ZOZAC DEVELOPMENTS P/L

26 Lithgow Street GOULBURN

STORMWATER MANAGEMENT REPORT

Report No: P0019077/V01

Rev: 01

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Premise

DOCUMENT AUTHORISATION					
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Prepared By		**Reviewed By**		**Authorised By**	
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EXECUTIVE SUMMARY

This Stormwater Management Report (SMR) is required to articulate the design methods used to address matters concerning Local Flooding, Stormwater detention and Water Sensitive Urban Design (WSUD) on the proposed development.

To investigate the effects of local flooding on the proposed development of 26 Lithgow Street Goulburn (The Site), the following document from Goulburn Mulwaree Council (Council) was used:

Flood Planning Constraint Category (FPCC) – Overland Flow
Goulburn Mulwaree Overland Flow Flood Study
Proj No. 180068, Date 09-2022. Figure 4

The relative catchments were sized and runoffs quantified to provide local flood levels.

This SMR will assess The Sites' stormwater runoff treatment measures for compilance in both quantity and quality targets.

It is intended that the following document is referenced in conjunction with this SMR:

Town House Development
26 Lithgow Street Goulburn
Issued for Development Application Approval

Ref P001907 rev A, Premise, September 2024 – (The Civil Design)

1. INTRODUCTION

Premise has been commissioned by ZOZAC DEV to prepare a SMR for the proposed development of The Site.

The Site is located within the Goulburn CBD whereby the downstream drainage infrastructure exists and is operational. See **Figure 1**

Figure 1 – 26 Lithgow Street Goulburn (source : Nearmap March 2024)

The Site is located relatively high within the catchment of a local tributary to the Wollondilly River and clear of any flood or backwater effects from the river (see Figure 2).

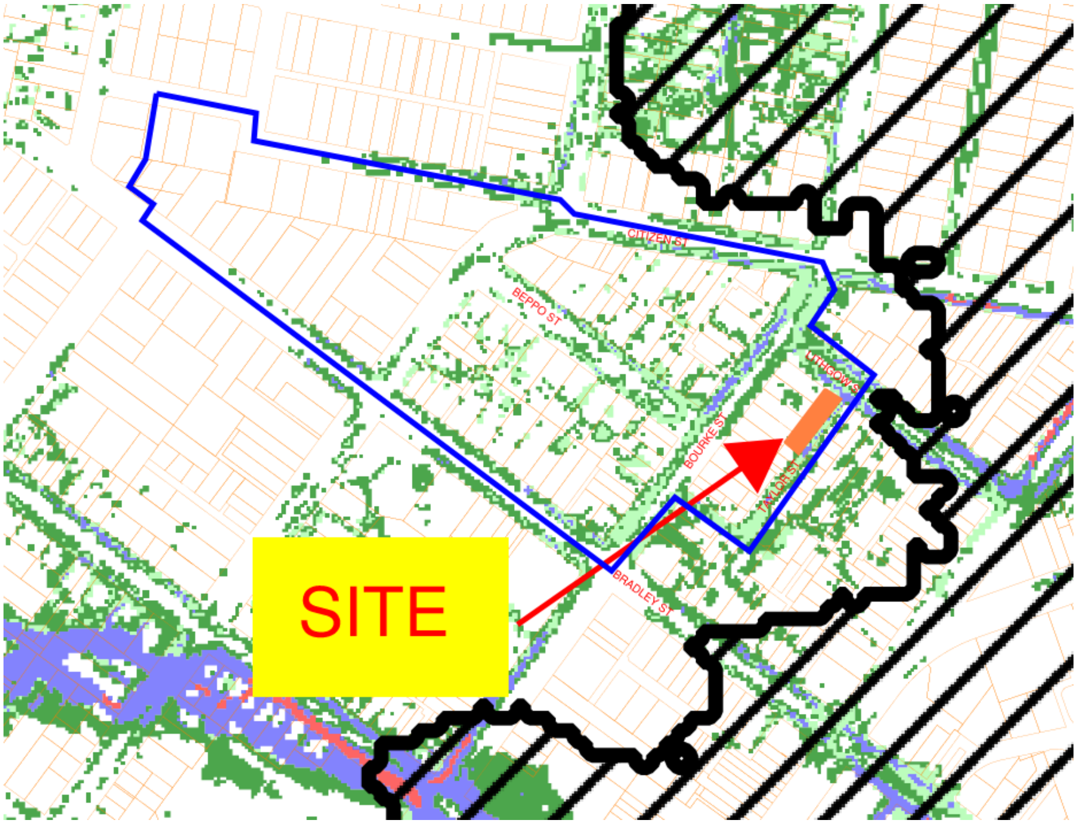

Figure 2 – Catchment Affecting The Site

The Council has adopted

Flood Planning Constraint Category (FPCC) – Overland Flow

Goulburn Mulwaree Overland Flow Flood Study, Project No. 180068, GRC Hydro 09-2022

providing guidance on the areas of interest when investigating flood affectation.

The Sydney Catchment Authority (SCA) has developed WNSWUM to achieve a neutral or beneficial effect (NorBE) on water quality for proposed urban and rural land use developments. MUSIC is used in the modelling of water quality and stands for 'Model for Urban Stormwater Improvement Conceptualisation', which is a decision support system for simulating the performance of stormwater management measures.

For stormwater, NorBE is assessed by comparing the quality of runoff from the pre-development site with that from the post-development site including proposed stormwater treatment measures (such as water sensitive design elements) that may be needed to mitigate pollutant loads and concentrations resulting from the proposed land use change.

This document, a standard under the SEPP, addresses the requirements for compliance with NorBE in relation to MUSIC modelling to assess stormwater quality impacts.

1.1 Objective of Report

1.1.1 FLOOD AFFECTATION TO THE SITE.

The PFCC is used to locate numerous Points of Interest (POI) to calculate the 100 year stormwater runoff width and depth in these key points to provide minimum floor and garage levels to be used in the proposed design.

1.1.2 DETENTION OF DEVELOPED FLOWS

The detention investigation is required to ensure the developed stormwater runoff flows do not exceed predevelopment levels.

1.1.3 WATER SENSITIVE URBAN DESIGN

To ensure that a development and its associated treatment measures are inline with NorBE principles on water quality.

1.2 Scope of Investigation

1.2.1 FLOOD MODELLING

The figure below provides the location of three (3) POIs that will be investigated when quantifying the effects of the 100 year stormwater runoff on The Site The PFCC is used to locate numerous POIs and calculate the 100 year stormwater runoff width and depth in these key points, namely:

POI 1 : Northern Lane of Lithgow Street;

POI 2 : Southern Lane of Lithgow Street; and

POI 3 : Taylor Street.

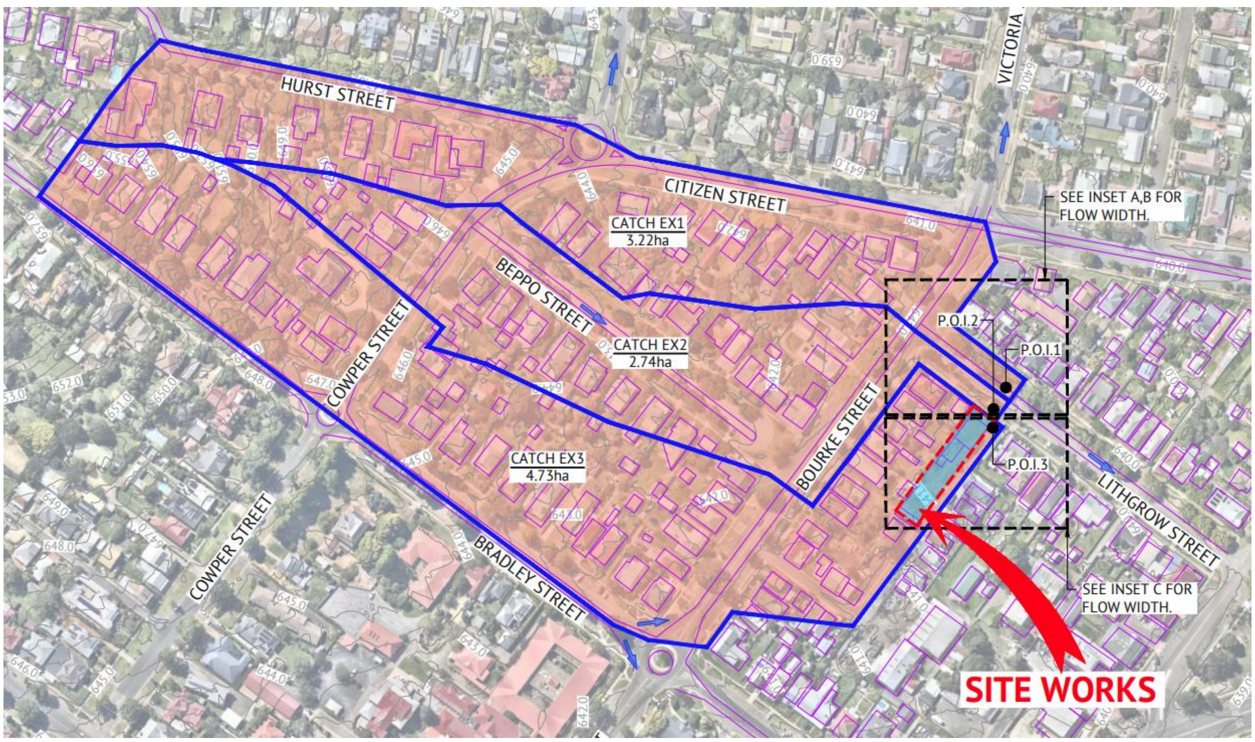

Figure 3 - Locations of Points Of Interest (Source: The Civil Design Plans 2024)

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1.2.2 DETENTION AND NORBE MODELLING

The survey of the existing site shows the reminance of a dwelling and sheds, see Figure 4, the providing predevelopment condition.

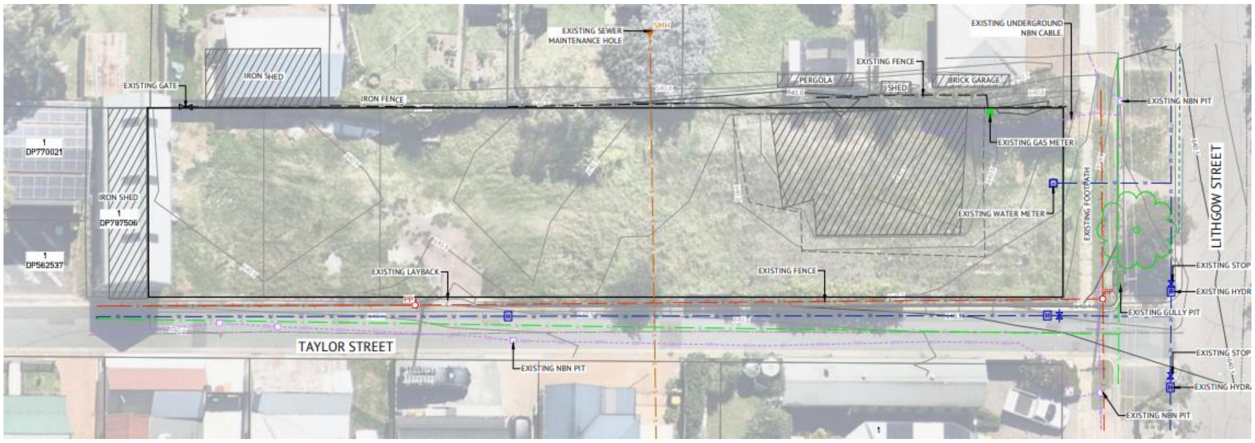

Figure 4 - Existing Site (Source: Premise 2024)

The proposed development can be seen in Figure 5 below and will be used to gauge the effect of detention and NorBE measures.

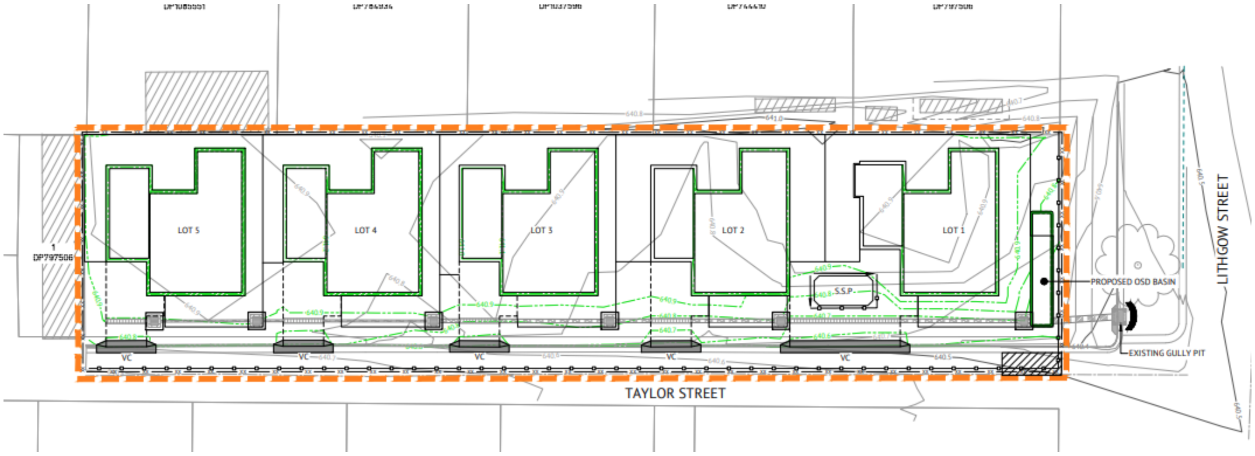

Figure 5 - Proposed Development (Source Planning Matters 2024)

2. METHOD CALCULATION

2.1 Flood Investigation Method

2.1.1 THE FPCC

The FPCC was flood modelled using TUFLOW and a considerably larger catchment than the local catchments for the 3 POIs and, as such, provides the following:

1. Typically a high storm duration for the critical storm (approx 9 hours resulting in the flood extents shown on the FPCC maps); and
2. Flood extents are calculated using LIDAR contour information that are not as accurate as surveyed topographical contour information.

2.1.2 THE RATIONAL METHOD

The Rational Method is an approved method to design proposed stormwater drainage network and provides road flood width and depths for localised road catchments.

It is generally accepted that using The Rational Method yields results that exceed those using TUFLOW in quantity when investigating smaller catchments.

2.1.3 FPCC VS THE RATIONAL METHOD

The following is a list of expected differences between FPCC and The Rational Method results:

- FPCC critical storm occurs approx in 9 hours and The Rational Method has a maximum time of concentration of 14-20mins dependant upon circumstances. Essentially ensuring The Rational Method will provide greater flows;
- FPCC 3D model will have inaccuracies at the local level and may indicate stormwater flows surcharging road centrelines (for example) whereby surveyed topographical contours confirm this is not the case; and
- FPCC does not take into account The Proposed Internal Works. These have the following effects:
    - The sheet flows expected through the lots surrounding The Site will, in part, be intercepted by the proposed works and directed to Lithgow Street; and
    - The Site development will be detained to mimic predevelopment flows, having an indescernable effect in the FPCC but significant to the immediate surrounds.

2.2 Water Quality and Quantity Treatment Method

Proposed treatment measures are modelled in DRAINS and MUSIC for quantity and quality compliance respectively, achieving the following criteria:

- The mean annual pollutant loads for the post-development case must be 10% less than the pre-development case for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). For gross pollutants, the postdevelopment load only needs to be equal to or less than pre-development load;
- Pollutant concentrations for TP and TN for the post-development case must be equal to or better compared to the pre-development case for the 98th percentiles over the five-year modelling period when runoff occurs. As meeting the pollutant percentile concentrations for TP generally also meets the requirements for TSS, cumulative frequency analysis is not required for either TSS nor gross pollutants; and
- The developed stormwater runoff flows must not exceed predevelopment levels in quantum.

2.2.1 RAINWATER TANKS

Two (2) kilolitre (kL) rainwater tanks are proposed for each dwelling in the development. In addition the following configurations and assumptions were used for rainwater tanks and water use:

• Roof areas, rainwater tanks and water demand were aggregated for all lots;

• All roofs are 100% impervious, and the appropriate rainfall threshold for roofs was adopted from WNSWUM Table 4.3 replicated below;

• All of the dwelling roof area for each lot could be configured to direct all runoff to an above ground tank;

• It was assumed that 80% of rainwater tank capacity was available to harvest, and that the other 20% of capacity was configured for mains top-up;

• It was assumed that each dwelling was a 1 to 2 bedroom dwelling with total water demand for each dwelling based on the values provided in WNSWUM Table 5.3;

• It was assumed that up to 90% of the internal domestic water demand (toilets + laundry + hot water), would be sourced from the rainwater tanks, and 100% of external garden water use is also sourced from the tanks (see WNSWUM Table 5.3 replicated below)

Table 4.3: Default rainfall threshold values

Surface type	Rainfall threshold (mm)
Roofs	0.3
Sealed roads, driveways, paving, car parks and paths	1.5
Unsealed roads and car parks	1.5
Permeable paving (open proportion)[1]	0
Permeable paving (paved proportion)[1]	1.5
Land use zoning	
For all land uses (residential, rural residential etc.)	1.0

[1] Refer to Section 5.2.2.2 for further discussion on modelling permeable paving

Table 5.3: Water demands for rural and urban dwellings (adapted from Coombes *et al.* 2003)

	Rural dwelling rainwater tank sole water supply				Urban dwelling reticulated water supply			
	Annual internal use in kilolitres (kL/yr/dwelling)							
No. of bedrooms[1]	**1 to 2**	**3**	**4**	**5**	**1 to 2**	**3**	**4**	**5**
Toilet (25%)	31	44	57	71	46	66	86	106
Toilet + laundry (50%)	60	88	115	142	91	131	172	212
Toilet + laundry + hot water (90%)	110	159	206	256	164	237	309	384
Toilet + laundry + hot water + other (100%)	122	175	230	283	183	263	343	424
	Daily internal use in kilolitres (kL/day/dwelling)							
No. of bedrooms[1]	**1**	**2**	**3**	**4**	**1 to 2**	**3**	**4**	**5**
Toilet (25%)	0.085	0.120	0.155	0.195	0.125	0.180	0.235	0.290
Toilet + laundry (50%)	0.165	0.240	0.315	0.390	0.250	0.360	0.470	0.580
Toilet + laundry + hot water (90%)	0.300	0.435	0.565	0.700	0.450	0.650	0.845	1.045
Toilet + laundry + hot water + other (100%)	0.335	0.480	0.630	0.775	0.500	0.720	0.940	1.160
	External and commercial / industrial use							
External residential use eg gardens	For a typical urban lot - 0.15 kL/day/dwelling or 55 kL/yr/dwelling							
Commercial / Industrial Use	Indicative 0.1 kL/day/1000 m^2 of roof area (internal use) & 20 kL/yr/1000 m^2 (external use) - Development-specific data may provide better reuse values							

[1] Note - Where the number of bedrooms is unknown as for subdivisions, assume 4 bedrooms per dwelling

Figure 6 - WNSWUM Tables 4.3 and 5.3

Land Use/surface type	Total area (ha)	Sub-catchment areas (ha)				
Pre-development						
Garden	0.08					
Driveway	0.003					
Dwelling	0.024					
Total	**0.107**					
Post-development		lot 1	lot 2	lot 3	lot 4	lot 5
Residential roofs	0.045	0.009	0.009	0.009	0.009	0.009
Driveways	0.011	0.003	0.002	0.002	0.002	0.002
Courtyards	0.048	0.012	0.009	0.009	0.009	0.009
Bypass	0.003					
Total	**0.107**					

Figure 7 - Catchment Details

2.2.2 BIODETENTION BASIN

A 17m^2 Biodetention Basin has been provided at the developments outlet and is protected by a low brick wall and pool type safety fencing with locked gate.

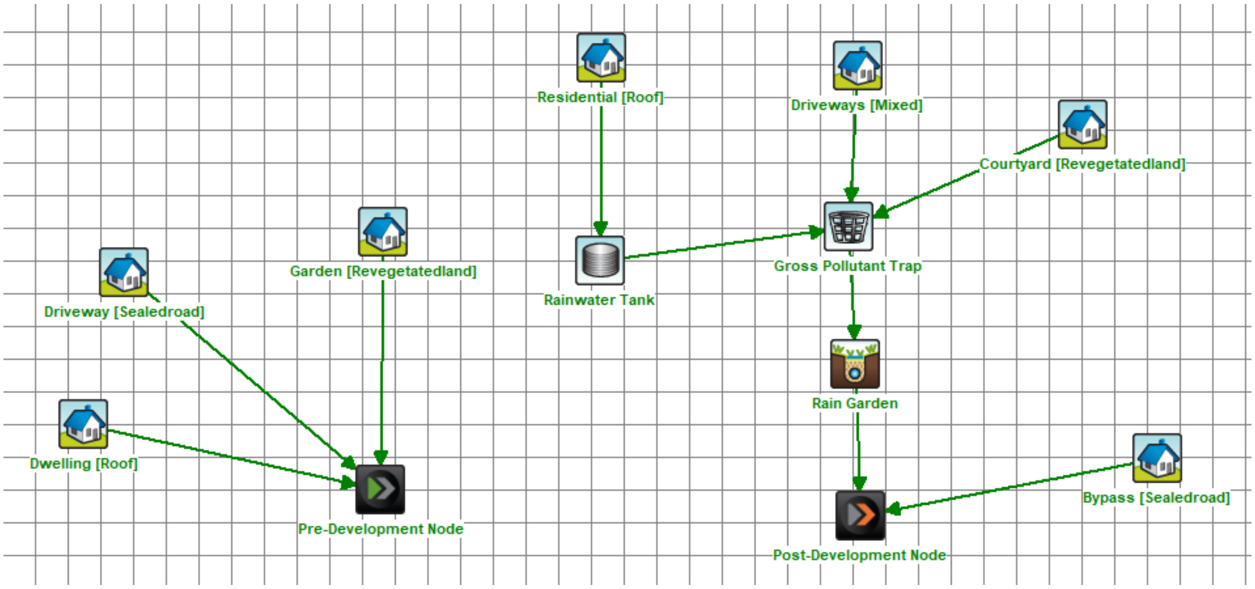

Figure 8 - MUSIC Layout

The Biodetention system is governed by a control pit as shown in the Civil Design Plans.

3. THE RESULTS

3.1 Flood Investigation Results

The following is the table included in The Proposed Road Design and reproduced below for easy reference.

POINT OF INTEREST	Coeff of Runoff C	Reach	Time of Concentration Tc (min)	Intensity I (mm/hr)	Area A (ha)	Q_{100} l/s	Road Slope %	Roughness n	Flow Width (m)	Flow Depth (m)
POI 1	0.85	640	11.3	130	3.22	990	1.5	0.012	5.75	0.199
POI 2	0.85	590	10.9	133	2.74	861	1.5	0.012	5.45	0.190
POI 3	0.85	720	12.0	126	4.73	1408	2.5	0.012	5.97	0.206

Figure 9 - 100 Year Stormwater Runoff Estimations at POI 1, 2 and 3

3.1.1 POI : 1 AND 2

The following are figures showing the flood extents in plan and perspective views for POI : 1 and 2

Figure 10 - POI : 1 and 2 - 100 Year Stormwater Runoff Effects

3.1.2 POI : 3

The following are figures showing the flood extents in plan and perspective views for POI : 3

Figure 11 - POI : 3 - 100 Year Stormwater Runoff Effects

The flood levels were then used to determine minimum design floor and garage levels.

3.1.3 MINIMUM DESIGN FLOOR AND GARAGE LEVELS

LOT	GUTTER LEVEL	FLOOD DEPTH	MINIMUM FINISHED FLOOR LEVEL[1]	MINIMUM GARAGE LEVEL[2]
1	640.46	0.206	640.966	640.816
2	640.51	0.206	641.016	640.866
3	640.56	0.206	641.066	640.916
4	640.625	0.206	641.131	640.981
5	640.69	0.206	641.196	641.046

[1] MINIMUM FINISHED FLOOR LEVEL is 300mm above 100yr flood level
[2] MINIMUM GARAGE LEVEL is 150mm above 100yr flood level

Figure 12 - Minimum Floor and Garage Design Levels

3.2 Stormwater Quality and Quantity

Scenario/Catchment	Annual Pollutant Loading (kg/yr)			
	Tss	Tp	Tn	GP
Pre-development (1)	9.84	0.031	0.371	4.95
Post-development (2)	5.02	0.023	0.124	0.15
Difference (3) = (1) – (2)	4.82	0.008	0.247	4.8
% Improvement = (3)/(1)*100	49%	26%	67%	97%
Neutral or beneficial effect (Y/N)	Y	Y	Y	Y

Figure 13 - Stormwater Quality Results (using NorBE principles)

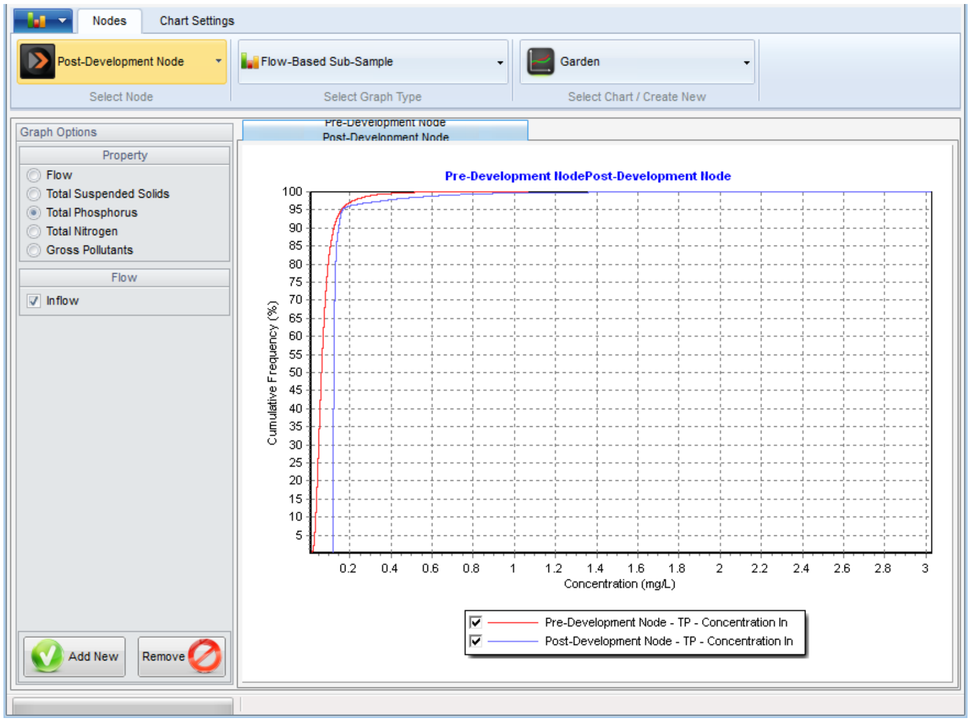

Figure 14 - Pre and Post development outcomes for Total Phosphorus (Tp)

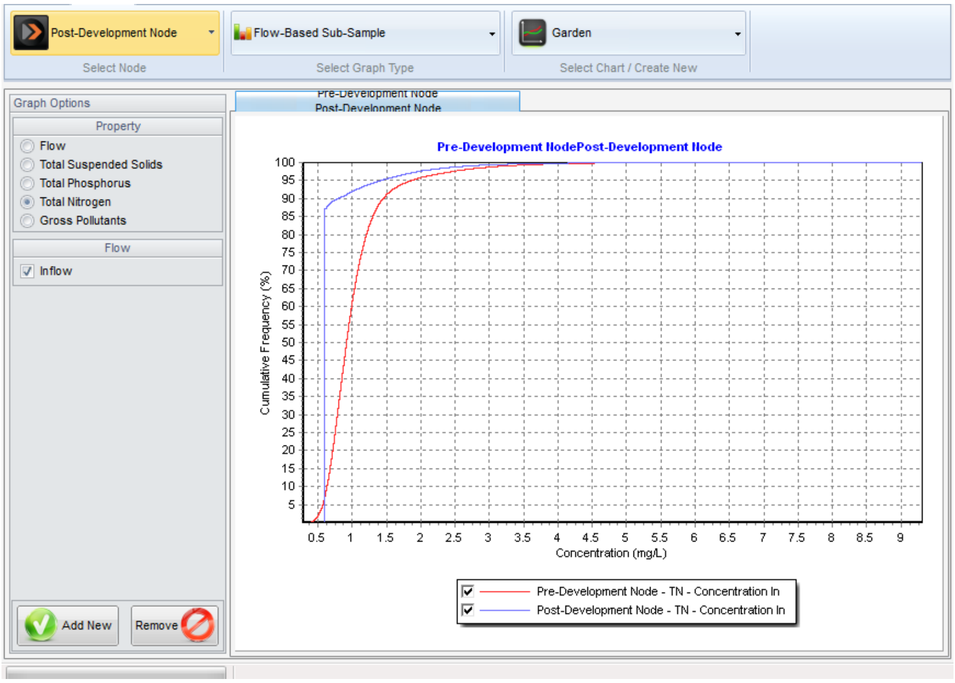

Figure 15 - Pre and Post development outcomes for Total Nitrogen (Tn)

RETURN	PRE DEVELOPMENT (l/s)	POST DEVELOPMENT OUTFLOW (l/s)	POST DEVELOPMENT WSL
0.2EY	13	11	640.26
10	17	12	640.37
20	22	13	640.53
50	24	24	640.53
100	28	26	640.55

CONTROLS
1. 100mm Low Flow pipe inv639.55
2. 2m Weir inv640.55

Figure 16 - Detention Results (using DRAINS)

4. DISCUSSION AND CONCLUSION

4.1 Flooding

Whilst the design floods are calculated to be contained entirely within the road corridors, it is councils policy to maintain gaps under perimeter fencing in consideration of upstream sheet flows (however minor). It is recommended typically a 50mm gap at its base of all fencing be maintained within the proposal.

All Finished Floor Levels have more than 300mm freeboard to flood levels and Garage Levels more than 150mm freeboard.

4.2 Stormwater Treatment

All lots are to have 2kL rainwater tanks which, with the BioDetention Basin will:

1. Ensure Stormwater runoff Quality is compliant with NorBE principles; and
2. Developed flows are reduced to predevelopment levels.