# APPENDIX K
# SERVICE INFRASTRUCTURE REPORT


# Lot 1507 Eighty Road, Baldivis Local Structure Plan

# Service Infrastructure Report

- Final 4
- May 2011

**SERLING CONSULTING (WA) PTY LTD**

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23 May, 2011

# Lot 1507 Eighty Road, Baldivis

# Local Structure Plan

# Service Infrastructure Report

- Final 4
- 20/05/2011

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# Contents

Document history and status

| Revision | Date issued | Reviewed by | Approved by | Date approved | Revision type |
|---|---|---|---|---|---|
| Rev 0 | 9.09.2010 | G Alexander | G Alexander | 9.09.2010 | |
| Rev 1 | 23.09.2010. | G Alexander | G Alexander | 23.09.2010 | |
| Final | 29.09.2010 | G Alexander | G Alexander | 29.09.2010 | |
| Final 2 | 25.01.2011 | W du Toit | W du Toit | 25.01.2011 | |
| Final 3 | 15.03.2011 | W du Toit | W du Toit | 23.03.2011 | |
| Final 4 | 20.05.2011 | W du Toit | W du Toit | 23.05.2011 | |
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## Distribution of copies

| Revision | Copy no | Quantity | Issued to |
|---|---|---|---|
| Rev 0 | (digital word) | 1 | TBB |
| Rev 1 | (digital word) | 1 | TBB |
| Final | (digital word) | 1 | TBB |
| Final 2 | (digital word) | 1 | Internal |
| Final 3 | 1 | 2 | TBB and Rockingham Park |
| Final 4 | 1 | 2 | TBB and Rockingham Park |
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|---|---|
| **Printed:** | 23 May 2011 |
| **Last saved:** | 23 May 2011 |
| **File name:** | Q:\Projects\SC00102.000 - Lot 1507 Eighty Road LSP\Reports\R01 Lot 1507 Eighty Road BaldivisService Report 110523.doc |
| **Author:** | Gil Alexander |
| **Project Manager:** | W du Toit |
| **Name of organisation:** | Rockingham Park Pty Ltd |
| **Name of project:** | Lot 15407 Eighty Road, Baldivis – Parkland Heights LSP |
| **Name of document:** | Infrastructure Servicing Report |
| **Document version:** | Final 4 |
| **Project number:** | SC00102.010 |

# 1. Introduction

## 1.1 General

The landholding is appropriately zoned for urban development under both the Metropolitan and District Planning Schemes and a local structure plan over the landholding is current. This LSP is being reviewed by Taylor Burrell Barnett with the view of updating the planning to meet current market demands while respecting existing approvals. The plan includes the future alignment of Nairn Drive,various internal roads, a primary school and village centre and portions of both active and passive open space. A Draft Local Structure Plan is included in **Appendix A – *Modified Local Structure Plan.***

An infestation of European Borer into the pine plantation that has occupied the land holding has necessitated the clearing of the entire pine plantation by the Forest Products Commission (FPC). The clearing and burning operation have been completed.

A DA approval for the bulk earthworks for the first stage of development on the landholding was granted by the council in order for the works to be completed prior to the commencement of the moratorium commencing 1 October 2010. These earthworks have been completed. Civil works for the Stage 1 area commenced in April 2011.

A very preliminary Staging plan has been included as **Appendix B – *Preliminary Staging Plan*.**

This infrastructure servicing report has been prepared by Serling Consulting (WA) Pty Ltd to support the new LSP and subsequent sub division planning processes.

## 1.2 Limitation of this Report

This report has been prepared for use by Rockingham Park Pty Ltd, Serling Consulting (WA) Pty Ltd and consultants commissioned for work on Lot 1507 Eighty Road, Baldivis. This is a preliminary servicing report with constraints on the availability of only indicative information, the scope, budget and time available for the services. The consulting service and this report have been completed with the degree of skill, care and diligence normally exercised by members of the engineering profession performing services of a similar nature. No other warranty, expressed or implied, is made as to the accuracy of the data and professional advice included in this report.

This report has not been prepared for use by parties other than Rockingham Park Pty Ltd and its consulting advisers. It may not contain sufficient information for the purposes of other parties or for other uses.

Serling Consulting (WA) Pty Ltd takes no responsibility for the completeness of any subsequent copies of this report.

# 2. Servicing

## 2.1 Road Access

The subject landholding has road frontages and hence direct access to Eighty Road to the west and to Sixty Eighty Road to the south. Direct road access is also available from a number of road reserves linking into "The Ridge" Estate along its northern boundary, inclusive of Nairn and Arpenteur Drives and to a number of minor roads linking into "Avalon" Estate along its eastern boundary.

The Nairn Drive MRS road reservation traverses the landholding linking the existing section of Nairn Drive to the north east of the landholding through to the future intersection of Sixty-Eight and Karnup Roads in the south west corner of the site.

Eighty Road is a rural standard road in good condition with chip seal, limestone shoulders and open side v-drains with stormwater drainage flowing into adjoining land holdings. As part of the conditions of subdivision Eighty Road will need to be upgraded to an urban standard road with kerbs, drainage swales or formalised piped drainage system, lighting and a Shared Path along the frontage of the landholding. It is proposed to progressively upgrade Eighty Road to match the staged development of the subject landholding.

Sixty Eight Road is a rural standard road in need of maintenance due to recent heavy traffic use by the development to the immediate east of the landholding. The LSP proposes limited access onto both Eighty and Sixty-Eight Roads.

Nairn Drive is proposed to be a 4 lane separated district collector road for the first section coming from the north and then a 2 lane separated road past the school all the way to Sixty Eight Road. It is anticipated that the council will require the developer to undertake the full earthworks within the Nairn Drive road reserve, and to construct one pavement/ 2 lanes through the development including drainage and lighting. The drainage will be integrated into the urban piped stormwater system. It is also understood that as part of this construction, Eighty Road will need to be re aligned to the north of Sixty-Eight Road to form a T-intersection with Nairn Drive. It is proposed to progressively construct Nairn Drive through the land holding to match the staged development of the landholding.

Internal roads are proposed to be a minimum of 6 metre wide, with a minimum road reserve width of 16 metres.

Due to existing topography, it is proposed that some of the east west orientated roads to the east of the landholding will have a maximum slope of 1V:10H to accommodate the current steep slope of the existing topography. A proposed concept earthworks plan underlies the plans included in **Appendix C.**

## 2.2 Stormwater Drainage

A preliminary AAMGL assessment undertaken by ENV indicates that the water table grade is very flat with an average level of RL2.0 and a west to east groundwater flow pattern.

A Local Water Management Strategy (LWMS) has been prepared by ENV for the land and is currently before the City and Department of Water for review.

The undulating topography and sandy geology provides an ideal environment for the adoption of water sensitive design principles focussing on infiltration. The drainage strategy proposed for the development incorporates progressive infiltration along the entire length of the storm water system through the use of trapped "leaky" bases, swales and below ground StormTech infiltration systems as appropriate. This holds back the timing of the peak flow, dissipates the nutrients and first flush in a water sensitive design approach, reduces the pipe sizes and reduces the quantity of storm water discharging into the infiltration basins.

Within the Nairn Drive road reserve, which is designed at approximately 1% grade, it is proposed to incorporate a below ground infiltration system (StormTech) with associated surface swales to accommodate the first flush storm. These swales and below ground infiltration system are then linked into the swales and a StormTech sub soil infiltration system located within the east west orientated linear POS areas that finally discharge into appropriately located infiltration basins.

The infiltration basins are proposed to have a maximum side slope of 1V:6H, with water depths of between 600mm and 900mm for the 10 year and 100 year storm events respectively.

Alternatively drainage within the Nairn Drive road reserve can be infiltrated progressively through sunken basins located within the median strips.

Open drainage infiltration basins have been strategically located in the POS areas that cater for the total of ten (10) sub catchments within the development. Preliminary modelling indicates that all the infiltration basins within the landholding require no more than 25% of

the area of the POS for the 10 year storm event, and the overall system is capable of handling the 100 year storm event without flooding the developed lots. Refer to **Appendix C – *Drainage Catchment Plans*** for details on the typical drainage system showing the sub catchment boundaries, the location of the swales, below ground infiltration system and location and size of the infiltration basis required for the 1 in 1yr, 1 in 5yr, 1 in 10yr and 1 in 100yr storm events.

## 2.3 Landform and Siteworks

The subject area is on the western portion of the Swan Coastal Plain and comprises undulating landforms containing valleys and ridges. There are two main ridges running roughly north south through the landholding with high point levels at RL19 and RL33m AHD. Levels vary from RL 3.9 in the north western corner to RL10.2 in the south western corner fronting Eighty Road, with levels varying from RL27 in the north eastern corner to RL25 in the south eastern corner along the eastern boundary.

In order to bring the land below the 30m contour line (above which reticulated water cannot be supplied) and shape the landholding to facilitate residential development, some 2M $m^3$ of excess cut will be removed from the site. Agreement has been reached between the owners along the eastern boundary of the landholding to lower existing levels in the order of up to 6m to better suit the developments proposed on these landholdings and to achieve a workable interface between the developments. This reduction of level on the eastern boundary assists in reducing the maximum grade of 1V:10H that has been adopted to achieve a maximum retaining wall height of 2m on the side boundaries of the north south oriented lots that front the proposed east west roads to the east of the landholding. (Refer to ***Appendix A- Modified Structure Plan***).

A geotechnical report undertaken by SKM in October 2009 concluded that the material was generally sand with a moderate to good drainage coefficient that would be suitable for a residential development and would achieve a site classification of Class A. Refer to ***SKM Geotechnical Report Oct 2009, available on request.***

Other than along a section of Eighty Road where the water table was within 2 m of the surface, the balance of the site has the water table varying up to 30 m from the surface.

The initial Stages of the development along the Eighty Road frontage will achieve a balanced cut to fill earthworks on the site. It is proposed to progressively export the excess 2M m3 of cut that is to be generated over the likely 10 year life of the project in advance of the staged development.

## 2.4 Acid Sulphate Soils

An ASS investigation undertaken on the site by ENV suggests that there is a potential for ASS soils in the immediate vicinity of Eighty Road for excavation beyond 3 m deep. The

establishment of a pump station approximately mid-way along Eighty Road and 500 metres of sewer extending northwards along Eighty Road have potential to disturb ASS and the groundwater. Maximum depth of excavations will be to approximately 6m below ground level and dewatering would be locally required. Sewer development further to the east within the higher terrain will not intersect the water table and is therefore unlikely to disturb ASS.

Allowance will need to be made for lime treatment of sewer trenches and the Waste Water Pumping Station (WWPS) excavations in the risk zone in accordance with current ASS policy. Dewatering discharge is also likely to require lime treatment especially for the WWPS excavations. The balance of the landholding is not expected to require treatment. Once service design is sufficiently advanced, additional soil and groundwater testing will be carried out and incorporated into an ASS and Dewatering Management Plan (ASSDMP), which will direct works for the best soil, groundwater and dewatering management practices.

## 2.5 Sewerage

Water Corporation waste water planning shows 2 Waste Water Pumping Stations (WWPS) and Pressure Mains (PMs) located within the landholding, being Baldivis South WWPS "K" and Baldivis South WWPS "N". Refer to **Appendix D – *Water Corporation Waste Water Planning***. Although previous planning showed Baldivis South WWPS "N" to the south of the landholding, the final catchmemt plans for the area will confirm the final positions and it is a conservative assumption to allow for both inside the landholding.

Initial stages of the estate are currently being constructed in the northwest corner of the landholding fronting Eighty Road. Servicing of these stages is reliant upon construction of Baldivis South WWPS "K" as the Water Corporation do not support tankering. Negotiations over the construction of a WWPS Type 40 permanent station have commenced with Water Corporation with the proposed site being on the eastern side of Eighty Road within a future POS area.

There were a number of design options considered for the pressure main with the outcome of the options evaluation submitted to Water Corporation listed below.

Initially sewerage discharge will be into an existing pressure main located next to Nairn Drive in "The Ridge" Estate. For this option, sewer will be pumped from the proposed pumping station through a 1,360m pressure main to an existing Water Corporation

pressure main in the Nairn Drive area. The pumping system will have to be synchronised with the Cottonwood Drive temporary pumping station.

Once capacity is reached at the discharge point (expected after 3-5 years of development), this pressure main has to be extended to a discharge point more than 2,150m from the pumping station into an existing DN300 gravity main. This discharge point will be in use for several years of further development, as the ultimate pressure main option will only be completed and used following further Water Corporation headworks.

The proposed ultimate discharge arrangement is located around 300m east of the intersection of Smirk Road & Sixty Eight Road where it is to discharge into a DN450 gravity sewer reticulation. The Wastewater Pumping Station required in this area and DN450 gravity main is not currently available nor a timeframe as to when it is expected to become available.

The WWPS is a capital works item for the Water Corporation, and as such the costs are funded by the developer and reimbursed by the Water Corporation according to a formula based on the number of lots titled compared to the number of lots calculated by the Water Corporation to justify the capital works expenditure. The agreement is formalised through a Customer Constructed Works Agreement (CCWA). Only permanent infrastructure falls within the CCWA as being reimbursable by the Water Corporation to the Developer.

It is expected that the initial pressure main constructions will not be capital works items, as it is seen as temporary works.

The gravity sewer along Eighty Road is to be a deep sewer up to 6m deep. There are numerous services along Eighty Road including a high pressure gas main, 375 water distribution main, private waste water pressure main, Telstra optic fibre cables and 132kV overhead power cables. Given these constraints as well as the existing tree line, open trenching along the majority of the gravity sewer to the pump station is not possible and boring is the most appropriate method for laying the sewer.

Land development to the east of Nairn Drive (expected to commence about 2020), will result in the requirement to construct the second Baldivis South WWPS “N”, located in the southern part of the development, in the Sixty-Eight Road area. Allowance has been made for this WWPS to be located in a proposed POS area just off Sixty-Eight Road, but no detail work has been completed for this pumping station, so the location has not been confirmed. It may well be outside the boundaries of Lot 1507.

## 2.6 Water Supply

The landholding falls within the Tamworth tank water reticulation area. Water supply to the eastern part of the landholding is currently limited until the existing DN500 water distribution main in Nairn Drive has been extended south to the existing DN250 reticulation main at The Ridge Boulevard. This work is currently underway. The DN500 water main is proposed to be progressively extended southwards along Nairn Drive as a DN400 water main as a Water Corporation prefunded capital works item as the development front moves southwards along Nairn Drive.

There is an existing DN375 water main located on the eastern side of Eighty Road that will need to be extended southwards as a Water Corporation prefunded capital works item along the front of the landholding to service the southwest of the landholding. The northwest of the landholding is to be serviced by the DN200 water main in Arpenteur Drive. The distribution mains in Nairn Drive and Eighty Road will be linked by reticulation sized mains through the development road network as the development front develops. (Refer **Appendix F – *Water Master Plan***)

The Water Corporation has notified that land above the 30 metre contour is unable to be supplied by the Corporation and local boosting of water supply may be required. As per **Appendix A- *Modified Local Structure Plan***, none of the landholding will fall above the RL30 contour.

## 2.7 WestNet Gas

The landholding is in close proximity to current WestNet gas infrastructure located within Eighty Road. Existing gas headworks should have sufficient capacity to supply to the development.

Gas is not an essential service, and as such will not be required as part of the WAPC conditions of subdivision. It is recommended however, that gas be provided so that the development can be marketed as "fully serviced", and to match the level of services provided by other developments within the Baldivis area.

The cost of the internal reticulation to the lots is presently funded by WestNet Energy (primarily since it is not an essential service), and is installed by the civil contractor, under an agreement with WA Gas Network, at the same time as the other services are installed.

## 2.8 Underground Power

Western Power has a 132 kV high voltage aerial feeder line located within the landholding along the Eighty Road frontage. This aerial feeder line requires an 18m wide easement which precludes construction of buildings. The developer has identified this as a constraint to planning of the estate and proposes to retain the aerial service. The development will incorporate HV and LV underground power throughout by connection to the existing aerial service.

It is likely that the initial stage would satisfy the Western Power economic test of the Western Power HV pool. Provided that the development progresses in an organised frontal pattern, with ample notification to the service authority it is likely to fall within the standard sub divisional requirements, and as such would attract the normal system charge and receive High Voltage Credits. (Refer **Appendix E – *Power Master Plan)***.

## 2.9 Telecommunications

There is existing Telstra infrastructure located immediately to the east of the HV aerial power lines within the landholding along the Eighty Road frontage. With the impending rollout of the national broadband service, there will no longer be a copper to node service installed. The developer will need to arrange for an NBNCo approved pit and pipe system design. This would be under the normal arrangements for a residential development whereby the developer pays for the pit and pipe and NBN Co. provides the cables and the additional infrastructure at their cost.

The external NBNCo connection will most likely be using the existing Telstra infrastructure in the Eighty Road reserve.

## 2.10 Scheme Costs

The subject landholding does not fall within the boundaries of an area that attracts scheme costs.

# Appendix A Modified Local Structure Plan


# Local Structure Plan

LOT 1507, BALDIVIS

A ROCKINGHAM PARK PTY LTD PROJECT

DRAFT

plan: 00/075/021E
date: 20/04/2011
projection: PCG 94
designed: DR
checked: BDM
drawn: BR
scale: 1:5000@A3 | 1:2000@A0
0 50 100m

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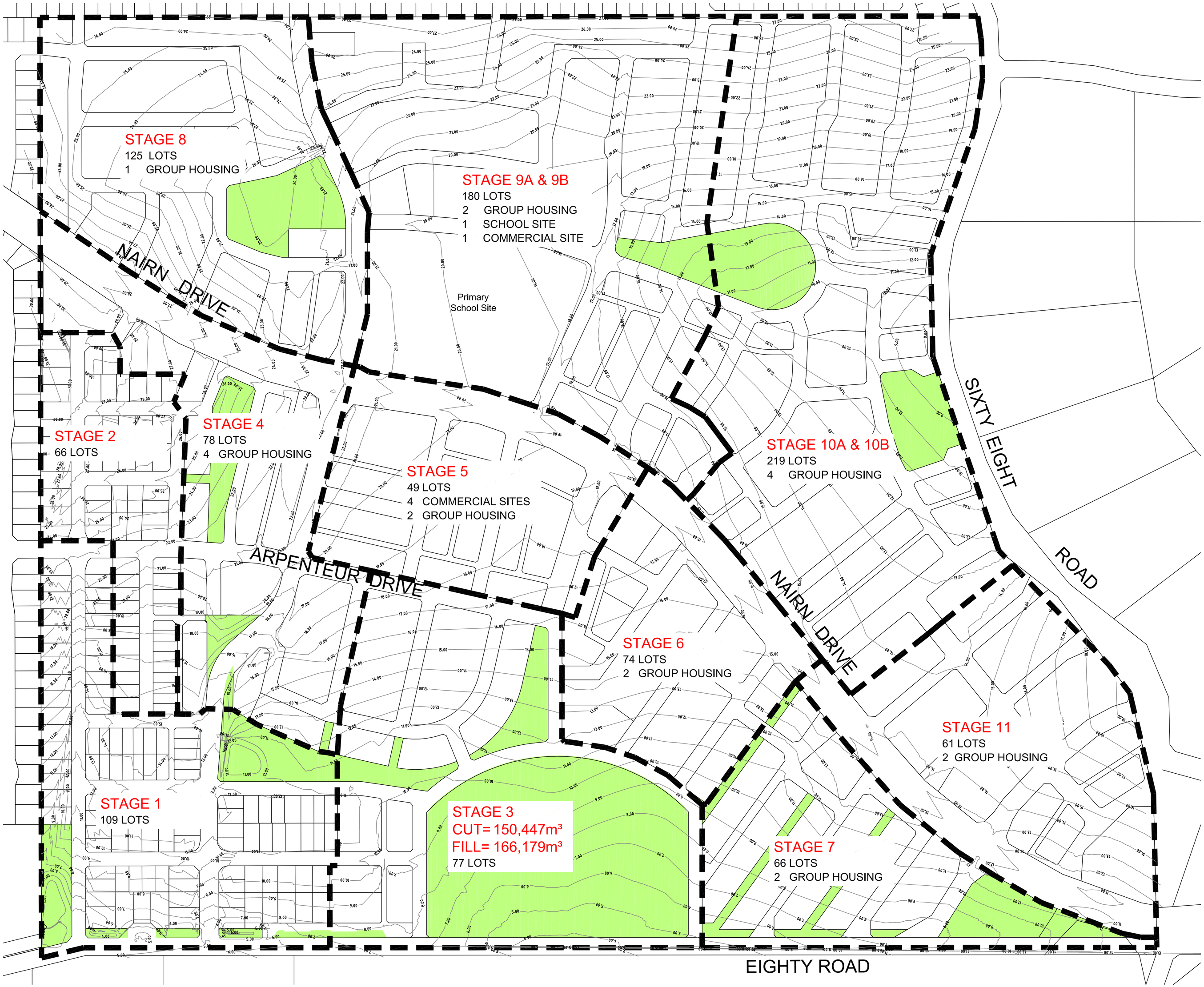
# Appendix B Preliminary Staging Plan




## NOTES

1. DRAWING FOR INFORMATION ONLY. FOR DETAILED DESIGN INFORMATION REFER TO STAGE SPECIFIC DRAWINGS AND SPECIFICATION.

## LEGEND

- PRELIMINARY DESIGN FINISHED SURFACE CONTOUR (1.0m INTERVAL)
- PROPOSED STAGING BOUNDARY

**PRELIMINARY AND UNCHECKED**

**CHECK PRINT Apr 20, 2011**

- ☐ DRAFTING CHECK
- ☐ DESIGN CHECK
- ☐ CLIENT REVIEW
- ☐ APPROVED BY ENGINEER

| REV No. | DATE | DRAFTING CHECK | DESIGN REVIEW | REV'D P.ENG. | APP'D P.MGR | AMENDMENT |
|---|---|---|---|---|---|---|
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| | | | |
|---|---|---|---|
| CLIENT: ROCKINGHAM PARK | | | |
| PROJECT: LOT 1507 - BALDIVIS - PARKLAND HEIGHTS | | | |
| DRAFTER: R.DE JONG | DRAFTING CHECK | REVIEWED PROJECT MANAGER | APPROVED PROJECT DIRECTOR |
| DESIGNED: R.DE JONG | DESIGN REVIEW | | |

TITLE: PRELIMINARY OVERALL STAGING PLAN

| SHEET | DATUM | WAPC No. | PROJECT No. | DRAWING No. | REVISION |
|---|---|---|---|---|---|
| A1 | A.H.D. | SCALE 1:1000 | SC00102.010 | SK060 | A |

'*' INDICATES A COPY OF AN ORIGINAL SIGNED DRAWING

# Appendix C Drainage Catchment Plans

- Figure 1 Drainage Catchment Plan 1 in 1 year storm event
- Figure 2 Drainage Catchment Plan 1 in 5 year storm event
- Figure 3 Drainage Catchment Plan 1 in 10 year storm event
- Figure 4 Drainage Catchment Plan 1 in 100 year storm event


## DESIGN ASSUMPTIONS

1. WHERE SUBDIVISION LAYOUT NOT AVALIABLE IMPERVIOUS AREA EQUALS 25% OF TOTAL CATCHMENT AREA.
2. INFILTRATION AREA IS ESTIMATED AT 25% OF ALL
   - POS
   - ROAD / MEDIAN AREA WITHIN CATCHMENT
   - BELOW GROUND INFILTRATION NETWORK AREA

## LEGEND

- GENERALISED DRAINAGE FLOW DIRECTION
- EXTENT OF SITE CATCHMENT BOUNDARY
- DRAINAGE SUB CATCHMENT BOUNDARY
- PROPOSED SURFACE CONTOUR
- 36 EXISTING SURFACE CONTOUR
- PROPOSED PUBLIC OPEN SPACE
- PROPOSED SWALES / BELOW GROUND INFILTRATION SYSTEM
- DENOTES DRAINAGE INFILTRATION BASIN. SHAPE TO BE DETERMINED AT DETAIL DESIGN
- DENOTES 1 in 1 STORM TWL
- DENOTES 1 in 5 STORM TWL
- DENOTES 1 in 10 STORM TWL
- DENOTES 1 in 100 STORM TWL

### AREAS AND STORAGE 1 IN 1 STORM

| SWALE | CATCHMENT | IMPERVIOUS AREA | INFILTRATION RATE | SWALE AREA | STORM VOLUME |
|---|---|---|---|---|---|
| 1 | 1.33 ha | 1.20 ha | 3.0m/DAY | 546m$^2$ | 70m$^3$ |
| 2 | 1.89 ha | 1.70 ha | 3.0m/DAY | 902m$^2$ | 110m$^3$ |
| 3 | 1.56 ha | 1.40 ha | 3.0m/DAY | 594m$^2$ | 110m$^3$ |
| 4 | 1.73 ha | 1.56 ha | 3.0m/DAY | 551m$^2$ | 100m$^3$ |
| 5 | 0.99 ha | 0.89 ha | 3.0m/DAY | 462m$^2$ | 50m$^3$ |

| BASIN | CATCHMENT AREA | IMPERVIOUS AREA | INFILTRATION RATE | BASIN AREA | STORM VOLUME |
|---|---|---|---|---|---|
| B1 | 3.77 ha | 3.39 ha | 3.0m/DAY | 1878m$^2$ | 300m$^3$ |
| B2 | 6.32 ha | 5.69 ha | 3.0m/DAY | 2654m$^2$ | 470m$^3$ |
| B3 | 5.09 ha | 4.58 ha | 3.0m/DAY | 1508m$^2$ | 560m$^3$ |
| B4 | 2.06 ha | 1.85 ha | 3.0m/DAY | 1043m$^2$ | 170m$^3$ |
| B5 | 3.03 ha | 2.73 ha | 3.0m/DAY | 1816m$^2$ | 180m$^3$ |
| B6 | 1.27 ha | 1.14 ha | 3.0m/DAY | 1732m$^2$ | 10m$^3$ |
| B7 | 1.89 ha | 1.70 ha | 3.0m/DAY | 798m$^2$ | 140m$^3$ |
| B8 | 1.10 ha | 0.99 ha | 3.0m/DAY | 750m$^2$ | 60m$^3$ |
| B9 | 3.43 ha | 3.09 ha | 3.0m/DAY | 1924m$^2$ | 260m$^3$ |
| B10 | 2.12 ha | 1.91 ha | 3.0m/DAY | 814m$^2$ | 200m$^3$ |

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0 25 50 75 100 125 150 metres

SCALE 1 : 2 500 (A3)
DATUM: AHD

09.078

PARKLAND HEIGHTS
LOT 1507 EIGHTY ROAD, BALDIVIS
URBAN WATER MANAGEMENT PLAN

# DRAINAGE CATCHMENT PLAN - 1 IN 1YR STORM EVENT

FIGURE 1

env Australia


## DESIGN ASSUMPTIONS

1. WHERE SUBDIVISION LAYOUT NOT AVALIABLE IMPERVIOUS AREA EQUALS 25% OF TOTAL CATCHMENT AREA.

2. INFILTRATION AREA IS ESTIMATED AT 25% OF ALL
   - POS
   - ROAD / MEDIAN AREA WITHIN CATCHMENT
   - BELOW GROUND INFILTRATION NETWORK AREA

## LEGEND

- GENERALISED DRAINAGE FLOW DIRECTION
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- DRAINAGE SUB CATCHMENT BOUNDARY
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- PROPOSED PUBLIC OPEN SPACE
- PROPOSED BELOW GROUND INFILTRATION STORAGE
- DENOTES DRAINAGE INFILTRATION BASIN. SHAPE TO BE DETERMINED AT DETAIL DESIGN
- DENOTES 1 in 1 STORM TWL
- DENOTES 1 in 5 STORM TWL
- DENOTES 1 in 10 STORM TWL
- DENOTES 1 in 100 STORM TWL

### AREAS AND STORAGE 1 IN 5 STORM

| SWALE | CATCHMENT | IMPERVIOUS AREA | INFILTRATION RATE | SWALE AREA | STORM VOLUME |
|---|---|---|---|---|---|
| 1 | 1.33 ha | 1.20 ha | 3.0m/DAY | 691m$^2$ | 120m$^3$ |
| 2 | 1.89 ha | 1.70 ha | 3.0m/DAY | 1232m$^2$ | 190m$^3$ |
| 3 | 1.56 ha | 1.40 ha | 3.0m/DAY | 836m$^2$ | 180m$^3$ |
| 4 | 1.73 ha | 1.56 ha | 3.0m/DAY | 755m$^2$ | 180m$^3$ |
| 5 | 0.99 ha | 0.89 ha | 3.0m/DAY | 573m$^2$ | 80m$^3$ |

| BASIN | CATCHMENT AREA | IMPERVIOUS AREA | INFILTRATION RATE | BASIN AREA | STORM VOLUME |
|---|---|---|---|---|---|
| B1 | 3.77 ha | 3.39 ha | 3.0m/DAY | 2085m$^2$ | 740m$^3$ |
| B2 | 6.32 ha | 5.69 ha | 3.0m/DAY | 2893m$^2$ | 1070m$^3$ |
| B3 | 5.09 ha | 4.58 ha | 3.0m/DAY | 1755m$^2$ | 1050m$^3$ |
| B4 | 2.06 ha | 1.85 ha | 3.0m/DAY | 1206m$^2$ | 430m$^3$ |
| B5 | 3.03 ha | 2.73 ha | 3.0m/DAY | 1975m$^2$ | 520m$^3$ |
| B6 | 1.27 ha | 1.14 ha | 3.0m/DAY | 1795m$^2$ | 140m$^3$ |
| B7 | 1.89 ha | 1.70 ha | 3.0m/DAY | 878m$^2$ | 270m$^3$ |
| B8 | 1.10 ha | 0.99 ha | 3.0m/DAY | 810m$^2$ | 130m$^3$ |
| B9 | 3.43 ha | 3.09 ha | 3.0m/DAY | 2112m$^2$ | 650m$^3$ |
| B10 | 2.12 ha | 1.91 ha | 3.0m/DAY | 961m$^2$ | 400m$^3$ |

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0 25 50 75 100 125 150 metres

SCALE 1 : 2 500 (A3)
DATUM: AHD

PARKLAND HEIGHTS
LOT 1507 EIGHTY ROAD, BALDIVIS
URBAN WATER MANAGEMENT PLAN

# DRAINAGE CATCHMENT PLAN - 1 IN 5YR STORM EVENT

FIGURE 2

env Australia


## DESIGN ASSUMPTIONS

1. WHERE SUBDIVISION LAYOUT NOT AVALIABLE IMPERVIOUS AREA EQUALS 25% OF TOTAL CATCHMENT AREA.

2. INFILTRATION AREA IS ESTIMATED AT 25% OF ALL
   - POS
   - ROAD / MEDIAN AREA WITHIN CATCHMENT
   - BELOW GROUND INFILTRATION NETWORK AREA

## LEGEND

- GENERALISED DRAINAGE FLOW DIRECTION
- EXTENT OF SITE CATCHMENT BOUNDARY
- DRAINAGE SUB CATCHMENT BOUNDARY
- PROPOSED SURFACE CONTOUR
- 36 EXISTING SURFACE CONTOUR
- PROPOSED PUBLIC OPEN SPACE
- PROPOSED BELOW GROUND INFILTRATION STORAGE
- DENOTES DRAINAGE INFILTRATION BASIN. SHAPE TO BE DETERMINED AT DETAIL DESIGN
- DENOTES 1 in 1 STORM TWL
- DENOTES 1 in 5 STORM TWL
- DENOTES 1 in 10 STORM TWL
- DENOTES 1 in 100 STORM TWL

### AREAS AND STORAGE 1 IN 10 STORM

| SWALE | CATCHMENT | IMPERVIOUS AREA | INFILTRATION RATE | SWALE AREA | STORM VOLUME |
|---|---|---|---|---|---|
| 1 | 1.33 ha | 1.20 ha | 3.0m/DAY | 737m$^2$ | 130m$^3$ |
| 2 | 1.89 ha | 1.70 ha | 3.0m/DAY | 1335m$^2$ | 220m$^3$ |
| 3 | 1.56 ha | 1.40 ha | 3.0m/DAY | 908m$^2$ | 200m$^3$ |
| 4 | 1.73 ha | 1.56 ha | 3.0m/DAY | 819m$^2$ | 210m$^3$ |
| 5 | 0.99 ha | 0.89 ha | 3.0m/DAY | 607m$^2$ | 90m$^3$ |

| BASIN | CATCHMENT AREA | IMPERVIOUS AREA | INFILTRATION RATE | BASIN AREA | STORM VOLUME |
|---|---|---|---|---|---|
| B1 | 3.77 ha | 3.39 ha | 3.0m/DAY | 2159m$^2$ | 910m$^3$ |
| B2 | 6.32 ha | 5.69 ha | 3.0m/DAY | 2977m$^2$ | 1290m$^3$ |
| B3 | 5.09 ha | 4.58 ha | 3.0m/DAY | 1839m$^2$ | 1230m$^3$ |
| B4 | 2.06 ha | 1.85 ha | 3.0m/DAY | 1265m$^2$ | 530m$^3$ |
| B5 | 3.03 ha | 2.73 ha | 3.0m/DAY | 2034m$^2$ | 660m$^3$ |
| B6 | 1.27 ha | 1.14 ha | 3.0m/DAY | 1840m$^2$ | 230m$^3$ |
| B7 | 1.89 ha | 1.70 ha | 3.0m/DAY | 902m$^2$ | 320m$^3$ |
| B8 | 1.10 ha | 0.99 ha | 3.0m/DAY | 836m$^2$ | 170m$^3$ |
| B9 | 3.43 ha | 3.09 ha | 3.0m/DAY | 2180m$^2$ | 790m$^3$ |
| B10 | 2.12 ha | 1.91 ha | 3.0m/DAY | 1012m$^2$ | 480m$^3$ |

PRELIMINARY AND UNCHECKED

**CHECK PRINT Feb 28, 2011**

- ☐ DRAFTING CHECK
- ☐ DESIGN CHECK
- ☐ CLIENT REVIEW
- ☐ APPROVED BY ENGINEER

SERLING CONSULTING
INNOVATIVE ENGINEERING SOLUTIONS

Serling Consulting (WA) Pty Ltd
ACN: 136 628 058
UNIT 210/396 SCARBOROUGH BEACH ROAD
OSBORNE PARK WA 6017
Telephone (08) 9202 8740
Facsimile (08) 9202 8749


0 25 50 75 100 125 150 metres

SCALE 1 : 2 500 (A3)
DATUM: AHD

09.078

PARKLAND HEIGHTS
LOT 1507 EIGHTY ROAD, BALDIVIS
URBAN WATER MANAGEMENT PLAN

# DRAINAGE CATCHMENT PLAN - 1 IN 10YR STORM EVENT

FIGURE 3

env Australia


## DESIGN ASSUMPTIONS

1. WHERE SUBDIVISION LAYOUT NOT AVALIABLE IMPERVIOUS AREA EQUALS 25% OF TOTAL CATCHMENT AREA.

2. INFILTRATION AREA IS ESTIMATED AT 25% OF ALL
   - POS
   - ROAD / MEDIAN AREA WITHIN CATCHMENT
   - BELOW GROUND INFILTRATION NETWORK AREA

## LEGEND

- GENERALISED DRAINAGE FLOW DIRECTION
- EXTENT OF SITE CATCHMENT BOUNDARY
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- 36 EXISTING SURFACE CONTOUR
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- DENOTES DRAINAGE INFILTRATION BASIN. SHAPE TO BE DETERMINED AT DETAIL DESIGN
- DENOTES 1 in 1 STORM TWL
- DENOTES 1 in 5 STORM TWL
- DENOTES 1 in 10 STORM TWL
- DENOTES 1 in 100 STORM TWL

### AREAS AND STORAGE 1 IN 100 STORM

| SWALE | CATCHMENT | IMPERVIOUS AREA | INFILTRATION RATE | SWALE AREA | STORM VOLUME |
|---|---|---|---|---|---|
| 1 | 1.33 ha | 1.20 ha | 3.0m/DAY | 879m$^2$ | 180m$^3$ |
| 2 | 1.89 ha | 1.70 ha | 3.0m/DAY | 1678m$^2$ | 310m$^3$ |
| 3 | 1.56 ha | 1.40 ha | 3.0m/DAY | 1134m$^2$ | 270m$^3$ |
| 4 | 1.73 ha | 1.56 ha | 3.0m/DAY | 1020m$^2$ | 300m$^3$ |
| 5 | 0.99 ha | 0.89 ha | 3.0m/DAY | 711m$^2$ | 130m$^3$ |

| BASIN | CATCHMENT AREA | IMPERVIOUS AREA | INFILTRATION RATE | BASIN AREA | STORM VOLUME |
|---|---|---|---|---|---|
| B1 | 3.77 ha | 3.39 ha | 3.0m/DAY | 2495m$^2$ | 1700m$^3$ |
| B2 | 6.32 ha | 5.69 ha | 3.0m/DAY | 3365m$^2$ | 2350m$^3$ |
| B3 | 5.09 ha | 4.58 ha | 3.0m/DAY | 2227m$^2$ | 2100m$^3$ |
| B4 | 2.06 ha | 1.85 ha | 3.0m/DAY | 1546m$^2$ | 1050m$^3$ |
| B5 | 3.03 ha | 2.73 ha | 3.0m/DAY | 2293m$^2$ | 1290m$^3$ |
| B6 | 1.27 ha | 1.14 ha | 3.0m/DAY | 2119m$^2$ | 860m$^3$ |
| B7 | 1.89 ha | 1.70 ha | 3.0m/DAY | 935m$^2$ | 380m$^3$ |
| B8 | 1.10 ha | 0.99 ha | 3.0m/DAY | 942m$^2$ | 310m$^3$ |
| B9 | 3.43 ha | 3.09 ha | 3.0m/DAY | 2501m$^2$ | 1480m$^3$ |
| B10 | 2.12 ha | 1.91 ha | 3.0m/DAY | 1245m$^2$ | 820m$^3$ |

PRELIMINARY AND UNCHECKED

**CHECK PRINT Feb 28, 2011**

- ☐ DRAFTING CHECK _____
- ☐ DESIGN CHECK _____
- ☐ CLIENT REVIEW _____
- ☐ APPROVED BY ENGINEER _____

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09.078

0 25 50 75 100 125 150 metres

SCALE 1 : 2 500 (A3)
DATUM: AHD

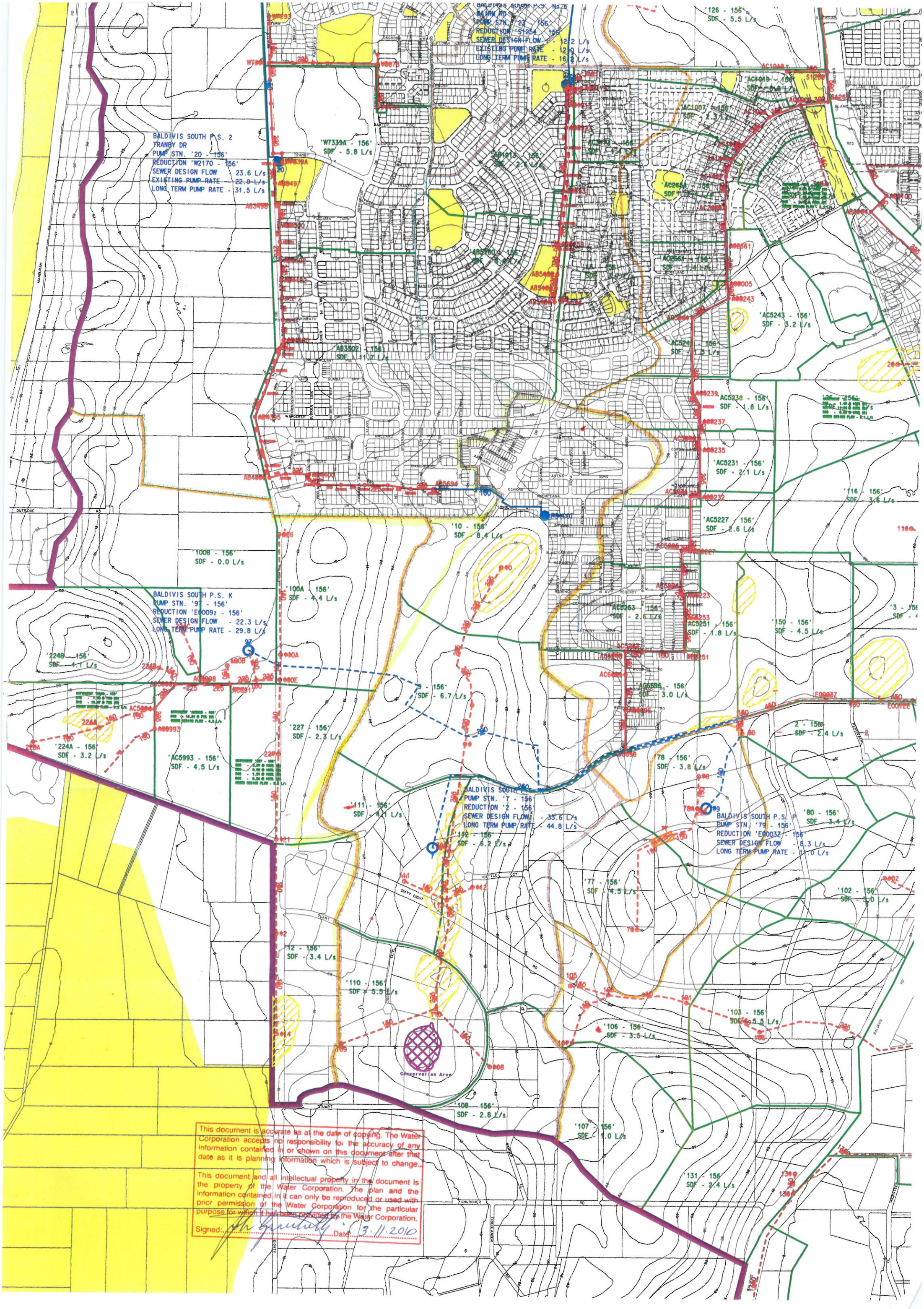
PARKLAND HEIGHTS
LOT 1507 EIGHTY ROAD, BALDIVIS
URBAN WATER MANAGEMENT PLAN

# DRAINAGE CATCHMENT PLAN - 1 IN 100YR STORM EVENT

FIGURE 4

env Australia

# Appendix D Water Corporation Waste Water Planning



# Appendix E Power Master Plan

# 3E CONSULTING ENGINEERS

Condor Tower
Suite 1, Level 2
22 St George's Tce
Perth WA 6000
PO Box 3184
Perth WA 6832
tel: 08 6314 9000
fax: 08 9325 3351
email: admin@3ece.com.au




LAT 00° 00' 00" S
LONG 000° 00' 00" E

| | | | |
|---|---|---|---|
| Scale | 1:2000 | @ A1 Original Paper Size | |
| Base File Date | - | Design Date | 14/03/2011 |
| Designed | BR | Drawn | BR |
| Checked | JS | Approved | DJ |
| Western Power Reference No. | - | WAPC No. | - |
| Local Authority | - | | |
| Civil Consultant | - | | |

# PARKLAND HEIGHTS
## ELECTRICAL RETICULATION LAYOUT
## HV CONCEPT

| Sheet | Of | 3E Drawing Number | Revision |
|---|---|---|---|
| 1 | 1 | 3E10239G-01 | 1 |

| REV | DESCRIPTION | DATE | DRAWN | CHKD | ISSUED |
|---|---|---|---|---|---|
| 1 | ISSUED TO CLIENT FOR COMMENT | 18-03-11 | BR | JS | RS |

ARROW DENOTES DIRECTION TO PEG WITH WHICH DUCTS ARE TO BE ALIGNED

DUCTS TO BE LAID TO WP SPECIFICATION AS OUTLINED IN UNDERGROUND DISTRIBUTION SCHEMES MANUAL - POLICY AND INSTALLATION OPTIONS

DENOTES PREVIOUSLY REQUESTED DUCTS

Dimensions and scales to be checked prior to measuring cable lengths

METRES

100 0 100 200

Preliminary

610 RESERVE & DRAINAGE
611 RESERVE
612 RESERVE
613 RESERVE
EIGHTY ROAD
1507

SCHEME BDY.
RETAINING WALL

CABLE
400mm2 HV
240mm2 HV
185mm2 HV
95mm2 HV
50mm2 HV
35mm2 HV
240mm2 LV
185mm2 LV
120mm2 LV
25mm2 LV
16mm2 SL
10mm2 SL
40 C PILOT

STREET LIGHTS EXISTING
CUSTOMER NUMBER__ __ SWITCH OFF__ __
42W CF
80W MV
125W MV
70w HPS
150w HPS
250w HPS
70/75w MH
150w MH
250w MH

AERIAL CONDUCTORS AND POLES
NEW POLE (ANY TYPE AS INDICATED)
EXISTING POLE (ANY TYPE AS INDICATED)
EXISTING AERIAL CONDUCTORS (SIZE AND TYPE AS INDICATED)

PILLARS
MINI - WORKING END
MINI
UNIVERSAL
LINK
100/200AMP CUTOUT

TRANSFORMERS
SWITCHGEAR

# Appendix F Water Master Plan


# Draft Local Structure Plan (for discussion purposes only)

LOT 1507, BALDIVIS

A ROCKINGHAM PARK PTY LTD PROJECT

Taylor Burrell Barnett Town Planning & Design
187 Roberts Road Subiaco Western Australia 6008
p: (08) 9382 2911 f: (08) 9382 4586 e: admin@tbbplanning.com.au

8/2/11