PRELIMINARY SERVICING STRATEGY

IN SUPPORT OF A PLANNING PROPOSAL

PROPOSAL TO AMEND THE ORANGE LOCAL ENVIRONMENTAL PLAN 2011 IN RESPECT OF LAND AT LEEDS PARADE, CLERGATE

PREPARED FOR:

ROSEDALE GARDENS ESTATE PTY LTD

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ABBREVIATIONS

ET	Equivalent Tenement
kg	Kilogram
kL	Kilolitre (1,000 litres)
L	Litre
L/s	Litres per second
ML	Megalitre (1,000 kL)
OCC	Orange City Council
PDD	Peak Day Demand
PID	Peak Instantaneous Demand
STP	Sewage Treatment Plant
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids

Introduction

1.1 BACKGROUND

Rosedale Gardens Estate Pty Ltd intends to develop a staged large lot residential subdivision on land consisting of the former Orange abattoir at the northern end of Leeds Parade, Orange.

In order to facilitate the subdivision an amendment to the Orange Local Environmental Plan 2011 is required to rezone the subject land from RU1 – Primary Production and IN1 – General Industrial to R5 – Large Lot Residential and E4 – Environmental Living.

The subject land is described in **Section 1.2** and has an overall area of approximately 290 hectares.

A master plan for the site has been developed generating approximately 450 lots with a minimum size of 4,000 square metres.

Staging is predicated on the development commencing at the Leeds Parade intersection (south) with each release to adequately respond to demand requirements, without over saturation.

This assessment is conducted on the development at completion; that is, water, sewerage and stormwater servicing for 450 lots.

1.2 SUBJECT SITE

The subject site is formed of:

- Lot 15 DP6694, 390 Clergate Road, Orange
- Lot 3 DP255983, 440 Clergate Road, Orange
- Lot 2 DP255983, 440 Clergate Road, Orange
- Lot 14 DP6694, 440 Clergate Road, Orange
- Lot 25 DP6694, 440 Clergate Road, Orange

The site is located approximately 5 kilometres north of Orange central business district (CBD) and 1.8 kilometres (3.5 kilometres by road) from the North Orange shopping centre. The site has an area of approximately 290 hectares and is bounded to the north by Pearce Lane, to the west by the Main Western Railway Line and to the south and east by private late. The southern portion of the site (Lot 15) is currently zoned IN1 – General Industrial with the remainder of the currently zoned RU1 – Primary Production.

The site is depicted in **Figure 1**.

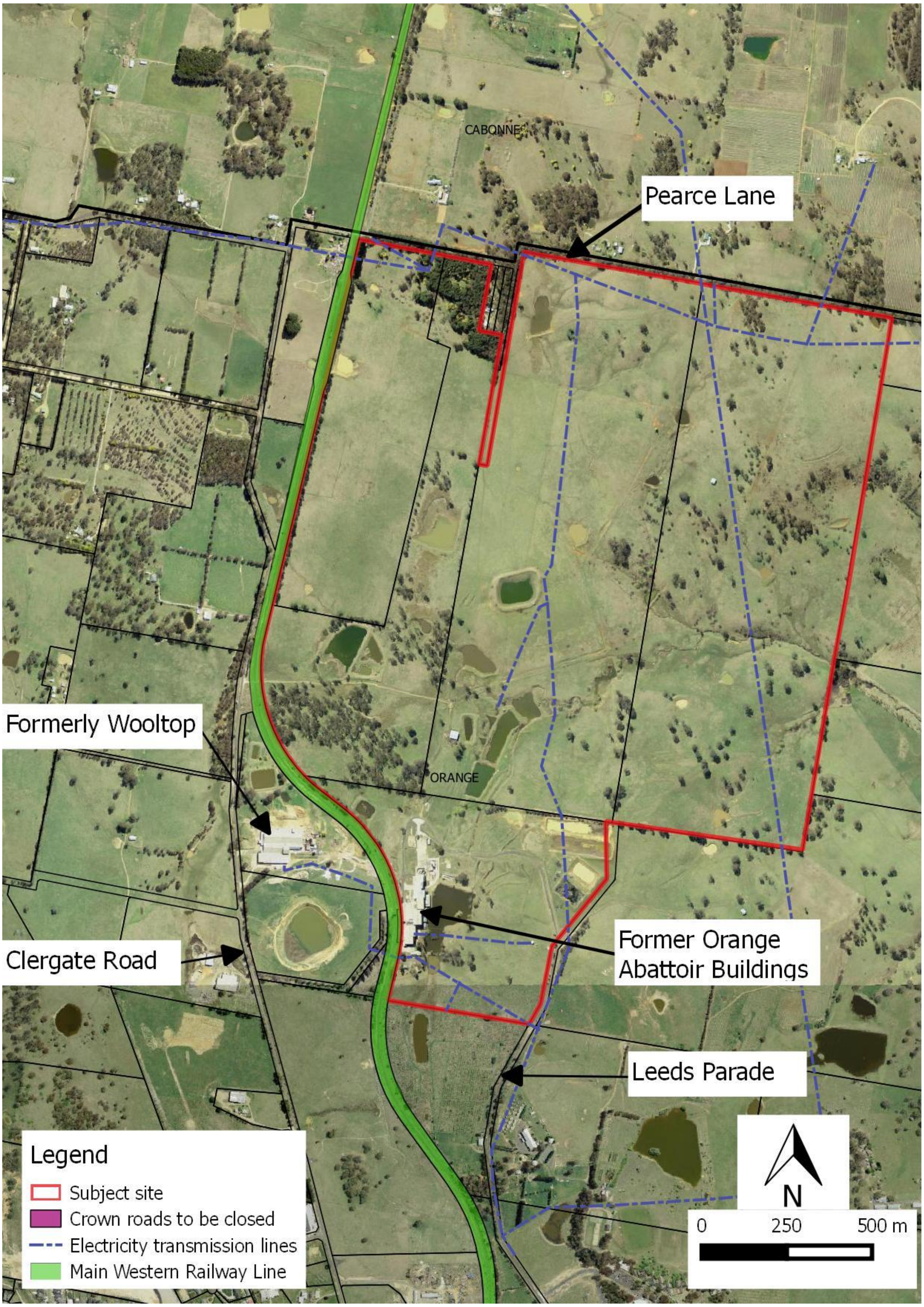

Figure 1: **The subject site (Source: Six Maps)**

1.3 PRELIMINARY SERVICING STRATEGY

This preliminary servicing strategy provides a high level assessment of water, sewerage and stormwater serving for the proposed development.

The details presented in this report are subject to change as the layout and design of the development proceeds.

Water

2.1 OBJECTIVES

The objectives for water servicing are to:

- provide water services that comply with Orange City Council's relevant Level of Service (LOS) targets; and
- make the development water neutral in terms of the annual demand on Orange's water supply.

2.2 BACKGROUND DATA

Orange City Council has completed a 30 year water and sewerage servicing strategy that identified at a strategic level how to service future development areas. The strategy was based on detailed modelling of the system. In terms of water, the strategy included areas covered by the proposed development as shown in **Figure 2**.

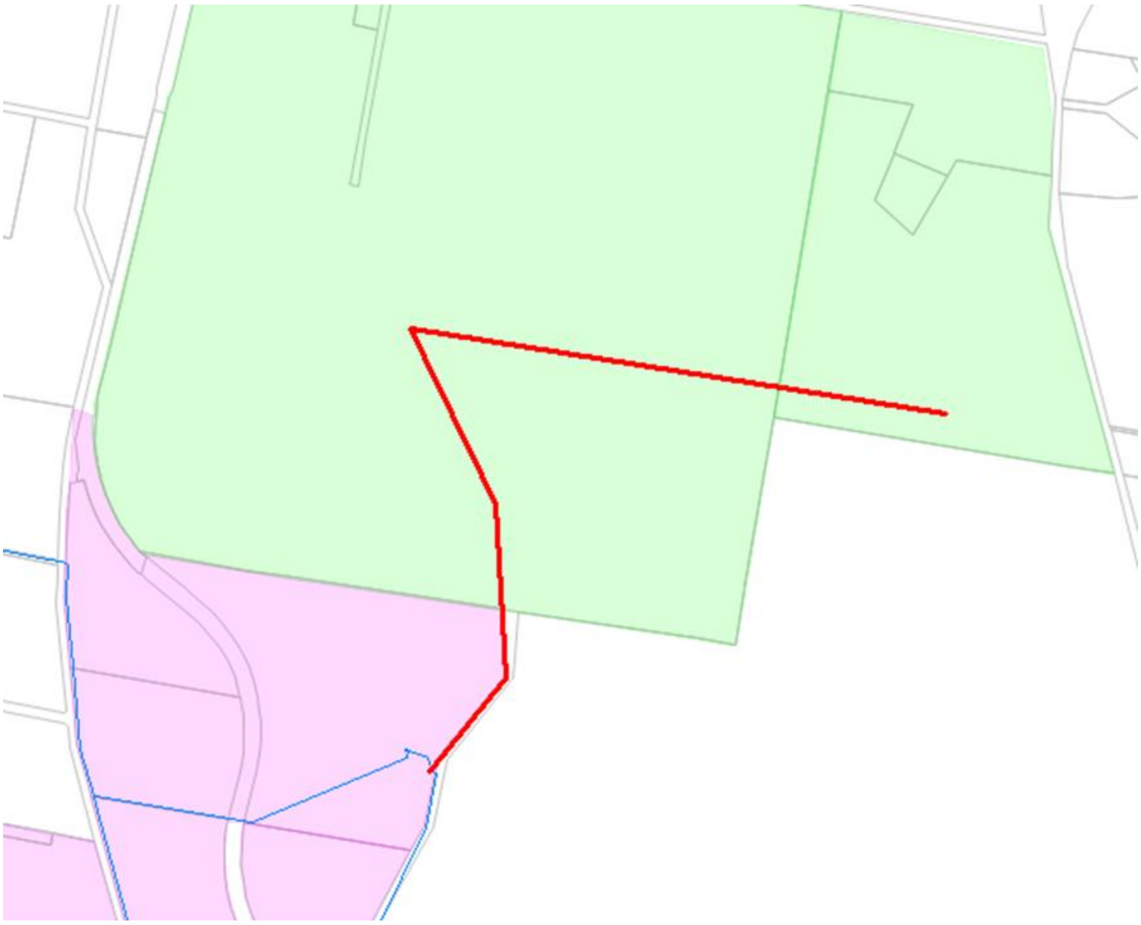

Figure 2: OCC strategic water servicing (courtesy of OCC)

Water supply for this area is delivered along a 200 mm main that follows Leeds Parade to just beyond the university entrance and then reduces to a 150 mm main through to the former abattoir site.

The OCC strategic water servicing strategy identified the potential for 505 Equivalent Tenements (ET) in the RU1 zone with 270 lots developed over 30 years. These ETs could be supplied from the existing 200/150 mm main in Leeds Parade via a 150 mm main which was arbitrarily located through the development area, with its final location being subject to further design and consideration of development patterns.

2.3 DESIGN CRITERIA

Water servicing for the development would meet the following key design criteria:

- Average supply 690 L/day/household
- PID 0.10 L/s/tenement
- PDD 1,700 L/day/tenement (single supply system)
- Pressure Minimum 20 m @ PID
- Maximum 60 m @ PID
- Firefighting Minimum residual pressure 12 m

These design values are consistent with those adopted for the 30 water and sewerage servicing strategy.

2.4 PRELIMINARY WATER SERVICING STRATEGY

The proposal would ultimately create approximately 450 ETs which would have the following water demand requirements:

- Average daily supply 310 kL/day; 113 ML/year
- PID 45 L/s
- PDD 765 kL

The PID could be supplied through the existing 200 mm main in Leeds Parade, with an upgrade to the 150 mm section along Leeds Parade to 200 mm. The upgrade of the 150 mm section would not be required in the short term with its timing dependent on lot uptake.

A conceptual water main layout is indicated in **Figure 3**. Subject to detailed design, the minimum size of the main servicing the proposal would be 200 mm reducing in size to 150/100 mm as peak flows reduce towards the extremities of the development.

2.5 WATER NEUTRAL DEVELOPMENT

The proposal would ultimately increase the average annual water demand by around 113 ML/year. There is an opportunity to make the development water neutral in terms of annual demand by incorporating stormwater harvesting. The concept would be to harvest a portion of the additional flow created by impervious surfaces and transfer this to OCC's existing stormwater harvesting holding pond which would add to the yield of this scheme. Initial estimates indicate at least 130 to 150 ML/year could be harvested which would make the proposal water neutral.

Further details are provided in **Section 4**.

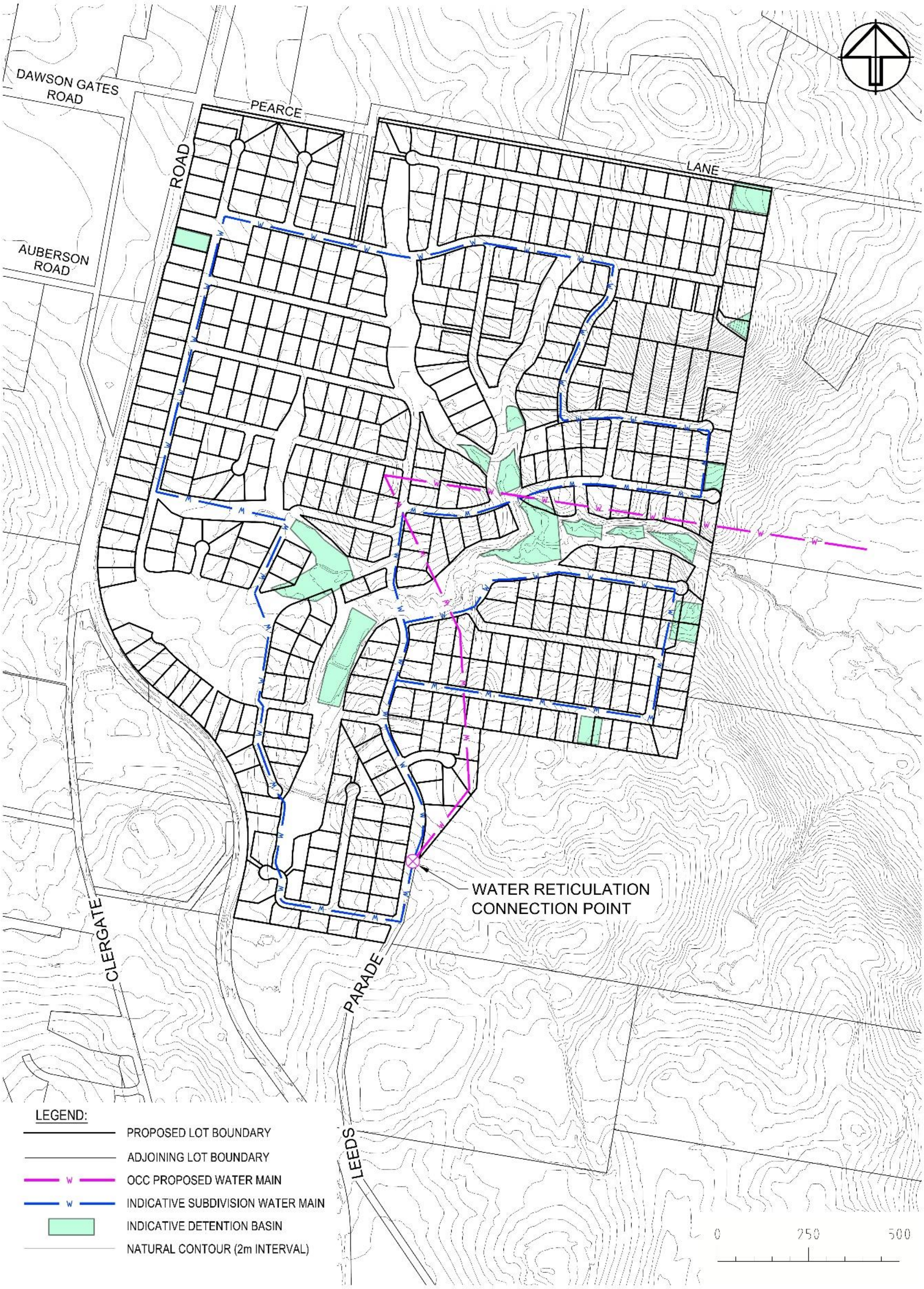

Figure 3: Conceptual water servicing

Sewerage

3.1 OBJECTIVES

The objective for sewerage servicing is to provide services that comply with Orange City Council's relevant Level of Service (LOS) targets.

3.2 BACKGROUND DATA

Orange City Council has completed a 30 year water and sewerage servicing strategy that identified at a strategic level how to service future development areas. The strategy was based on detailed modelling of the system. In terms of sewerage, the strategy included two areas covered by the proposed development as shown in **Figures 4** and **5**.

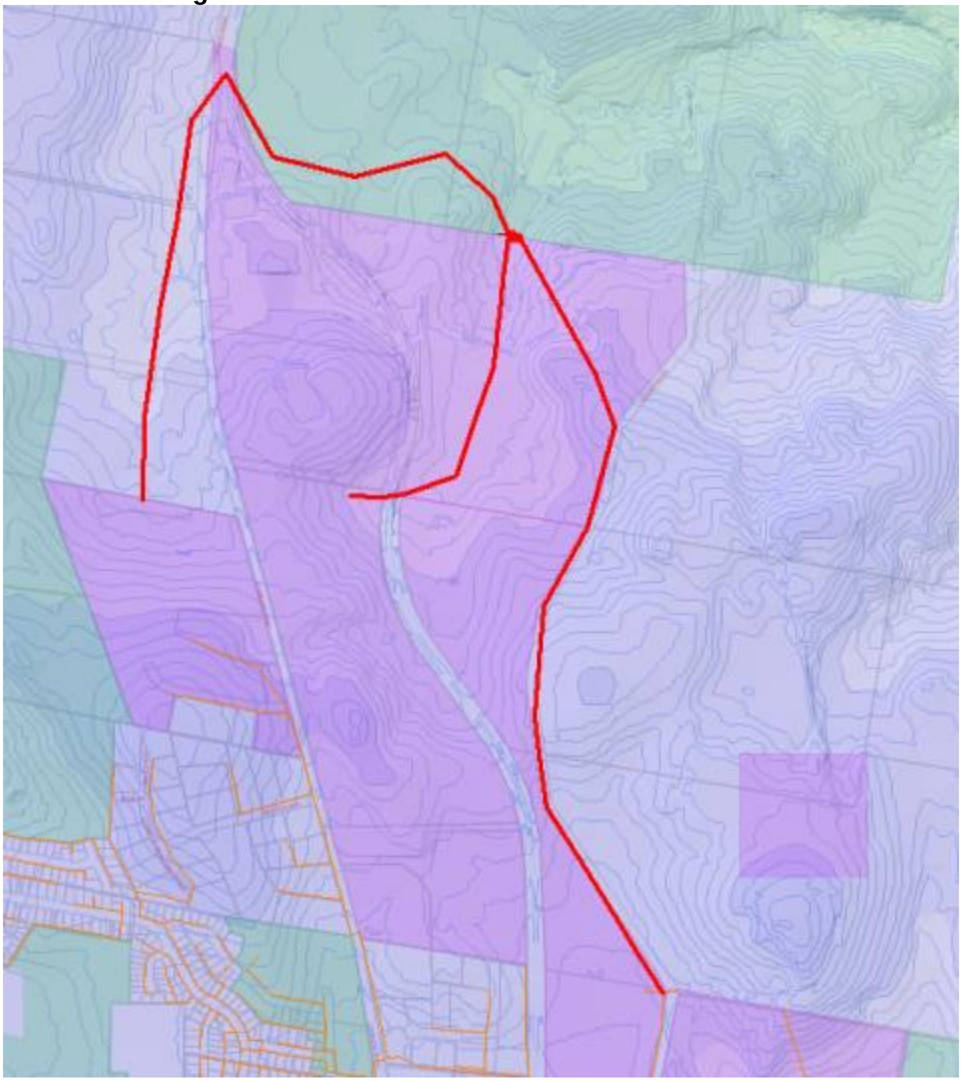

Figure 4: OCC strategic sewerage servicing – industrial area (courtesy of OCC)

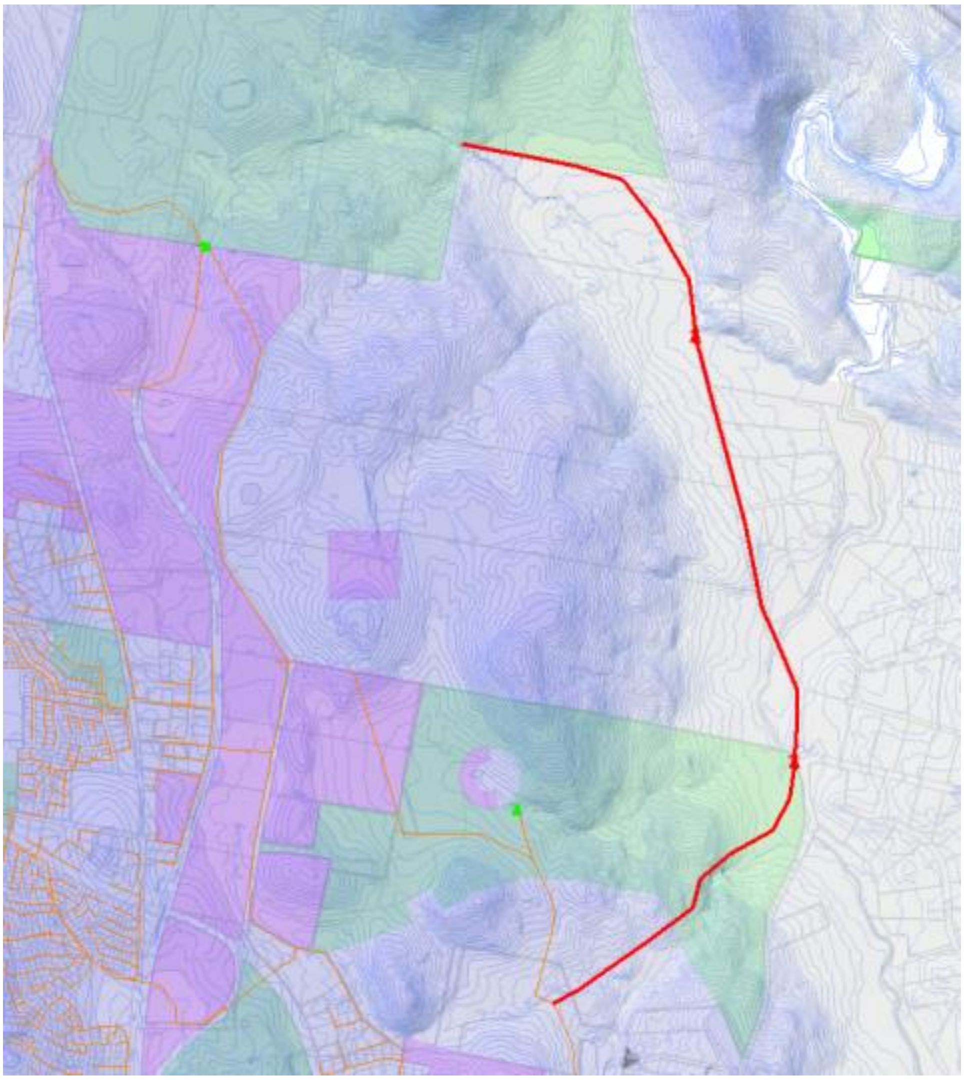

Figure 5: OCC strategic sewerage servicing – rural residential area (courtesy of OCC)

The OCC strategy identified a network of gravity mains from the industrial area discharging to a pump station that would discharge sewage back to an existing gravity sewer in Leeds Parade. This system was sized for 50 ET.

A second gravity main and pump station system was proposed for the rural residential areas, with a rising main along Ophir Road discharging to an existing gravity sewer main near the Sewage Treatment Plant (STP). This system was sized for 505 ET. The proposed pump station at Ophir Road was located so that it could service potential development in the RU1 land east of the proposed development site. Both pump stations were sized at 10 L/s.

Both pump stations discharge to the same existing gravity sewer main which indicates this main has adequate capacity to manage the additional load.

3.3 DESIGN CRITERIA

Average dry weather flows are 450 L/ET/day.

Wet weather flows are derived from modelling which was undertaken as part of OCC's 30 year water and sewerage servicing strategy and is accounted for in the pump station sizing.

3.4 PRELIMINARY SEWERAGE SERVICING STRATEGY

The proposal would ultimately create approximately 450 ETs which would generate the following sewage flows:

- Average dry weather flow 202 kL/day; 74 ML/year

The ultimate total dry weather flow equates to a flow rate of 7 L/s over 8 hours. The indicative pump station capacity of 2 x 10 L/s would provide adequate capacity for dry and wet weather flow.

A conceptual sewerage layout is indicated in **Figure 3**. This is consistent with the strategy proposed by OCC and incorporates a pump station for the upper part of the proposed development and a pump station system for the lower part. Gravity sewer mains would discharge to the pump stations.

The site falls to the north and the east and conceptually could be serviced entirely using the pump station located at Ophir Road. These options can be examined in more detail as the layout and staging is finalised.

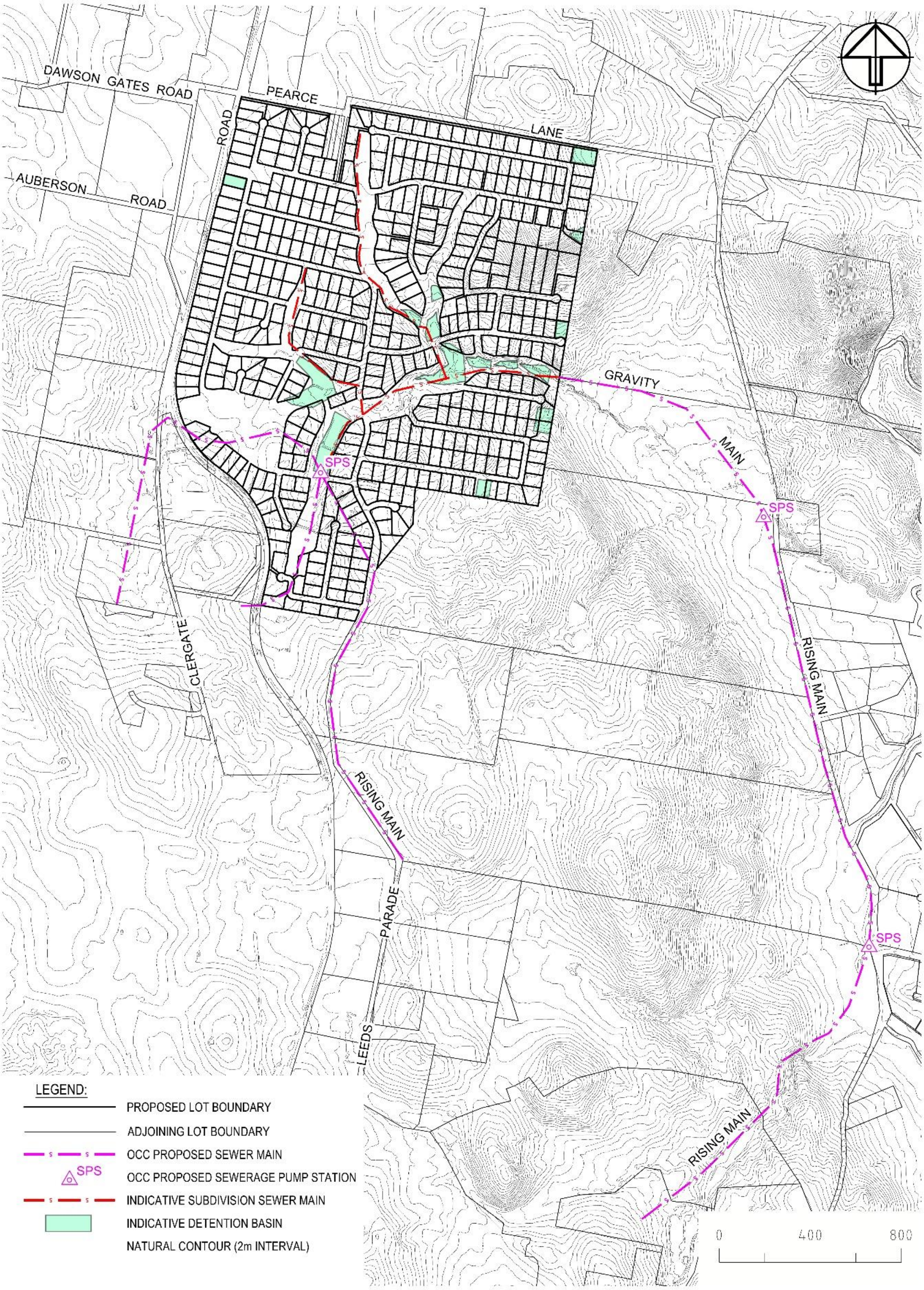

Figure 6: Conceptual sewerage servicing

Stormwater Management

4.1 INTRODUCTION

A high level assessment of the subject site has been undertaken to determine the effect of the proposed development on stormwater quantity and quality leaving the site. The assessment has been undertaken using the following:

- A site inspection;
- Available topographic data;
- Design and historic rainfall data for Orange; and
- The concept master plan layout.

The concept master plan is shown on **Figure 3**.

4.2 DESIGN

4.2.1 DESIGN OBJECTIVES

Stormwater runoff from the site would be managed on site to achieve the following objectives:

- Zero increase in post-development peak flows over the existing case for flood events up to and including the 1% Average Exceedance Probability (AEP) event;
- Zero increase in post-development annual pollutant loads leaving the site over the existing case; and
- Additional runoff volumes are harvested to supplement OCC's stormwater harvesting scheme and make the development water neutral.

The stormwater design strategy would ensure that all stormwater runoff generated on the site is collected and treated to prior to discharge or harvesting.

4.2.2 CONCEPTUAL DESIGN

Two main drainage lines pass through site flowing generally in a northerly and easterly direction towards Ophir Road and then Summer Hill Creek. Smaller drainage depressions join these two drainage lines. There are three smaller subcatchments along the eastern boundary and one along the western boundary that drain to separate drainage lines.

The conceptual stormwater management system includes a series of constructed stormwater management ponds (constructed wetland systems) along the main drainage line and in the smaller sub-catchments. These ponds would be multi-function stormwater management systems that would manage peak flow (stormwater detention) and stormwater quality and provide an opportunity for stormwater harvesting. They would also provide open space and passive recreation opportunities.

The conceptual location of the stormwater management ponds is provided on **Figure 7**.

4.2.3 HYDROLOGIC MODELLING

An XP-RAFTS model was set up for the site which includes all catchments within and draining towards the site. The catchment boundaries used in the XP-RAFTS model are shown on **Figure 7**.

To achieve the design objective of 'Zero increase in post-development peak flows over the existing case for flood events up to and including the 1% Average Exceedance Probability (AEP) event' stormwater detention basins are required. The location of proposed detention basins are shown on **Figure 7**.

The proposed detention basins would be designed to have 'air space' above the normal water level of wetlands that would provide the required detention storage to meet the design objective.

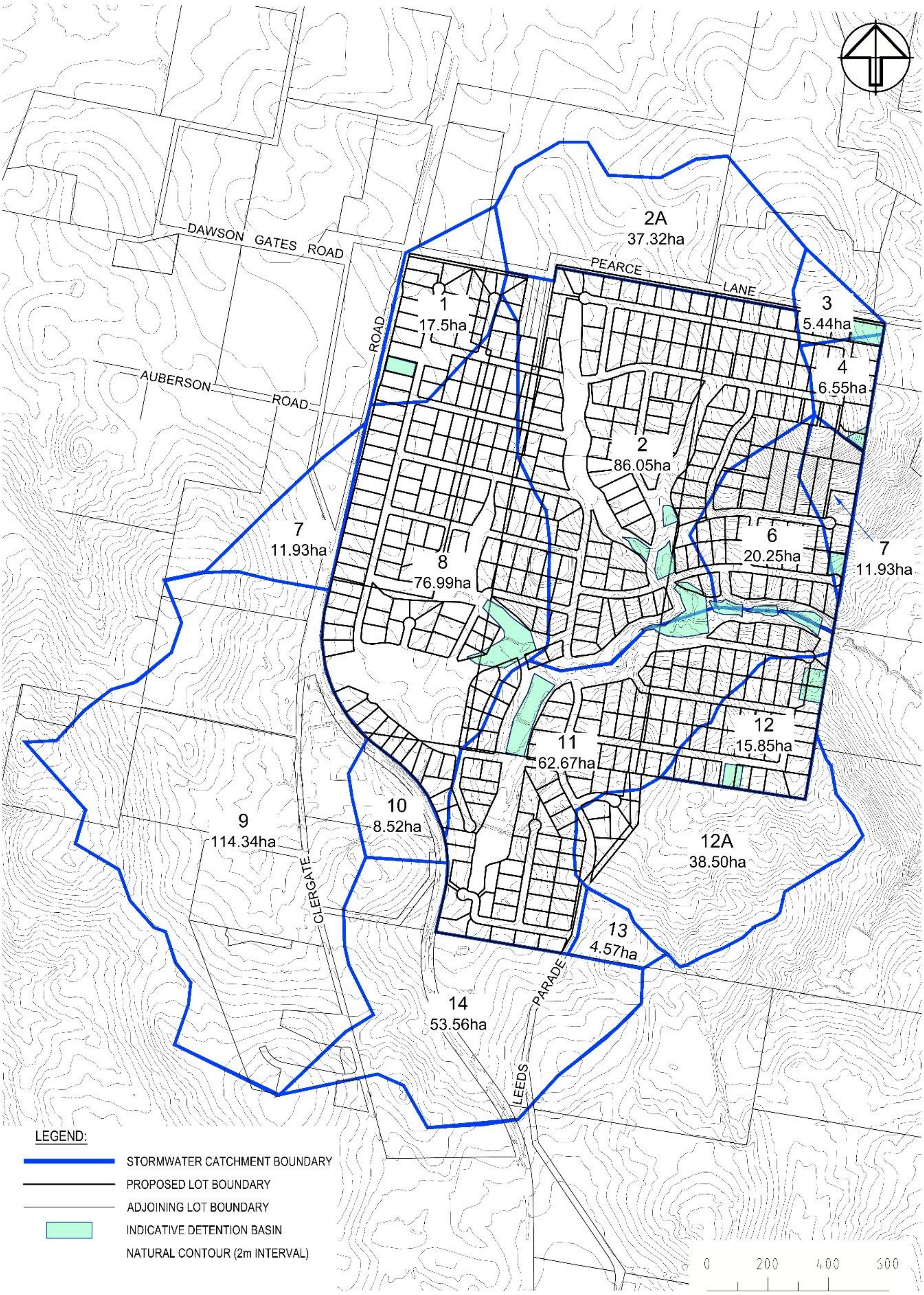

Figure 7: **Stormwater catchments and conceptual layout**

4.2.3.1 Modelling Results

A summary of the XP-RAFTS modelling results for each catchment outlet from the site are shown in **Table 4.1**.

Table 4.1 – XP-RAFTS Results

Outlet	AEP	Existing Peak Flow (m^3/s)	Post- Development Peak Flow (m^3/s)
1	1	0.209	0.198
	10	0.845	0.590
	100	2.510	2.469
3	1	0.098	0.093
	10	0.530	0.398
	100	1.410	0.860
4	1	0.117	0.111
	10	0.622	0.364
	100	1.685	1.151
5	1	0.115	0.1084
	10	0.608	0.357
	100	1.406	1.10
11	1	3.085	2.691
	10	14.46	12.15
	100	37.84	29.21
12	1	0.625	0.556
	10	2.500	2.210
	100	7.160	6.354

The results in **Table 4.1** show that the peak flows from the post-development site are below the existing peak flows for up to and including the 1% AEP flood event.

4.2.4 WATER QUALITY MODELLING

The design objective for the stormwater management system in terms of water quality is to ensure that the system achieves 'Zero increase in post-development annual pollutant loads leaving the site over the existing case'. To achieve this design objective the following stormwater treatment devices would be integrated with the development:

- Grassed swales;
- Gross Pollutant Traps; and
- Constructed wetlands.

The proposed stormwater treatment system would ensure that no stormwater leaves the site without a minimum level of treatment.

The proposed stormwater management system and wetland configuration was modelled using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) developed by the Cooperative Research Centre for Catchment Hydrology.

MUSIC was developed as an aid to decision making and predicts the performance of stormwater quality management systems. It enables users to evaluate conceptual designs of stormwater management systems to ensure they are appropriate for their catchments. By simulating the performance of stormwater quality improvement measures, MUSIC determines if proposed systems can meet specified water quality objectives.

The existing site and external catchments were modelled as agricultural and the proposed site was modelled as urban with a 20% impervious fraction.

4.2.4.1 Water Quality Modelling Results

The MUSIC modelling results for the site are summarised in **Table 4.2.**

Table 4.2 – MUSIC Modelling Results

Parameter	Existing	Post Development Pre-Treatment	Post Development Post-Treatment	% Reduction from Pre-Treatment	% Change from Existing
Flow (ML/yr)	936	1270	1150	9.45	+22
TSS (kg/yr)	47200	125000	23700	81	-49.8
TP (kg/yr)	185	337	102	69.7	-44.9
TN (kg/yr)	1500	2830	1490	47.3	-0.67

Water quality modelling results show that the proposed stormwater treatment system reduces pollutant levels to below the levels in stormwater currently leaving the site, achieving the strategy of 'Zero increase in post-development annual pollutant loads leaving the site over the existing case'.

4.2.5 STORMWATER HARVESTING OPPORTUNITY

The MUSIC modelling indicates that the post development discharge volume from the site increases from 936 ML/year to 1150 ML/year; an increase of 214 ML/year. This is due to the additional runoff volume created by impervious surfaces.

The increased annual flow volume provides an opportunity for stormwater harvesting. Conceptually a harvesting scheme could operate in the same way that the Ploughmans Creek stormwater scheme works, that is:

- A portion of the runoff volume would be captured in the air space in each constructed stormwater wetland during runoff events. This capture and storage also reduces peak flow;
- The captured runoff volume would be released slowly over 4 to 5 days (which provides water quality treatment) and creates a low flow through the drainage line;
- A small pond and pump station on the drainage line at the eastern edge of the development area would harvest water and pump it via a small diameter rising main to OCC's stormwater holding pond, or the drainage line that leads to this pond. It would then combine with other harvested stormwater passing through the existing treatment system before being pumped to Suma Park Dam.

Initial modelling of this scheme indicates that 130 to 150 ML/year could be harvested. This would reduce the site runoff volume to around 1,000 ML/year which is only slightly more than the existing average site runoff volume.

The stormwater harvesting concept is subject to further development and discussion with OCC as it would need to integrate with the existing system.

4.2.6 FLOODING

Flooding has not been specifically covered by this report; however some preliminary calculations show that the proposed stormwater flows can be contained within the proposed drainage reserves. A full assessment of flooding will be completed during the detailed design stage.

The design of all stormwater overland flow paths within the site would ensure they have capacity to convey the 1% AEP flood event.