

Geomorphologic classification for the structure plan area reported in the *Perth Metropolitan Region 1:50,000 Environmental Geology Series, Rockingham (Part of Sheets 2033 I and 2033 IV)* (Gozzard 1983) indicates that the general geology of the area consists primarily of the following soil types:

(i) Spearwood Sand formed during the Pleistocene era. This sand is described as a pale yellowish brown, medium to coarse-grained, sub-angular quartz, trace of feldspar, moderately sorted and of residual origin (Gozzard 1983). Tamala limestone (quartz) is the potential origin of the sand. The Spearwood Sand is considered to have high permeability, with a low to moderate load bearing capacity (Gozzard 1983); and

(ii) Limestone soil types also formed during the Pleistocene era described as pale yellowish brown, fine to coarse grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar and of aeolian origin (Gozzard 1983). The permeability of limestone generally found in the immediate area is described as high, with a variable load bearing capacity (Cardno BSD, 2009).

4.3 Hydrology

Groundwater

Based on the Department of Water *Perth Groundwater Atlas* (2003), the groundwater generally flows in a westerly direction towards the coast and the groundwater table contours are at 1.0m AHD. Regional groundwater levels having been recorded from 0.03m AHD – 1.62m AHD (Cardno, 2008). Groundwater testing undertaken for the local structure planning to the west and south indicates the quality of the groundwater is poor due to saline encroachment. Unless the groundwater undergoes some form of treatment (such as "shandying"), groundwater from the superficial aquifer is not considered to be suitable for irrigation purposes.

In the lower lying area of the LSP development site (i.e. 3.0m AHD) the groundwater level is closer to the surface. In 2008 Cardno measured the groundwater level at the site to be 0.6m AHD. This is approximately 1.9m below the lowest part of the land. Subject to detailed engineering design, the required 1.2 metre minimum separation distance between the finished lot levels and the highest known groundwater table level can be met. At Cross Road, the depth to groundwater is generally an average of 18m.

As part of the preparation of the City of Cockburn draft Packham North District Structure Plan, groundwater monitoring has been undertaken and the report *Packham North Groundwater Monitoring Report* (Cardno, 2010) provides a basis as to pre-development hydrological studies, which can be utilised to assist in future planning of proposed development. A Local Water Management Strategy has also been prepared for the Packham North District Structure Plan, which is included as an Appendix to the District Structure Plan report.

Surface Water

There are no permanent surface water bodies within the LSP area. Sheet drainage across the development site from west to east is limited due to the high permeability and infiltration at source which is characteristic of sandy Spearwood soils.

Wetlands

There are no wetlands within the LSP area. To the east, a small dampland exists on Lots 1, 2, 4, 300 & 301 Hamilton Road adjacent the LSP development site (**Figure 5 – Ocean Road Dampland**). This dampland is not identified in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain*. However, the wetland is listed in the City of Cockburn Municipal Heritage Inventory as a place of heritage significance. Under the Packham North DSP and [Watson Local Structure Plan], this wetland is proposed to be protected within public open space. The 'Landscape Strategy Report & Ocean Road Public Open Space Management Plan' (RPS, 2011) outlines a management plan for the wetland to address drainage, access, fire management, weed control and rehabilitation.

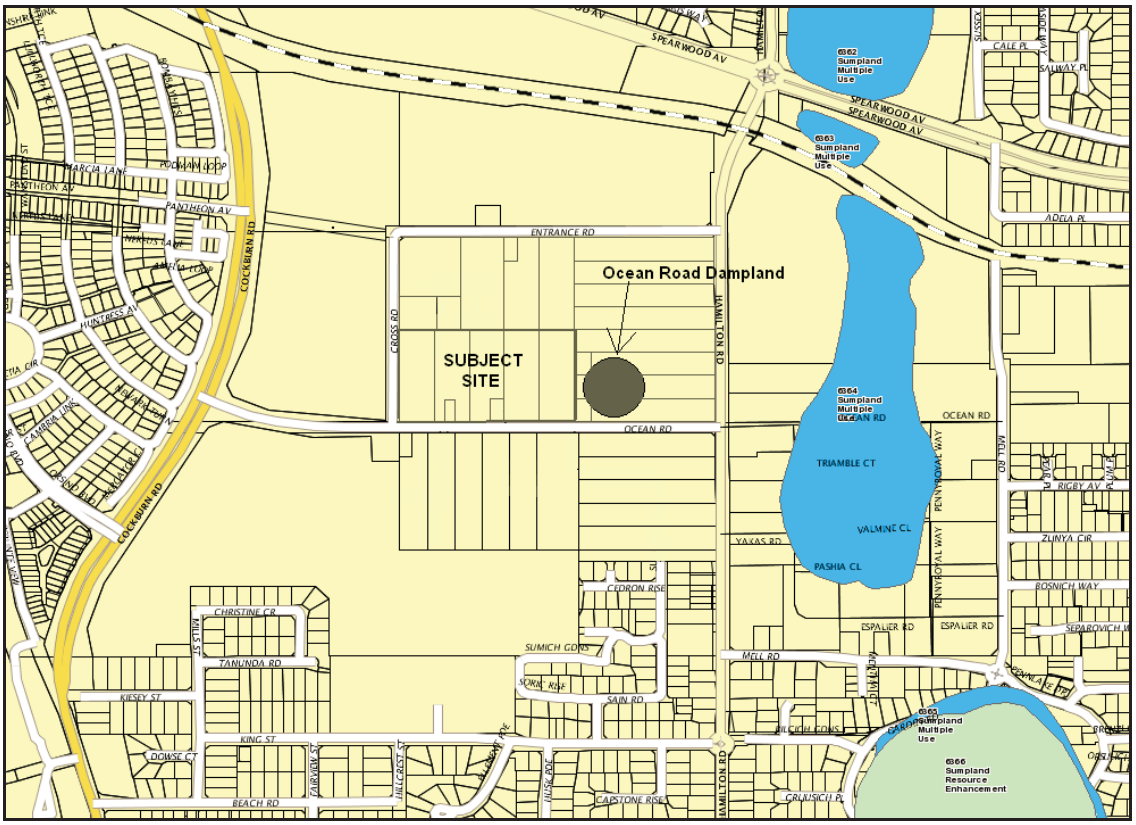


Figure 5 Ocean Road Dampland adjacent to LSP. Wetlands contained in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain* are also shown.
(Source: WA Atlas, 2012 – *modified*)

4.4 Acid Sulphate Soils

A desktop assessment to determine the presence of Acid Sulphate Soils (ASS) indicates an unlikelihood of there being any ASS affecting the LSP development site. Notwithstanding the ASS mapping contained in **Figure 6 – Acid Sulphate Soils**, within the core lower lying area of the Ocean Road dampland, there maybe localised peaty or clayey materials with potential ASS.

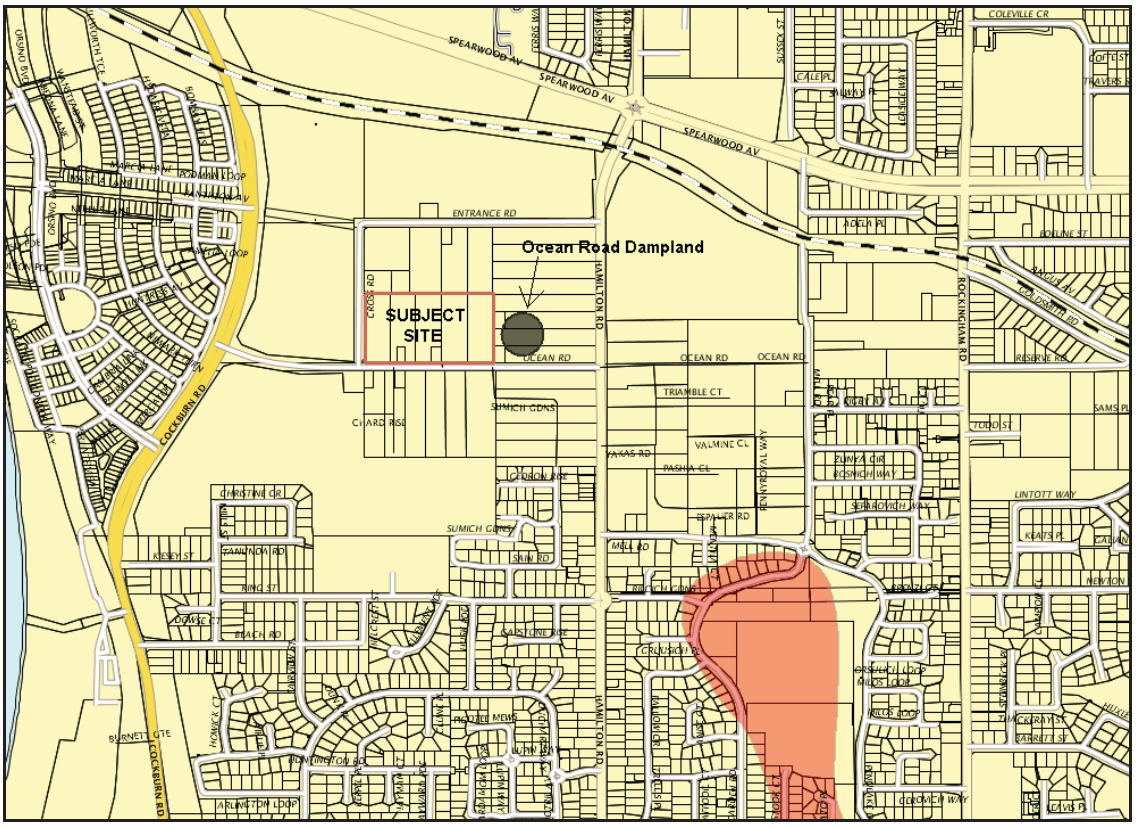


Figure 6 Acid Sulphate Soils desktop mapping indicating the LSP area has a low risk of Acid Sulphate Soils (Source: WA Atlas, 2012 – *modified*)

It should be noted that the Ocean Road dampland does not extend into the LSP area. The LSP proposes development up to the eastern boundary of the LSP and in this area detailed geotechnical investigations will need to be undertaken prior to any subdivision and or development. It is unlikely that ASS will affect development within the LSP area as the core areas of the dampland are further to the east (approx. 20m – 30m) from the LSP boundary. Acid sulphate soils pose no unacceptable risks to development if left undisturbed. Should any road upgrading, servicing or drainage infrastructure be planned within areas potentially containing ASS, an acid sulphate soils investigation would be carried out to inform any required acid sulphate soils management plan prior to works being undertaken.

4.5 Vegetation, Flora & Fauna

All lots within the LSP development site have been 'parkland cleared' to provide for residential development and semi-rural agricultural use. As a result, the vegetation condition of the pre-development vegetation community has been significantly disturbed by human activity.

Vegetation condition assessed to the following criteria (Keighery, 1993):

Classification	Vegetation Condition
Pristine	Pristine or nearly so, no obvious signs of disturbance
Excellent	Vegetation structure intact, disturbance affecting individual species and weds are non-aggressive species
Very Good	Vegetation structure altered, obvious signs of disturbance
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate to it
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as being 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs

Keighery, B (1994) *Bushland Plant Survey, Guide to Community Survey for the Community, Wildflower Society WA*

In classifying the existing vegetation condition using Keighery (1993), the vegetation within the subject site is classified as being "Completely Degraded". A Flora & Fauna Survey is not considered necessary due to the land being 'Completely Degraded' as a result of extensive clearing for residential development and semi-agricultural use.

(*Left*) Southerly view of development site

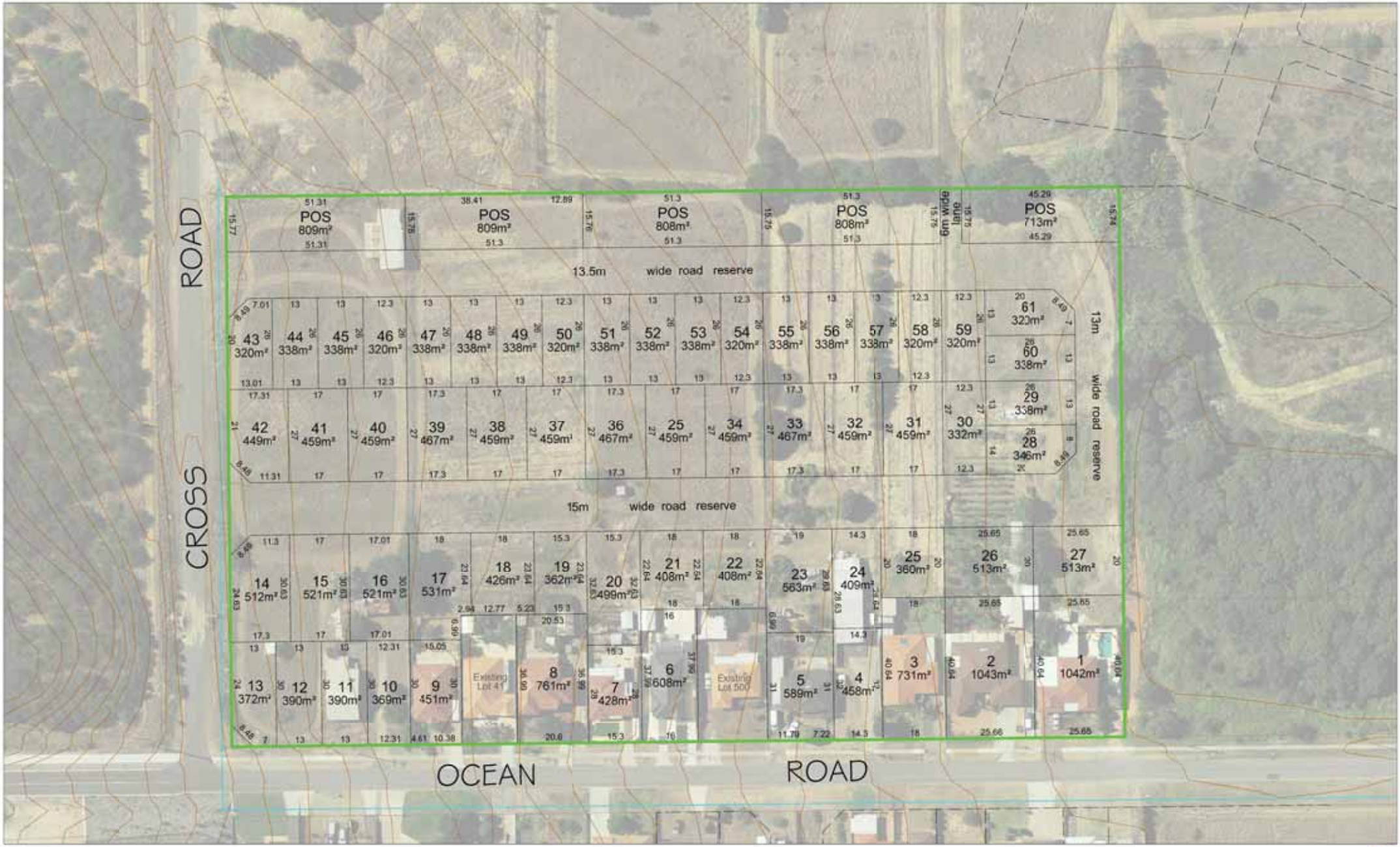
4.6 Indigenous & European Heritage

Indigenous Heritage

A search of the Department of Indigeneous Affairs Aboriginal Heritage Inquiry System indicates that there are no recorded sites in the LSP area. It is important to note that the database of heritage sites held by the DIA is not comprehensive and there exists the potential for unknown sites of Indigeneous heritage significance to be located inside or within close proximity to the subject land. Due to the level of disturbance to the subject land as a result of development activities and clearing over the past years, an archaeological survey is not considered necessary, however, archaeological monitoring is recommended for any eventual excavation works as part of subdivision and development. The process for protecting Indigeneous heritage sites and considering proposals that may impact a known site is set out under the *Aboriginal Heritage Act 1972*. The Act protects all Aboriginal sites in WA whether they are known to the DIA or not. The Act provides for a clear process for addressing these issues as they relate to the proposed structure planning.

European Heritage

There are no places or sites of cultural significance within the LSP area under the City of Cockburn Municipal Heritage Inventory and State Heritage Register.



Plan No. : 15539-4
Revision : REV.1
Scale :1:1000@A3

LEGEND
- Water Mains
- Sewer Mains
- Power Lines
- 135 Contours
- Existing Boundary
- Proposed Boundary
- Application Area

SUBDIVISION CONCEPT PLAN
LOTS 14-18 OCEAN PLAN
COOGEE

whelans TOWN PLANNING
120 Edinborough Beach Road North Hawthorn WA 6010 www.whelans.com.au

5.0 LOCAL STRUCTURE PLAN

5.1 LSP Community Design Rationale

The LSP provides for two land uses being residential (with mixed densities) and local parks and recreation. The LSP has been prepared to provide a comprehensive strategic plan to guide the future subdivision and development of the fragmented landholdings, which until the closure of the former food processing plant, had limited potential for urban development. The LSP seeks to create an urban environment that is based on a logical and permeable movement network system that combines to create a pleasant walking/cycling environment.

Cohesion of the LSP with the [Watson Local Structure Plan] was considered important to enable linkages between the two developments, particularly as a local neighbourhood centre is proposed to the NE of the LSP development site. Another key element is the linear extension of the Ocean Road wetland POS system providing a corridor connection with the MRS 'Parks and Recreation' reserve to the west. This is consistent with the Packham North DSP. The corridor also enables landowners within the LSP landholdings to set aside the required 10% POS area at the rear of the lots. The design elements of the LSP will be discussed in more detail in this report.

5.2 Residential Densities and Yield

The LSP ultimately provides for approximately 68 dwellings with a density coding ranging from R25 – R30. Proposed development as provided by the LSP could accommodate up to approximately 156 people based on an average household of 2.3 persons.

The range in residential density provides opportunity for a diversity of lot sizes and housing types, responsive to the site's location. Opportunities for medium density housing have been placed to take advantage of and overlook public open space. Orientation of lots towards public open space increases passive surveillance of public open space, including the wetland to the east.

The R25 density provides for efficient sized residential lots (i.e. 350m2 – 450m^2), which also provides opportunity, in some instances, for retention of existing dwellings on larger lots (i.e. 700m^2 – 800m^2), which could at some point in the future be further subdivided into two lots subject to dwelling demolition. Table 1 provides an estimate of the residential dwelling yield across the varying residential densities based on the **Subdivision Concept Plan**. Table 2 provides development statistics which can be used to measure the performance of the LSP and conceptual subdivision design against the key target outcomes of *Directions 2031* and *Liveable Neighbourhoods*.

Table 1. Estimate of the residential dwelling yield of the LSP

RESIDENTIAL LOT TYPE	DENSITY	YIELD	HOUSING TYPES
Low density residential	R25 R25 ('Duplex' Lots)*	37 10	Single Dwellings Single/Grouped Dwellings
Medium density residential	R30	21	Single Dwellings
LSP Estimated Potential Dwelling Yield		**68**	

* Larger (R25) lots with potential for two dwellings subject to demolition of existing dwelling

Table 2 Development Statistics (based on Subdivision Concept Plan)

	Site Outcomes	Target Density
Total LSP Landholdings Area	40, 470m^2	-
Area set aside for roads, drainage & POS	12,119m^2 (30% total site area)	-
Balance area for residential development	28,351m^2	-
Estimate ultimate number of dwellings	68 dwellings[3]	-
Estimated number dwellings per *site hectare*[1]	24 dwellings/ha	**Liveable Neighbourhoods** 12 – 20 dwellings per site hectare for lots not within 400m of commercial centre
LSP target density per *gross urban hectare*[2]	17 dwellings/site ha	**Directions 2031** 15 dwellings per gross urban hectare

1 Liveable Neighbourhoods definition of *site hectare* is the area available for residential development excluding roads, non-residential uses, public open space and drainage areas.

2 Directions 2031 definition of *gross urban hectare* is the gross area available for urban development

3 63 lots actually proposed in the Subdivision Concept Plan with retention of existing dwellings

The LSP delivers approximately 24 dwellings per *site hectare*, which meets the Liveable Neighbourhoods minimum requirement of 12 - 20 dwellings per site hectare. Similarly, the LSP delivers approximately 17 dwellings per gross urban hectare, which meets the target density of 15 dwellings per gross urban hectare under Directions 2031.

5.3 LSP Proposed Land Uses

The proposed land uses are identified in the LSP Plan under 'Zones/Reserves' and will guide future subdivision and development of the land pursuant to the provisions of Clause 6.2.3.2 of the City of Cockburn Town Planning Scheme No. 3 (LPS 5), which states:

6.2.3.2 "The subdivision and development of land within a Structure Planning area is generally to be in accordance with any structure plan that applies to that land."

Once the LSP is adopted the provisions of TPS 3 Clause 6.2.6.3 apply, which provides that where any reserves, zones and Residential Density Codes are imposed in the local structure plan, these shall have the same effect as if they were part of the Scheme. The general land uses proposed in the LSP are set out in Table 3.

Table 3. Proposed land uses in the LSP Update

Land Use	Description
Residential	Land uses permitted as per TPS 3 for 'Residential' zone with R-Code densities ranging R25 – R30.
Public Open Space	Areas to be ceded as Crown Reserve for Local 'Parks and Recreation' reservation with a Management Order to the local authority

5.4 Integration with Surrounding Land Uses

The LSP has been designed to connect into existing and proposed development. To the north a narrow 6.0m wide laneway is proposed to connect into the proposed road network within the [Watson Local Structure Plan] refer to Figure 8. This laneway will provide residents within the LSP better access to the proposed future neighbourhood centre to the NE on Hamilton Road. The laneway will also provide an alternative emergency access route should the loop road to Cross Road be blocked by fire or other emergency/hazard.

The linear public open space 'parkway' connecting the Ocean Road wetland POS area and MRS 'Parks and Recreation' reserve on the western side of Cross Road is consistent with the Packham North District Structure Plan. The linear POS corridor also forms part of a much wider corridor that is to be provided in future when the landowners to the north undertake structure planning. In the interim, the POS corridor provides a buffer to existing residential lots to the north.

To the west and south the LSP adjoins the existing constructed roads of Cross Road and Ocean Road respectively. The proposed internal road provides an interface with the adjacent Ocean Road wetland area to the east of the LSP development site. The proposed road network and its rationale is further discussed under 5.1 'Street Layout'.

In the context of the surrounding existing and proposed development, the LSP provides for a sense of place through its legible and responsive design to the development site context and opportunities for views and interface with natural assets. The LSP landholdings can also be developed independently utilising the existing road infrastructure and without relying on access through other private lots.

5.5 Population & Employment

Based on an average household size of 2.3 persons per dwelling, the LSP would result in a residential population of approximately 156 people for the proposed 68 dwellings indicatively shown in the Subdivision Concept Plan.

The LSP is not in a new growth area and therefore the expectation for the LSP to provide for opportunities for significant local employment [promoting concepts of self-sufficiency as those stated in Liveable Neighbourhoods] is reduced. No commercial or mixed use land is proposed in the LSP as this has not been provided for in the Packham North District Structure Plan northern local neighbourhood centre.

In terms of local employment opportunities (i.e. within 400m – 800m walking distance) there are areas provided in the proposed Packham North DSP, such as the mixed business precinct to the east on Rockingham Road and the local neighbourhood centres to the NE and SE on Hamilton Road. Further out to within 2km to the east there is the Phoenix District Centre and nearby Spearwood Industrial Park. Approximately 4km to the north is the Fremantle business district and 7km to the south is the Henderson industrial and ship building precinct. Opportunities for home-based employment within the LSP would exist under the provisions of TPS 3 in a 'Residential' zone.

5.6 Education & Community Infrastructure

No community purpose sites, for land uses such as community centres, child day care centres, meeting halls and kindergartens have been provided for in the LSP. The primary reason for this is because there is already adequate established community infrastructure in the locality to cater for demand.

Similarly, no public or private primary or high school sites have been provided for in the LSP. There is already considered to be sufficient education facilities in the surrounding established localities to accommodate the increase population resulting from the LSP. This is consistent with the Packham North DSP.

5.7 Street Layout

The LSP proposes a site responsive street network that provides access from existing road infrastructure to create good internal connectivity with external linkages for local vehicle, pedestrian and bicycle modes of transport. The proposed local internal 'loop road' is consistent with the local road hierarchy and reinforces legibility. It also provides for traffic management aimed at restricting vehicle speed, limit the negative impact of through traffic and create safe conditions for all street users. It is intended that the proposed 'loop road' will provide a multi-purpose public space, designed to accommodate and balance traffic management with other functions such as community space, safe pedestrian environment, vehicle parking and as an entrance into the residential environment.

A 6.0m wide paved laneway will form part of the public street network and is proposed to connect with the proposed local centre on Hamilton Road within the Watson Local Structure Plan. This will increase the permeability of the road network. It will also serve as an alternative emergency access route. It is envisaged that this 'laneway will not be created until the land to the north owned by the Watson Group is developed and a road constructed so that a link between the developments can be established.

The location of the laneway has been identified in the NE corner of the LSP area (specifically on Lot 18) due to (i) the landowners directly to the north (Lots 2, 20 & 21) have indicated their unwillingness at present to develop their lands, and (ii) negotiations have been held with Council and Watson Group (landowner of Lot 9) which supports connection of the laneway with the proposed future road as shown in the [Watson Local Structure Plan]. For this reason, the laneway is required in the NE corner of the LSP development site. However, the laneway cannot be located on the eastern boundary of Lot 18 as the land is lower lying and presents drainage issues.

The internal local access road has been designed to enable development to front all streets, public open space and the wetland area to the east. This will promote surveillance, activity and visual interest which contribute towards making streets and public spaces a safe place for social interaction. Where lots are proposed to side onto public spaces (i.e. Ocean Road wetland area), a Detailed Area Plan can be prepared so as to guide development in achieving good design and built form outcomes. This will be further discussed in 5.3.

Neighbourhood permeability is provided through the provision of the laneway. A road connection between the internal access loop road and Ocean Road is not possible without demolition of existing dwellings. The Subdivision Concept Plan provides for the retention of dwellings due to their current value and significance to the landowners. The length of the internal residential block is 243.5m. Liveable Neighbourhoods recommends a maximum neighbourhood block length of 230m.

In this case it is suggested that the proposed length of the neighbourhood block could be supported based on the following reasons:

1) The row of existing dwellings along Ocean Road (which are to be retained) limits the ability to provide an effective location for a through road, in order to increase permeability without demolition of existing structures.

2) Ocean Road and the linear POS parkway (required under the Packham North DSP) limits the ability to design north-south orientated neighbourhood blocks similar to that proposed in the [Watson Local Structure Plan]. The space is simply too confined.

3) Ultimately, the provision of a laneway in the NE corner of the LSP development site will increase the permeability of the internal loop road to enable access/egress other than from Cross Road.

4) The LSP has already provided approximately 30% in land set aside for roads and public open space, which is higher than the expected 25% baseline provision for 'greenfield' developments. This is primarily attributed to the length of internal road having lots on only one side so as to provide an interface with POS areas. From a developer's view, having lots on only one side of a road is generally undesirable, principally as the costs to create the road are recouped from sale of lots on one side only. Subsequently, any further land that is required to be set aside for roads would have a negative impact on the landowners.

5) Further loss of (2) lots in the LSP in order to provide increased permeability is not seen as being critically necessary to achieve residential amenity or significant gains in sustainability.

5.8 Housing Typologies

The LSP provides opportunity for a diverse mix of lot and housing typologies. For instance, this can be achieved through a combination of developer house & land packages and land sales. Level sites that are terraced reflect the ideal building site to reduce housing cost and create more affordable housing. For this reason, retaining walls will be used where necessary without significantly altering the natural topography and landform.

The use of retaining walls within development will allow for the general landform to be retained, whilst also providing quality homesites and lot sizes consistent with optimal and viable lot yield. Table 4 is a brief summary of the types of dwellings that could potentially be delivered in the LSP.

Table 4. Housing typologies for Local Structure Plan

Lots & Housing Types	Typical Width	Typical Depth	Typical Area	R-Code	Typical Built Form	Estimated Yield (Lots)
Residential 'Front Loaded' Lots	15m - 17m	27m - 30m	450m^2 to 520m2	R25	Single Dwellings	30
Residential 'Front Loaded' Lots	12m - 13m	26m - 30m	340m^2	R30	Single Dwellings	21
Residential 'Front Loaded' Lots	13m	27m – 30m	360m^2 to 420m^2	R25	Single Dwellings	17
ESTIMATED DWELLING YIELD						**68**

5.9 Use of Detailed Area Plans

A Detailed Area Plan (DAP) or Area Specific Plan (ASP) will be required for certain lots within the LSP in order to work towards achievement of a better residential built form outcome. DAPs will provide the mechanism to enable lot design to be linked to a future dwelling, without building development plan/s being submitted at subdivision. This has particular application for small/narrower lots and lots abutting public open space, where design coordination is required to ensure that buildings are suitable for the occupier and the streetscape amenity.

DAPs for the LSP will be prepared and approved at subdivision stage, when lots are created and the DAPs will be used as the basis for subdivision and development. The areas where DAPs are envisaged to be required in future subdivision/s are shown on the LSP plan.

DAPs will be required for certain lots in the LSP, these include:

- Variation of the R-Code front setback requirement for R30 lots fronting the Ocean Road wetland area to the east. This is necessary in order to achieve the minimum 20m Building Protection Zone by specifying an absolute minimum front setback of 4.0 metres. In this instance the BPZ will comprise of a 3.0m firebreak within the POS, 13.0m road reserve and 4.0m front setback.

- Variation of the R-Code front setback requirement for R25 lots fronting the internal access loop road to ensure that a uniform front setback is achieved for streetscape amenity. This will also maximise the effective building area for lots that are proposed with an irregular shape (i.e. reduced length to width ratio) due to retention of the existing dwellings along Ocean Road.

- Requirement for any proposed lot abutting the Ocean Road wetland public open space area to have a mandatory garage boundary wall (fire rated) on the shared POS boundary. This is to reduce risk from bush fire by providing *shielding* to the main dwelling.

The **Indicative Detailed Area Plan for R-Code Variations** (*overleaf*) for the R25 & R30 lots show conceptually the detailed area planning required to achieve desired built form outcomes.

INDICATIVE DETAILED AREA PLAN FOR R-CODE VARIATIONS

The City of Cockburn Town Planning Scheme No. 3 and the Residential Design Codes are varied in the following manner:

1) For all R25 and R30 lots, a five percent (5%) variation to minimum open space requirements (in addition to that described in the Open Space definition of the Codes) shall be permitted for single storey dwellings. Open space shall be calculated in accordance with the provisions of the 2008 R-Codes.

2) For R30 lots the absolute minimum front setback for development shall be 4.0m. This may be varied at the discretion of the Council where it is demonstrated that the development complies with the minimum 20m Building Protection Zone to the eastern vegetation fire hazard within the wetland area.

3) For R25 lots the front setback of the lots shall be determined in accordance with the following:

   - Minimum front setback of 2.0m
   - Average front setback of 4.0m
   - Maximum front setback of 6.0m

4) All other setbacks on this DAP shall be in accordance with the R-Codes.

5) For Lot 'xxx' a fire rated garage boundary wall shall be required adjoining the eastern boundary with public open space to assist in 'shielding' from bushfire.

6.0 SUSTAINABLE DESIGN

6.1 Energy Conservation

For urban residential design, there are three main areas of sustainable and climate-sensitive design. In general, these are to reduce energy consumption, optimise on-site solar access and protect solar access for neighbouring properties. The LSP design assists in reducing energy consumption through orientating the neighbourhood blocks E-W to create lots that are orientated north-south. A north-south orientation of lots maximises solar access and cooling breezes. This will be discussed further in 6.2. The provision of street blocks to create regular shaped lots in the LSP is important for also providing micro-planning opportunities to design more energy efficient dwellings.

6.2 Lot Design for Climate Responsive Dwellings

Contemporary structure planning should provide greater site responsive lot design to allow opportunity for climate-responsive dwelling design. This can be achieved through orientation of roads and street blocks, which is advocated in Liveable Neighbourhoods.

The climate of Perth can be summarised as follows:

> "Perth experiences a Mediterranean-type climate, characterised by hot, dry summers and mild, wet winters. Perth experiences seasonal extremes in weather, from hot summer days when southeasterly winds arrive, to cold wet, windy winter days as cold fronts from the Indian Ocean move in ….south to southwesterly afternoon seas breezes are common in spring and summer ….Regular sea breezes moderate the climate in the warmer months. Hot days are usually followed by a cool change with fresh to strong southerly sea breezes." (Bureau of Meteorology, 2011)

Residents living in Perth experience the frequent afternoon sea breezes during the warmer and hot months of the year, which allow opportunity for the cooling of dwellings. The proposed LSP road and street block layout create opportunities for lot building design to maximise the micro-climate benefits of southerly cooling breezes. Approximately 95% of the proposed lots in the Subdivision Concept Plan can achieve a true north-south orientation.

A north-south orientation also enables solar access opportunity for dwelling design to capture winter sun. The LSP allows lots to be designed to enable dwellings to have sunny outdoor space, to be energy efficient, to have the main living areas facing north and to have shade on the main living windows in summer. The majority of lots within the LSP will have a true north-south orientation, which provides opportunity for solar passive design.

6.3 Surface and Ground Water Management

As part of the Packham North District Structure Plan, a District Water Management Strategy has been prepared to set the framework for urban water management. To ensure that the quantity and quality of surface and ground water is maintained, an Urban Water Management Strategy (UWMS) will be prepared and implemented at the subdivision stage. This will include measures to address appropriate treatment and disposal of stormwater runoff and groundwater recharge.

7.0 MOVEMENT NETWORK

7.1 Existing Movement Network

Regional & District Road Network

The LSP development site is within 300m of Cockburn Road to the west, which is a north-south 'Primary Regional Road' under the Metropolitan Region Scheme. Cockburn Road is directly accessible via Ocean Road, which intersects at a "T" junction. To the east approximately 2kms, Stock Road is also classified as a north-south 'Primary Regional Road' and is accessible via Spearwood Avenue or the local road network. Spearwood Avenue, which runs east-west and is within 800m of the LSP landholdings, is identified as 'Other Regional Roads' under the MRS. There is good accessibility to the subject site via these regional and district level roads.

Local Road Network

In general, the LSP landholdings can be accessed via Hamilton Road, Ocean Road and Cross Road. Cross Road is a local road that provides separation between residential lots and the MRS 'Parks and Recreation' reserve to the west. Cross Road is a poorly constructed bitumen road without kerbs or drainage. This road will need to be upgraded as part of development.

Hamiton Road is a 'Neighbourhood Connector' road that runs north-south through the Packham North District Structure Plan area. Hamilton Road is an important road route linking the localities of Spearwood and Coogee.

Ocean Road is the main east-west road connecting Hamilton Road with Cockburn Road to the west and is expected to carry approximately 3,500 vehicles per day. The section of Ocean Road adjacent the LSP is not part of the 'Primary Regional Road' section of Ocean Road. This balance section is a 'Neighbourhood Connector B' road connecting with Hamilton Road.

The MRS reservation [**Figure 9 – Ocean Road MRS reservation**] refers to the future intersection realignment with Cockburn Road. This future realignment of Ocean Road is under the planning and control of Main Roads WA. MRS reservation of the remainder of Ocean Road, that section connecting with Hamilton Road, for inclusion in the 'Primary Regional Road' reservation, is not required.

7.2 Proposed Movement Network - Roads

Hamilton Road

The Packham North District Structure Plan proposes a roundabout intersection at Hamilton Road and Ocean Road. The Ocean Road Local Structure Plan proposes a 15m wide subdivision road being an extension of Ocean Road east of Hamilton Road. This will result in a cross intersection at Hamilton Road/Ocean Road with a controlled roundabout.

Figure 9. Ocean Road MRS reservation refers mainly to a future realignment to provide for a new intersection with Cockburn Road and land required for drainage.

Liveable Neighbourhoods specifies 'Neighbourhood Connector' roads as having maximum traffic volumes of 7,000 vehicles per day. Hamilton Road already carries over 8,000 vehicles per day (MRWA 2007/08) and is expected to increase to between 11,000 – 13,000 vehicles per day in the future. As part of the Watson Local Structure Plan and Ocean Road Local Structure Plan, it is proposed that the Hamilton Road pavement be increased to provide for 4.5m traffic/cycle lanes on either side of a 2m painted medium. The increase in width to the pavement would only occur on the eastern side of Hamilton Road due to the existing power transmission line infrastructure.

Ocean Road

Some of the lots within the LSP are proposed to front Ocean Road. As part of subdivision, it is likely that the Ocean Road pavement will be required to be upgraded from its current 6 metre pavement width to a pavement width of 7.0 metres (500mm pavement widening either side). This would be consistent with the recently upgraded Ocean Road pavement to the west at 7.0 metres in width. The details of the widening of the road pavement and upgrading of drainage infrastructure would be undertaken at the subdivision stage in consultation with the local authority.

(*Left*) View of Ocean Rd looking north

Local Access Roads

The proposed internal loop road varies in width from 13.0m – 15.0m. Council's standard width for new local access roads is for a 15.0m wide road reserve to accommodate pavement, kerbing, servicing & drainage infrastructure, paths and landscaping. This road reserve width may be reduced to 13.5m where the local access road provides separation between residential lots and public open space. In this instance, a road reserve width of 13.0m has been accepted on the basis that it is for a short length (i.e. 53m), it provides a connection between minor sections of local access road and widening to 13.5m would compromise the area of land available for building on R30 lots.

The road reserve widths in the LSP provides for more land efficient street reserves, including narrower pavement that concurrently promote reduced vehicle speeds, reduced kerb radii and provision for pathways, landscaping, verge treatments, street parking and street trees. Wherever possible, common trenching of services will be provided for, subject to approval by the utility service providers. This can enable the width of road verges to be narrowed by reducing the width of the utilities corridor.

Intersection Treatments

No intersection treatments are proposed as the new subdivision loop road intersections with Cross Road will be "T" junctions and Cross Road is only a local access road with development only on the eastern side. It is not expected to carry significant volumes of traffic.

Similarly the intersection with Cross Road and Ocean Road is not required to be upgraded as a result of the LSP or under the Packham North DSP. Considerations may be given to providing a raised crossover for the laneway connecting the LSP development site with future development to the north-east. The raised crossing through public open space would assist in calming traffic and place making by denoting a transition through the development.

7.3 Proposed Movement Network – Pedestrian/Cyclists

Vehicle speeds on local access streets will be limited through detailed road design measures including reduced pavement width appropriate to traffic volume. Within the LSP there is no use of cul-de-sacs enabling more permeable and safe pedestrian and bicycle access.

Paths are proposed along the section of Cross Road adjoining the LSP development site and within the local access road. The LSP map shows the conceptual location for proposed paths linking with the existing and proposed surrounding pathway network. The exact location of pathways will be determined in liaison with the local authority at the subdivision stage.

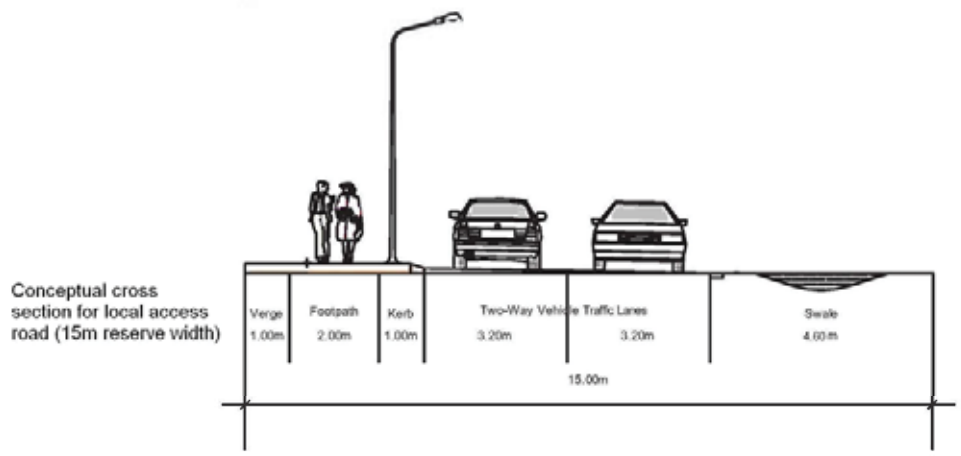
7.4 Proposed Movement Network – Public Transport

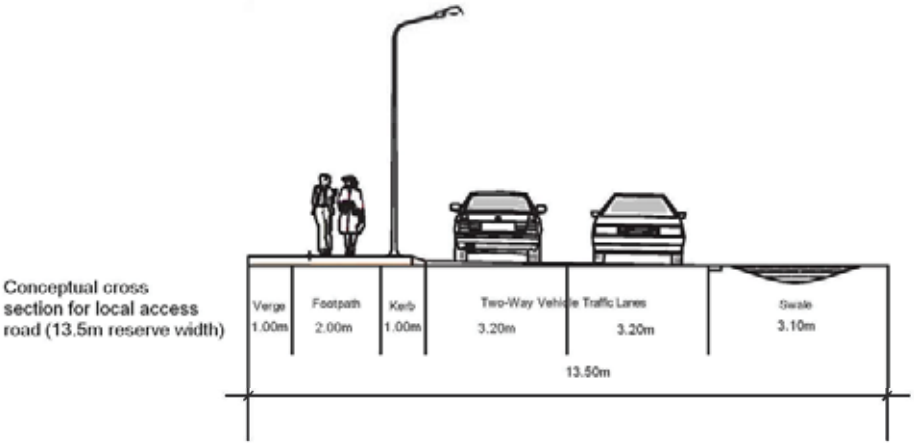
Transperth has bus routes along Cockburn Road and Hamilton Road. The nearest bus stops on either side of Cockburn Road are approximately within 300m west of the LSP landholdings and are situated at the SE termination of Newark Turn (Port Coogee Marina). The nearest bus stops on either side of Hamilton Road are within 250m east of the LSP landholdings around the intersection of Ocean and Hamilton Roads.

Ocean Road provides a reasonable direct access route to these bus services which are located on a 'Primary Regional Road' and 'Integrator Aerial B' level road respectively. Pathways are currently provided along both pedestrian routes to these bus services. The LSP development site is within 400m (5 minute walking distance) of public transport bus services than operate along major transport routes.

7.5 Street Parking

No specific provision of on-street parking embayments are proposed within the LSP, however, the standard pavement width of local access roads could allow for localised on-street parking, whereby vehicles must pass around parked vehicles. This has been found to assist in traffic calming of streets and is generally acceptable in most residential neighbourhoods where speed limits are between 40 – 50km/hr (refer to **Indicative Cross Section** for proposed internal access road).





(Above) Indicative cross sections for the two main subdivision internal local access roads

8.0 PUBLIC OPEN SPACE

8.1 Public Open Space Provision

The LSP provides for 3,946m^2 or 10.1% of the development site as Public Open Space (POS). Consistent with the Packham North District Structure Plan, the POS for the proposed LSP has been provided as a linear parkway which will serve to form part of an ultimate connection between the MRS 'Parks and Recreation' reserve to the west and the Ocean Road wetland POS area to the east.

The advantage of each landholding (except for Lots 41 & 500) in the LSP providing POS at the rear of the lot is that at the time of subdivision, each landowner can respectively cede POS as part of subdivision. It is envisaged that as and when each landowner subdivides, the respective portion of POS will be set aside as a Crown Reserve for public recreation. This will be further discussed under 13.0 '*Implementation & Staging*'.

8.2 Public Open Space Typologies

The LSP provides for a 3,946m^2 area to be set aside for a neighbourhood park utilised for active and passive recreation. Some of this land is proposed to be developed for parkland in combination with 1:1 yr average recurrence interval (ARI) drainage infrastructure (i.e. roadside linear swale). The POS area is not proposed to be fenced with restricted public access. Rather it will be developed as open parkland with the final design to be determined in liaison with the local authority at subdivision stage.

The POS parkway is proposed with an east-west orientation as per the Packham North DSP. The parkway concept is effective in providing a linear 'greenbelt' through the development site, which will contribute towards pedestrian/cyclist movement, visual amenity and *place making*. In addition, the parkways will also assist in urban water management.

The parkway will not specifically serve as an ecological corridor for native fauna movement, due to it being narrow and "parkland cleared". However, it may serve this function in a minor capacity.

The width of the proposed parkway will ultimately become wider once the landowners to the north develop their land for urban use in line with the Packham North District Structure Plan. Typically, the parkway may contain a shared use path, seated resting furniture, appropriate species of tree plantings and mulched dry landscaping using native and drought tolerant shrub species that are adapted to the local environment.

8.3 Public Open Space Schedule

Table 5 comprises the POS Schedule for the LSP as follows:

LSP Site Area Less			4.0470 ha
Foreshore Reserve Environmental protection policy areas Wetlands to be ceded Protected bushland site Unrestricted POS sites not included in POS contribution Lot 41 (already subdivided) Lot 500 (already subdivided)	Nil Nil Nil Nil 0.0581 ha 0.0760 ha		0.1341 ha
Total Net site area			**3.9129 ha**
Deductions (LN Element 4 – R43) Primary School Town centres and commercial Dedicated drainage reserve Transmission corridors Other approved contingencies	 Nil Nil Nil Nil Nil		0 ha
Gross Subdivisible area (GSA)			3.9129 ha
Public open space @ 10 per cent required			**0.3912 ha**
Public open space contribution			
May comprise: - minimum 80 per cent unrestricted POS - Maximum 20 per cent restricted use POS	 0.3129 ha 0.0783 ha		0.3912 ha
Unrestricted POS area (Non-Drainage Areas > 5yr ARI)			0.3946 ha
Linear Parkway		0.3946 ha	
Restricted use POS area (1:5 yr ARI)	Nil	Nil	0.0 ha
Public open space provision provided			**0.3946 ha (10.1%)**

Notes

(1) 1:1 yr drainage infrastructure will be contained within the Linear Parkway POS as roadside drainage swales

9.0 LOCAL WATER MANAGEMENT

9.1 Local Stormwater Drainage

The LSP development site has highly permeable sandy soils and adequate separation to ground water. In this instance, the development site is highly suitable for urban development and on-site infiltration to maximise groundwater recharge.

The proposed development will have the potential to increase the proportion of impervious areas across the site. This in turn will lead to an increase in the volume of stormwater runoff during rainfall events, thereby altering the natural hydrological behaviour of the site. Urban development of the site will also have the potential to cause nutrients and pollutants (i.e. hydrocarbons and metals) being discharged via runoff to infiltrate into the soil profile and groundwater. If unmanaged, urban stormwater runoff can impact groundwater quality and groundwater levels. Urban stormwater will therefore need to be managed through carefully designed and appropriate treatment measures.

The proposed loop road in the LSP has been designed to assist in providing for effective urban water management by facilitating overflow paths. Street verges and median swales will be used to infiltrate drainage as close to source as possible. All future residential development will be required to contain stormwater on-site. This can be undertaken using standard soak wells and other stormwater disposal techniques, such as directing water run-off to garden beds.

A District/Local Water Management Strategy has been prepared by Cardno for the Packham North District Structure Plan area. The proposed LSP development site forms part of the DWMS catchment area and the proposed road layout and configuration of POS is consistent with the principles of the DWMS. At subdivision stage an Urban Water Management Strategy will be prepared as part of subdivision approval.

9.2 1 year, 5 year and 100 year ARI events

Table 6 outlines the specific local water management principles for the 1 year, 5 year and 100 year Average Recurrence Interval (ARI) events.

9.3 Groundwater Management

Given the characteristics of the development site (i.e. soil type, hydrology, depth to groundwater etc) the proposed development will not result in any specific requirement for groundwater level controls, such as sub surface drainage and/or fill to be imported, to achieve minimum separation distances to groundwater levels where reticulated sewerage is provided. The relatively deep groundwater level below the natural sandy surface of the land provides for direct infiltration of stormwater, as close as source as possible. Notwithstanding, as part of the Urban Water Management Plan, adequate pretreatment measures prior to infiltration to groundwater will be provided to protect groundwater quality.

Table 6 1yr, 5yr & 100yr ARI stormwater management

ARI Event	Local Water Management Principles
1 Year	Retention and treatment onsite of 1 hour duration 1 year ARI event with grooves connected to soak wells; Stormwater contained within each lot prior to discharge/infiltration to groundwater; Road runoff infiltration as close to source as possible using water sensitive urban design measures (i.e. roadside swales)
5 Year	Bioretention structures (i.e. soakwells within the road reserve) to treat and infiltrate stormwater to groundwater;
100 Year	Accommodated via overland flow paths to enable conveyance of runoff to infiltration dam/sump (unfenced) at the base of Lot 18 in designated 1:100 yr low lying detention area as per DWMS;

10.0 FIRE MANAGEMENT PLAN

A Fire Management Plan (FMP) has been prepared to inform the LSP design and recommend fire management (refer to **Appendix 1 – Fire Management Plan**). The general aim of the FMP is to minimise the impact of bushfire for the protection of people, property and the environment. The LSP area is rated as 'Low' fire risk due to there being minimal fuel loading as a result of previous vegetation clearing. However areas adjacent to the LSP area are classified as 'Moderate' fire risk due to more substantial vegetation. In particular, this refers to the bushland to the west of Cross Road and the wetland area on the eastern boundary of the LSP. These vegetated areas in proximity to the LSP development site pose a potential bushfire threat to future residential development. The proposed linear public open space parkway is not considered to present a significant fire risk as the POS will be developed and maintained as parkland with a low fuel loading. In accordance with the WAPC *Planning for Bush Fire Protection Guidelines,* the risk of bushfire will be managed in terms of the following:

- A detailed FMP being prepared and implemented by the developer at the subdivision stage;
- Fire hydrants being installed by the developer in accordance with Australian Standards;
- Proposed residential dwellings on individual lots at the interface of the adjacent vegetated areas being constructed to Bushfire Attack Level (BAL) 12.5, 19 or 29 and AS3959-2009 construction standards as applicable to the external fire hazards;
- Proposed residential dwellings within the 100m Hazard Separation Zone being constructed in accordance with BAL 12.5 AS3959-2009. Detailed assessment for changes to the BAL Assessment can be undertaken by individual owners due to changes in the landscape, for instance, introduction of housing which thereby increases opportunities for 'shielding'. This may be undertaken at construction stage by an accredited Fire Management Consultant with approval from the local authority;
- Section 70A notifications on title advising prospective purchasers of the FMP;
- A building protection zone (i.e. low fuel loading) of 20 metres is recommended from any external housing walls to external vegetated areas with 'moderate' fire risk.

(*Left*) Example of 3m wide firebreak adjacent to new housing which would be similar to the LSP eastern interface with wetland area. Recommended dwelling construction standard BAL 29.

11.0 LANDSCAPING

The underlining concepts guiding future landscape design within the proposed LSP roads and public open space areas of the LSP are:

- Provision of public facilities which cater primarily for recreational activities to suit the predicted demographic for the locality, including but not limited to active uses and passive uses such as picnics, nature observation, passive contemplation, walking exercise etc;

- Bio retention swales to collect stormwater runoff, planted with fringing vegetation to provide a nutrient stripping function;

- Integrated path systems to link and create areas suitable for walking, dog walking, cycling, skating and similar;

- Planting in POS and street verges and swales will consist of a mixture of turf, native and exotic species, with an emphasis wherever possible on using indigenous plantings;

- Diversity of street tree plantings to form strong avenue and high amenity streetscapes.

A more detailed landscaping design and management plan will be provided as a condition of subdivision approval. Landscape design will minimise water use, with shrub planting to be native or similar (*above left*). Water harvesting from direct urban stormwater runoff or other sources (i.e. swales, weirs and drainage channels) will be used where possible for passive irrigation purposes. The use of organic mulches and 'amended earth' techniques will assist in water conservation and reduced irrigation dependency. Landscaping of public open space may also consider 'edible landscaping' such as use of fruit trees (*above right*).

12.0 INFRASTRUCTURE & SERVICING

The *Lots 14 – 18 Ocean Road Engineering Services Report* (DEC, 2012) has been prepared following preliminary investigation and planning for infrastructure and servicing of the LSP. The following is a general summary of the report. For further details refer to **Engineering Servicing Report – Appendix 2**.

12.1 Wastewater

Servicing investigations as part of the preparation of the Packham North District Structure Plan and other local structure plans mentioned indicates the availability of the area being able to be serviced by Water Corporation reticulated sewerage. Wastewater is proposed to be disposed through a reticulated pipe network gravity fed to the proposed Spearwood Pumping Station (Type 40 Spearwood J-066 wastewater pumping station).

The proposed Spearwood Pumping Station will be developed adjacent to the Fremantle Mount Pleasant Diversion Pressure Main within the central spinal POS land (portion of Lot 6 Mell Road) as shown in the Ocean Road Local Structure Plan. Wastewater gravity fed to the Spearwood Pumping Station will then be pumped to an existing DN915 collector sewer to the east in Reserve Road.

The proposed pumping station would be constructed under a prefunded private arrangement between the two major developers of the Watson Local Structure Plan and Ocean Road Local Structure Plan and the Water Corporation. The pump station is not proposed as a DCA item.

12.2 Water Supply

Preliminary investigations indicate that the LSP area is located within the boundary of the Water Corporation's Water Supply Scheme. There is an existing 150mm water main along Ocean Road fronting the development and a 100mm main in Cross Road.

To service the Packham North District Structure Plan area, the Water Corporation advises that a 300mm trunk water main will need to be extended from Port Coogee along Ocean Road to the development area. It is likely that this infrastructure extension will be ushered in by the other two developers undertaking larger structure planning projects in the Packham North DSP.

12.3 Power

Western Power has indicated that there is sufficient capacity in the grid for the residential development as part of the proposed LSP. There is an existing dual circuit 132kV overhead powerline located within the road reserves on the northern side of Entrance Road and the western side of Hamilton Road.

There is an existing 22kV overhead powerline located within the road reserve on the northern side of Ocean Road. This existing overhead 22kV line will need to be removed and replaced with new underground cable at subdivision/development stage. Maintenance of power to occupied homes will be a priority during subdivision construction. This can be accomplished through staging of works, however, at some point there would be a temporary (i.e. half day) disconnection of power to existing homes in order to transition to underground power.

12.4 Telecommunications

The LSP area can be serviced by the existing telecommunications infrastructure within Ocean Road and Cross Road. This infrastructure will need to be extended to service the proposed development, with some upgrading likely to be required. The developer will also likely be required to install National Broadband Network (NBN) 'pipe and pit' to allow for future installation of cables for the NBN. This can be accommodated within common telecommunications trenching.

12.5 Gas

Alinta Gas indicates that the Packham North DSP area can be supplied with reticulated gas via extensions from existing reticulated gas mains in Hamilton Road, Ocean Road and Mell Road. To service the proposed LSP area, the developer will need to extend the existing gas mains infrastructure on the south verge of Ocean Road.

12.6 Earthworks

Earthworking of the site will be required in areas to create level lots for dwelling construction and provision of roads and services. Siteworks will generally comprise of clearing the land, removal of unwanted materials and localised cut to fill.

Due to its coastal location, there may be isolated pockets of limestone found, particularly in the western part of the LSP area. If any limestone is encountered, it will be broken up prior to use as potential structural fill and replaced with sand. Sand will be used to fill other required areas.

Changes in elevation will be provided for by construction of either retaining walls or batters. The height of retaining walls will vary due to natural ground level differences and wherever possible, the natural topography will remain, though benched.

Level sites that are terraced reflect the ideal building site to reduce housing cost and create more affordable housing. Retaining walls will be used to provide terraced lots and absorb level differences. Wherever possible, the height of retaining walls will be kept to a minimum and may vary due to natural ground level differences. Wherever possible, the natural topography will remain, though benched. It is not envisaged that retaining walls will be significantly high, with most walls less than 1.0 metre.

(*Left*) Example of terraced style retaining to create level building sites.

12.7 Roads & Drainage

In accordance with City of Cockburn engineering standards, the roadways will generally be constructed in the conventional manner, with asphalt wearing coarse on a granular base coarse and cast-in-situ concrete kerbing with piped drainage and provision of footpaths. Roads will not exceed a 10% gradient (1:10) and will generally consist of two way single carriageways, with widths of 3.2m. Further geotechnical investigations can confirm the exact design of the roads and drainage infrastructure.

A District Water Management Strategy (DWMS) for the Packham North District Structure Plan was prepared by Cardno for the City of Cockburn. The DWMS aims to put in place strategies for water management that will protect water resources and minimise environmental impacts. The DWMS covers the LSP area and has provided sufficient information to determine the location of drainage infrastructure (i.e. swales) within public open space. The LSP has been prepared consistent with the DWMS and Packham North DSP and reflects the areas required for public open space, which can also accommodate drainage infrastructure.

Stormwater from Ocean Road will drain to the existing gully pits at the low point east of the development site. Stormwater from Cross Road will be directed to verge drainage swales. Stormwater from the proposed internal subdivision road will be contained within the development using underground storage (i.e. soakwells) and swales within the northern proposed POS area. In accordance with the DWMS the low lying area to the east of Lot 18 is designated as a 1:100 year drainage inundation area. The details for stormwater drainage Urban Water Management flows for the proposed residential development of the LSP area will be undertaken at the subdivision and development stage.

13.0 STAGING

13.1 Staging and Anticipated Timeframes

Subdivision and development is likely to be influenced by market demand. However, it is envisaged that subdivision is likely to occur as soon as practicable once the local structure plan has been approved. Conditional subdivision approval for a single subdivision application lodged to cover the LSP could be obtained as early as July 2013. Construction of lots could commence with some lots being constructed by the middle of 2014. However, this would be subject to construction and commissioning of the required sewer pump station to meet with Water Corporation standards. This will be undertaken by the other two major land developers, who are currently progressing subdivision approvals.

Notwithstanding the fragmented landholdings, it is anticipated that the development will be undertaken in a single stage as agreed by the landowners. Due to the requirement for each landowner to provide land for the construction of the internal loop road, landowners in the LSP have indicated a willingness to construct this road immediately upon LSP and subdivision conditional approval.

13.2 Development Contributions

Local Scheme Amendment No. 87 will provide for DCA 12 for the multiple landholdings within the Packham North District Structure Plan area. DCA 12 costs include, but not limited to drainage, servicing, engineering and environmental studies prefunded by Council and other common costs that arise through the structure plan process.

Wherever possible, lots have been designed to allow development by respective landowners to be undertaken independently. Where this cannot be achieved, landowners will coordinate sharing of costs for provision of infrastructure (i.e. POS, drainage, roads etc) and servicing under a cost sharing agreement. This agreement will be entered into by each landowner and managed by the landowners' project manager as part of the land subdivision process.

14.0 REFERENCES

Soils and Landforms of the Perth Area, Department of Agriculture, 2003

Acid Sulphate Soil Desktop Assessment, Cardno BSD, May 2009

Perth Metropolitan Region 1:50,000 Environmental Geology Series, Rockingham (Part of Sheets 2033 I and 2033 IV, Geological Survey of Western Australia) (Gozzard J.R 1983)

Perth Groundwater Atlas, Department of Water,2003

Hamilton Road/Mell Road Coogee Servicing Report, Cardno BSD, 2008

APPENDIX 1 – FIRE MANAGEMENT PLAN

APPENDIX 2 – ENGINEERING SERVICING REPORT