

It is certified that this Structure Plan was approved by resolution of the Western Australian Planning Commission on 11/1/2016  
 This Structure Plan expires on 11/1/2026  
 Signed [Signature]  
 Director, Planning and Development  
 File No. 110/137

Ordinary Council Meeting: 8/10/2015  
 Western Australian Planning Commission Approval:  
 11/01/2016  
 Structure Plan Expires: 14/01/2036  
 Doc Set ID: 11973159  
 File No: 110/137 & 110/246

Plan No. : 20644-5  
 Revision : REV.0  
 Scale : 1:1000@A3

© This plan must not be reproduced without the permission of WHELANS.  
 All measurements and areas are subject to survey.  
 Suite 4 First Floor 40 Hasler Road Osborne Park WA 6017 www.whelans.com.au

- LEGEND**
- ● ● Pathway - Dual Use Path
  - ● ● Pathway - Pedestrian
  - Indicative planning over land outside of structure plan
  - Structure Plan Boundary
  - Indicative local access roads
  - Indicative laneways

- ZONES**
- Residential
- RESERVES**
- Parks and Recreation

Note: Final road design subject to further planning at subdivision approval stage

**STRUCTURE PLAN**  
**LOT 1, 2 & 20 ENTRANCE ROAD**  
**COOGEE**

DATE DRAWN: 25/06/2015  
 DRAWN BY: CML  
 CHECKED BY: JF  
 FILE: 150555 Lot 20, 21 Local Structure Plan.dgn  
 V DATTAL: AHD  
 H DATTAL: MAGAM (S)



- 8 JAN 2016

FILE SPN/0785

# LOTS 1, 2 & 20 ENTRANCE ROAD, COOGEE LOCAL STRUCTURE PLAN



**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:

**11 January 2016**

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:

**14 January 2036**

## TABLE OF VARIATION(S) TO STRUCTURE PLAN

Variation No.	Description of Variation	Date Adopted by Council	Date Endorsed by the WAPC (if required)

## EXECUTIVE SUMMARY

This Structure Plan (SP) has been prepared for the various landholdings being Lots 1, 2 & 20 Entrance Road, Coogee. The land the subject of this SP comprises (3) 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 SP area is within the Metropolitan South-West Corridor and is situated within the municipality of the City of Cockburn (City) and the locality of Coogee.

This SP provides the planning framework to guide and facilitate the development of 1.824 hectares of land for urban purposes and has been prepared in accordance with the provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

The SP forms part of the Packham North District Structure Plan and is in between the Structure Plan for Lots 14 – 18 Ocean Road, the Structure Plan for Lots 1 – 8, 132, 300 & 301 Hamilton Road and Lot 9 Entrance Road, Coogee/Spearwood and the Structure Plan for Lots 21 & 22 Cross Road, Coogee. Essentially the SP completes the structure planning for the Packham North District Structure Plan in Coogee.

The Structure Plans mentioned above for neighbouring and surrounding land have been adopted by the City and endorsed by the WAPC and subdivision/construction works have commenced for these developments. The SP design provides for integration with the adjoining approved Structure Plan areas and once this SP is approved, it will enable subdivision application/s to be lodged for the subject land. This structure plan has been adopted by the City and endorsed by the WAPC.

Item	Data	Section number referenced within the Structure Plan Report
Gross Structure Plan Area	1.824 hectares	2.2
Area of each land use proposed		
<u>Zones</u>		
Residential	1.186 hectares (65% of site)	5.1
<u>Reserves</u>		
Parks & Recreation	0.1824 hectares (10 % of site)	7.3
Public Open Space	0.1824 hectares (10% POS)	
Amount of restricted Public Open Space as per Liveable Neighbourhoods	Nil	
Composition of Public Open Space		7.3
- Local Park	0.1824 hectares (10 % of site)	

Estimated Lot Yield	26 lots	5.1
Estimated Number of Dwellings	36 dwellings	5.1
Estimated Residential Density		
- dwellings per gross hectare <i>As per Directions 2031</i>	20 dwellings per gross hectare	5.1
- dwellings per site hectare <i>As per Liveable Neighbourhoods</i>	30 dwellings per site hectare	5.1
Estimated Population	101 people @ 2.8 people/household	5.3

## TABLE OF CONTENTS

---

### **PART ONE – IMPLEMENTATION**

1.0	STRUCTURE PLAN AREA	10
2.0	OPERATION	10
3.0	STAGING	10
4.0	SUBDIVISION & DEVELOPMENT REQUIREMENTS	10
4.1	Land Use & Permissibility	10
4.2	Residential Density	10
4.3	Local Development Plans	10
4.4	Notifications on Title	11
4.5	Road upgrades	11
5.0	OTHER REQUIREMENTS	11
6.0	ADDITIONAL INFORMATION	11

### **PART TWO – EXPLANATORY SECTION**

1.0	INTRODUCTION	12
1.1	Purpose	12
1.2	Background	12
2.0	LAND DESCRIPTION	13

2.1	Location	13
2.2	Land ownership	13
2.3	Existing Land Use	13
2.4	Surrounding Context	13
<b>3.0</b>	<b>PLANNING FRAMEWORK</b>	<b>14</b>
3.1	Draft South Metropolitan Peel Sub-Regional Planning Framework	14
3.2	Directions 2031	14
3.3	Metropolitan Region Scheme	14
3.4	Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy	14
3.5	Packham North District Structure Plan	15
3.6	Liveable Neighbourhoods	16
3.7	City of Cockburn Town Planning Scheme No. 3	17
3.8	City of Cockburn Local Planning Strategy	17
3.9	'Watson' Structure Plan (Eliza Ponds Estate)	17
3.10	Ocean Road Structure Plan	17
3.11	Lots 21 & 22 Cross Road Structure Plan	17
<b>4.0</b>	<b>SITE CONDITIONS &amp; ENVIRONMENT</b>	<b>18</b>
4.1	Topography	18
4.2	Geology and Soils	18
4.3	Hydrology	19
4.4	Acid Sulfate Soils	19
4.5	Vegetation, Flora & Fauna	20
4.6	Bushfire Management	20

<b>5.0</b>	<b>STRUCTURE PLAN</b>	<b>21</b>
5.1	Residential Densities and Yield	21
5.2	SP Proposed Land Uses	23
5.3	Population & Employment	23
5.4	Street Layout	23
5.5	Housing Typologies	24
5.6	Use of Detailed Area Plans	24
5.7	Variations to Residential Design Codes	24
<b>6.0</b>	<b>MOVEMENT NETWORK</b>	<b>28</b>
6.1	Existing Movement Network	28
6.2	Proposed Movement Network - Roads	28
6.3	Proposed Movement Network – Pedestrian/Cyclists	29
6.4	Proposed Movement Network – Public Transport	29
6.5	Street Parking	29
<b>7.0</b>	<b>PUBLIC OPEN SPACE</b>	<b>30</b>
7.1	Public Open Space Provision	30
7.2	Public Open Space Typologies	30
7.3	Public Open Space Schedule	31
<b>8.0</b>	<b>LOCAL WATER MANAGEMENT</b>	<b>32</b>
8.1	Local Stormwater Drainage	32
8.2	1 year, 5 year and 100 year ARI events	32
8.3	Groundwater Management	33
<b>9.0</b>	<b>LANDSCAPING</b>	<b>34</b>

<b>10.0</b>	<b>INFRASTRUCTURE &amp; SERVICING</b>	<b>35</b>
10.1	Wastewater	35
10.2	Water Supply	35
10.3	Power	35
10.4	Telecommunications	36
10.5	Gas	36
10.6	Earthworks	36
10.7	Roads & Pathways	36
10.8	Drainage	37
<b>11.0</b>	<b>STAGING</b>	<b>38</b>
11.1	Staging and Anticipated Timeframes	38
11.2	Development Contributions	38
11.3	Services & Infrastructure	38
<b>12.0</b>	<b>REFERENCES</b>	<b>39</b>

## APPENDICES

Appendix No.	Document Title	Approval Required or Supporting Document only	Approval Status	Approval Agency
1	Engineering Servicing Report (Development Engineering Consultants, September 2014)	Supporting Document	N/A	N/A
2	Pre-lodgement Consultation Table	Supporting Document	N/A	N/A

## PART ONE (IMPLEMENTATION)

### 1.0 STRUCTURE PLAN AREA

The Structure Plan is identified as the *Lots 1, 2 & 20 Entrance Road Structure Plan* (Plan No. 20644-5 Rev .0).

This Structure Plan shall apply to the land contained within the inner edge of the line denoting the structure plan boundary on the Structure Plan Map.

### 2.0 OPERATION

The date the Structure Plan comes into effect is the date the Structure Plan is approved by the Western Australian Planning Commission as set out in the Structure Plan - Certification Page.

### 3.0 STAGING

The Structure Plan is likely to be developed in 2 - 3 stages, with each stage to commence as and when each landowner subdivides. There are no specific triggers for each stage of development.

### 4.0 SUBDIVISION & DEVELOPMENT REQUIREMENTS

4.1	Land Use & Permissibility	<p>The Structure Plan Map outlines the Zones and Reserves applicable within the Structure Plan Area and these will guide future subdivision and development of the land.</p> <p>Land use permissibility within the Structure Plan Area shall generally be in accordance with the corresponding Zone under the City of Cockburn Town Planning Scheme No. 3.</p>
4.2	Residential Density	<ol style="list-style-type: none"> <li>1. Residential densities applicable to the Structure Plan Area shall be those residential densities shown on the Structure Plan Map.</li> <li>2. The Structure Plan shall provide for a minimum 15 dwellings per site hectare at the subdivision approval stage.</li> </ol>
4.3	Local Development Plans	<p>Local Development Plans (LDP's) are required to be prepared and implemented pursuant to the provisions of City of Cockburn Town Planning Scheme No. 3 and the <i>Planning &amp; Development (Local Planning Schemes) Regulations 2015</i>, for lots with the following site attributes, but not limited to:</p> <p>(i) Lots with direct boundary frontage (primary or secondary) to an area of Public Open Space; and</p>

		(ii) Lots with rear-loaded (laneway) vehicle access.
4.4	Notifications on Title	<p>In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate(s) of Title(s) to advise of the following: -</p> <p>1. This land may be affected by midge from nearby lakes and/or wetlands. Enquiries can be made with the City of Cockburn Environmental Services.</p>
4.5	Road upgrades	Entrance Road to be upgraded abutting the Structure Plan frontage to Entrance Road.

## 5.0 OTHER REQUIREMENTS

5.1	Development Contribution Items and Arrangements	The developer is to make satisfactory arrangements with the City of Cockburn to provide proportional contributions toward those items of development infrastructure defined in the City of Cockburn Town Planning Scheme No. 3 for Developer Contribution Area 12 ('DCA 12') and Developer Contribution Area 13 ('DCA 13').
-----	---	---

## 6.0 ADDITIONAL INFORMATION

6.1	Additional Information	<p>The following investigations and management plans may be required at the subdivision stage, where appropriate:</p> <ul style="list-style-type: none"> <li>• Urban Water Management Plan/s (aligning with the Local Water Management Strategy); and</li> <li>• Public Open Space Management Plan.</li> </ul>
-----	------------------------	--



Plan No.: 20644-5  
 Revision: REV.0  
 Scale: 1:1000@A3  
 Suite 4 First Floor 40 Hasler Road Osborne Park WA 6017 www.whelans.com.au

#### LEGEND

- ● ● Pathway - Dual Use Path
- ● ● Pathway - Pedestrian
- Indicative planning over land outside of structure plan
- Structure Plan Boundary
- Indicative local access roads
- Indicative laneways

#### ZONES

Residential

#### RESERVES

Parks and Recreation

Note: Final road design subject to further planning at subdivision approval stage

### STRUCTURE PLAN LOT 1, 2 & 20 ENTRANCE ROAD COOGEE

DATE DRAWN: 25/06/2015  
 DRAWN BY: CML  
 CHECKED BY: JF  
 FILE: 150595 Lot 20, 21 Local Structure Plan.dwg  
 V: DATUM: AND  
 H: DATUM: MAGAN (55)

## PART TWO (EXPLANATORY SECTION)

### 1.0 INTRODUCTION

---

#### 1.1 Purpose

This report provides the planning rationale for the Structure Plan (SP) prepared for the various landholdings being Lots 1, 2 & 20 Entrance Road, Coogee (herein referred as the "SP landholdings"). **Figure 1** shows the location of the SP landholdings in the context of the locality of Coogee, proximity to Fremantle and the Port Coogee marina development to the west of Cockburn Road.

The SP has been prepared taking into consideration the planning framework of the City's Packham North District Structure Plan (DSP) and Structure Planning that has been approved for land to the west, east and south of the SP landholdings. The proposed SP will integrate with the Structure Planning that has already taken place within the DSP area. This will be discussed in further detail in the report.

#### 1.2 Background

The area within the SP was previously affected by the Watsons food processing plant odour buffer, which was one of the main reasons for holding up urban development. With the closure of the food plant in April 2009, the SP landholdings and surrounding area was subsequently rezoned to 'Development' zone under Scheme Amendment No. 70.

The approved DSP and District Water Management Strategy for Amendment No. 70 'Development' zoned area provides the foundational planning framework for consideration of this SP. In addition, Scheme Amendment No. 87, which was gazetted on 24 July 2012 includes the DSP area in DCA 12 – Packham North. This provides a framework for development contributions from the respective landowners within the DSP.

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

## 2.0 LAND DESCRIPTION

---

### 2.1 Location

The land the subject of this Structure Plan (SP) comprises (3) 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 SP 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 Land ownership

The SP area contains (3) land parcels (refer to Table 1) with an approximate area of 1.824 hectares, in private ownership. **Figure 2** shows the boundaries of the lots that form the SP area and neighbouring context.

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

Lot	Plan/Diagram	Volume	Folio
1	58695	1561	257
2	58695	1561	258
20	12073	1079	438

### 2.3 Existing Land Use

The SP area has been previously cleared for residential development, including semi-rural use. Predominantly exotic grasses and weeds have mostly replaced the original vegetation. Lot 1 contains an existing dwelling. Lot 2 contains an existing dwelling fronting Entrance Road with the rear mostly cleared however undeveloped land. Lot 20 contains two existing dwellings fronting Entrance Road with the rear cleared but also mostly undeveloped. **Figure 3** shows the subject site and existing development. The proposed SP provides opportunity for the existing dwellings to be either retained or demolished to allow for further subdivision.

### 2.4 Surrounding Context

The SP area is within the locality of Coogee. **Figure 4** provides an overview of the SP in relation to nearby urban development. The former site of the food processing plant on Hamilton Road has now been demolished and new residential lots are being constructed to the east (Eliza Ponds Estate), to the south (Ocean Road Estate) and the the west (Coogee Parkside). Land to the north has been included in an approved Structure Plan, however it is understood that this area is proposed for future urban development in the medium term. The proposed SP will integrate with the neighbouring structure planned areas. The coast and Port Coogee is approximately 650 metres further west of the subject site.

## 3.0 PLANNING FRAMEWORK

---

### STATE & REGIONAL PLANNING

#### 3.1 *Draft South Metropolitan Peel Sub-Regional Planning Framework*

The Draft South Metropolitan Peel Sub-Regional Planning Framework (SMPSRPF) is an overarching strategic planning instruments that broadly sets out the future settlement pattern for Perth & Peel regions for the next 35 – 40 years to accommodate an expected population of 3.5 million people. The SMPSRPF compliments Directions 2031 by providing four draft sub-regional planning frameworks. The sub-regional frameworks for each sector of the Perth and Peel regions clearly identifies future land uses through urban consolidation, integrated infrastructure and development, co-location of services and the strategic location of employment opportunities.

#### 3.2 *Directions 2031*

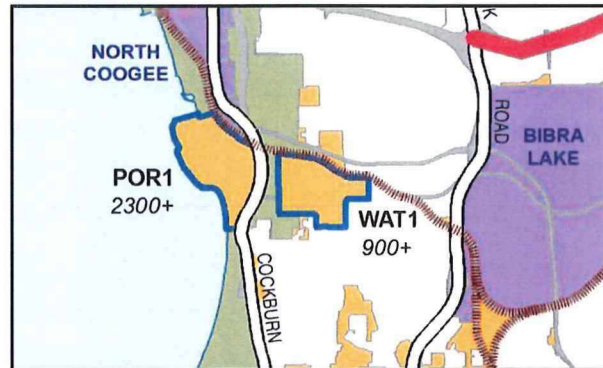
Directions 2031 establishes the vision for the future growth of Perth and Peel regions. It provides a framework in which population growth is to be accommodated. Directions 2031 seeks a 50% increase in the current average residential density of 10 dwellings per gross urban zoned hectare; and has set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

#### 3.3 *Metropolitan Region Scheme*

The SP landholdings is zoned 'Urban' under the Metropolitan Region Scheme (MRS). The land directly neighbouring the SP landholdings to the north, south, west and east is also zoned 'Urban' under the MRS.

#### 3.4 *Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy*

The Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy identifies the SP development site as part of the "WAT1" precinct with an estimated potential for the future creation of 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]

### 3.5 Packham North District Structure Plan

The SP has been prepared within the framework of the City's DSP. The purpose of the DSP 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 Structure Plans and future applications for subdivision and development.

The SP has been prepared in accordance with the planning objectives set out in the structure plan, which includes allocation of public open space (POS), access, interfacing with adjoining land uses, movement linkages and areas for residential use.



Packham North District Structure Plan (Source: City of Cockburn, 2014)

### 3.6 *Liveable Neighbourhoods*

Liveable Neighbourhoods (LN) 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 SP has been designed in accordance with the principles of Liveable Neighbourhoods, in particular, the layout of roads and POS. Consistent with LN, the SP provides a high level of connectivity with good external linkages to cycle, pedestrian and public transport networks. The road design in the SP is legible and reduces car travel distances by creating alternative routes. These aspects are further addressed in the report when referring to the indicative Subdivision Concept Plan for the SP landholdings.

LN encourages walkable access to activity nodes and POS. Within the SP, all lots are within 400 metres walking distance from POS areas. This provides residents in the SP with opportunities for active lifestyle and recreation within 5 minutes walking distance from residences. This is further addressed in the report.

Consistent with LN, it is important for the SP design to respond to site characteristics and site context. The SP design has taken into consideration the natural topography, surrounding land uses, solar orientation and existing developments. Proposed lots can achieve an E-W or N-S orientation, which provides in most instances, good opportunity for solar orientation for dwelling design and outdoor living areas.

Within the SP, lots that face parkland increase opportunity for passive surveillance and interaction with public spaces. Lot shape and proportion of width to depth is considered important and the lots in the SP have been designed to be rectangular in shape with a greater depth than width wherever possible. This ensures the ability to develop the lots with high quality housing and built form and conformity with the Residential Design Codes of Western Australia. Other aspects of LN principles, such as local water management and, diversity of lot sizes and target residential density are addressed further in the SP report.

## LOCAL PLANNING

### 3.7 *City of Cockburn Town Planning Scheme No. 3*

The SP area is zoned 'Development – DA31' under the City's TPS 3. The provisions of TPS 3 require preparation and approval of a Structure Plan prior to any subdivision and development, unless Clause 6.2.4.2 of TPS 3 applies.

### 3.8 *City of Cockburn Local Planning Strategy*

The City's 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 SP is consistent with this philosophy in that it provides for a range of dwelling types, POS that are within walking distance and a permeable road network.

### 3.9 *'Watson' Structure Plan (Eliza Ponds Estate)*

A Structure Plan for Lots 1 – 8, 132, 300 & 301 Hamilton Road and Lot 9 Entrance Road, Coogee/Spearwood (herein referred to as 'Watson SP') has been approved for the former food processing plant and surrounding land that has previously been affected by the food processing plant odour buffer. The Watson SP provides guidance for future structure planning over neighbouring land to the east of the SP landholdings. It is proposed that a road linkage is provided between the SP landholdings to the Watson SP, to ultimately link structure planning roads with the existing road network.

The proposed SP and its context with other Structure Plans in the DSP development area is shown in **Plan 2**.

### 3.10 *Ocean Road Structure Plan*

A Structure Plan has been approved for Lots 14 – 18 Ocean Road, which neighbours the SP to the south. No direct interface is necessary with this Structure Plan, except that both SPs share (and create) the east-west POS link between Beeliar Regional Park and the wetland conservation area to the south-east of the SP. This is consistent with the DSP.

### 3.11 *Lots 21 & 22 Cross Road Structure Plan*

A Structure Plan has been endorsed by the WAPC for neighbouring Lots 21 & 22 Cross Road to the west. The SP proposes two road connections to link the SP landholdings with Lots 21 & 22 structure plan area. The road linkages will provide a seamless transition between the Lots 21 & 22 Cross Road SP and the SP landholdings. The proposed SP will provide POS which connects with the planned POS areas to the west and south, to complete the POS parkway consistent with the DSP.

## 4.0 SITE CONDITIONS & ENVIRONMENT

---

### 4.1 Topography

The topography of the SP varies in the range of 7.0 - 9.0m AHD in the SW portion of the SP area sloping consistently down to a central flat area of approximately 4.0m AHD, then gradually slopes up to approximately 5.5m – 6.5m AHD in the NE portion of the SP. Preliminary earthworks finished lot levels for the proposed lots directly abutting the SP landholdings to the east range approximately 6.1m – 8.1m as the land generally rises to the east.

### 4.2 Geology and Soils

The SP landholdings 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).

The geology and soil types found within the SP area are compatible with and can support the proposed urban development.

## 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 Structure Planning to the east 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 lowest lying area of the SP landholdings (i.e. approximately 4.0m AHD) the groundwater level is closer to the surface at approximately 1.2m AHD. However, the required 1.2 metre minimum separation distance between the finished lot levels and the highest known groundwater table level can be met.

As part of the preparation of the DSP, 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.

### Surface Water & Wetlands

There are no permanent surface water bodies within the SP landholdings. 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.

There are no wetlands within the SP landholdings identified in the DEC database *Geomorphic Wetlands of the Swan Coastal Plain*. Accordingly the SP landholdings is unaffected by any localised surface water features.

## 4.4 Acid Sulfate Soils

A desktop assessment to determine the presence of Acid Sulfate Soils (ASS) indicates it is unlikely that there be any ASS affecting the SP landholdings. Notwithstanding, any development within the SP will require a preliminary site investigation to be undertaken prior to any subdivision and or development.

Should any development be proposed within areas identified to contain ASS, a detailed geotechnical ASS investigation would be carried out to inform the preparation and approval of an ASS management plan, prior to works being undertaken.

#### 4.5 Vegetation, Flora & Fauna

The SP landholdings have been previously '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 completely removed and degraded 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 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.

#### 4.6 Bushfire Management

The SP landholdings are not within 100m of any significant stand of vegetation that would pose a substantial bushfire risk to future residential dwellings within the SP. Accordingly a bushfire hazard assessment is not required for the SP.

## 5.0 STRUCTURE PLAN

### 5.1 Residential Densities and Yield

The SP ultimately provides for approximately 36 dwellings (at ultimate development) with a density coding ranging from R30 to R40. Proposed development as provided by the SP could accommodate up to approximately 101 people based on an average household of 2.8 persons.

The proposed R30 and R40 densities provide opportunity for medium density lot sizes and housing types, responsive to the site's location. In particular, medium density housing has been located to take advantage of and overlook POS. Orientation of lots towards POS increases passive surveillance of POS to the south.

The R40 density fronting Entrance Road provides for opportunity for retention of existing dwellings on larger lots, which could at some point in the future be further subdivided, 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 (Plan 3). Table 2 provides development statistics which can be used to measure the performance of the SP 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 SP

RESIDENTIAL LOT TYPE	DENSITY	YIELD	HOUSING TYPES
Medium density residential	R30	19	Single Dwellings
Medium density residential	R40 <sup>1</sup> R40 (Strata) <sup>2</sup>	14 3	Single Dwellings Grouped Dwellings
SP Estimated Potential Dwelling Yield		36	

<sup>1</sup> Includes Lots 12 & 21 (R40) lots with potential for two dwellings, subject to demolition of existing dwelling

<sup>2</sup> Includes existing Lot 1 further subdivided into (3) strata lots

**Table 2** Development Statistics (based on Subdivision Concept Plan)

	Site Outcomes	Target Density
Total SP Landholdings Area	18,235m <sup>2</sup>	-
Area set aside for roads, drainage & POS	4,030m <sup>2</sup>	-
Balance area for residential development	11,869m <sup>2</sup>	-
Estimate ultimate number of dwellings	36 dwellings <sup>3</sup>	-
Estimated number dwellings per site hectare <sup>1</sup>	30 dwellings/ha	<b>Liveable Neighbourhoods</b> 12 – 20 dwellings per site hectare for standard lot layouts; or 20 – 30 dwellings per site hectare for areas within 400m of neighbourhood centres
SP target density per gross urban hectare <sup>2</sup>	20 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> 26 lots and 3 survey strata lots are shown in the Subdivision Concept Plan with retention of existing dwellings on Lots 2, 12 & 21.

The SP delivers approximately 30 dwellings per *site hectare*, which meets the Liveable Neighbourhoods density expectations for the site's locational context with regard to activity centres and major transport networks. Similarly, the SP delivers approximately 20 dwellings per gross urban hectare, which meets the target density of 15 dwellings per gross urban hectare under Directions 2031.

## 5.2 *SP Proposed Land Uses*

The proposed land uses are identified in the SP (Plan 1) under 'Zones' and 'Reserves' and will guide future subdivision and development of the land pursuant to the deemed provisions of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

## 5.3 *Population & Employment*

Based on an average household size of 2.8 persons per dwelling, the SP would result in a residential population of approximately 101 people for the proposed ultimate 36 dwellings that could be developed (as shown in Plan 3).

The SP is not in a new peripheral *greenfield* growth area and therefore the expectation for the SP 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 SP 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 east and south-east on Hamilton Road.

Within 2km to the east 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 SP would exist under the provisions of TPS 3 in a 'Residential' zone.

## 5.4 *Street Layout*

The SP proposes a site responsive street network that provides access from proposed structure planning road infrastructure to the west and east and to existing Entrance Road from the north. Connections to proposed roads in the west and east structure planning areas will create good internal connectivity with external linkages for local vehicle, pedestrian and bicycle modes of transport. The proposed local access roads are consistent with the local road hierarchy and reinforces legibility once these roads are linked with future development to the west and east under those approved structure plans.

The SP proposed roads will ultimately function as 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. The width of the proposed roads allows for the construction of footpaths consistent with Liveable Neighbourhoods.

## 5.5 *Housing Typologies*

The SP provides opportunity for a diverse mix of medium density size lot and housing typologies. For instance, this can be achieved through a combination of developer house & land packages and land sales, which could be provided for at landowners' discretion. This would be subject to further marketing review but not a detailed consideration at this stage.

Level sites that are terraced reflect the ideal building site to reduce housing cost and create more affordable housing. 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.

## 5.6 *Use of Local Development Plans*

A Local Development Plan (LDP) will be required for certain lots within the SP to achieve a desired residential built form outcome. LDPs 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 where design coordination is required to ensure that buildings are suitable for the occupier and the streetscape amenity.

LDPs can be prepared and approved at subdivision stage, to provide the mechanism for built form development controls to be put in place for a high quality development outcome which maximises the site's potential and makes efficient use of urban zoned land.

## 5.7 *Variations to Residential Design Codes*

With the changes to how Residential Medium Density Codes (RMD-Codes) are implemented, it may be necessary to prepare an LDP over lots created in the SP, in order to vary R-Code provisions. For instance, an LDP may be done for various lots within proposed stages in the western portion of the development. Alternatively, the RMD provisions could be implemented via creation of a local planning policy.

Within an LDP or policy, subject to further discussion with the City of Cockburn at the detailed subdivision stage, the applicable tables within the WAPC's Planning Bulletin 112/2015 - Medium-density single house development standards – Structure plan areas (referenced as RMD-R30 & RMD-R40 but these are not new zones), could be implemented for the R30 and R40 green title (single dwelling) lots created in the SP area.

The following **Table 3a** and **Table 3b** sets out the R-Code variations provided for in Planning Bulletin 112/2015 for the Residential R30 and Residential R40 areas of the Structure Plan.

**Table 3a.** Single House (R40) standards for medium density housing

<u>Building Setbacks</u>	<ul style="list-style-type: none"> <li>- Boundary setback minimum 1.2m for wall height 3.5m or less with major openings.</li> <li>- Boundary setback minimum 1.0m for wall height 3.5m or less without major openings.</li> <li>- Boundary walls are permitted to both side boundaries subject to (i) no maximum length to one side boundary and (ii) two thirds maximum length to second side boundary for wall height 3.5m or less.</li> <li>- Primary street setback minimum 2.0m with no averaging and minimum 1.5m to porch/veranda, no maximum length.</li> <li>- Secondary street setback minimum 1.0m.</li> </ul>
<u>Front Fences</u>	<ul style="list-style-type: none"> <li>- Front fences within the primary street setback area being a maximum height of 900mm above natural ground level, measured from the primary street side of the front fence.</li> </ul>
<u>Garages</u>	<ul style="list-style-type: none"> <li>- Primary street setback minimum 4.5m, which may be reduced to 4.0m where an existing or planned footpath or shared path is located more than 0.5m from the street boundary.</li> <li>- For lots with frontage 10.5m or greater, a double garage is permitted to a maximum width of 6.0m as viewed from the street subject to: <ul style="list-style-type: none"> <li>- garage setback a minimum of 0.5m behind the building alignment;</li> <li>- a major opening to a habitable room directly facing the primary street;</li> <li>- an entry feature consisting of a porch or veranda with a minimum depth of 1.2m; and</li> <li>- no vehicular crossover wider than 4.5m where it meets the street.</li> </ul> </li> <li>- Secondary street setback minimum 1.5m.</li> </ul>
<u>Open Space</u>	<ul style="list-style-type: none"> <li>- An outdoor living area (OLA) with an area of 10% of the lot size or 20m<sup>2</sup>, whichever is greater, directly accessible from a habitable room of the dwelling and located behind the street setback area.</li> <li>- At least 70% of the OLA must be uncovered and includes areas under eaves which adjoin uncovered areas.</li> <li>- The OLA has a minimum 3.0m length or width dimension.</li> </ul>

	<ul style="list-style-type: none"> <li>- Apart from the above, no other R-Code site cover standards apply.</li> </ul>
<u>Privacy</u>	<ul style="list-style-type: none"> <li>- No privacy provisions apply, with the exception of R-Code Clause 5.4.1 (C1.1). However, the setback distance is reduced to 3.0m to bedrooms and studies, 4.5m to major openings to habitable rooms other than bedrooms and studies and 6.0m to unenclosed outdoor active habitable spaces.</li> </ul>

**Table 3b.** Single House (R30) standards for medium density housing

<u>Building Setbacks</u>	<ul style="list-style-type: none"> <li>- Boundary setback minimum 1.2m for wall height 3.5m or less with major openings.</li> <li>- Boundary setback minimum 1.0m for wall height 3.5m or less without major openings.</li> <li>- Boundary walls are permitted to both side boundaries subject to (i) a maximum two thirds length to one side boundary and (ii) a maximum one third length to second side boundary, for wall height 3.5m or less.</li> <li>- Primary street setback minimum 2.0m with no averaging and minimum 1.5m to porch/veranda, no maximum length.</li> <li>- Secondary street setback minimum 1.0m.</li> </ul>
<u>Front Fences</u>	<ul style="list-style-type: none"> <li>- Front fences within the primary street setback area being a maximum height of 900mm above natural ground level, measured from the primary street side of the front fence.</li> </ul>
<u>Garages</u>	<ul style="list-style-type: none"> <li>- Primary street setback minimum 4.5m, which may be reduced to 4.0m where an existing or planned footpath or shared path is located more than 0.5m from the street boundary.</li> <li>- For lots with frontage between 10.5m and 12.0m, a double garage is permitted to a maximum width of 6.0m as viewed from the street subject to: <ul style="list-style-type: none"> <li>- garage setback a minimum of 0.5m behind the building alignment;</li> <li>- a major opening to a habitable room directly facing the primary street;</li> <li>- an entry feature consisting of a porch or veranda with a minimum depth of 1.2m; and</li> <li>- no vehicular crossover wider than 4.5m where it meets the street.</li> </ul> </li> <li>- Secondary street setback minimum 1.5m.</li> </ul>

<u>Open Space</u>	<ul style="list-style-type: none"> <li>- An outdoor living area (OLA) with an area of 10% of the lot size or 20m<sup>2</sup>, whichever is greater, directly accessible from a habitable room of the dwelling and located behind the street setback area.</li> <li>- At least 70% of the OLA must be uncovered and includes areas under eaves which adjoin uncovered areas.</li> <li>- The OLA has a minimum 3.0m length or width dimension.</li> <li>- Apart from the above, no other R-Code site cover standards apply.</li> </ul>
<u>Overshadowing</u>	<ul style="list-style-type: none"> <li>- No maximum overshadowing for wall height 3.5m or less.</li> <li>- No maximum overshadowing for wall height greater than 3.5m where overshadowing is confined to the front half of the adjoining neighbouring lot. If overshadowing intrudes into the rear half of the adjoining neighbouring lot, the shadow cast shall not exceed 35%.</li> </ul>
<u>Privacy</u>	<ul style="list-style-type: none"> <li>- No privacy provisions apply, with the exception of R-Code Clause 5.4.1 (C1.1). However, the setback distance is reduced to 3.0m to bedrooms and studies, 4.5m to major openings to habitable rooms other than bedrooms and studies and 6.0m to unenclosed outdoor active habitable spaces.</li> </ul>

## 6.0 MOVEMENT NETWORK

---

### 6.1 Existing Movement Network

#### Regional & District Road Network

The SP landholdings 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 SP landholdings, is identified as an 'Other Regional Road' under the MRS. There is good accessibility to the subject site via these regional and district level roads.

#### Local Road Network

In general, the SP landholdings can be accessed via Hamilton Road and Entrance Road, or Ocean Road and Cross Road or alternatively from the north via Entrance Road. Cross Road and Entrance Road are poorly constructed bitumen roads without kerbs or drainage. However it is expected that these roads will be upgraded as part of subdivision. It is noted that Entrance Road will serve as a local road leading directly to the future local centre at Hamilton Road (as shown in to Plan 2).

Hamilton Road is a 'Neighbourhood Connector' 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.

### 6.2 Proposed Movement Network - Roads

#### Local Access Roads

As shown on Plan 3 the proposed subdivision roads are to be a minimum of 15m wide. The City's standard width for new local access roads is for a 15m wide road reserve to accommodate pavement, kerbing, servicing & drainage infrastructure, paths and landscaping. The laneways and slip roads connected to the cul-de-sac head are proposed to be a minimum of 6.0m wide.

The road reserve widths in the SP 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 in relation to connections with existing and proposed roads. The existing and proposed local access roads are not expected to carry significant volumes of traffic and will have a sign posted speed limit of 50km/hr. Subsequently this does not necessitate any special intersection treatment.

### *6.3 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. Pathways are proposed along the sections of Entrance Road adjoining the SP landholdings and within the proposed local access roads. Plan 1 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 City of Cockburn at the subdivision stage. Footpaths are to be provided on all streets in accordance with the requirements of Liveable Neighbourhoods.

### *6.4 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 300m west of the SP 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 SP 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 B' level road respectively. Pathways are currently provided along both pedestrian routes to these bus services. The SP landholdings are within 400m (5 minute walking distance) of public transport bus services that operate along major transport routes.

### *6.5 Street Parking*

No specific provision of on-street parking embayments are proposed within the SP, 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 **Figure 5** and **Figure 6** for proposed indicative cross sections for internal access roads).

## 7.0 PUBLIC OPEN SPACE

### 7.1 Public Open Space Provision

The SP provides for 1,824m<sup>2</sup> meeting the minimum 10.0% POS required by WA Planning Commission under Liveable Neighbourhoods. Consistent with the DSP, the POS for the proposed SP 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.

Where the landowner of Lot 1 proposes to subdivide in future into 3 or more lots, a legal agreement between the landowner of Lot 1 and Lot 2 will cover any arrangements for the equitable provision of POS sufficient for the SP. The minimum 10% POS requirement per landholding within the SP development site is as follows:

**Table 4.** SP landholdings and required 10% POS

Lot	Area	10% POS Requirement	POS Provided
1	800m <sup>2</sup>	80m <sup>2</sup>	Nil*
2	7,300m <sup>2</sup>	730m <sup>2</sup>	810m <sup>2</sup>
20	10,135m <sup>2</sup>	1,013m <sup>2</sup>	1,014m <sup>2</sup>

\* Where the landowner of Lot 1 proposes to create (3) or more lots, the landowner of Lot 1 will provide a cash in lieu contribution to the landowner of Lot 2 for the surplus POS being provided by Lot 2 to cover the 10% POS requirement for Lot 1.

### 7.2 Public Open Space Typologies

The SP provides for a 1,824m<sup>2</sup> area (10% POS) to be set aside to create the neighbourhood park utilised for active and passive recreation envisaged under the Packham North District Structure Plan. The POS area is proposed to be developed as open parkland, with the final design to be determined in liaison with the City as part of subdivision works. The POS parkway is proposed with an east-west orientation as per the 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 can potentially 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.

### 7.3 Public Open Space Schedule

**Table 5** comprises the POS Schedule for the SP as follows:

SP Site Area			1.824 ha
Less			
<b>Deductions</b> (LN Element 4 – R43)			
Primary School	Nil		
Town centres and commercial	Nil		
Dedicated drainage reserve	Nil		
Transmission corridors	Nil		
Other approved contingencies	Nil		0.00 ha
Gross Subdivisible area (GSA)			1.824 ha
<b>Public open space @ 10 per cent required</b>			<b>0.1824 ha</b>
Public open space contribution			
May comprise:			
- minimum 80 per cent unrestricted POS	0.1460 ha		
- Maximum 20 per cent restricted use POS	0.0364 ha		0.1824 ha
<i>Unrestricted POS area (Non-Drainage Areas &gt; 5yr ARI)</i>			
Linear Parkway		0.1824 ha	0.1824 ha
<i>Restricted use POS area (1:5 yr ARI)</i>	Nil	Nil	0.0 ha
<b>Public open space provision provided</b>			<b>0.1824 ha (10.0%)</b>

Notes

- (1) Some 1:1 yr and 1:5yr drainage infrastructure may be contained within the Linear Parkway POS as roadside drainage swales. This will be subject to further detailed design at subdivision stage.
- (2) Final POS calculations will be subject to detailed survey and approval of an urban water management plan. 10% POS will be provided at subdivision stage, with the objective of providing the necessary land contribution to create the linear parkway as envisaged in the Packham North DSP.

## 8.0 LOCAL WATER MANAGEMENT

### 8.1 *Local Stormwater Drainage*

The SP 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 roads in the SP have been designed to assist in providing for effective urban water management by facilitating overflow paths. Wherever possible, street verges 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.

As part of the preparation of the City's DSP, 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. As a condition of subdivision, a Local Water Management Plan/Urban Water Management Plan will be required for the proposal.

### 8.2 *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.

### 8.3 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 UWMP, 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>Site soakage via retention and treatment on-site of 1 hour duration 1 year ARI event within grooves connected to a series of 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>	Bioretention structures (i.e. soakwells within the road reserve) to treat and infiltrate stormwater to groundwater;
<b>100 Year</b>	Drainage to the 1 in 100 year event storage inundation area in the District Water Management Strategy prepared by Cardno Consultants in 2011.

## 9.0 LANDSCAPING

The underlining concepts guiding future landscape design within the proposed SP roads and POS areas of the SP 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;
- Where employed, 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 will consist of a mixture of turf, native and exotic species, with an emphasis wherever possible on using indigenous plantings; and
- Diversity of street tree plantings to form strong avenue and high amenity streetscapes.



A detailed landscaping design and management plan could be provided as part of subdivision works. 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 POS may also consider 'edible landscaping' such as use of fruit trees (above right), in consultation with the City.

## 10.0 INFRASTRUCTURE & SERVICING

An *Engineering Services Report* (DEC, July 2015) has been prepared following preliminary investigation and planning for infrastructure and servicing of the SP. The following is a general summary of the report. For the full report refer to **Appendix 1**.

### 10.1 Wastewater

The SP landholdings is currently not connected to reticulated sewer. However, servicing investigations as part of the DSP and approval of other Structure Plans indicates the area is able to be serviced by Water Corporation reticulated sewerage. The development site can be connected via extensions to new reticulation sewers currently being constructed in adjacent developments. 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).

### 10.2 Water Supply

At present there is no Water Corporation reticulated water main serving the site. Preliminary investigations indicate that the SP area is located within the boundary of the Water Corporation's Water Supply Scheme. The existing 100mm main in Cross Road has been extended to the SW boundary of Lot 21 Cross Road as part of WAPC 147014 (Ocean Road Estate) subdivision to the south for Lots 14 – 17 Ocean Road. Further extension of services is proposed in neighbouring development and this will enable connection of proposed lots within the SP to reticulated water in consultation with the Water Corporation.

### 10.3 Power

There is sufficient capacity in the grid for proposed residential development as envisaged under this SP. Low voltage aerial power lines are located within Cross Road and Entrance Road. Any existing aerial service lines within the existing lots will need to be removed and replaced with underground services. A high voltage 132kV aerial line is located on the northern side of Entrance Road and this may require an easement, subject to consultation with Western Power. Any requirements for upgrading and provision of transformer sites can be determined as part of subdivision works.

## *10.4 Telecommunications*

The SP landholdings can be serviced by the existing telecommunications infrastructure within Entrance Road. This infrastructure will need to be extended to service the proposed development, with some upgrading likely to be required. The developer is also 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.

## *10.5 Gas*

There are existing gas mains within adjacent roads and proposed lots within the SP can potentially be serviced with reticulated gas via extensions to gas infrastructure. This could be further investigated at detailed design stage in consultation with ATCO, as part of subdivision works.

## *10.6 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 SP 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. It is noted that the City has imposed an earthworks embargo for this site during the months of November – March.

## *10.7 Roads & Pathways*

In accordance with City's 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 generally consist of two way single carriageways, with widths of 3.2m – 3.3m. Further geotechnical investigations can confirm the exact design of the roads and drainage infrastructure in consultation with the City.

## *10.8 Drainage*

The SP development site is proposed to be self-contained in terms of urban stormwater management for the 1 in 100 year storm event. Stormwater from the proposed internal subdivision road will be contained primarily within the development using underground storage (i.e. soakwells). The details for stormwater drainage regarding Urban Water Management flows for the proposed residential development of the SP area will be undertaken at the subdivision and development stage.

## 11.0 STAGING

### *11.1 Staging and Anticipated Timeframes*

Subdivision and development is likely to be influenced by market demand, however the SP landholdings could be subdivided immediately or in the short term with road access provided from Entrance Road through Lot 20. An alternative road connection would be dependent upon the provision of a connection to the proposed road network in Eliza Ponds to the east (i.e. laneway servicing lots abutting the POS).

### *11.2 Development Contributions*

Local Scheme Amendment No. 87 has provided for DCA 12 for the multiple landholdings within the DSP area. DCA 12 costs include, but not limited to drainage, servicing, engineering and environmental studies prefunded by the City and other common costs that arise through the structure plan process.

Local Scheme Amendment No. 103 provides for DCA 13 and the mechanism for developers to make contributions under an approved DCP for key community infrastructure proposed to service the City.

### *11.3 Services & Infrastructure*

Lots have been designed to allow development by respective landowners to be undertaken relatively independently, with Lot 2 only requiring one road access point from neighbouring land to the east or west from which to create the roads for subdivision of Lot 2.

Should the landowners of the SP landholdings proceed to subdivide concurrently, coordination and sharing of costs for provision of infrastructure (i.e. POS, drainage, roads etc) and servicing would be under a cost sharing agreement. This agreement could be entered into by each landowner and managed by the landowners' project manager as part of the land subdivision process. This cooperation of landowners has been a common practice for fragmented landholdings in the DSP.

## 12.0 REFERENCES

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

*Acid Sulfate 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

## PLANS



Plan No.: 20644-5  
 Revision: REV.0  
 Scale: 1:1000@A3

**LEGEND**

- ● ● Pathway - Dual Use Path
- ● ● Pathway - Pedestrian
- Indicative planning over land outside of structure plan
- Structure Plan Boundary
- Indicative local access roads
- Indicative laneways

**ZONES**

- Residential

**RESERVES**

- Parks and Recreation

Note: Final road design subject to further planning at subdivision approval stage

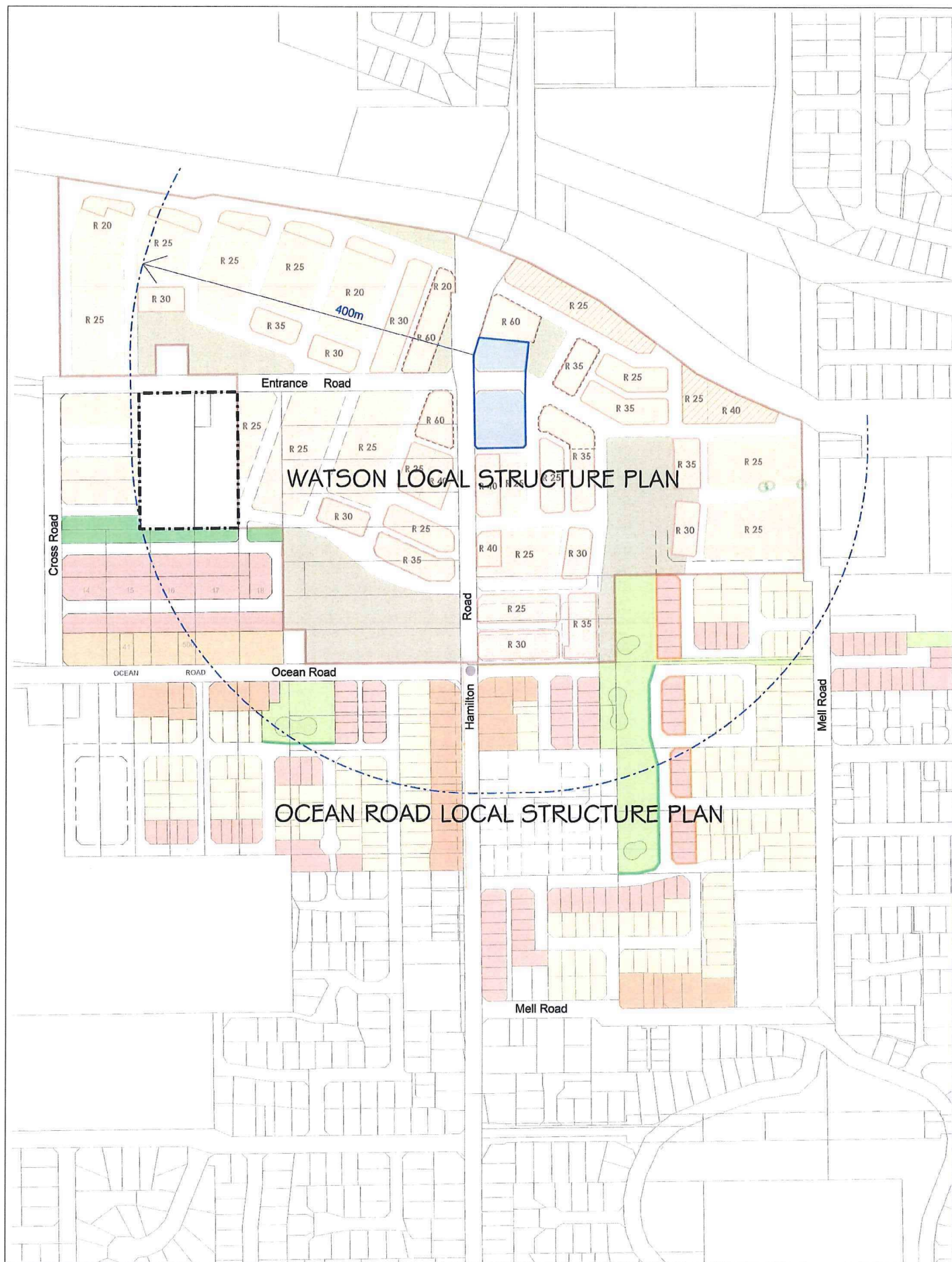
**STRUCTURE PLAN**  
**LOT 1, 2 & 20 ENTRANCE ROAD**  
**COOGEE**

**PLAN 1**

DATE DRAWN: 25/09/2015  
 DRAWN BY: CML  
 CHECKED BY: JF

FILE: 150255 Lot 20.2.1 Local Structure Plan.dwg  
 V DATUM: AHD  
 H DATUM: MAGAM (52)

**whelans**  
 TOWN PLANNING



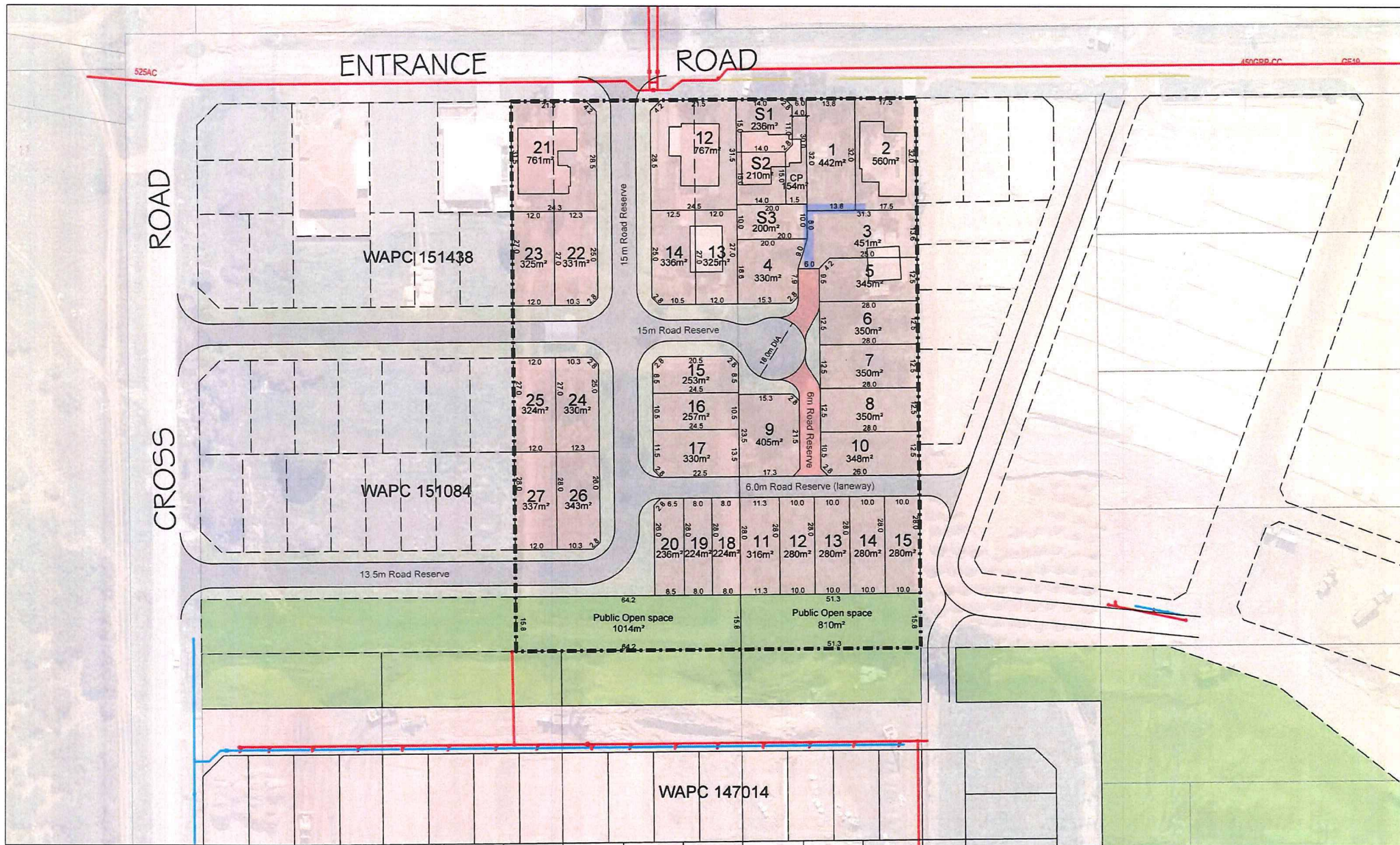
Plan No. : 20644-2  
 Revision : REV.0  
 Scale : 1:4000@A3

Structure Plan  
 Subject Site

PACKHAM NORTH  
 STRUCTURE PLANS  
 SPEARWOOD/COOGEE

PLAN 2

DATE DRAWN: 06/05/2015 FILE: 150508\_spearwood\_struct\_plans.dgn  
 DRAWN BY: CdeL Y DATTU: AVO  
 CHECKED BY: JEP H DATTU: MSAM (S)



Plan No. : 20644-4

Revision : REV.3

Scale : 1:1000@A3



This plan must be read in conjunction with the authorities of the relevant planning and engineering authorities and all applicable laws and regulations.

Whelans Planning  
Suite 4 First Floor 40 Master Road Osborne Park WA 6017 www.whelans.com.au

Original Lot Area

Lot 1 - 800m<sup>2</sup>  
Lot 2 - 7,300m<sup>2</sup>  
Lot 20 - 10,135m<sup>2</sup>

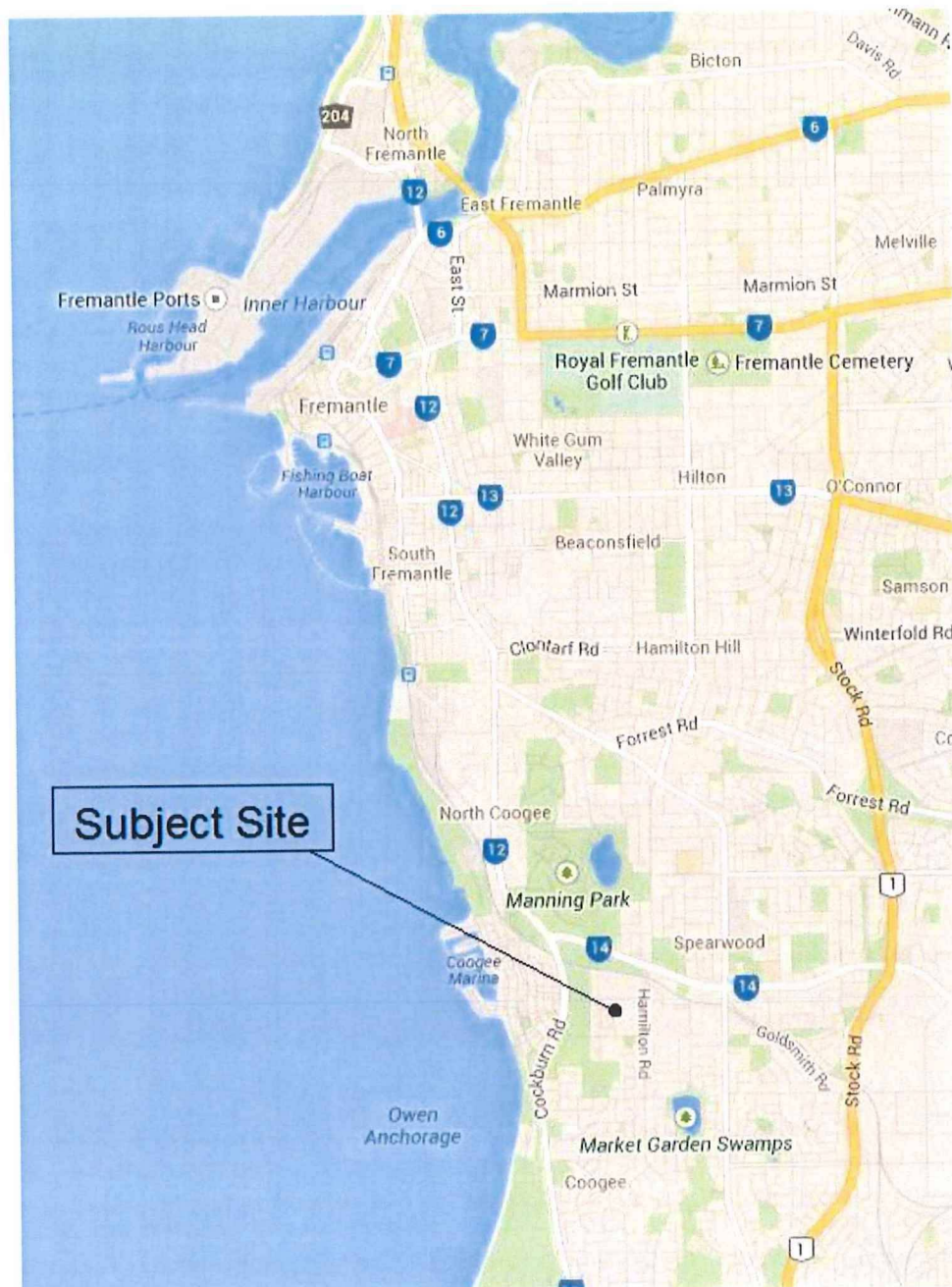
**SUBDIVISION CONCEPT PLAN  
LOT 1, 2 & 20 ENTRANCE ROAD  
COOGEE**

**PLAN 3**

DATE DRAWN: 20/05/2015  
DRAWN BY: Coll.  
CHECKED BY: JP  
FILE: 151025 Subdivision Concept v0.2.1.dwg  
V DATED: 14/05/2015  
H DATED: 14/05/2015

**whelans**  
TOWN PLANNING

## FIGURES



(Source: Google Maps, 2015)

**FIGURE 1**  
LOCATION PLAN



(Source: Landgate - modified, February 2015)

**FIGURE 2**  
CADASTRAL/AERIAL PLAN



(Source: Nearmaps, June 2015)

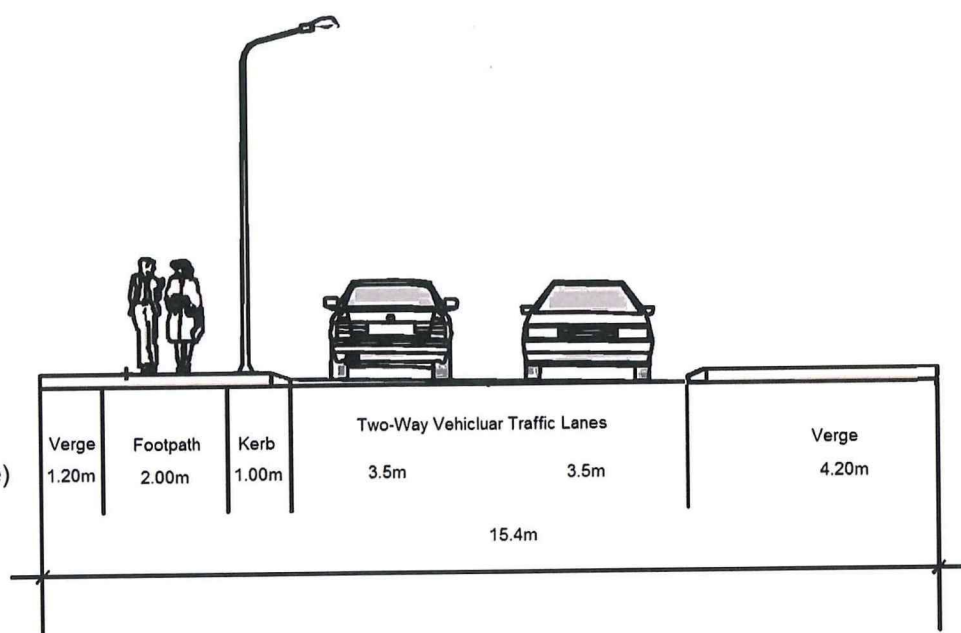
FIGURE 3  
LOTS 1, 2 & 20 ENTRANCE ROAD



(Source: Landgate - modified, 2014)

**FIGURE 4**  
SURROUNDING CONTEXT

Conceptual cross  
section for local access  
road (15.4m road reserve)



**FIGURE 5**  
INDICATIVE CROSS SECTION (15.4m) ROAD

## APPENDIX 1

### ENGINEERING SERVICING REPORT



DEVELOPMENT  
ENGINEERING  
CONSULTANTS

Telephone: (08) 9481 1900  
Facsimile: (08) 9481 1700  
Suite 3, Ground Floor  
The Atrium 123A Colin Street  
West Perth WA 6005

Our Ref: CGETER 06  
Servicing Report lot 2 Entrance Rd  
6<sup>th</sup> July 2012

**TERRANOVIS PTY LTD**  
**LOTS 1 & 2 ENTRANCE ROAD, COOGEE.**  
**ENGINEERING SERVICES REPORT.**

**General**

The above lots are to be developed into 15 green title residential lots and one strata lot containing three units. 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.

**Executive Summary.**

The land the subject of this report is located on Entrance Rd some 180 metres east of Cross Road and generally 300 metres west of Hamilton Rd, Coogee, 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 plus some sheds on lot 2.

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

The Environmental Geology map of the Geological Survey of Western Australia classifies this site as generally "S7" Sand derived from Tamala Limestone, which is considered suitable for urbanization. Its 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 from adjacent new developments along Entrance Rd. Power and telephone already pass along the site frontage. Entrance Rd is constructed as a sealed road but without kerbing and formal drainage.

All storm water discharging from the development up to the 1 in 10 year storm, will be contained on site in underground storage, whilst greater event storms will travel overland along roads to the 1 in 100 year basin, generally in line with the approved DWMS/LWMS for the area.

**Site**

Lots and 2 Entrance Rd are located on the south side of Entrance Rd between Cross Rd and Hamilton Rd. Each lot contains at least one residential building.

Entrance Road is a constructed sealed urban road in fair condition, 6 metres wide pavement.

The land is generally near the low point of Entrance Rd, which is located just west of the the north western corner of the site, and varies in elevation from RL 4m AHD on the north western corner and the south eastern corner and, to RL 6.5m AHD on the north eastern and south western corners.

The geology of the land is described by the Environmental Geology Map of the Geological Survey of WA, as being "S7, Sand derived from Tamala Limestone. This soil type is described as being suitable for urbanization.

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

Some buildings on the site will be demolished, with the house located on lot 1 remaining.

### **Development Proposal.**

It is proposed to develop the land into 15 green title lots and one strata lot containing 3 units, with all normal services, with links to abutting developments (existing and proposed) for sewer, water, power, roads, gas, phone and NBN services. All drainage up to the 1 in 10 year event storm to be retained on site, using best management practices, as generally set out in the DWMSW/LWMS.

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. Side boundary walls will match walls proposed for adjacent developments.

Drainage will be effected by site soakage in specified underground storage, with stormwater from larger than the design storm overflowing to the east into adjacent streets and thence to the 1 in 100 year event storage inundation area in the District Water Management Strategy (DWMS/ Local Water management Strategy(LWMS) prepared by Cardno Consultants in 2011.

The abutting existing Entrance Road will be upgraded to the requirements of the City of Cockburn, namely with formal piped drainage, kerbing and sheeting. All internal roads will be designed and constructed to current Council standards.

### **Earthworks & Retaining Walls.**

Because of the undulating nature of the site, overall earthworks will be required to provide level building blocks, thus necessitating extensive low height retaining walls, matched to proposed walls in developments on either side of the site.

All retaining walls will be subject to Council building approval.

Earthworks on site will entail removal of topsoil, cut and fill, and possible importation of sand fill to enable reasonable road design off Entrance Road.

### **Roads & Footpaths**

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

Footpaths will be installed in normal road reserves and Entrance Rd as determined by the City of Cockburn.

### **Drainage**

The site will be self contained as far as storm water drainage for the 1 in 10 year design storm is concerned. Entrance Road at the low point adjacent to the site is proposed to drain to a purpose built basin built by others, on the northern side of Entrance Road surrounding the Water Corporation Oxygen Injection facility.

Internal roads will drain south and east into an underground drainage structure located within the site at the junction with the future Santorini Boulevard. Stormwater from storms in excess of the 1 in 10 year storm will flow east into the designated drainage storage through the adjacent roads areas as per the DWMS/LWMS prepared by Cardno Consultants in 2011. Some amendments to the DWMSW/LWMS may be required after detailed engineering design, and will be detailed in the Urban Water Management Plan (UWMP) which will be prepared for the development. In particular, road design to match the surveyed site levels may dictate changes to drainage catchments.

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.

Lots with area greater than 350 m<sup>2</sup> will dispose of site drainage in soakwells within the lot, whereas lots smaller than this will be provided with roof drainage connections into the street drainage system.

### **Groundwater**

The groundwater level adjacent to the site has been measured at 0.61m AHD by Cardno in 2011, some 3.4m below the lowest part of the land. Their DWMS/LWMS states this to be Maximum Groundwater Level.

The groundwater Atlas of the Department of water (1997) shows the highest recorded groundwater level at RL 1.2m AHD.

### **Power**

It appears that sufficient power supply exists in the area to supply the development. A three phase low voltage aerial line is located along the southern verge of Entrance Rd abutting the site. This line will be relocated underground as part of the development.

A high voltage aerial pylon line is located along the north verge of Entrance Rd.

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.

### **Water Supply**

At present there is no Water Corporation reticulation water main serving the site. The neighbouring development is proposing to extend a 150mm diameter reticulation water main along the south verge of Entrance Road, and this will be extended and constructed across the site frontage by this development.

Internal reticulation mains will be extended through the development off this main to the approval of the Water Corporation. The 150mm main in Entrance Rd can be constructed past the Sewer pressure main valve pit located on the southern verge of Entrance Rd.

### **Sewer**

The site is not currently connected to sewer.

The sewer will be extended to the site from a proposed sewer to be constructed in Santorini Boulevard immediately east and abutting the site. This sewer will be brought to the site boundary during the construction of that development.

Internally the sewer will be extended to the western boundary.

A 450mm sewer pressure main is located along the southern verge of Entrance Road, and includes a large valve manhole just west of the site, which straddles several service alignments from 2.5m to 4.5m.

Lot 1, the strata development (lots S1 – S3), and lots 2 & 3 will be connected via a sewer to be extended along the driveway to lot 3 within an easement, as the sewer cannot be constructed along Entrance Road due to the large Water Corporation valve pit to the oxygen Injection facility taking up all service corridors except that designated for the 150mm water main.

### **Telephone & NBN**

Telstra services exist in the area along Entrance Road. These are most likely to be able to be extended to service this proposed development. Some upgrading may be required. Telstra normally requires twelve months notice of development starting to ascertain any upgrading requirements.

In accordance with recent agreement with NBN Corp, and in line with neighbouring developments, this development will 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.

There is now a NBN Headworks charge of \$600 per lot.

#### **Gas**

Gas mains are installed in the area, and will be extended to this development from the neighbouring development.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

THIS REPORT IS DATED 8<sup>TH</sup> JULY 2015.

## APPENDIX 2

### PRE-LODGEMENT CONSULTATION

**TABLE 6. PRE-LODGEMENT CONSULTATION**

AGENCY	DATE OF CONSULTATION	METHOD OF CONSULTATION	SUMMARY OF OUTCOME
City of Cockburn	Circa 03/2015	Meetings/Telephone	Preparation of SP for Lots 1, 2 & 20 required prior to subdivision approval. SP should be similar to SP approved for Lots 21 & 22 Cross Road and the SP for Lots 14 – 18 Ocean Road, Coogee. The proposed road layout in the SCP (Plan 3) was generally supported 'in-principle'.
Western Power	Circa 06/2015	Email/telephone discussion	SP development area can be connected to reticulated power supply.
Water Corporation	Circa 06/2015	Email/telephone discussion	SP development area can be connected to reticulated water and sewer.