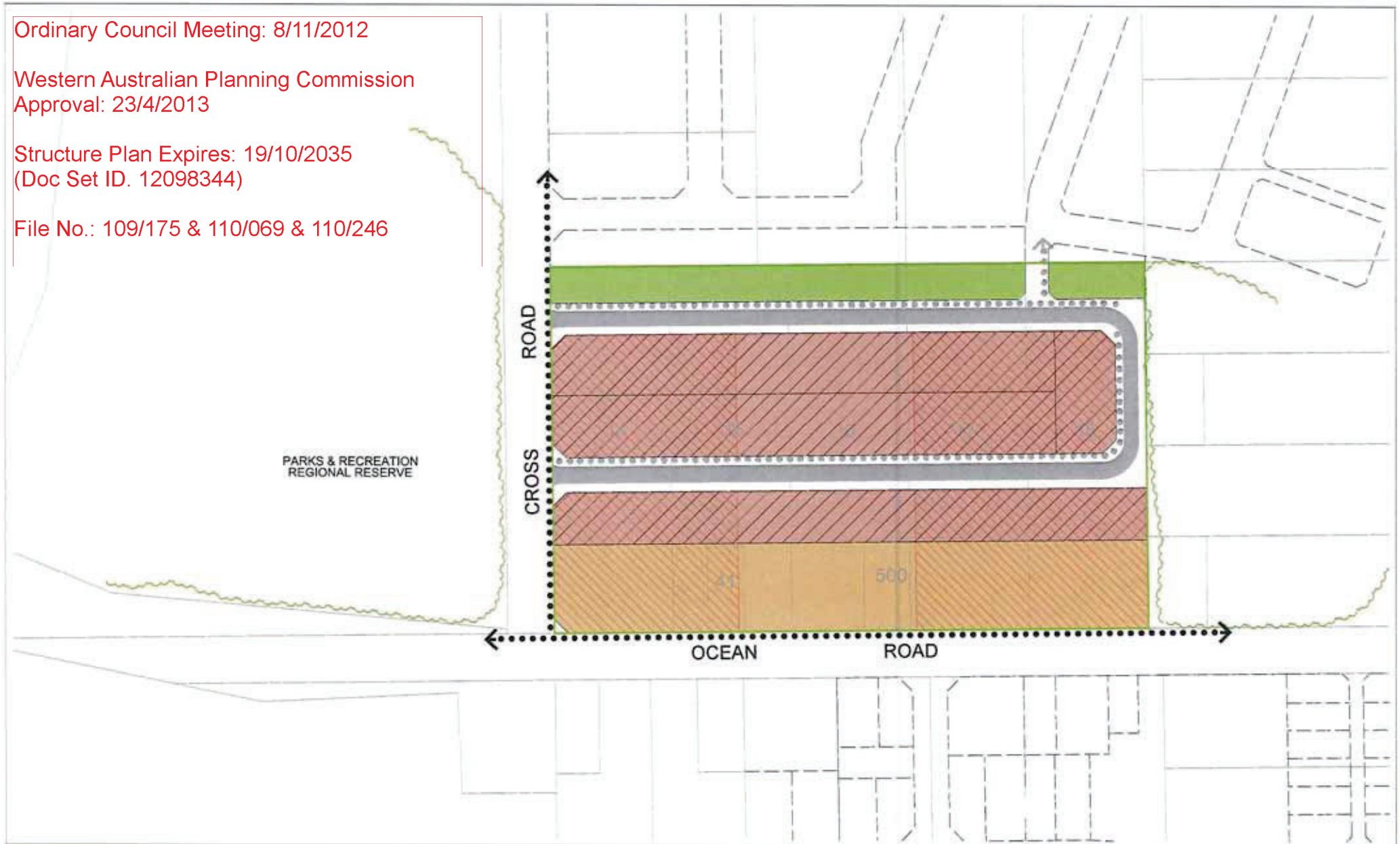


Ordinary Council Meeting: 8/11/2012

Western Australian Planning Commission  
Approval: 23/4/2013

Structure Plan Expires: 19/10/2035  
(Doc Set ID. 12098344)

File No.: 109/175 & 110/069 & 110/246



Plan No.: 15539-2

Revision: REV/3C

Scale: 1:1500@A3



122 Scarborough Beach Road Mount Hawthorn WA 6016 www.whelans.com.au

- LEGEND**
- ● ● Pathway - Dual Use Path
  - ○ ○ Pathway - Pedestrian
  - Lots that require Area Specific Plans (or DAPs)
  - Development subject to dwelling construction under AS2958-2009
  - Indicative planning over land outside 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 DRAFT: 2002/07/11  
DRAWN BY: JEP  
CHECKED BY: SA  
FILE: 12098344-structure-plan.dwg  
V: 01/01/02  
DATE/VERSION: 02/01/02

**whelans**  
TOWN PLANNING

04 APR 2013

SPN/0648

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



# 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	2.8350 hectares
- Parks & Recreation	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

### Executive Summary

<b>1.0</b>	<b>INTRODUCTION</b>	<b>12</b>
1.1	Purpose	12
1.2	Background	13
1.3	LSP Update Objectives	13
<b>2.0</b>	<b>LAND DESCRIPTION</b>	<b>14</b>
2.1	Location	14
2.2	Landownership	14
2.3	Existing Land Use	14
2.4	Surrounding Context	16
<b>3.0</b>	<b>PLANNING FRAMEWORK</b>	<b>17</b>
3.1	Directions 2031	17
3.2	Metropolitan Region Scheme	17
3.3	Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy	17
3.4	Cockburn Coast District Structure Plan	18
3.5	Packham North District Structure Plan	18
3.6	Liveable Neighbourhoods	19
3.7	City of Cockburn Town Planning Scheme No. 3	20
3.8	City of Cockburn Local Planning Strategy	20
3.9	'Watson' Local Structure Plan	20
3.10	Ocean Road Estate Local Structure Plan	20
3.11	City of Cockburn Scheme Amendment No. 87	21
<b>4.0</b>	<b>SITE CONDITIONS &amp; ENVIRONMENT</b>	<b>22</b>

4.1	Topography	22
4.2	Geology and Soils	22
4.3	Hydrology	23
4.4	Acid Sulphate Soils	25
4.5	Vegetation, Flora & Fauna	26
4.6	Indigenous & European Heritage	27
<b>5.0</b>	<b>LOCAL STRUCTURE PLAN</b>	<b>28</b>
5.1	LSP Community Design Rationale	28
5.2	Residential Densities and Yield	28
5.3	LSP Proposed Land Uses	30
5.4	Integration with Surrounding Land Uses	30
5.5	Population & Employment	31
5.6	Education & Community Infrastructure	31
5.7	Street Layout	32
5.8	Housing Typologies	33
5.9	Use of Detailed Area Plans	35
5.10	Proximity to Market Garden Swamp - Midge Buffer	35
<b>6.0</b>	<b>SUSTAINABLE DESIGN</b>	<b>38</b>
6.1	Energy Conservation	38
6.2	Lot Design for Climate Responsive Dwellings	38
6.3	Surface and Ground Water Management	39
<b>7.0</b>	<b>MOVEMENT NETWORK</b>	<b>40</b>
7.1	Existing Movement Network	40
7.2	Proposed Movement Network - Roads	40
7.3	Proposed Movement Network – Pedestrian/Cyclists	43

7.4	Proposed Movement Network – Public Transport	43
7.5	Street Parking	43
<b>8.0</b>	<b>PUBLIC OPEN SPACE</b>	<b>45</b>
8.1	Public Open Space Provision	45
8.2	Public Open Space Typologies	45
8.3	Public Open Space Schedule	46
<b>9.0</b>	<b>LOCAL WATER MANAGEMENT</b>	<b>47</b>
9.1	Local Stormwater Drainage	47
9.2	1 year, 5 year and 100 year ARI events	47
9.3	Groundwater Management	47
<b>10.0</b>	<b>FIRE MANAGEMENT PLAN</b>	<b>49</b>
<b>11.0</b>	<b>LANDSCAPING</b>	<b>50</b>
<b>12.0</b>	<b>INFRASTRUCTURE &amp; SERVICING</b>	<b>51</b>
12.1	Wastewater	51
12.2	Water Supply	51
12.3	Power	51
12.4	Telecommunications	52
12.5	Gas	52
12.6	Earthworks	52
12.7	Roads & Drainage	53
<b>13.0</b>	<b>STAGING</b>	<b>54</b>
13.1	Staging and Anticipated Timeframes	54
13.2	Development Contributions	54



## 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	<p>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.</p> <p>Land use permissibility within the Structure Plan area shall be in accordance with the corresponding zone or reserve under the Scheme.</p>
4. Residential Development Standards	<p>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:</p> <ul style="list-style-type: none"> <li>- 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.</li> </ul>

5. Development Contribution Arrangements	<p>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.</p> <p>The owner is to contribute towards key service and community infrastructure within an approved Development Contribution Plan for DCA12.</p> <p>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.</p>
6. Limitations or restrictions affecting subdivision and/or development	<p><u>Fire Management</u></p> <p>A Fire Management Plan will be required to be prepared and approved by the local authority and Fire &amp; 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.</p> <p><u>Midge Buffer</u></p> <p>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.</p>
7. Detailed Area Plan/s Requirements	<p>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.</p>

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

125 Strathmore Beach Road Mount Hawthorn WA 6010 www.whelans.com.au

**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 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: 20/02/17  
 DRAWN BY: JF  
 CHECKED BY: SF

FILE: 15539-2-01-001.psd  
 V: 0.01  
 DATE: 20/02/17

**whelans**  
 TOWN PLANNING



## 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.

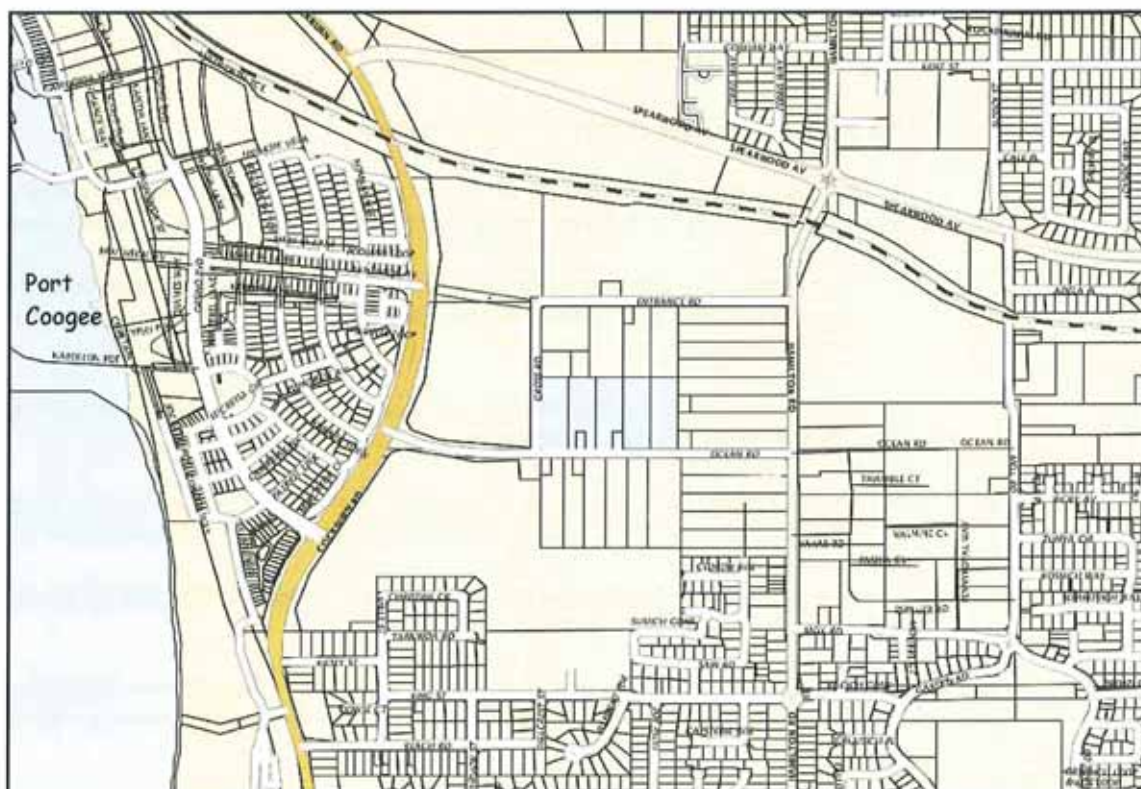


Figure 1. Location Plan of LSP area [blue] (Source: Landgate, 2012 - modified)

## 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<sup>2</sup> and 760m<sup>2</sup> 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.

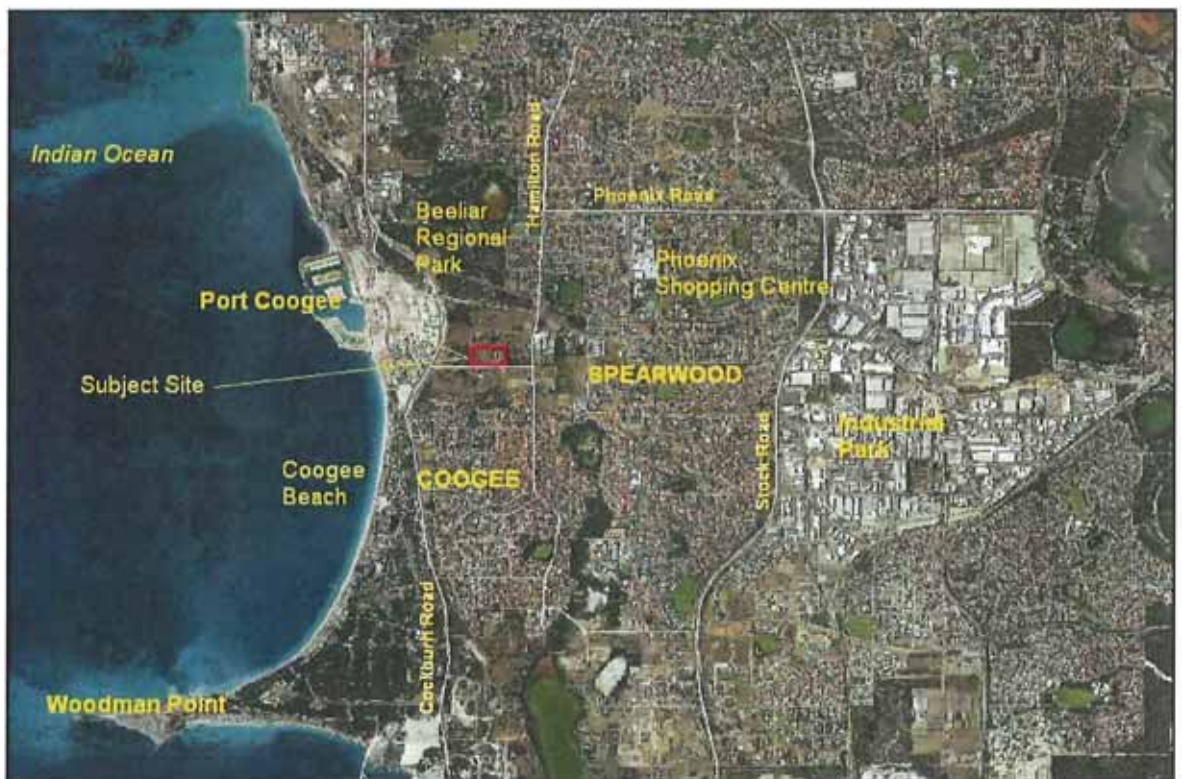


Figure 3 Surrounding Land Use Context



## 3.0 PLANNING FRAMEWORK

### STATE & REGIONAL PLANNING

#### 3.1 *Directions 2031*

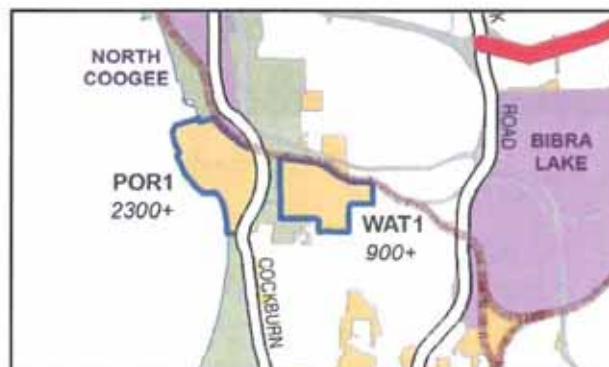
Directions 2031 establishes the vision for the future growth of Perth and Peel regions. It provides a framework in which population growth is to be accommodated. Directions 2031 seeks a 50% increase in the current average residential density 10 dwellings per gross urban zoned hectare; and has set a target 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 Neighbourhoods 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.



## LOCAL PLANNING

### 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.

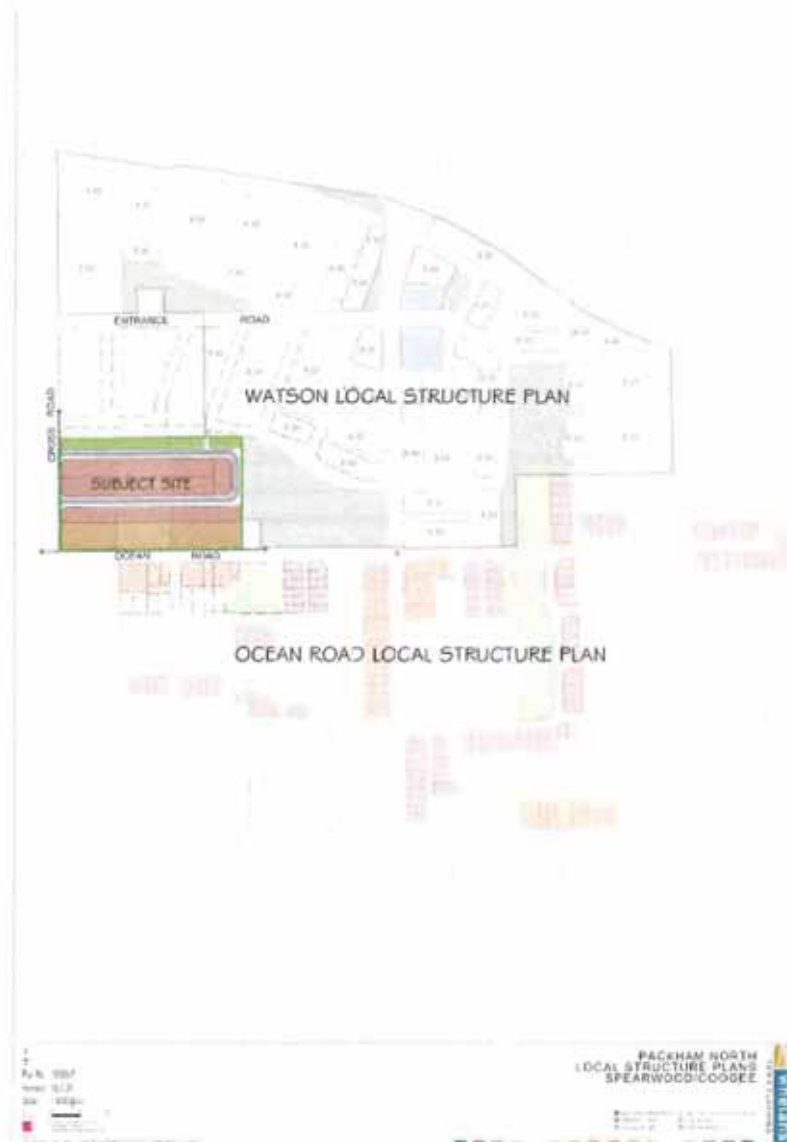


Figure 8 Combined Local Structure Plans showing context of the proposed LSP with the Watson Local Structure Plan and Ocean Road Local Structure Plan



## 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**)

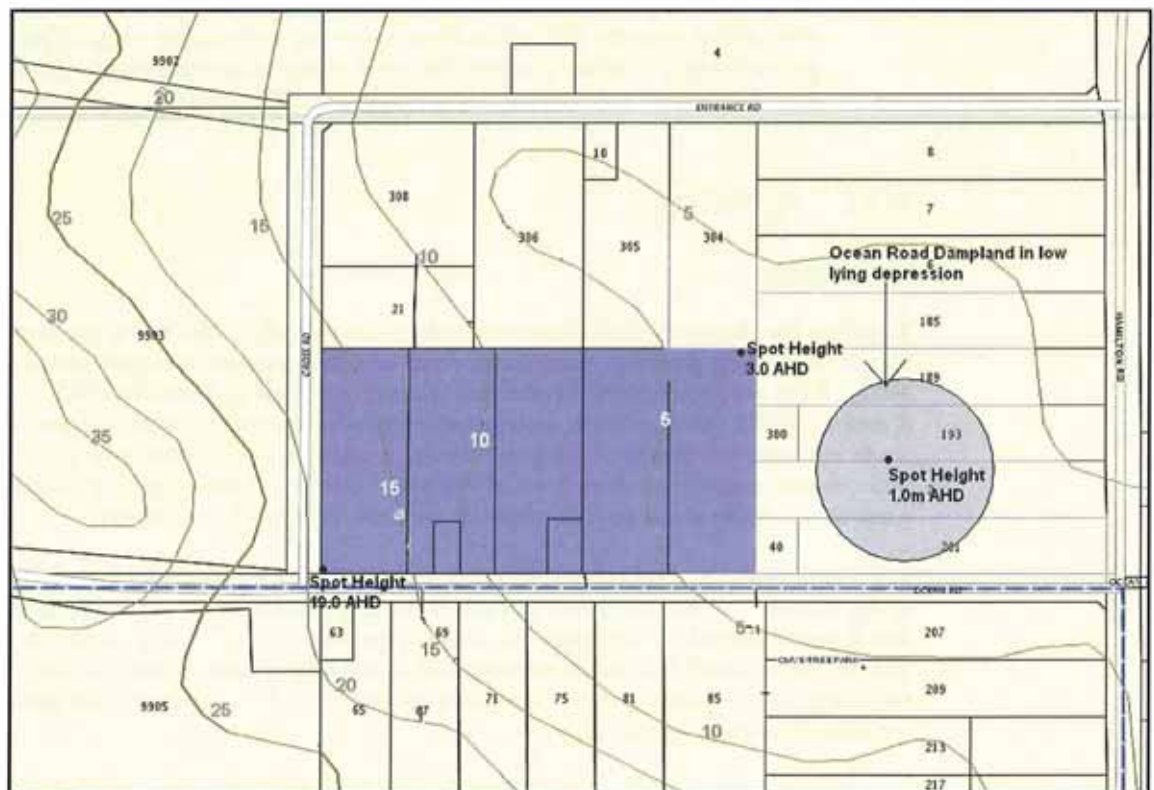


Figure 4 Contour Plan - LSP area with indicative spot heights (Source: Landgate, 2012 modified)

### 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.

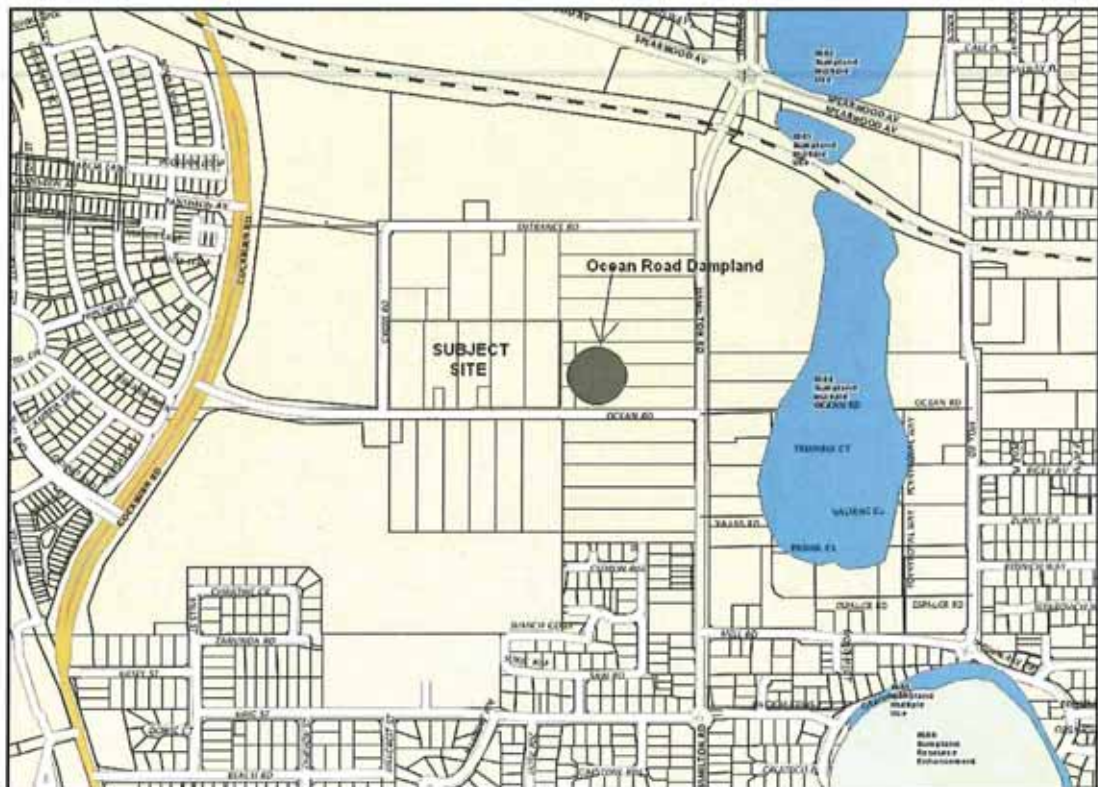


Figure 5 Ocean Road Dampland adjacent to LSP. Wetlands contained in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain* are also shown.  
(Source: WA Atlas, 2012 – modified)

#### 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.

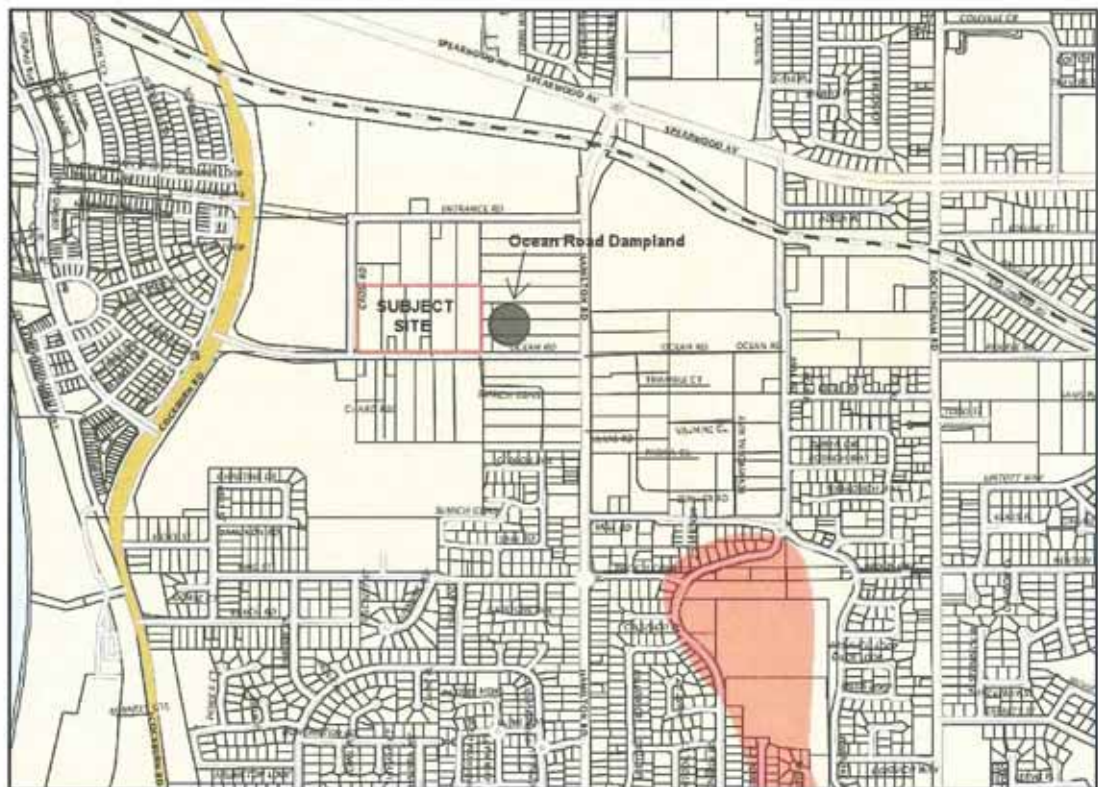


Figure 6 Acid Sulphate Soils desktop mapping indicating the LSP area has a low risk of Acid Sulphate Soils (Source: WA Atlas, 2012 – modified)

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 weeds are non-aggressive species
Very Good	Vegetation structure altered, obvious signs of disturbance
Good	Vegetation structure significantly altered by very obvious signs of multiple 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 Indigenous 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 Indigenous 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 Indigenous 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. 350m<sup>2</sup> – 450m<sup>2</sup>), which also provides opportunity, in some instances, for retention of existing dwellings on larger lots (i.e. 700m<sup>2</sup> – 800m<sup>2</sup>), 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 <sup>2</sup>	-
Area set aside for roads, drainage & POS	12,119m <sup>2</sup> (30% total site area)	-
Balance area for residential development	28,351m <sup>2</sup>	-
Estimate ultimate number of dwellings	68 dwellings <sup>3</sup>	-
Estimated number dwellings per site hectare <sup>1</sup>	24 dwellings/ha	<b>Liveable Neighbourhoods</b> 12 – 20 dwellings per site hectare for lots not within 400m of commercial centre
LSP target density per gross urban hectare <sup>2</sup>	17 dwellings/site ha	<b>Directions 2031</b> 15 dwellings per gross urban hectare

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

<sup>2</sup> Directions 2031 definition of *gross urban hectare* is the gross area available for urban development

<sup>3</sup> 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



Ver.	Description	Drawn	Date	Checked
1	Subdividing the P.O.S. area, separating Road 135, and lots 8012-8016	ACT	01/09/2019	SDM
2	Subdividing Road 135, to form and dividing P.O.S. 8012 to align with original lots	ACT	24/09/2019	SDM
3	Final Stage	LAV	19/10/2022	SDM

For a true to scale reproduction of this plan, plot it to A3 with the Pacing Scale set to 1:1000.

To ensure all lot areas are correct and consistent with the original plan, the original plan is to be used as the basis for all calculations. The original plan is to be used as the basis for all calculations.

ALL DISTANCES ARE IN METRES

SCALE 1:100 @ A3

McMULLEN NOLAN GROUP

Surveying Excellence



PLANNER'S DESIGN SOURCE for Rev 3

Planner: J. Thompson

Received date: 20/03/2019

File name: subdivision plan 1011.pdf

ENGINEER'S DESIGN SOURCE for Rev 3

Engineer: J. Thompson

Received date: 20/03/2019

File name: subdivision plan 1011.pdf

LOT 14 - 18 Ocean Road

Spearwood

Coogee

Terranovis Pty Ltd

97554 - 002 - C



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	450m <sup>2</sup> to 520m <sup>2</sup>	R30	Single Dwellings	30
Residential 'Front Loaded' Lots	12m - 13m	26m - 30m	340m <sup>2</sup>	R30	Single Dwellings	26
Residential 'Front Loaded' Lots	13m	27m - 30m	360m <sup>2</sup> to 420m <sup>2</sup>	R25	Single Dwellings	22
<b>ESTIMATED DWELLING YIELD</b>						<b>68</b>

## 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.

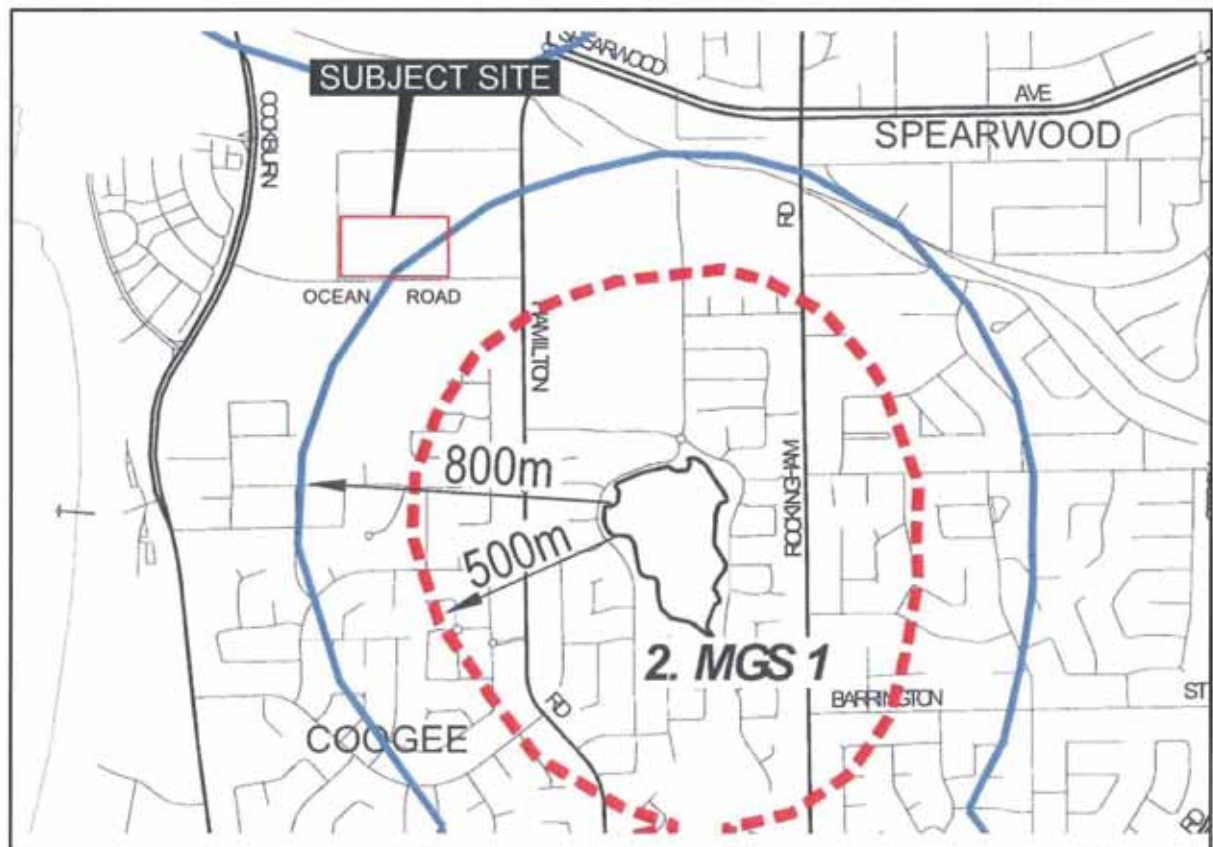


Figure 8a. Extent of midge buffer from Market Garden Swamp – MGS1 (Source: City of Cockburn Policy APD6, 2013)



## 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 sea 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.

Hamilton 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.



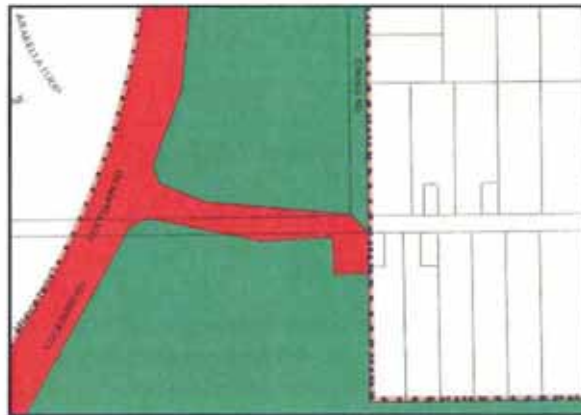


Figure 9. Ocean Road MRS reservation refers mainly to a future realignment to provide for a new intersection with Cockburn Road and land required for drainage.

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*

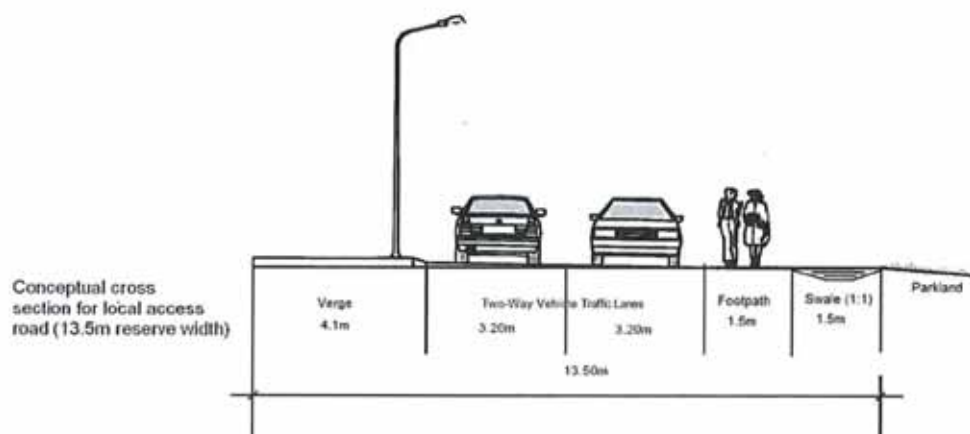
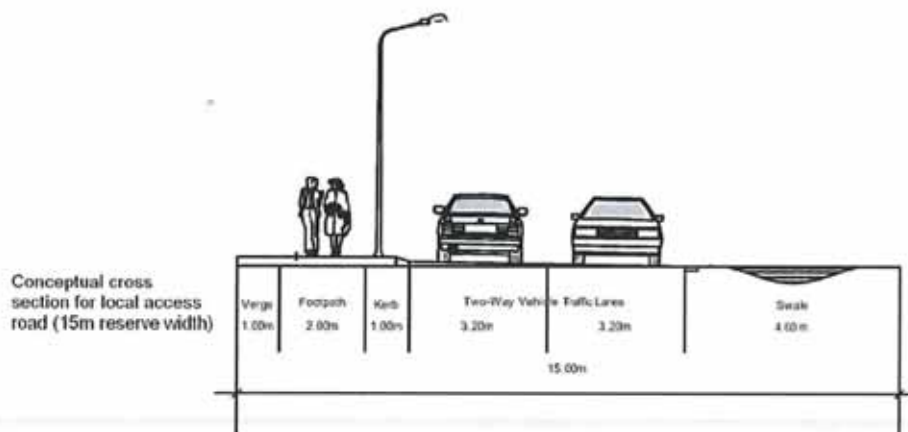
Transperth has bus routes along Cockburn Road and Hamilton Road. The nearest bus stops on either side of Cockburn Road are approximately within 300m west of the LSP landholdings and are situated at the SE termination of Newark Turn (Port Coogee Marina). The nearest bus stops on either side of Hamilton 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 4,047m<sup>2</sup> 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 4,047m<sup>2</sup> 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			4.0470 ha
Less			
Foreshore Reserve	Nil		
Environmental protection policy areas Wetlands to be ceded	Nil		
Protected bushland site	Nil		
Unrestricted POS sites not included in POS contribution	Nil		
<b>Total Net site area</b>			<b>4.0470 ha</b>
<b>Deductions (LN Element 4 – R43)</b>			
Primary School	Nil		
Town centres and commercial	Nil		
Dedicated drainage reserve	Nil		
Transmission corridors	Nil		
Other approved contingencies	Nil		0 ha
Gross Subdivisible area (GSA)			4.0470 ha
<b>Public open space @ 10 per cent required</b>			<b>0.4047 ha</b>
Public open space contribution			
May comprise:			
- minimum 80 per cent unrestricted POS	0.3237 ha		
- Maximum 20 per cent restricted use POS	0.0810 ha		0.4047 ha
<b>Unrestricted POS area (Non-Drainage Areas &gt; 5yr ARI)</b>			
Linear Parkway		0.4047 ha	0.4047 ha
<b>Restricted use POS area (1:5 yr ARI)</b>	Nil	Nil	0.0 ha
<b>Public open space provision provided</b>			<b>0.4047 ha (10.0%)</b>

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
<b>1 Year</b>	<p>Retention and treatment onsite of 1 hour duration 1 year ARI event with grooves connected to soak wells;</p> <p>Stormwater contained within each lot prior to discharge/infiltration to groundwater;</p> <p>Road runoff infiltration as close to source as possible using water sensitive urban design measures (i.e. roadside swales)</p>
<b>5 Year</b>	<p>Bioretention structures (i.e. soakwells within the road reserve) to treat and infiltrate stormwater to groundwater;</p>
<b>100 Year</b>	<p>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;</p>

## 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