PLANNING and ENVIRONMENT ACT
BAROONDARA PLANNING SCHEME

CONSENT UNDER CLAUSE 52.20
VPP2101334
ENDORSED PLAN
Sheet 1 of 46

Signed: for
MINISTER FOR ENERGY, ENVIRONMENT
AND CLIMATE CHANGE
Date: 5 Nov 2021

MORDUE ENGINEERING
STRUCTURAL ENGINEERING CONSULTANTS

1-12 Bills Street, Hawthorn

Report: WSUD Report

Job Number: J190070

Date: 27.08.2021

Revision: 4

Status: For Council Review

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Document history

Revision	Description	By	Date
1	Preliminary	AN	26/03/2021
2	Preliminary	AN	26/04/2021
3	For Council Review	AN	11/06/2021
4	For Council Review	AN	27/08/2021

1 Executive Summary

Water from the entire site area is to be captured and directed into a treatment system to achieve storm water discharge quality that exceeds recommendations of the 'Urban Stormwater: Best practice Environmental Management Guidelines' (1999) published by the CSIRO. The proposed system is as follows:

1. Three retention tanks will collect stormwater from roof areas. This water will be reused for irrigation of landscape and toilet flushing.
2. Three detention tanks of volumes 26 kL, 26 kL and 42 kL will collect stormwater from terrace areas and landscaping.
3. Two rain gardens – one for buildings A, B and C and another for buildings E, F and G to control of storm water discharge quality before it flows into the LPOD.
4. Storm water falling on a portion of Bills Street will flow directly to the LPOD.

The proposed detention/retention system satisfies the stormwater detention requirements of the planning permit and provides adequate stormwater retention to meet the demands of the landscaping.

2 Introduction

The site is located at 1-12 Bills Street, Hawthorn.

The site comprises of existing buildings that will be demolished and combined into one development. The development will consist of 6 buildings – A, B, C, E, F and G.

The total site area is 10,080 m^2.

The site has a gentle fall from approximately RL21.0 in the north-east corner to RL11.3 in the south-west corner.

Mordue Engineering has been engaged to prepare a Storm Water Management Plan (SWMP) and design and document the in-ground storm water system.

2.1 Site location

Site address: 1-12 Bills Street, Hawthorn
Site coordinates: 37°50'17.45"S 145°2'27.26"E

Figure 1 - Aerial view of existing site conditions

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2.2 Floor plans

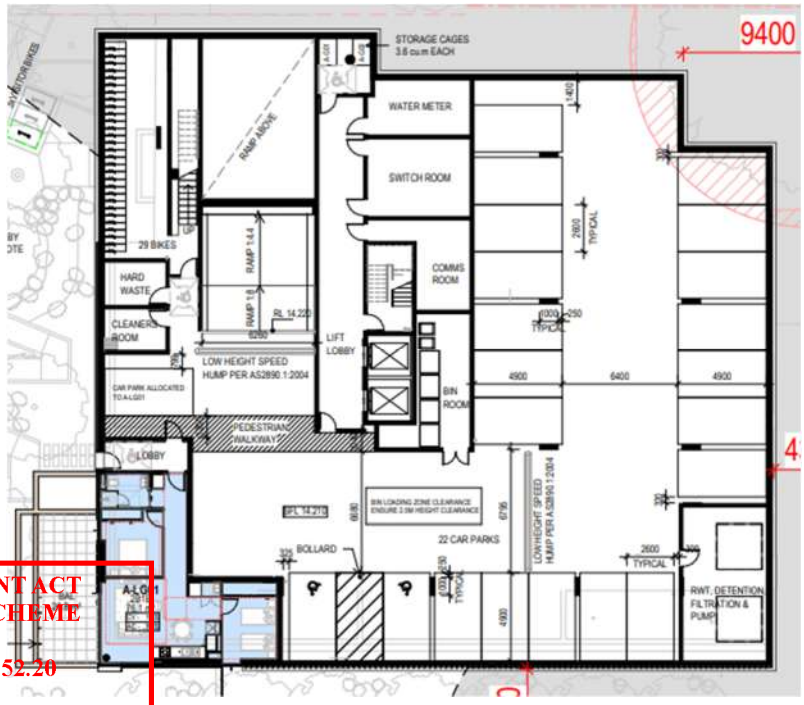

Figure 2 – Building A - Lower Ground plan

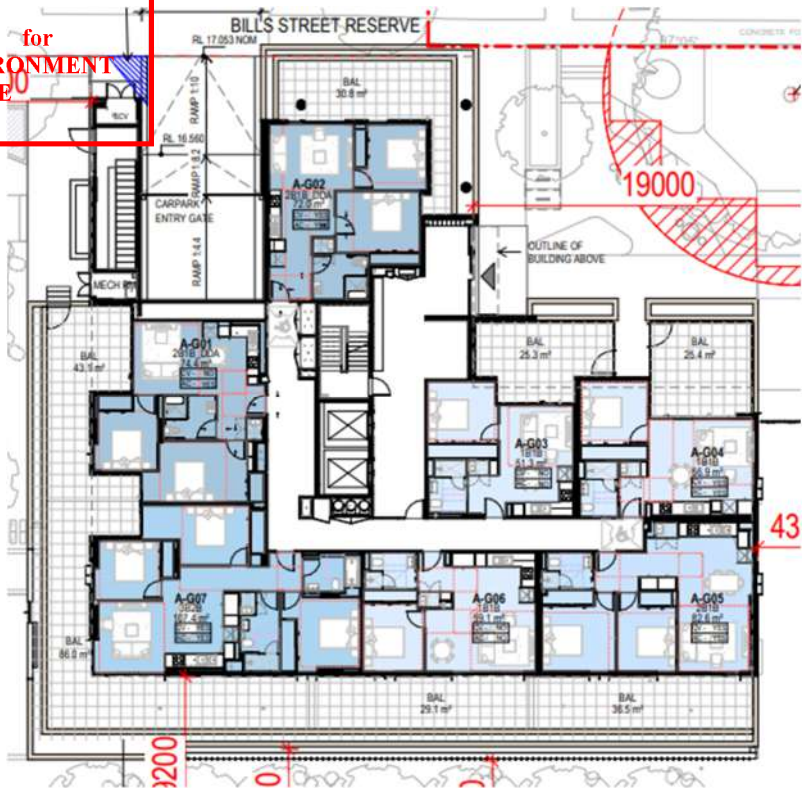

Figure 3 – Building A – Ground floor plan

Figure 4 – Building A – Level 1 plan

Figure 5 – Building A – Level 2 plan

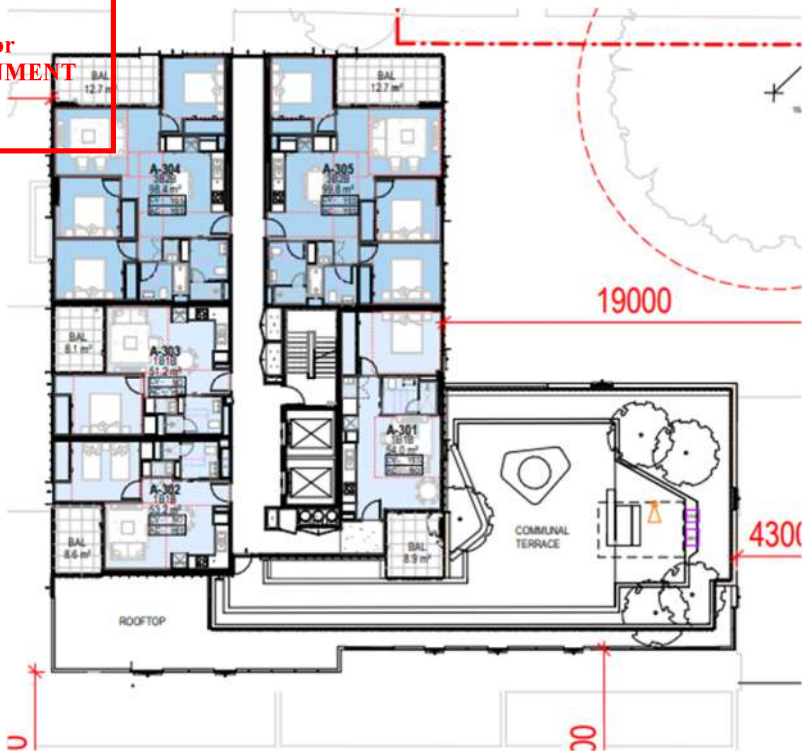

Figure 6 – Building A – Level 3 plan

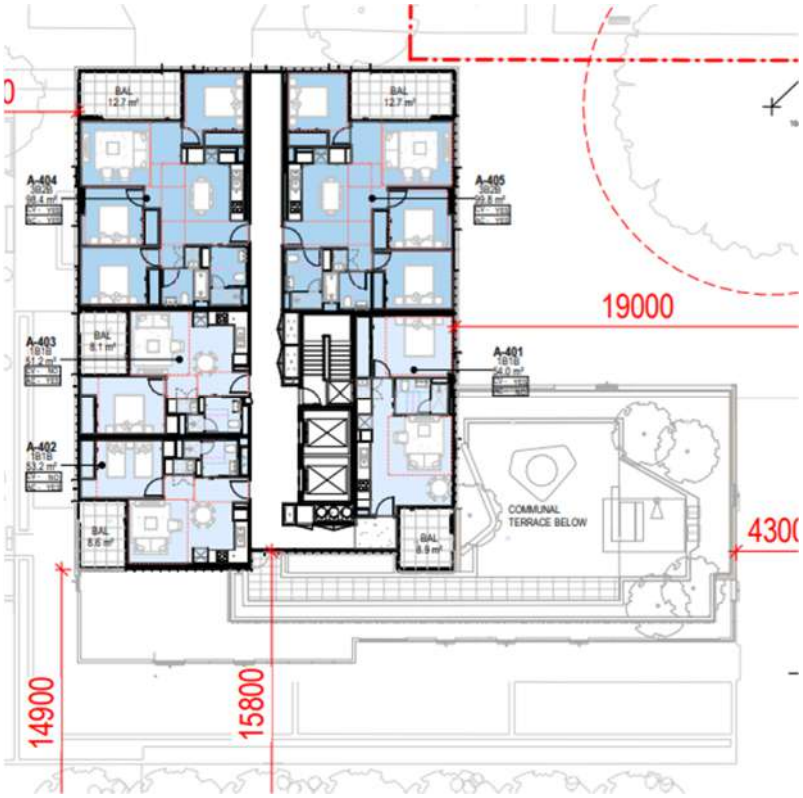

Figure 7 – Building A – Level 4 plan

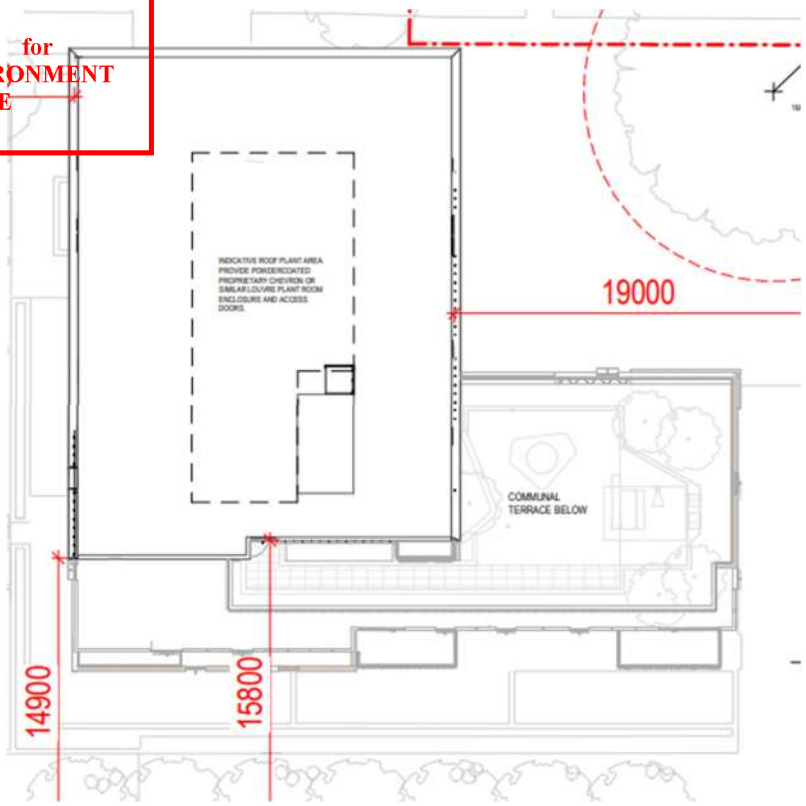

Figure 8 – Building A – Roof plan

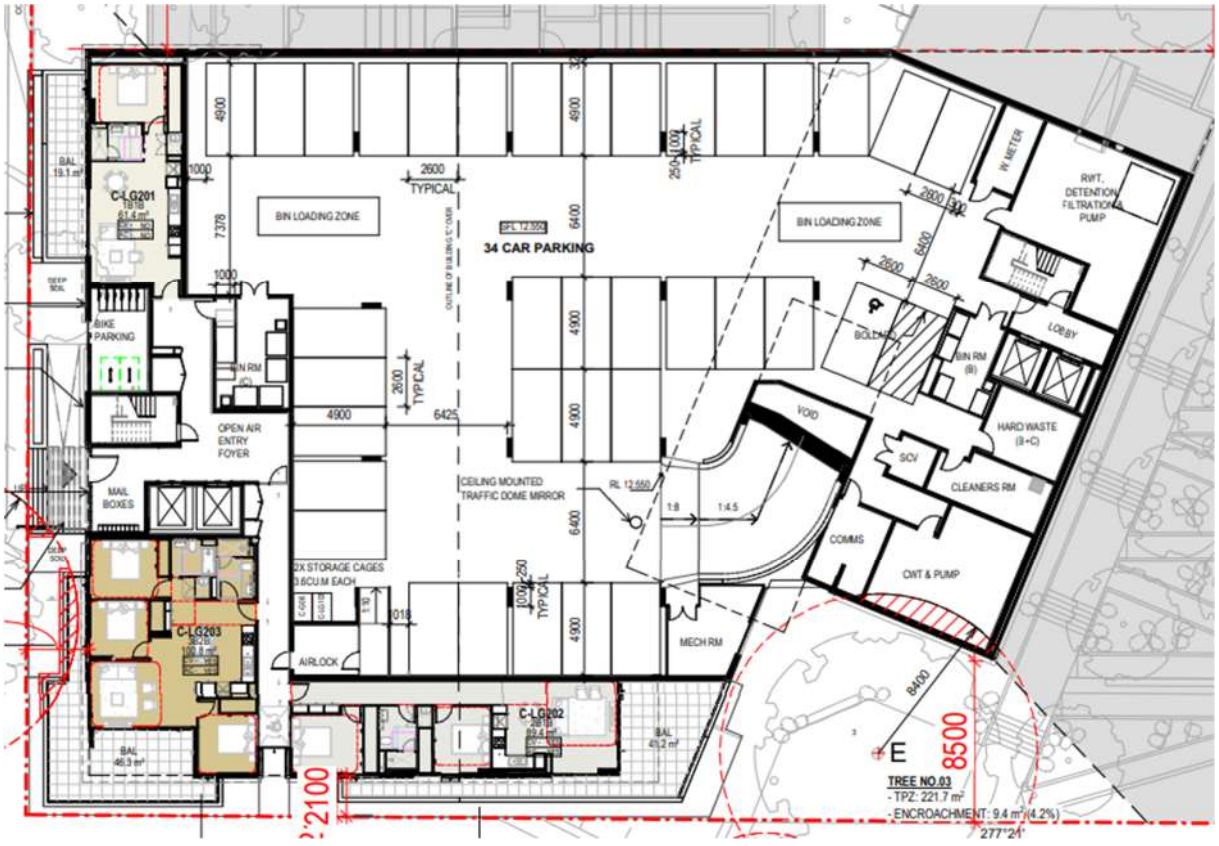

Figure 9 – Buildings B, C – Lower Ground 2 plan

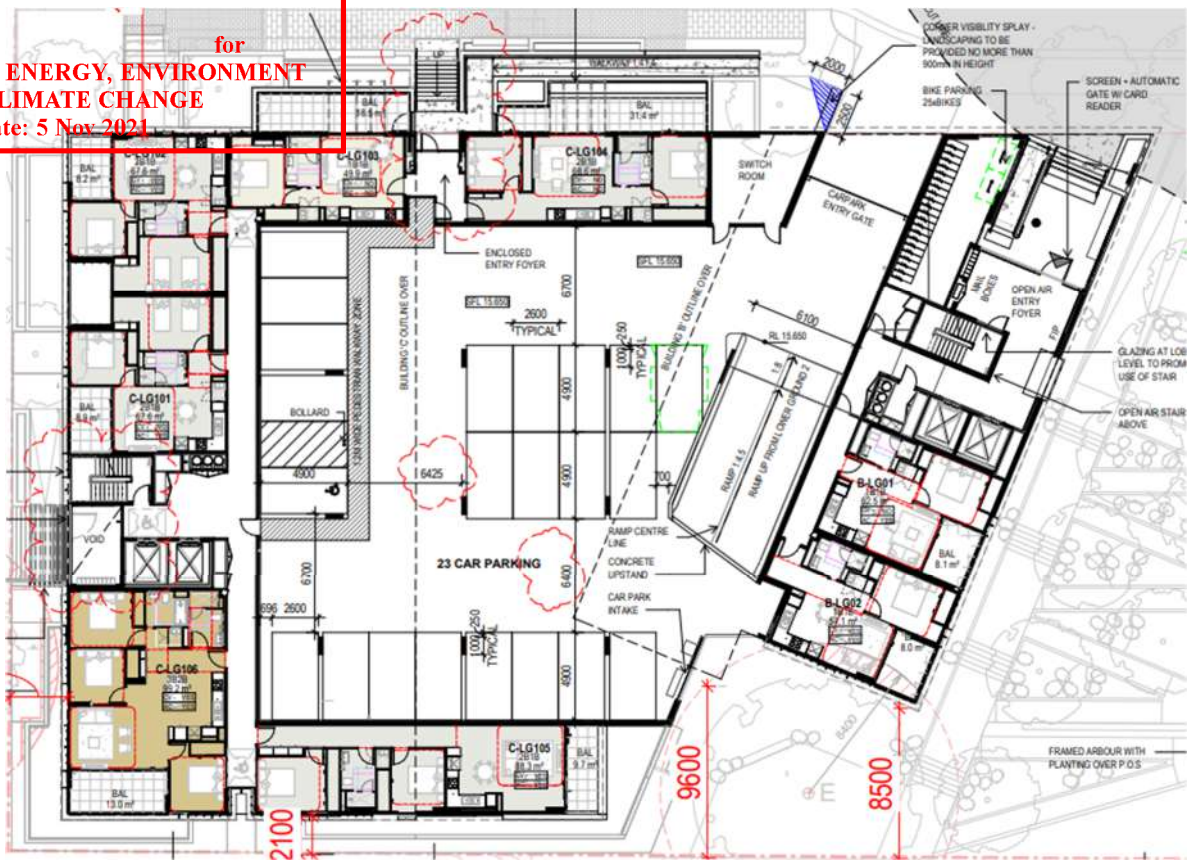

Figure 10 – Buildings B, C – Lower Ground 1 plan

Figure 11 – Building B, C – Ground floor plan

Figure 12 – Building B, C – Level 1 plan

Figure 13 – Building B, C – Level 2 plan

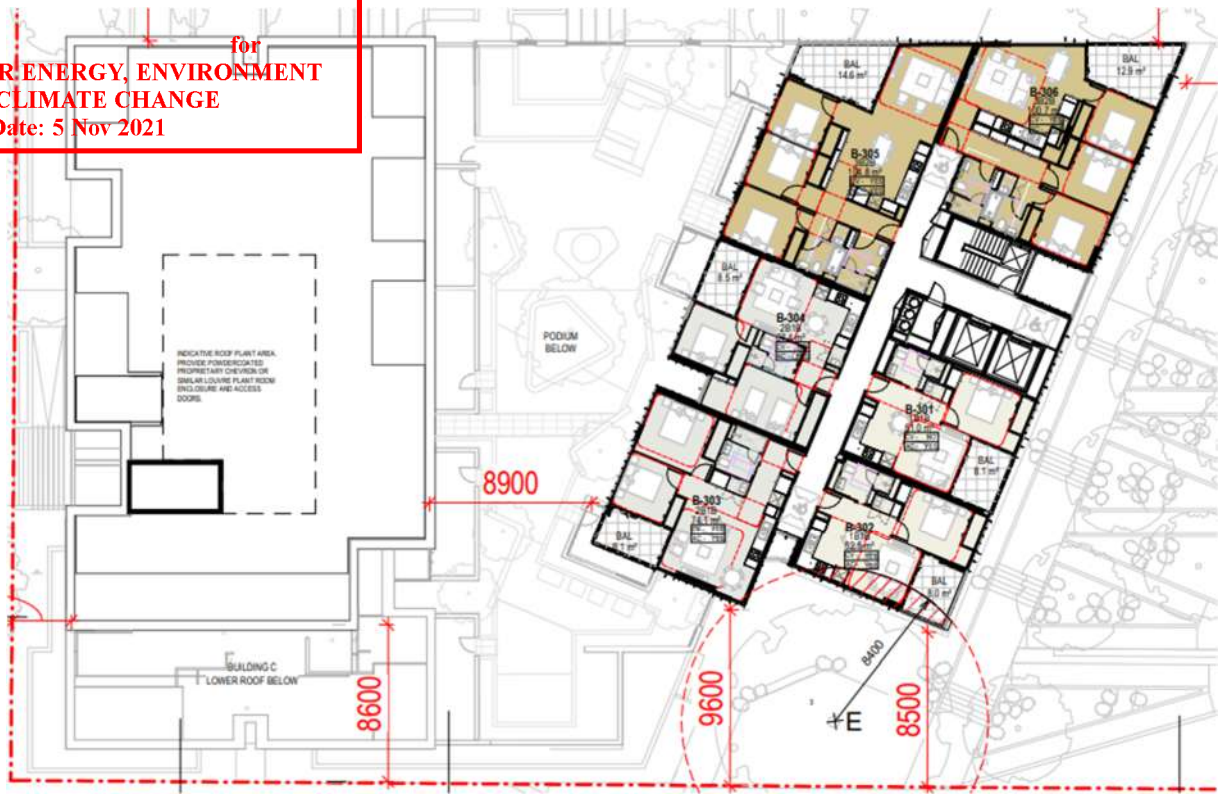

Figure 14 – Building B, C – Level 3 plan

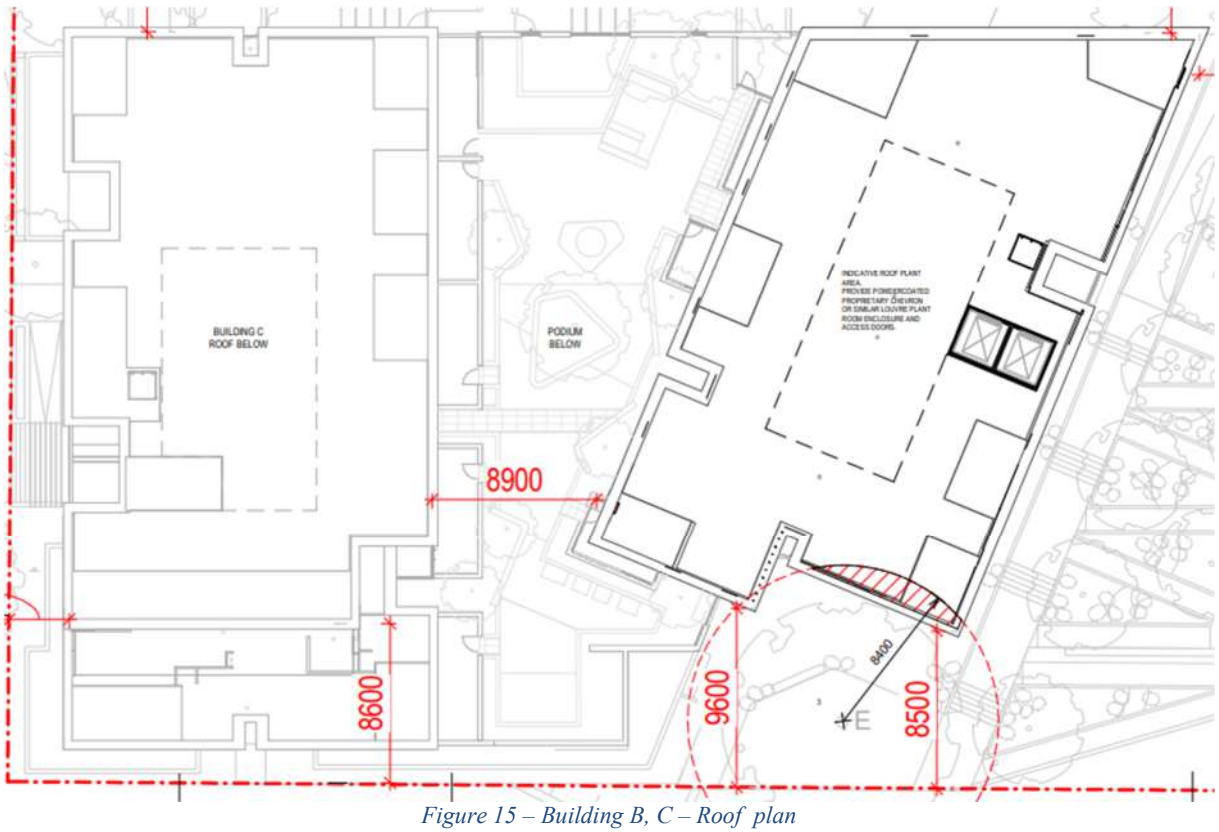

Figure 15 – Building B, C – Roof plan

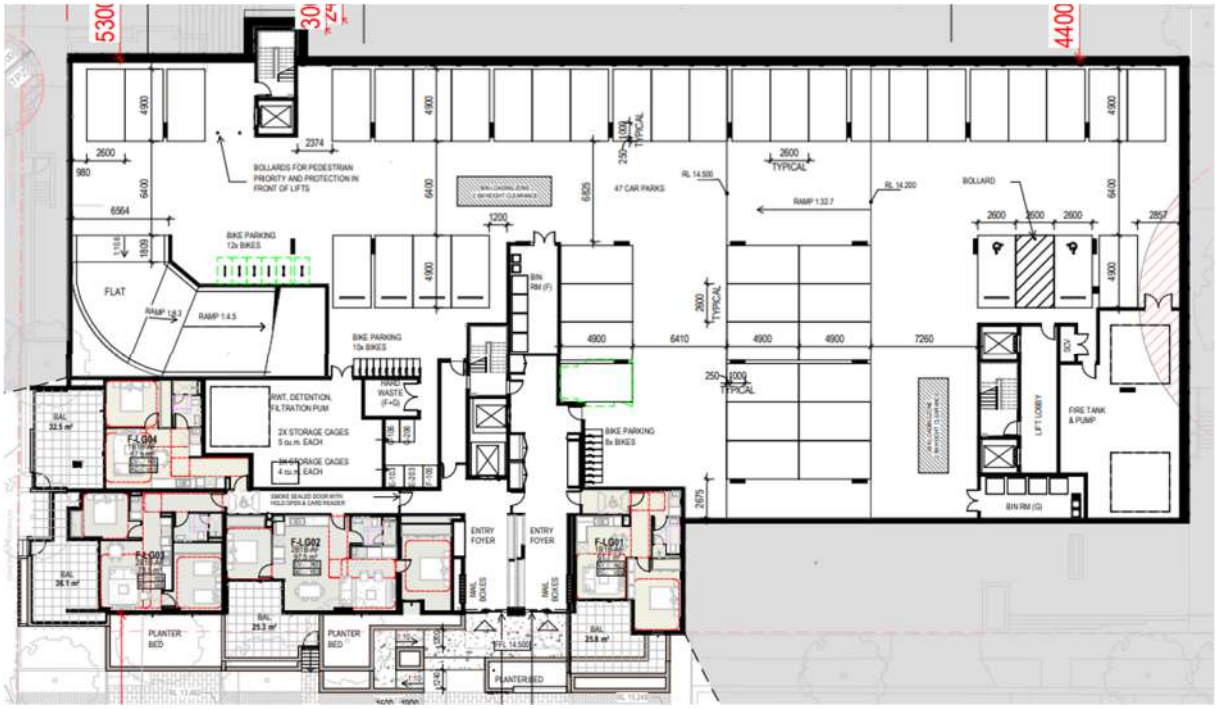

Figure 16 – Building E, F, G – Lower Ground plan

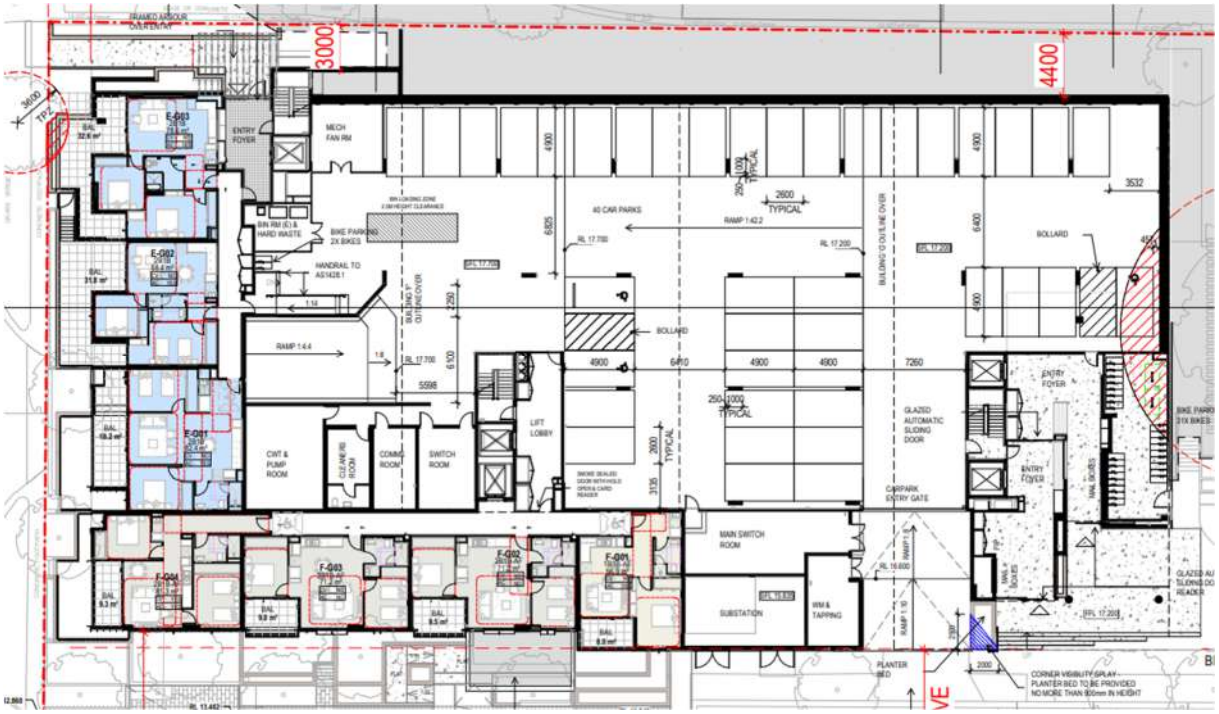

Figure 17 – Building E, F, G – Ground floor plan

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Figure 18 – Building E, F, G – Level 1 plan

Figure 19 – Building E, F, G – Level 2 plan

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Figure 20 – Building E, F, G – Level 3 plan

Figure 21 – Building E, F, G – Level 4 plan

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Figure 22 – Building E, F, G – Level 5 plan

Figure 23 – Building E, F, G – Level 6 plan

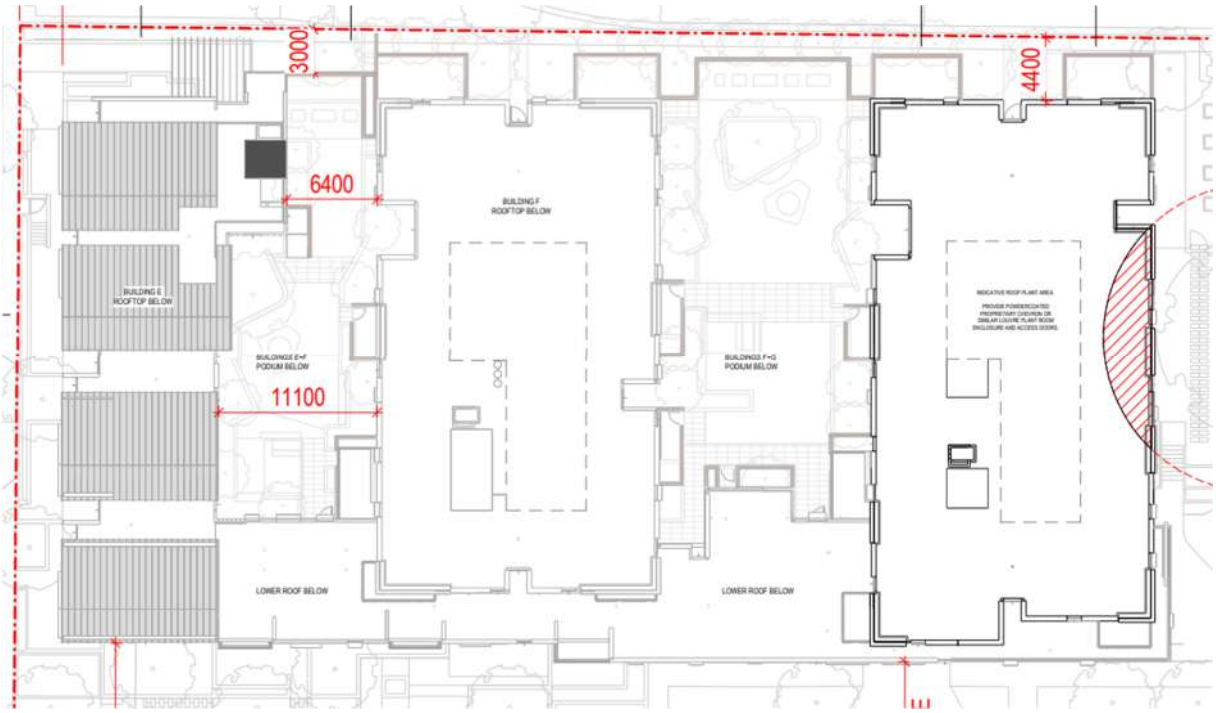

Figure 24 – Building E, F, G – Roof plan

2.3 Catchment areas

Building	Roof (m^2)	Terrace (m^2)	Landscape (m^2)	Total area (m^2)
A	540	202	288	1030
B	587	24	510	1122
C	589	150		739
E	360	55	-	415
F	625	274	-	899
G	678	199	-	877
North Precinct E-F	-	25	300	325
North Precinct F-G	-	60	399	459
Concrete pavement				453
Soft landscape				3692
Bills St. – Road area				316

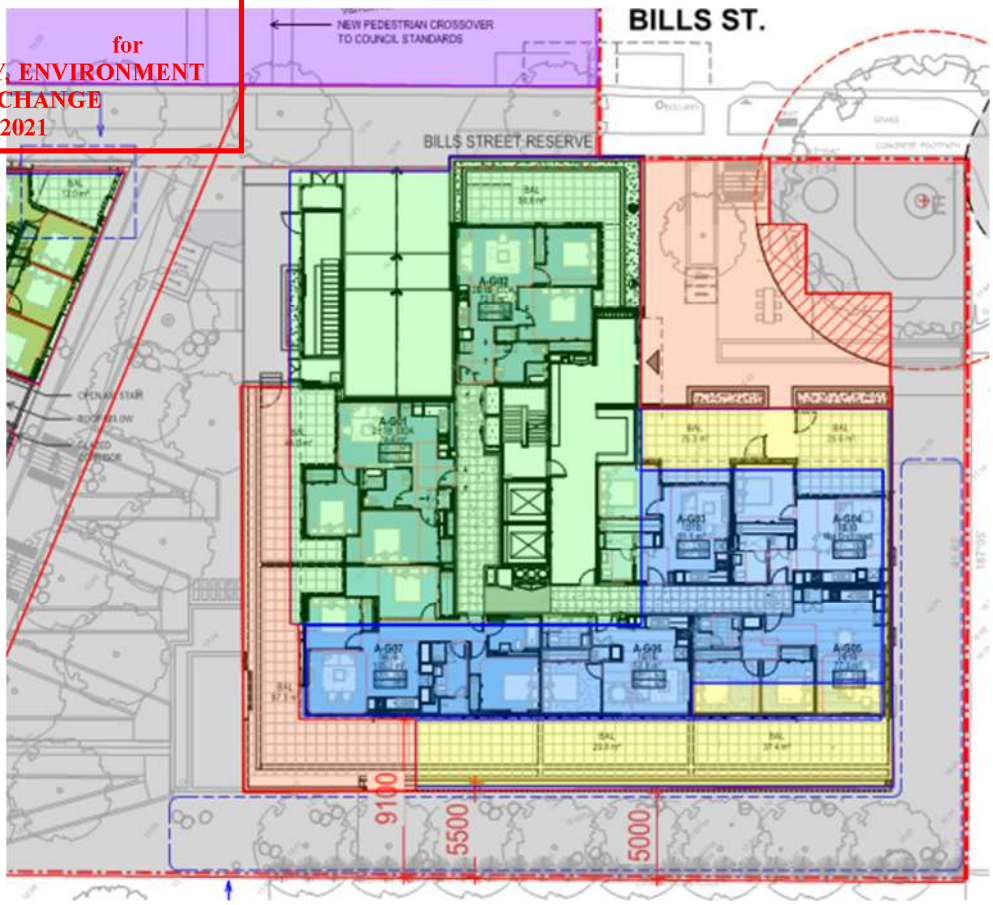

Figure 25 - Catchment plan – Building A
(Legend: GREEN – roof, YELLOW – Terrace, BLUE – podium landscape, ORANGE – concrete paving, GREY – soft landscape, PURPLE – road area)

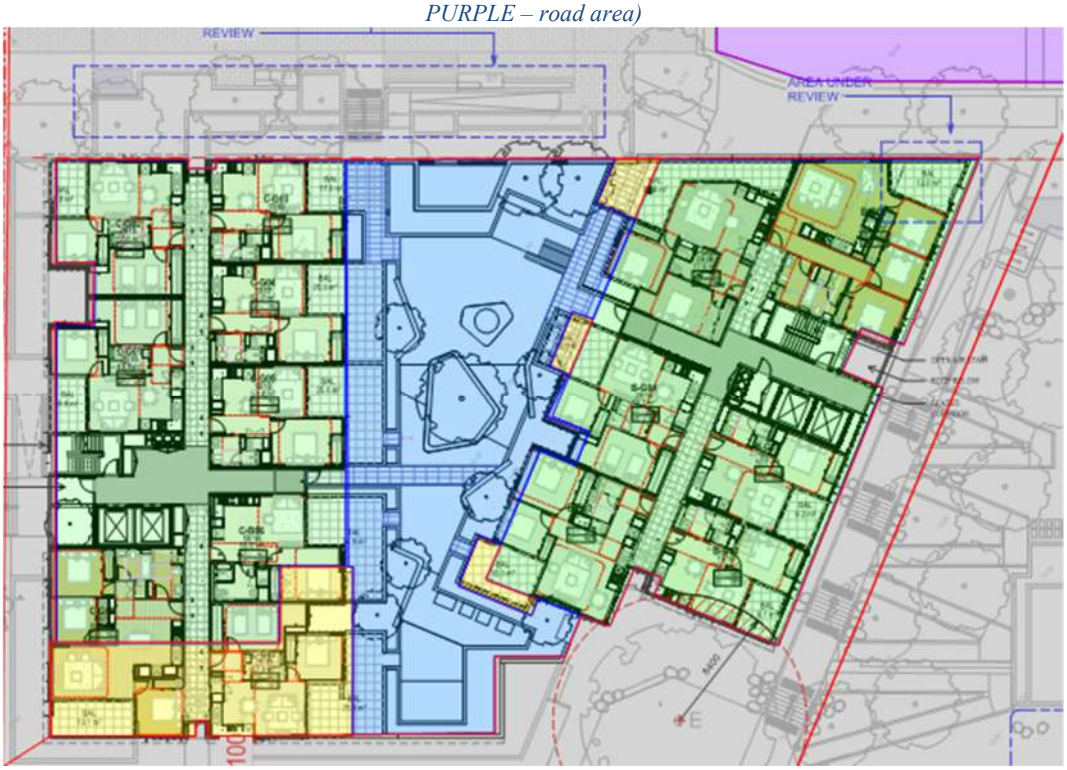

Figure 26 - Catchment plan – Buildings B & C

(Legend: GREEN – roof, YELLOW – Terrace, BLUE – podium landscape, ORANGE – concrete paving, GREY – soft landscape, PURPLE – road area)

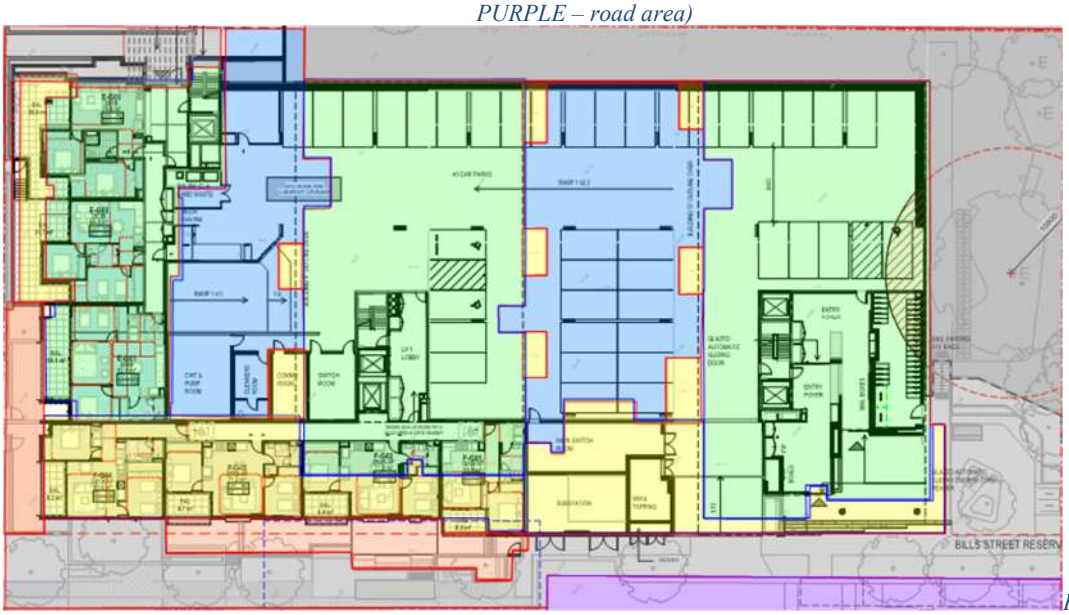

Figure 27 - Catchment plan – Buildings E, F & G
(Legend: GREEN – roof, YELLOW – Terrace, BLUE – podium landscape, ORANGE – concrete paving, GREY – soft landscape, PURPLE – road area)

2.4 Conditions of Legal point of discharge (LPOD)

LPOD conditions have been advised by the civil department of the City of Boroondara and are listed below.

- Storm water drainage runoff shall be collected in a complete and effective system of drains and connected to the Approved Point of Storm water discharge.
- Onsite detention (orifice) control pit is required to be designed to meet the council specified PSD and the detention volume in accordance with Council's standard drawing SD999 rev. J.
- No structure is to be built over and no cut or fill over:
  - A drainage easement on Title
  - An existing council storm water drain that is located outside any easement on Title.
- No ground water or anything other than storm water is to be discharged into an open drainage system.

See Appendix A for the complete LPD.

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3 Proposed Storm Water Management System

Water from the entire site area is to be captured and directed into two separate stormwater management systems where it is to be treated as follows:

- Water falling on the roof areas is to be conveyed via gravity to retention tanks. This water is then to be reused for irrigation of landscape and toilet flushing.
- Water falling on terraces and podium landscape areas is to be conveyed via gravity to detention tanks.
- Water falling on the soft landscape around the buildings is to be directed towards rain gardens via gravity.
- Flow from retention and detention tanks is to be gravity fed to rain gardens from where it will flow to the LPOD, also via gravity.
- Water falling on a portion of Bills Street will flow directly to the LPOD.

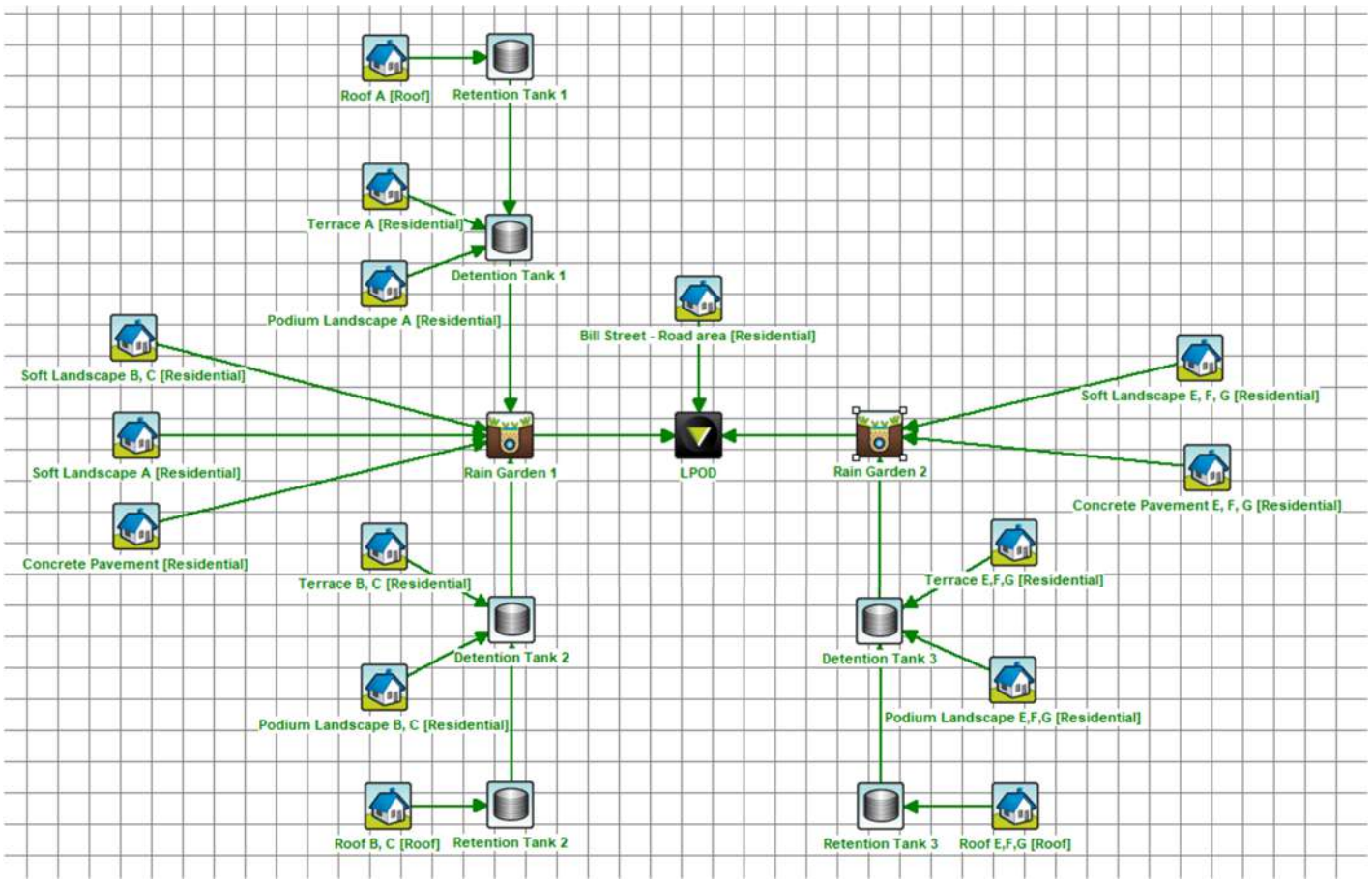

Figure 28 - Schematic plan of the proposed storm water management system

3.1 Design parameters

3.1.1 Reuse requirements

Building	Irrigation (kL/year)	Toilet flushing (kL/year)	Total (kL/year)
A	721	391	1112
B, C	1229	636	1865
E, F, G	4358	1215	5573

(A pattern of monthly loading has been assigned for irrigation reuse – refer to setup of retention tank nodes in MUSIC for further details)

3.1.2 Detention requirements

Size of on-site detention tanks and maximum values of permissible discharge (PSD) have been dictated directly by the civil department of the City of Boroondara. The relevant communication is presented in Appendix B.

Building Group	OSD tank size (m^3)	PSD (L/s)
A, B, C	51.2	43.6
E, F, G	41.5	35.7

3.1.3 Orifice Plate

(TBC)

3.1.4 Treatment requirements

In accordance with CSIRO 'Urban Stormwater Best Practice Environmental Management Guidelines – 2006'

Total Suspended Solids (SS)	80% reduction
Total Phosphorus (TP)	45% reduction
Total Nitrogen (TN)	45% reduction
Gross Pollutants	70% reduction

3.2 SW treatment

2 rain gardens have been specified in order to achieve quality of the outflow that surpasses the CSIRO best practice guidelines. The first rain garden of area 12.9 m^2 treats water falling on buildings A,B and C. The second rain garden of area 10.5 m^2 treats water falling on buildings E, F and G.

4 Model for Urban Stormwater Improvement Conceptualisation - MUSIC Analysis

4.1 Catchment setup

MUSIC analysis was carried out using the 1959 data from the Flemington Racecourse weather data station in 6 minute format as recommended in the 'MUSIC Guidelines – Recommended input parameters and modelling approaches for MUSIC users' (2010) published by Melbourne Water.

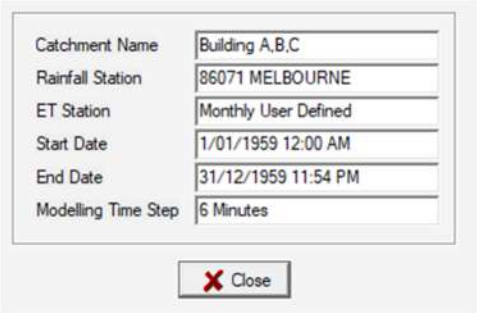

Figure 29 - MUSIC Catchment Properties

4.1.1 Treatment train

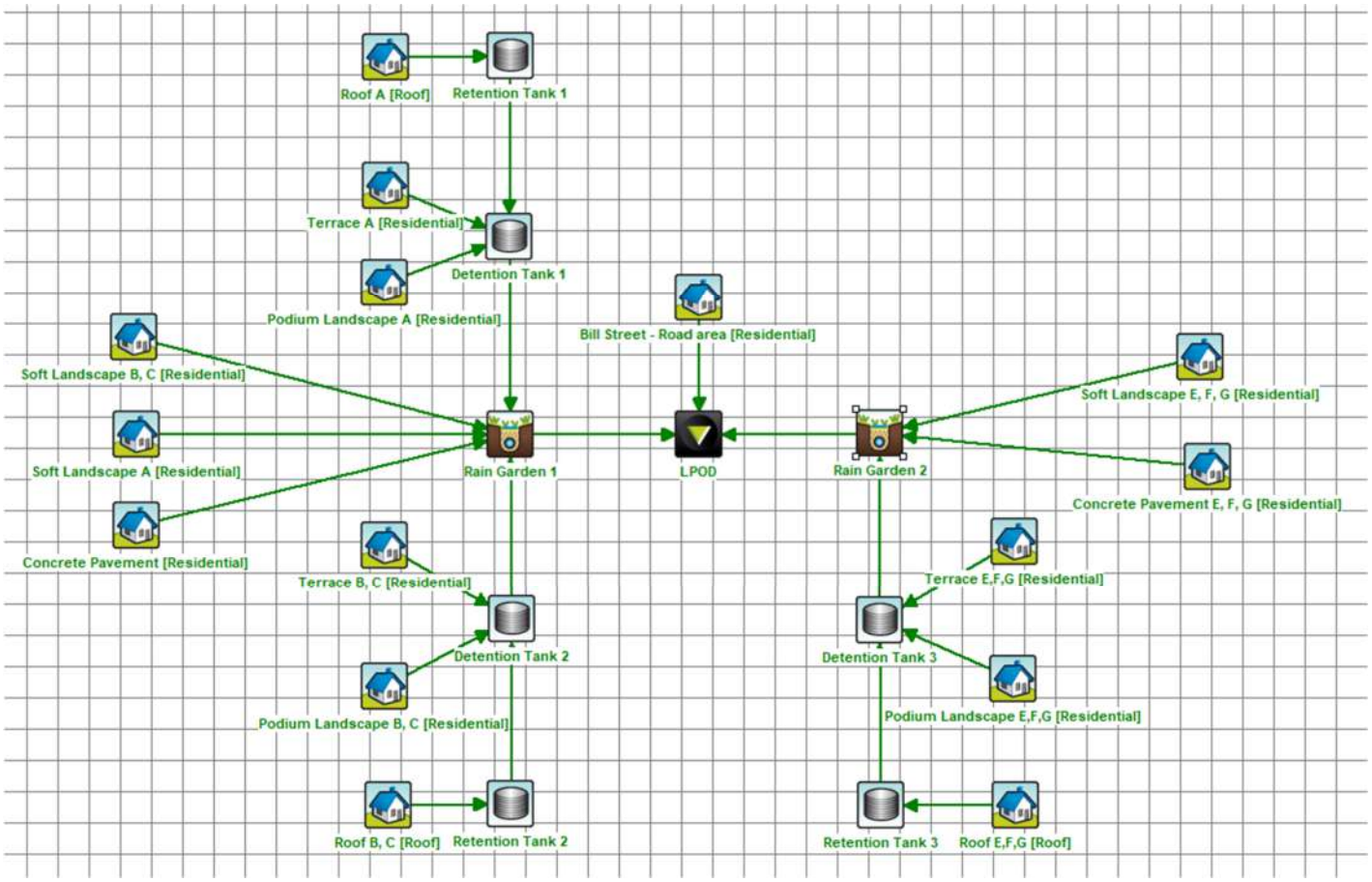

Figure 30 - Schematic treatment train

4.1.2 Catchment zones

Building A

Roof (impervious catchment area of 540 m^2 = 0.054 ha)

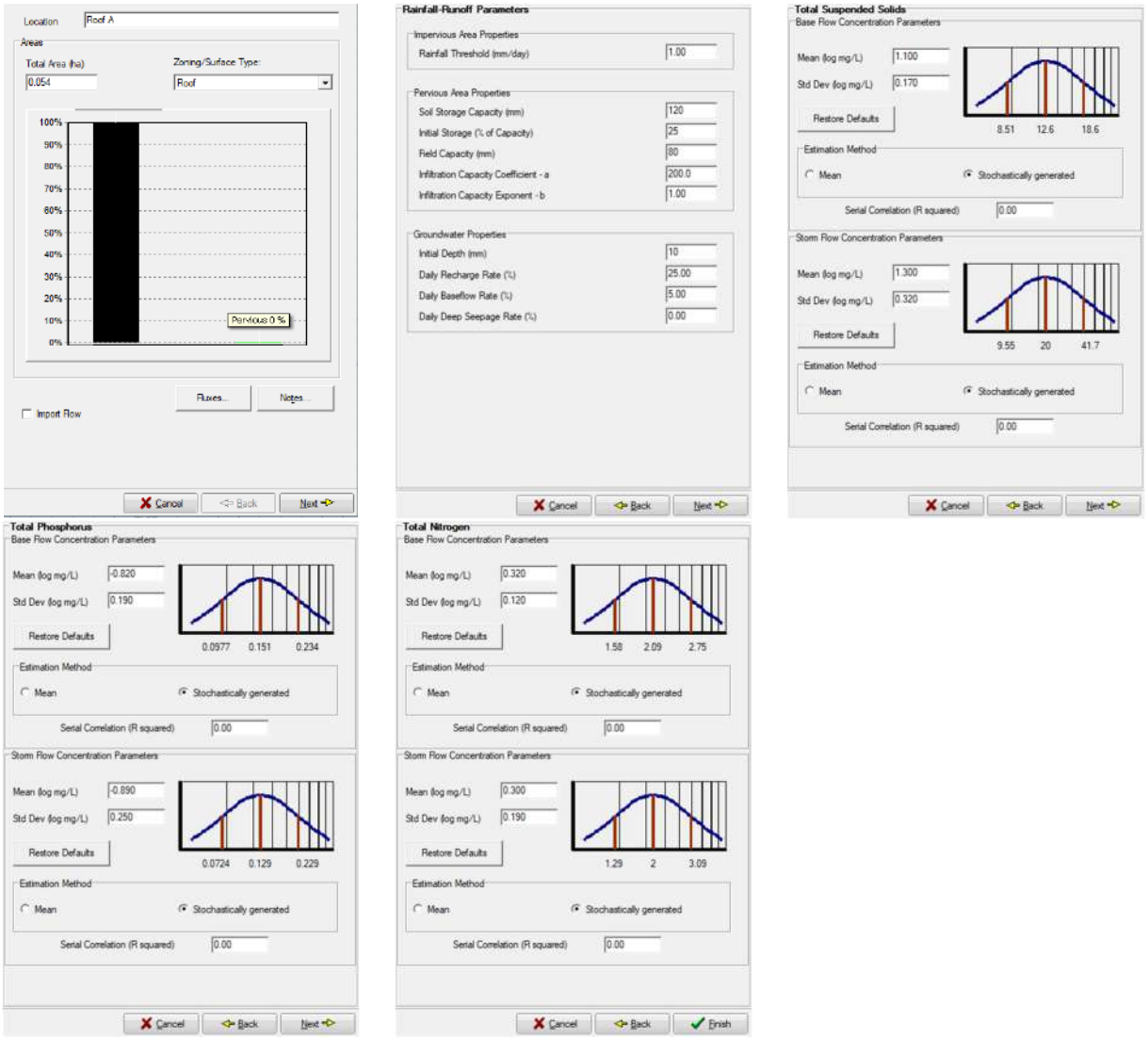

Figure 31 – Roof area node setup (Building A)

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Terrace (impervious catchment area of 200 m^2 = 0.020 ha)

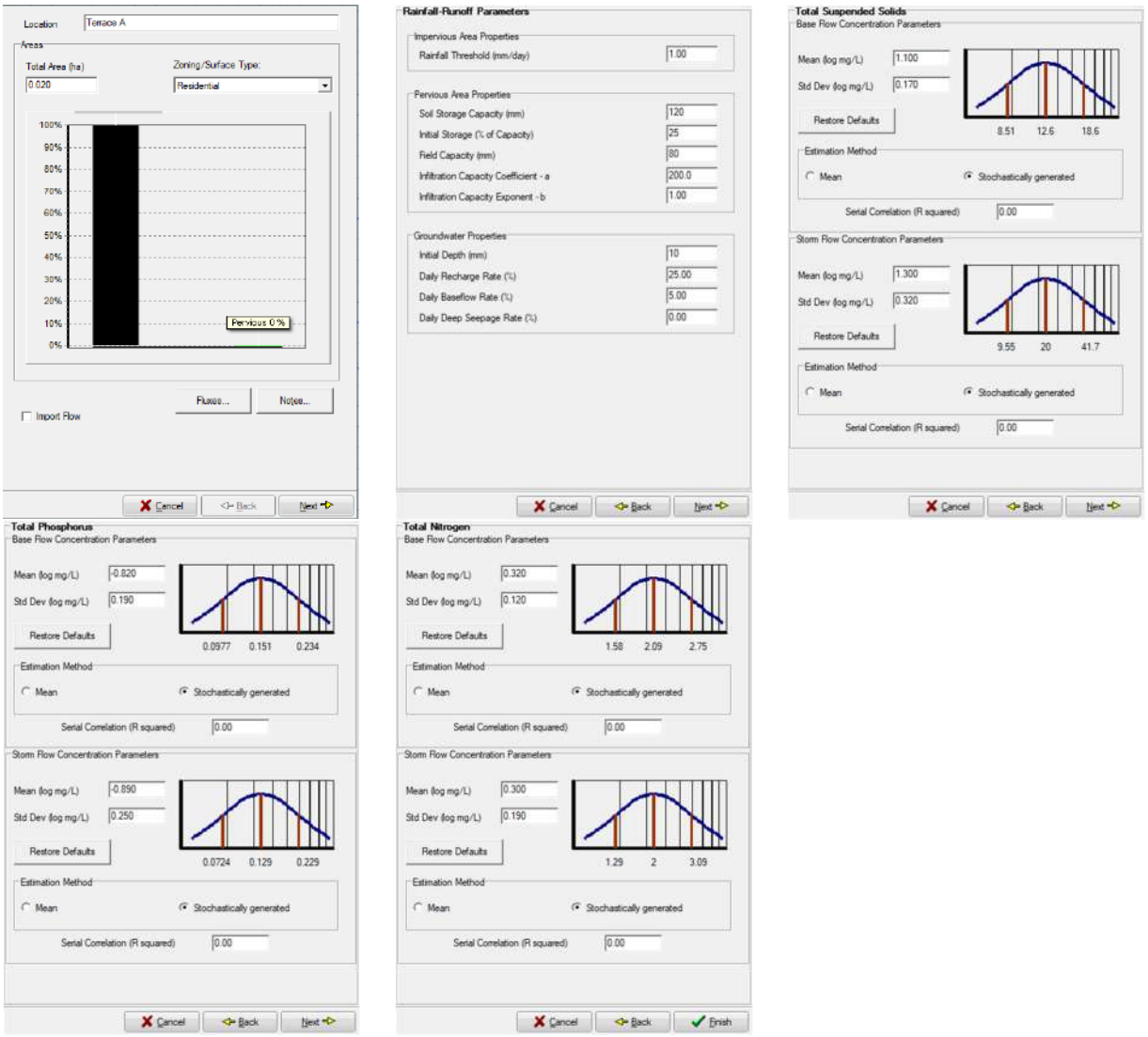

Figure 32 – Terrace area node setup (Building A)

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Podium Landscape (impervious catchment area of 290 m^2 = 0.029 ha)

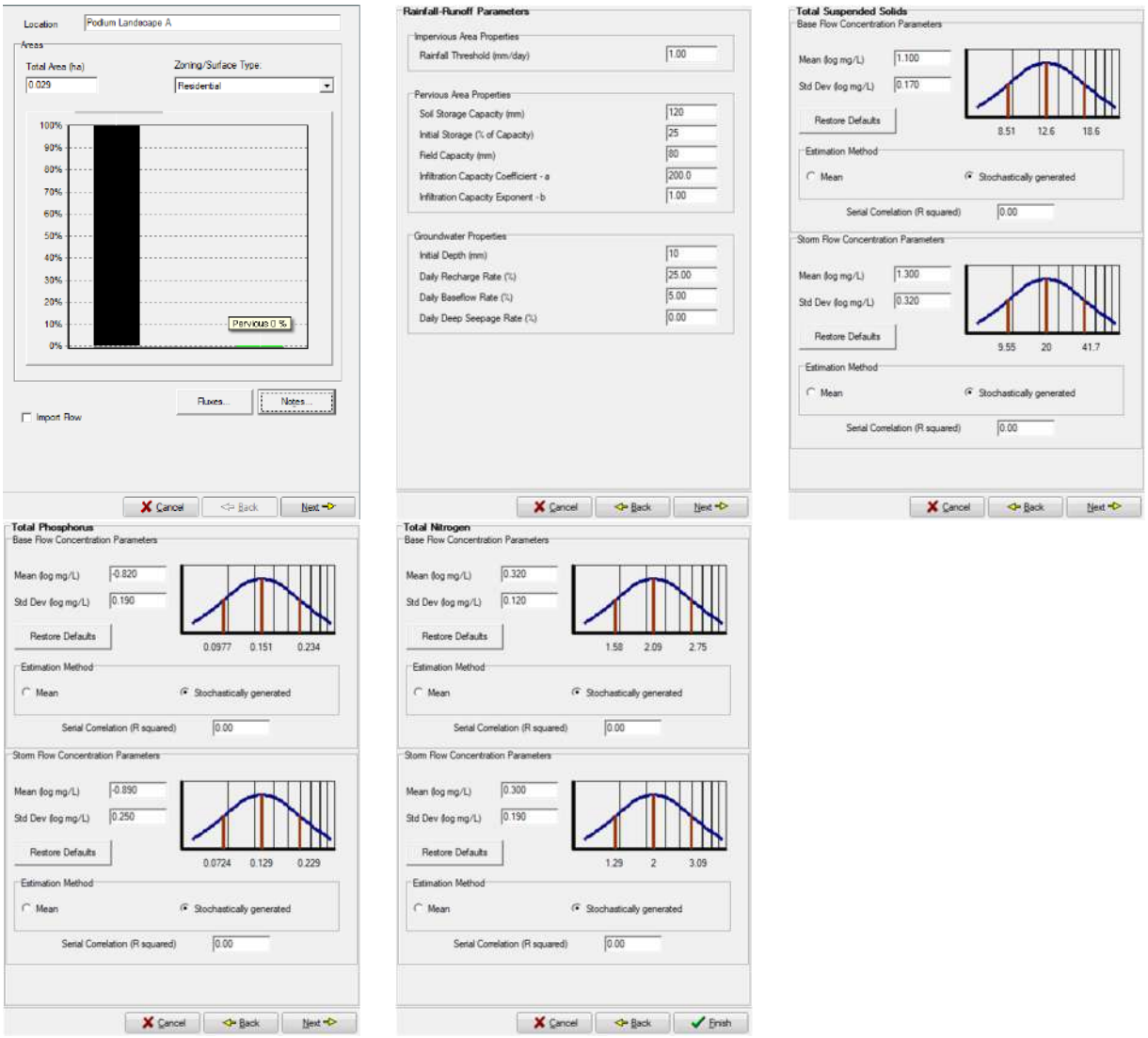

Figure 33 – Podium Landscape area node setup (Building A)

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Soft Landscape (pervious catchment area of 940 m^2 = 0.094 ha)

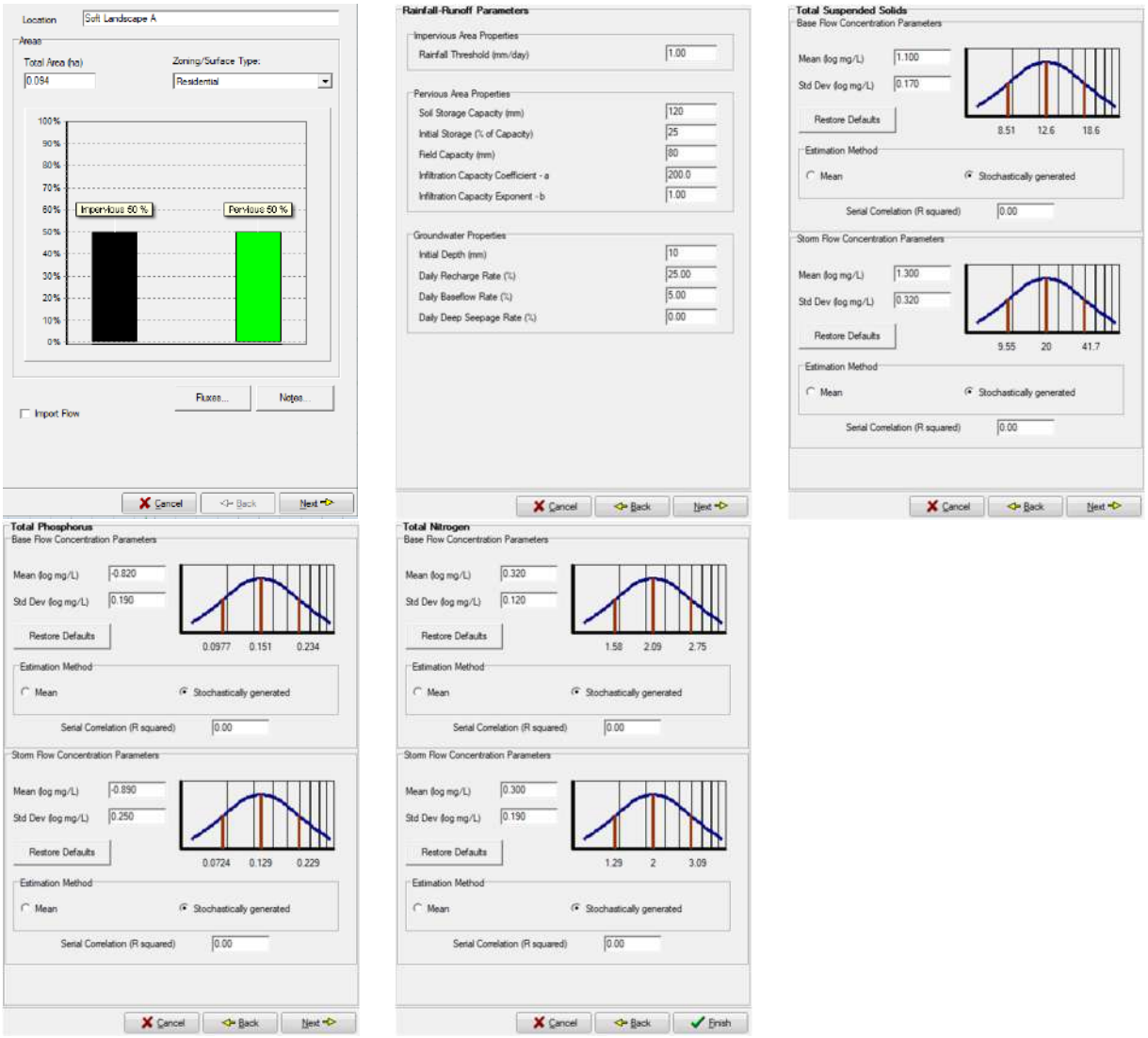

Figure 34 – Soft Landscape area node setup (Building A)

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Concrete Pavement (pervious catchment area of 280 m^2 = 0.028 ha)

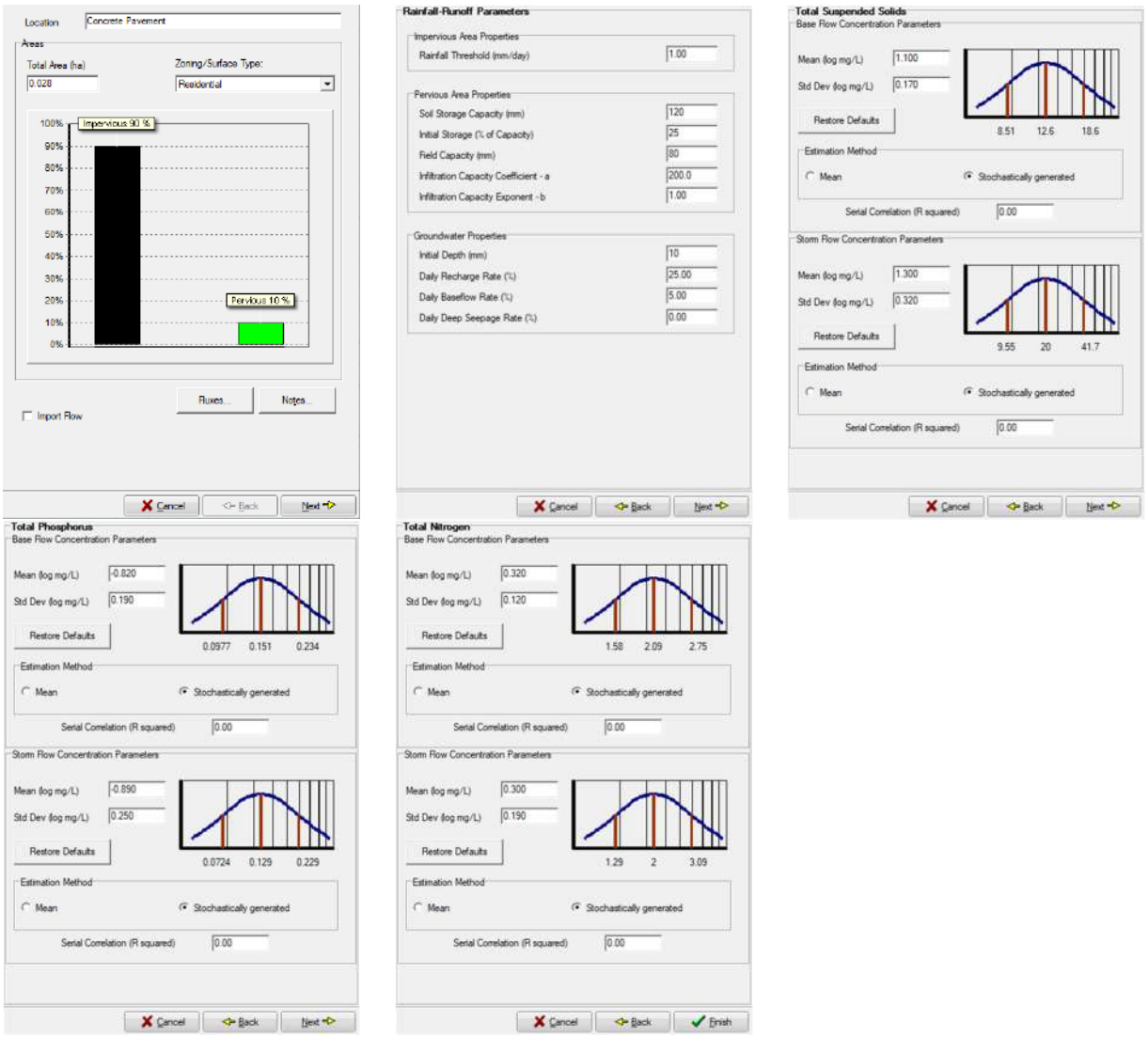

Figure 35 – Concrete Pavement area node setup (Building A)

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Building B & C

Roof (impervious catchment area of 1180 m^2 = 0.118 ha)

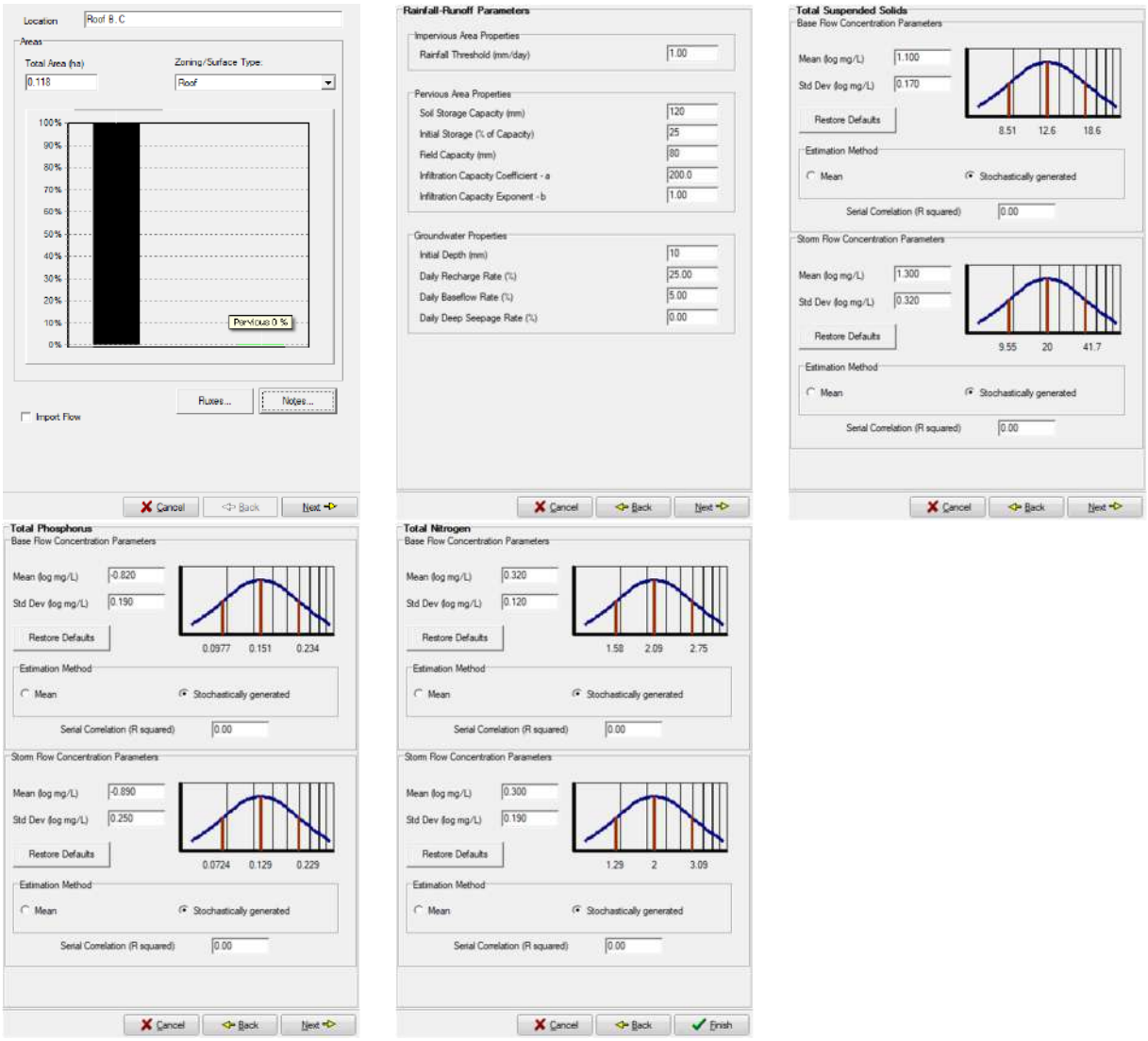

Figure 36 – Roof area node setup (Buildings B & C)

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Terrace (impervious catchment area of 170 m^2 = 0.017 ha)

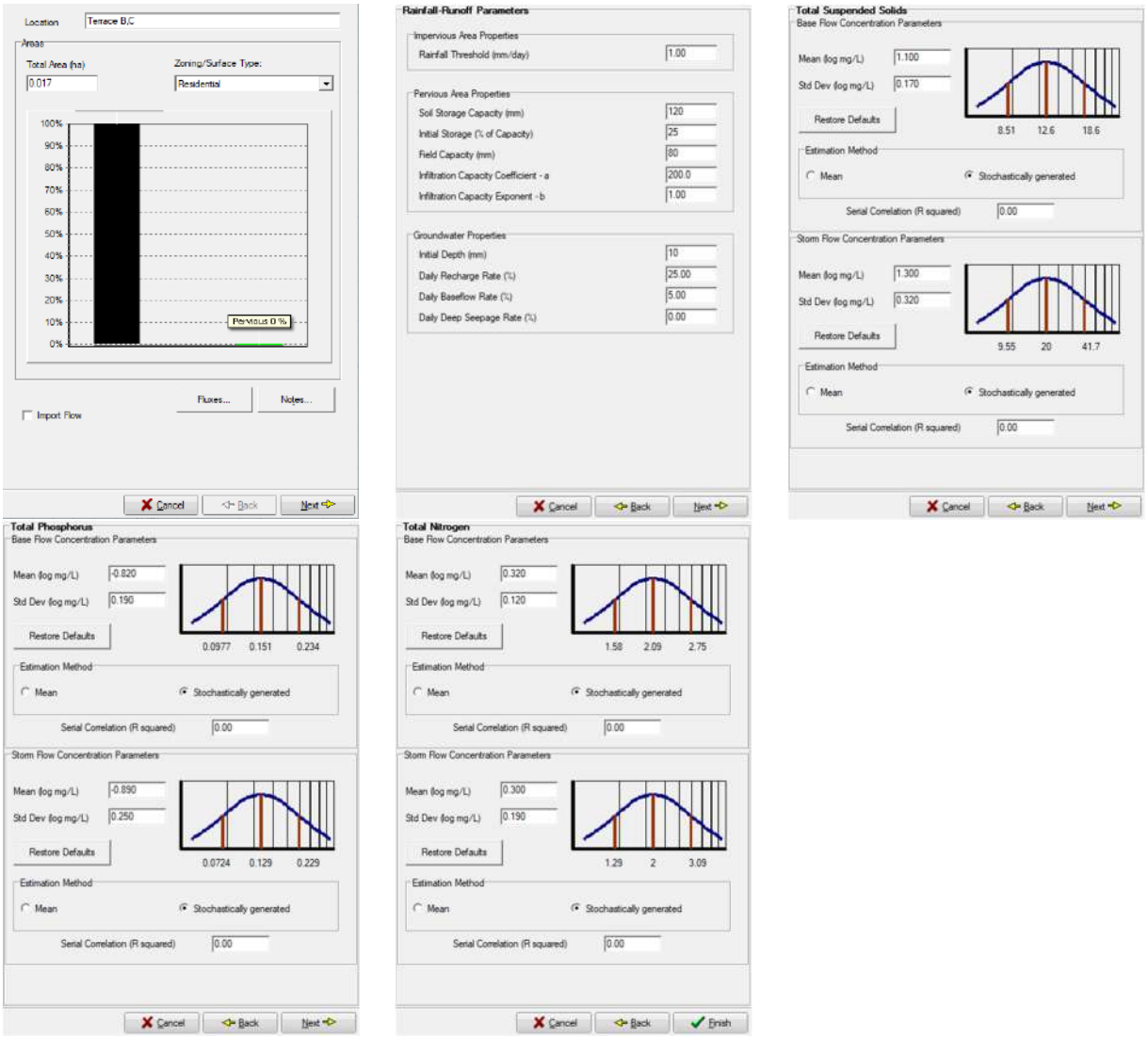

Figure 37 – Terrace area node setup (Buildings B & C)

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Podium Landscape (impervious catchment area of 510 m^2 = 0.051 ha)

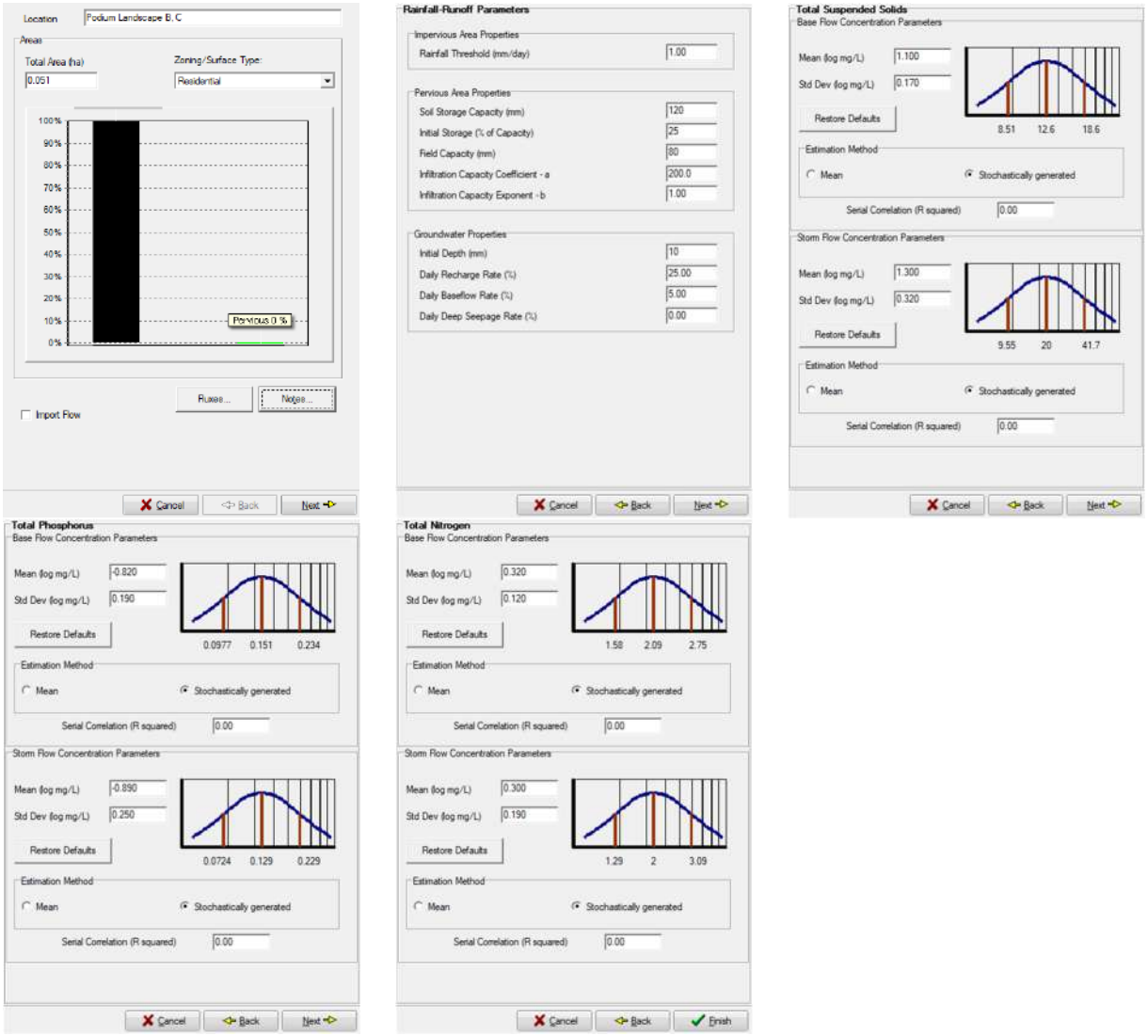

Figure 38 – Podium Landscape area node setup (Buildings B & C)

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Soft Landscape (pervious catchment area of 1160 m^2 = 0.116 ha)

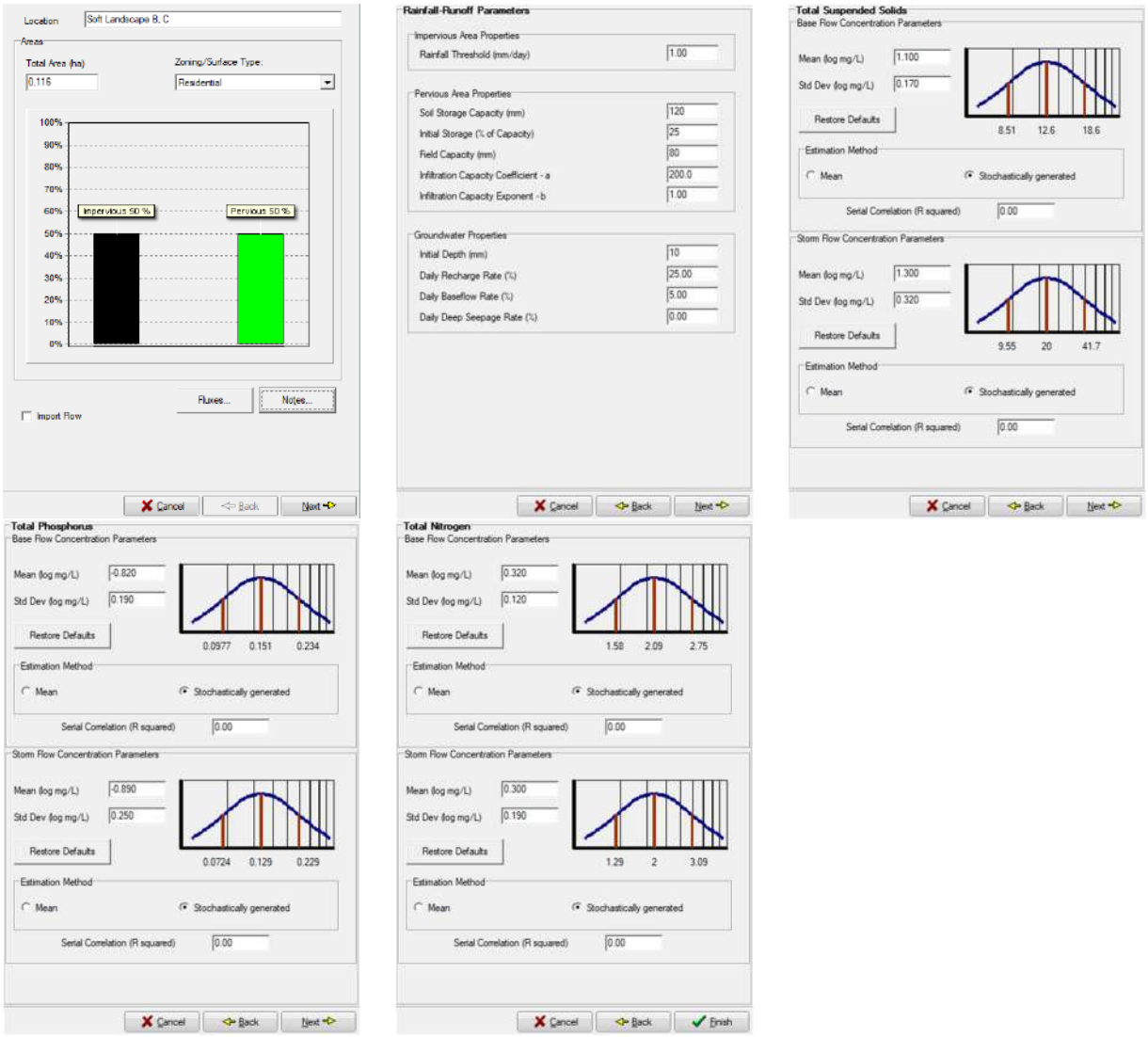

Figure 39 – Soft Landscape area node setup (Buildings B & C)

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Building E, F & G

Roof (impervious catchment area of 1670 m^2 = 0.167 ha)

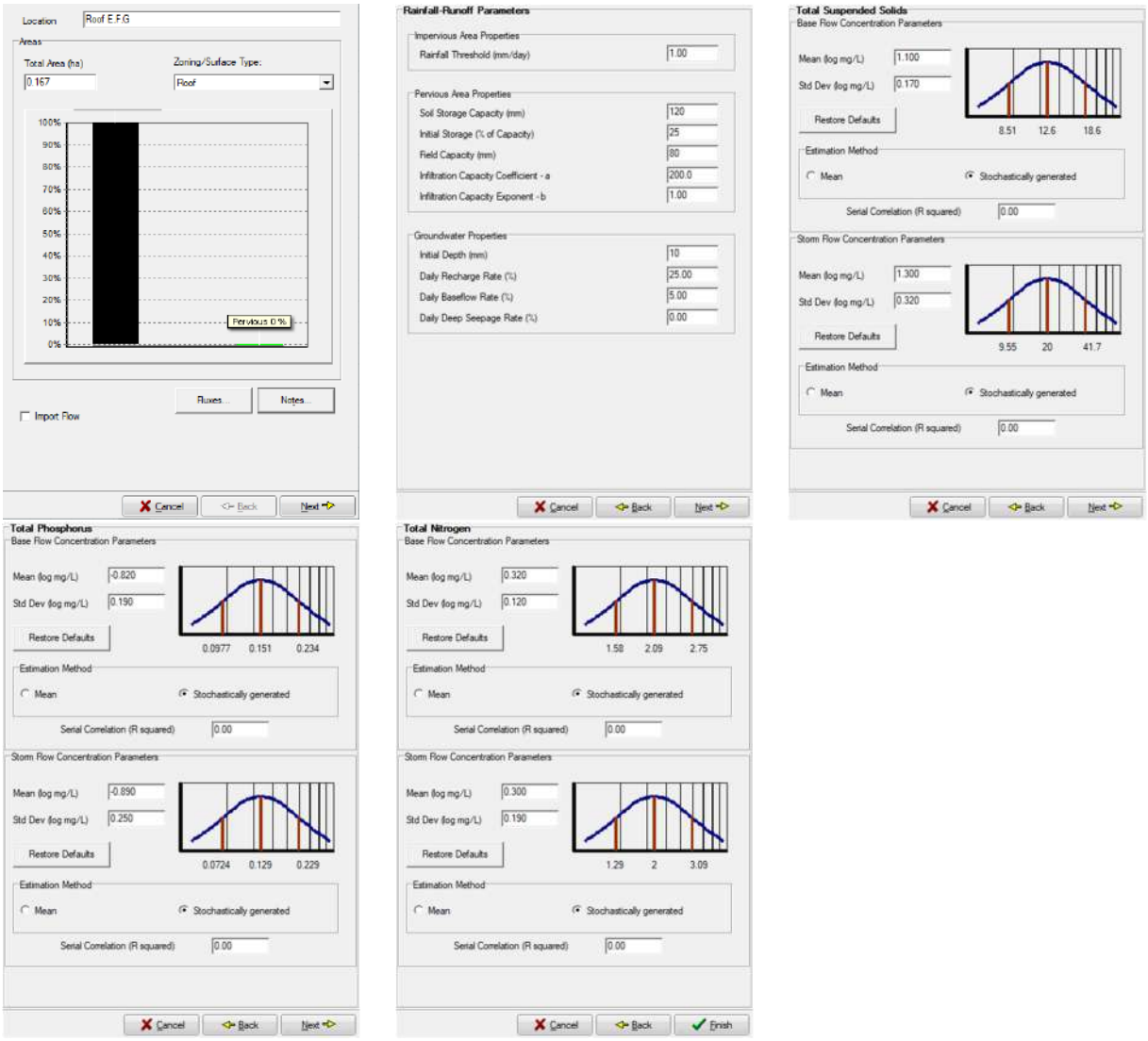

Figure 40 – Roof area node setup (Buildings E, F & G)

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Terrace (impervious catchment area of 530 m^2 = 0.053 ha)

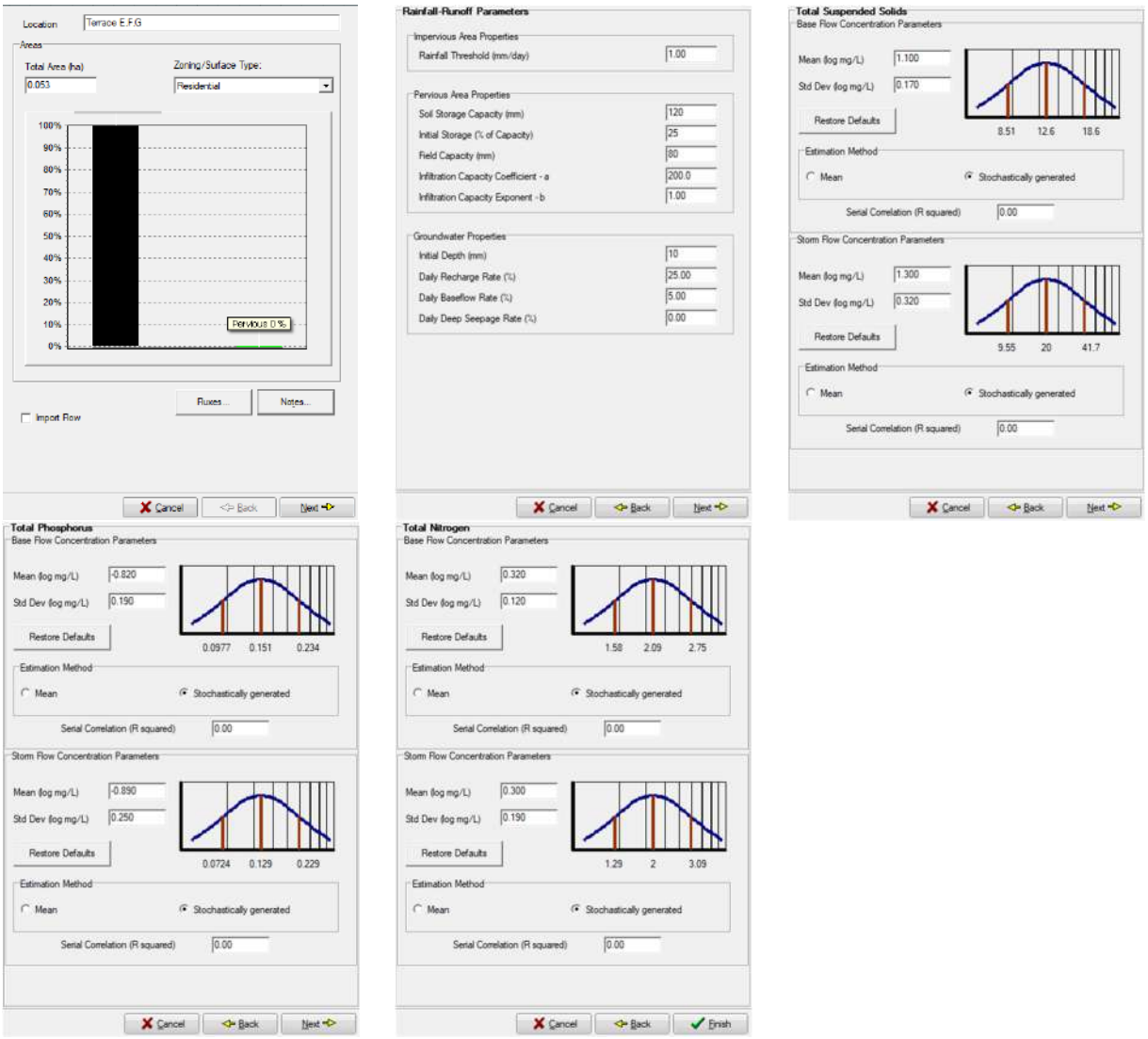

Figure 41 – Terrace area node setup (Buildings E, F & G)

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Podium Landscape (impervious catchment area of 780 m^2 = 0.078 ha)

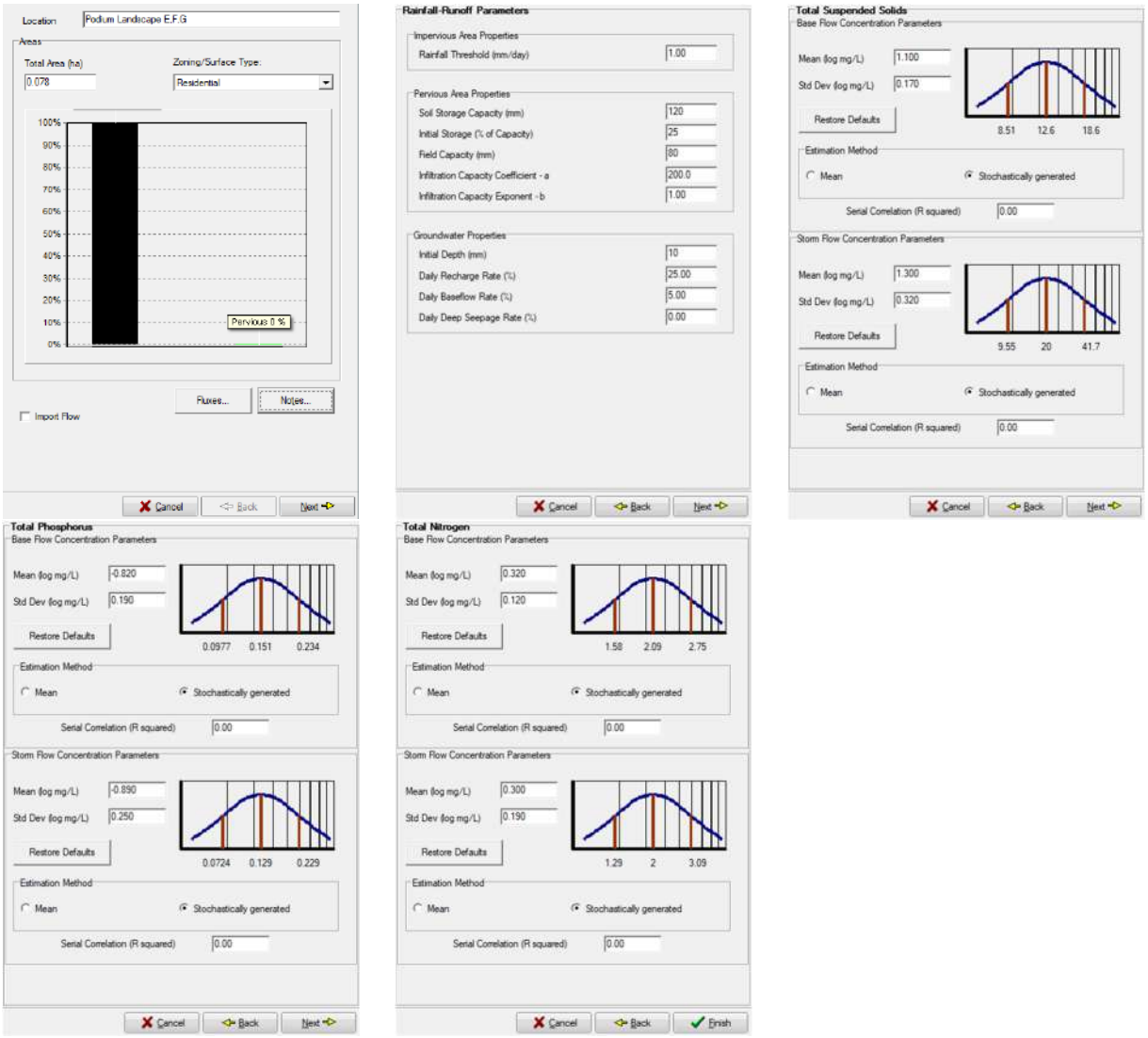

Figure 42 – Podium Landscape area node setup (Buildings E, F & G)

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Soft Landscape (pervious catchment area of 1270 m^2 = 0.127 ha)

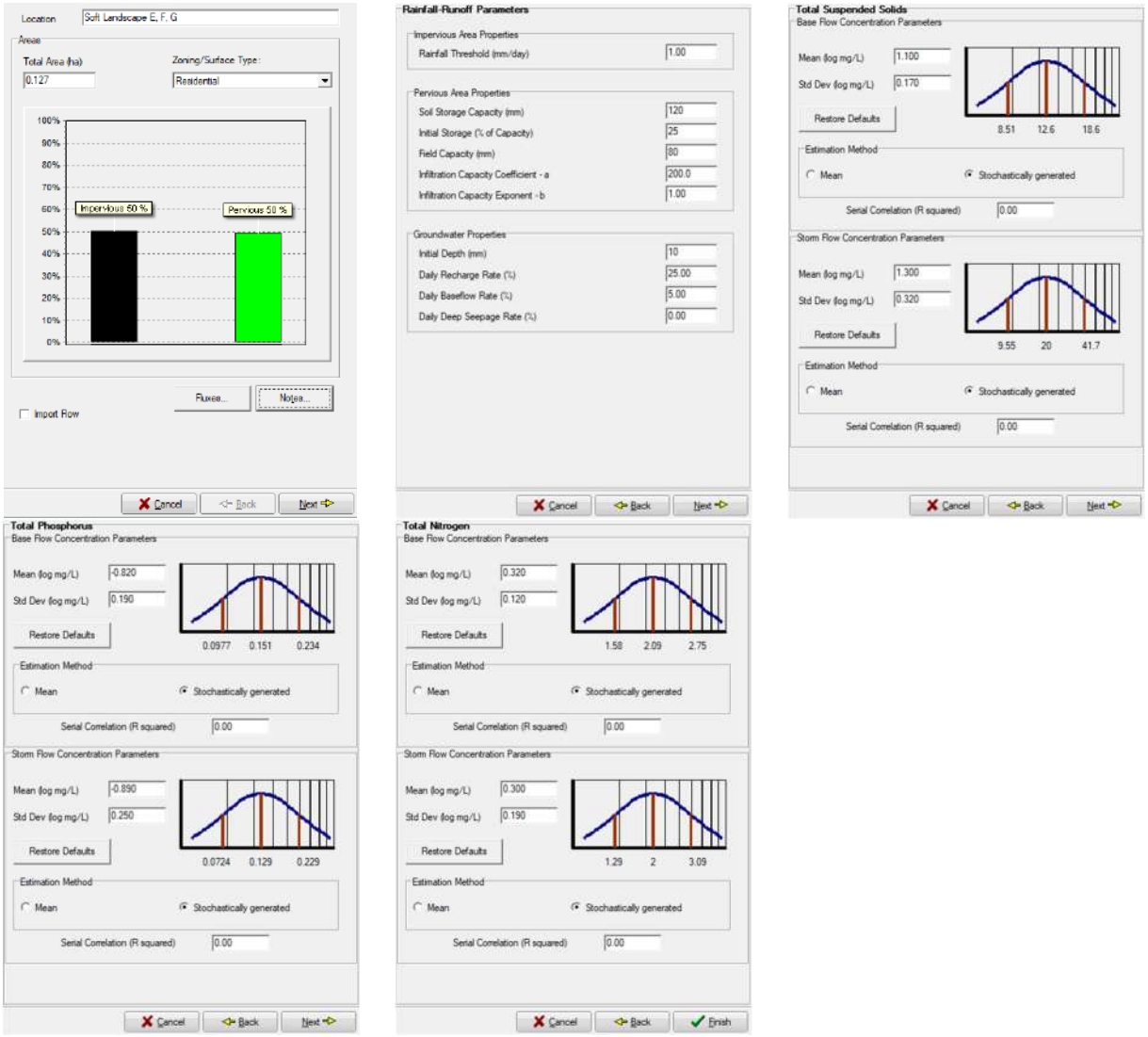

Figure 43 – Soft Landscape area node setup (Buildings E, F & G)

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Concrete Pavement (pervious catchment area of 170 m^2 = 0.017 ha)

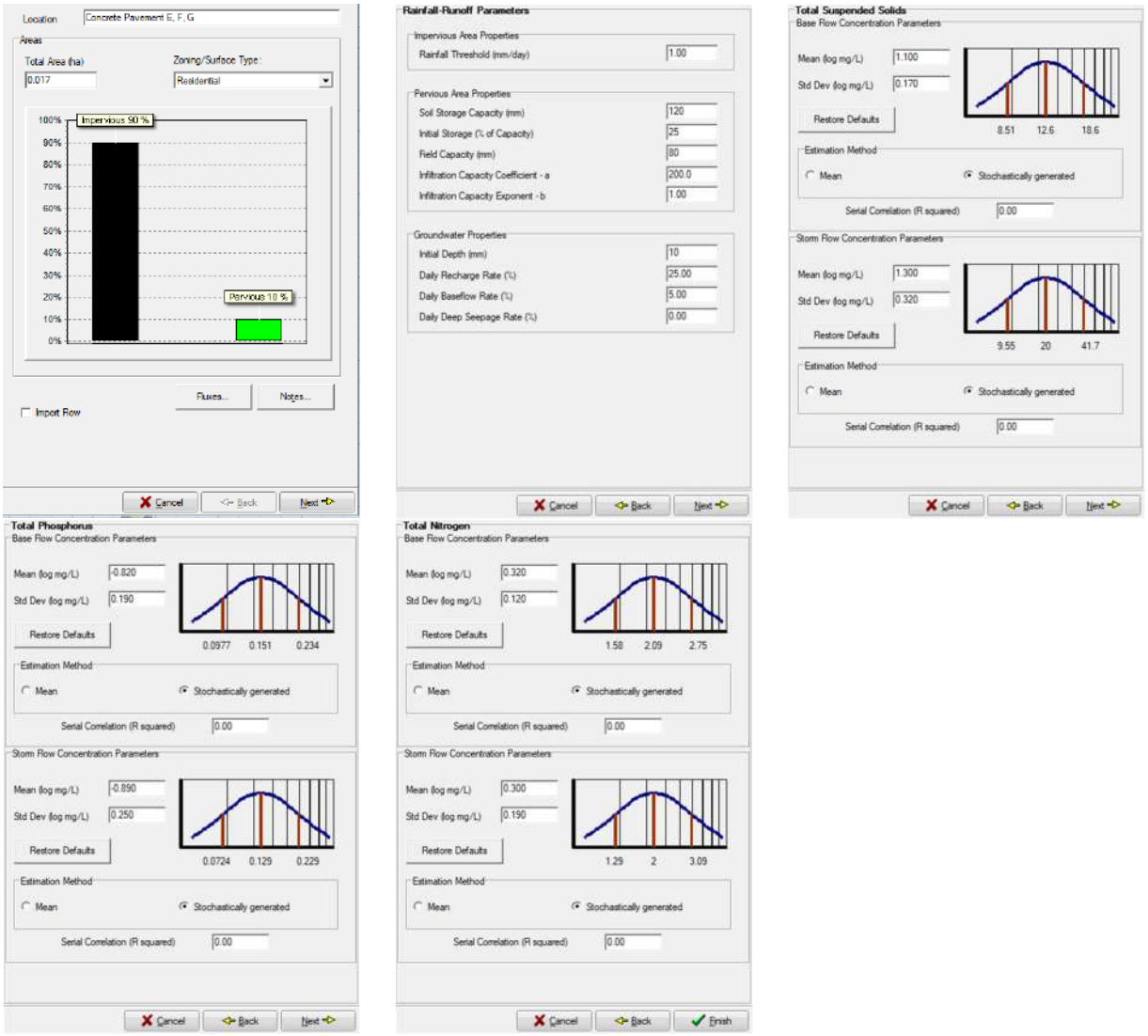

Figure 44 – Concrete Pavement area node setup (Buildings E, F & G)

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Bills Street – Road area (pervious catchment area of 320 m^2 = 0.032 ha)

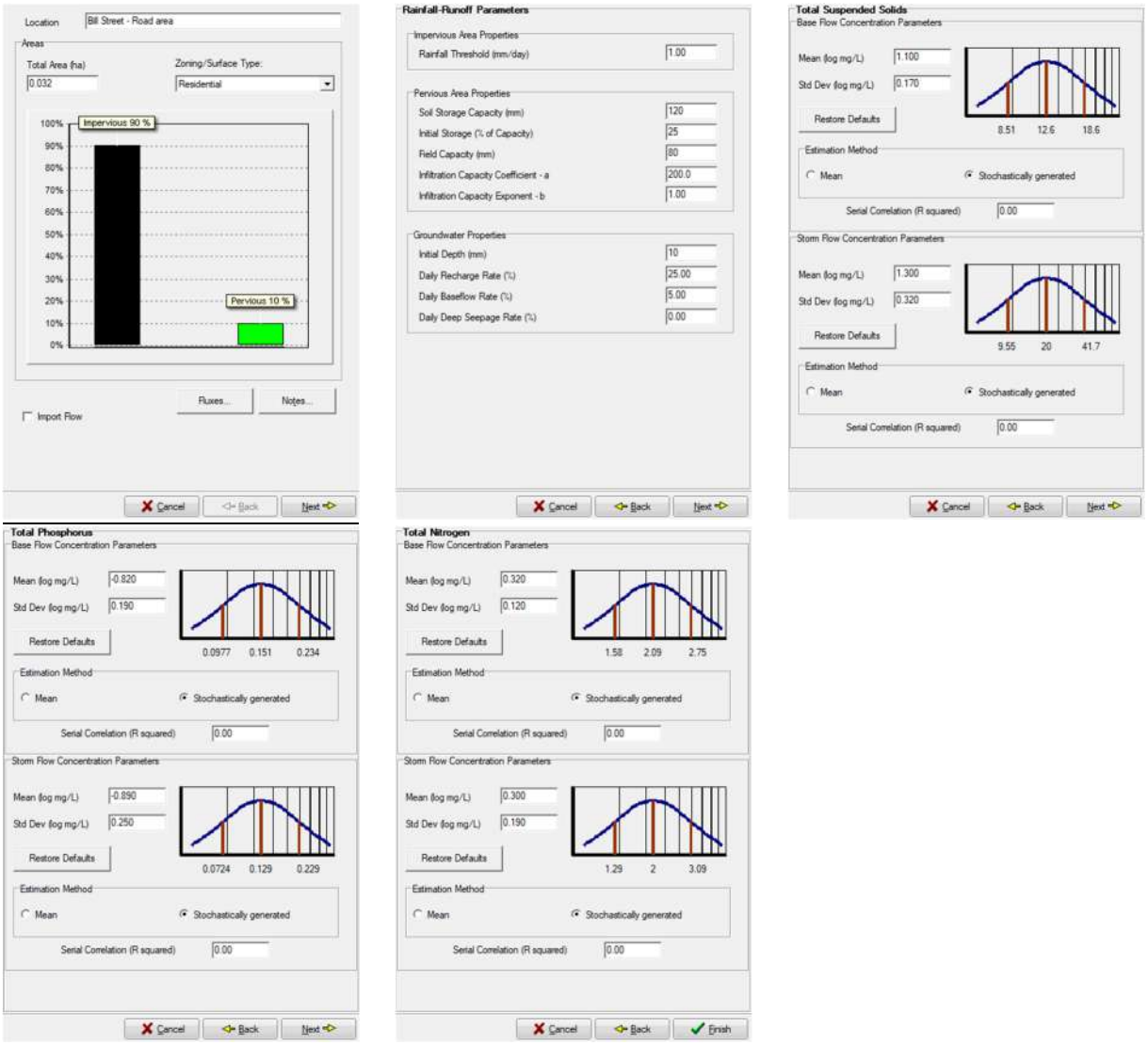

Figure 45 – Bill St. Road area node setup

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4.1.3 Tank Parameters

Retention tank 1 (Building A)

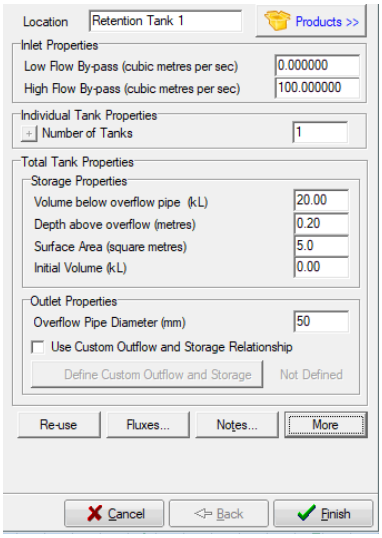

Figure 46 - Retention tank parameters

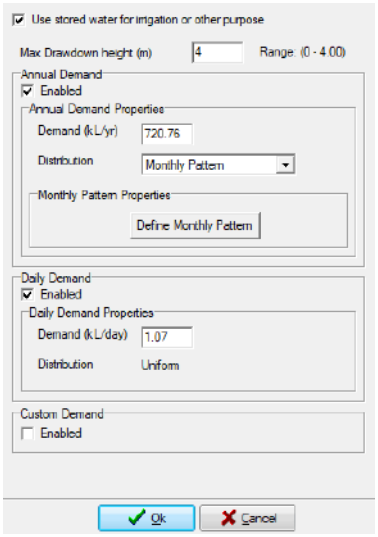

Figure 47 – Re-use parameters

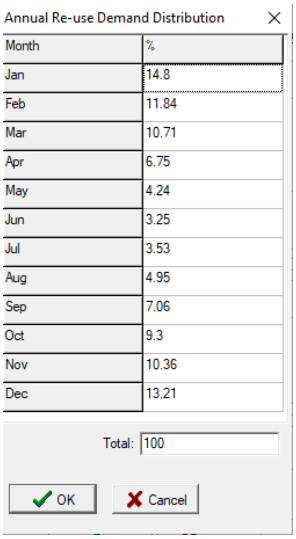

Figure 48 - Distribution of irrigation demand

Detention tank 1 (Building A)

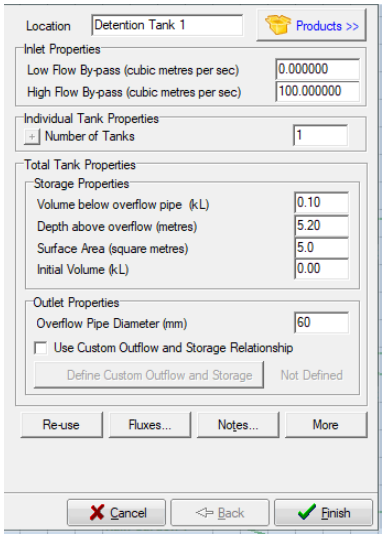

Figure 49 - Detention tank parameters

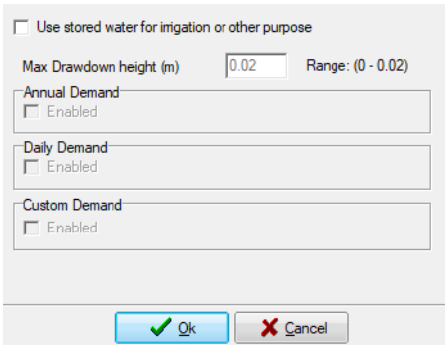

Figure 50 – Re-use parameters

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Retention tank 2 (Buildings B & C)

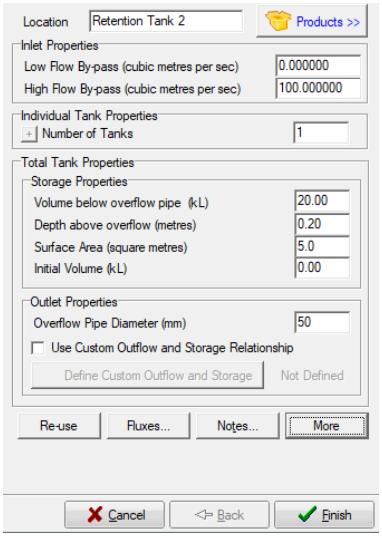

Figure 51 - Retention tank parameters

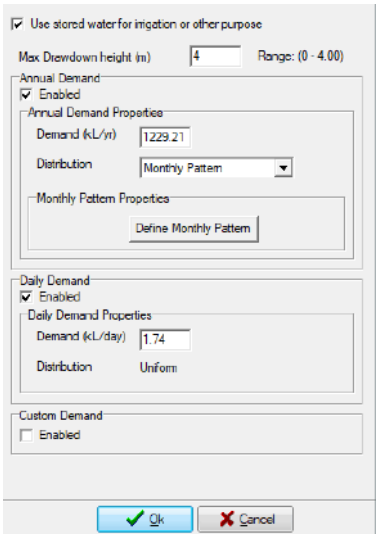

Figure 52 – Re-use parameters

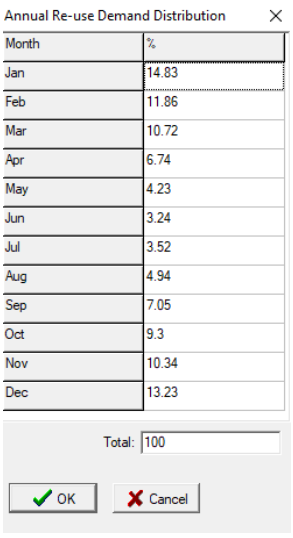

Figure 53 - Distribution of irrigation demand

Detention tank 2 (Buildings B & C)

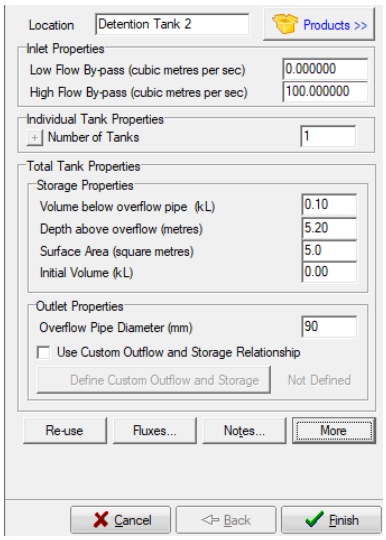

Figure 54 - Detention tank parameters

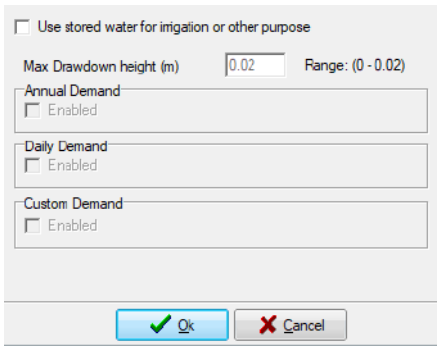

Figure 55 – Re-use parameters

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Retention tank 3 (Buildings E, F & G)

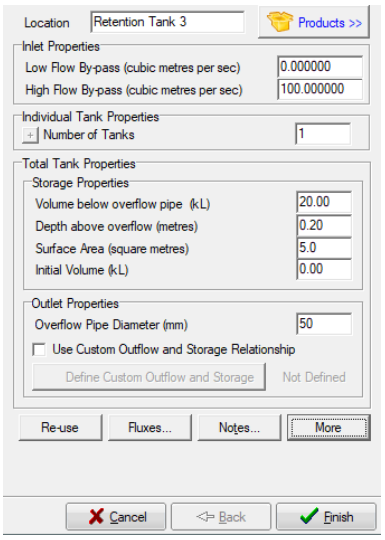

Figure 56 - Retention tank parameters

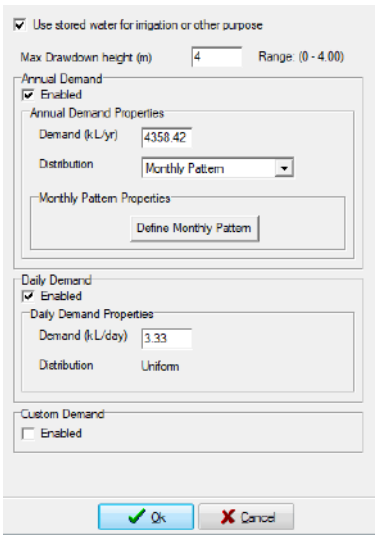

Figure 57 – Re-use parameters

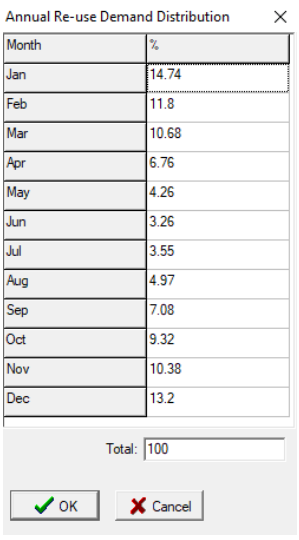

Figure 58 - Distribution of irrigation demand

Detention tank 3 (Buildings E, F & G)

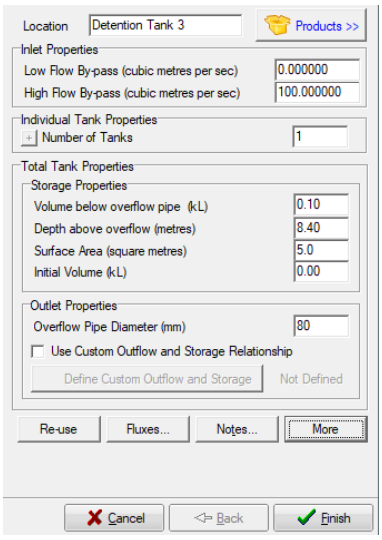

Figure 59 - Detention tank parameters

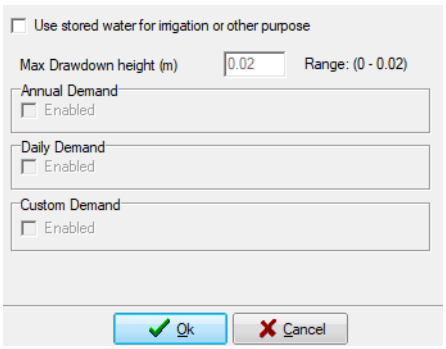

Figure 60 – Re-use parameters

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4.1.4 Rain Garden Parameters

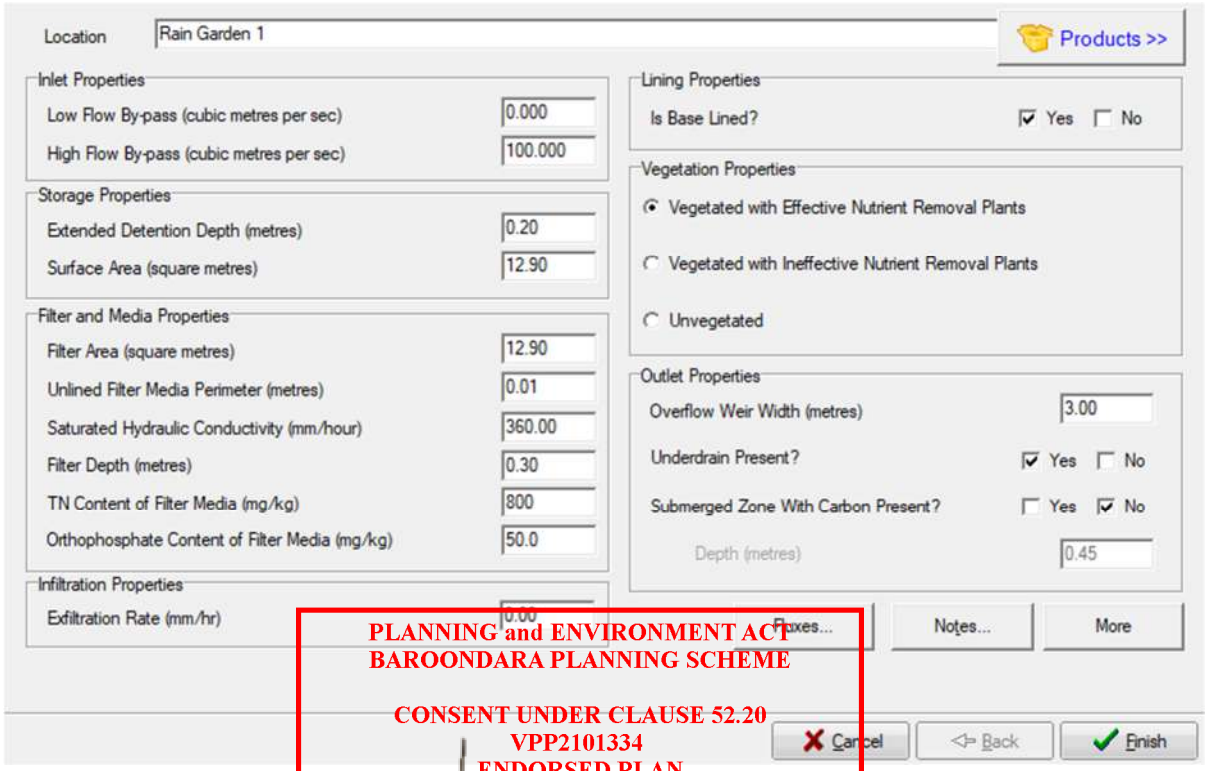

Figure 61 – Rain garden 1 parameters (for Buildings A, B, C)

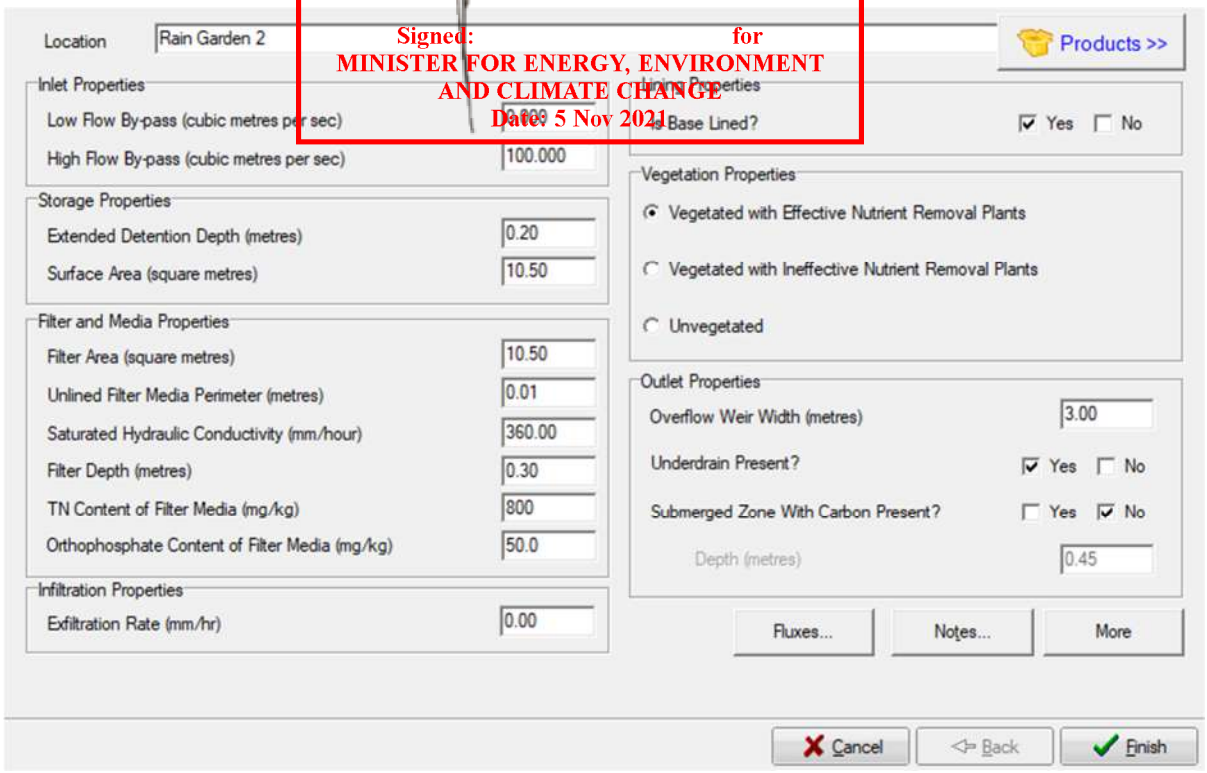

Figure 62 – Rain garden 2 parameters (for Buildings E, F, G)

4.2 Results

	Sources	Residual Load	% Reduction
Flow (ML/yr)	4.5	2.94	34.6
Total Suspended Solids (kg/yr)	541	93.5	82.7
Total Phosphorus (kg/yr)	1.06	0.412	61.2
Total Nitrogen (kg/yr)	9.9	3.47	65
Gross Pollutants (kg/yr)	171	5.92	96.5

Figure 63- Treatment Train Effectiveness output from MUSIC

	CSIRO reduction targets	Achieved reduction
Total Suspended Solids (SS)	80% reduction	82.7%
Total Phosphorous (TP)	45% reduction	61.2%
Total Nitrogen (TN)	45% reduction	65%
Gross Pollutants	70 % reduction	96.5%

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5 Treatment system summary

The treatment system is to consist of the following elements.

- Three retention tanks collecting stormwater from roof areas. This water will be reused for irrigation of landscape and toilet flushing.
- Three detention tanks of volumes 26 kL, 26 kL and 42 kL collecting stormwater from terrace areas and landscaping.
- Two rain gardens – one for buildings A, B and C (12.9 m^2) and another for buildings E, F and G (10.5 m^2) to meet the CSIRO Best Practice Guidelines.

6 Conclusion

The proposed treatment system achieves stormwater discharge quality that exceeds recommendations of the 'Urban Stormwater: Best practice Environmental Management Guidelines' (1999) published by the CSIRO, and is therefore considered to provide best practice control of storm water discharge quality.

The proposed detention/retention system satisfies the stormwater detention requirements of the planning permit and provides adequate stormwater retention to meet the demands of the landscaping.

Sincerely,

Anita Nair
Project Engineer

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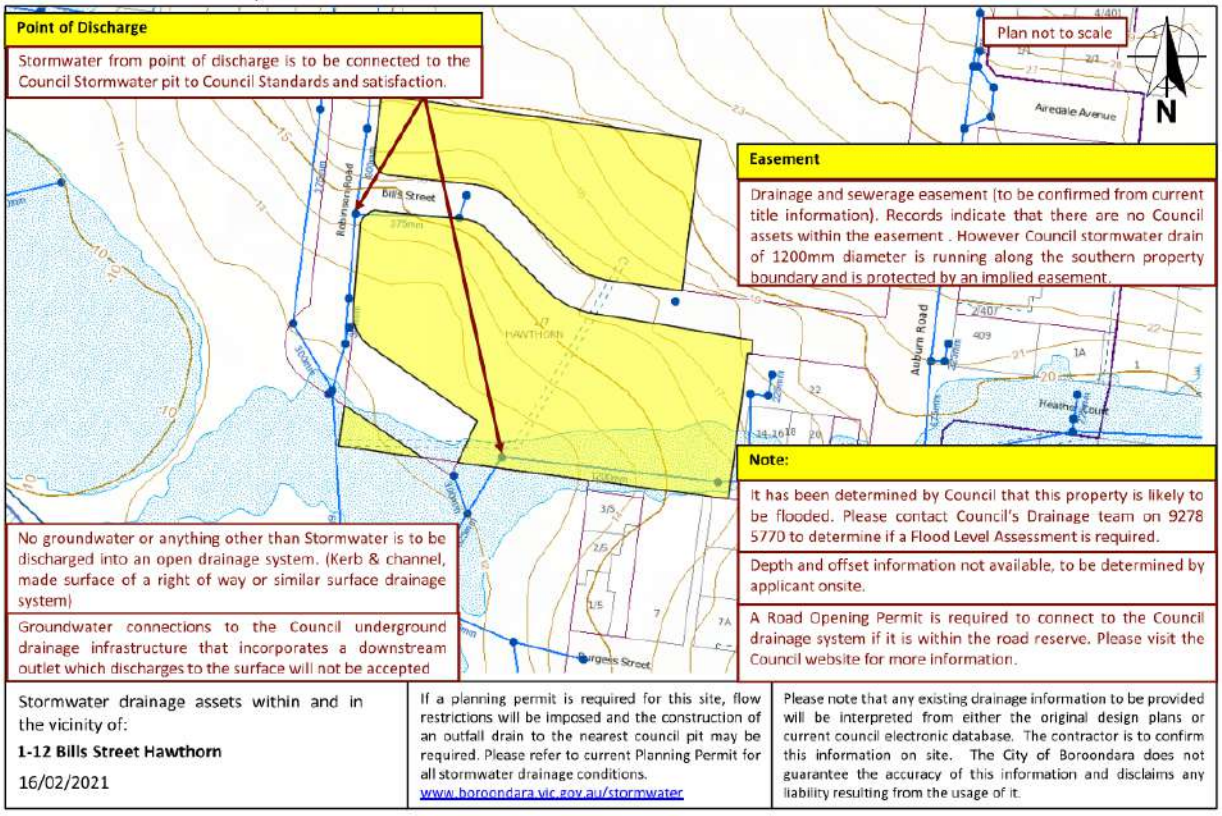
7 Appendix A – Legal Point of Discharge

STORMWATER DRAINAGE - POINT OF DISCHARGE

BOROONDARA City of Harmony

This information is provided by the City of Boroondara under the Building Regulations (Vic) 2018, Section 133, Sub-regulation 3: Stormwater drainage and section 44.3 of the amenity local law.



Point of Discharge

Stormwater from point of discharge is to be connected to the Council Stormwater pit to Council Standards and satisfaction.

Easement

Drainage and sewerage easement (to be confirmed from current title information). Records indicate that there are no Council assets within the easement . However Council stormwater drain of 1200mm diameter is running along the southern property boundary and is protected by an implied easement.

Note:

It has been determined by Council that this property is likely to be flooded. Please contact Council's Drainage team on 9278 5770 to determine if a Flood Level Assessment is required.

Depth and offset information not available, to be determined by applicant onsite.

A Road Opening Permit is required to connect to the Council drainage system if it is within the road reserve. Please visit the Council website for more information.

No groundwater or anything other than Stormwater is to be discharged into an open drainage system. (Kerb & channel, made surface of a right of way or similar surface drainage system)

Groundwater connections to the Council underground drainage infrastructure that incorporates a downstream outlet which discharges to the surface will not be accepted

Stormwater drainage assets within and in the vicinity of:

1-12 Bills Street Hawthorn

16/02/2021

If a planning permit is required for this site, flow restrictions will be imposed and the construction of an outfall drain to the nearest council pit may be required. Please refer to current Planning Permit for all stormwater drainage conditions.
www.boroondara.vic.gov.au/stormwater

Please note that any existing drainage information to be provided will be interpreted from either the original design plans or current council electronic database. The contractor is to confirm this information on site. The City of Boroondara does not guarantee the accuracy of this information and disclaims any liability resulting from the usage of it.

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COUNCIL'S STORMWATER DRAINAGE REQUIREMENTS

BOROONDARA
City of Harmony

Council's stormwater drainage requirements for **1-12 Bills Street Hawthorn** 16 February, 2021

Stormwater drainage runoff shall be collected in a complete and effective system of drains and connected to the Approved Point of Stormwater Discharge.

Storage volume and PSD will be provided by Council if requested with accurate site coverage details by e-mail to boroondara@boroondara.vic.gov.au.

An Onsite detention (orifice) control pit is required to be designed to meet the Council specified PSD and the detention volume in accordance with Council's standard drawing SD999 rev J.

No structure is to be built over and no cut or fill over:

i. A drainage easement on Title or;
ii. An existing Council stormwater drain that is located outside any easement on Title

Notes:

No groundwater or anything other than Stormwater is to be discharged into an open drainage system. (Kerb & channel, made surface of a right of way or similar surface drainage system)

At a minimum, detailed drainage design plans need to contain the following information:

- control pit orifice diameter in millimetre (+0/-2mm)
- orifice invert level in metres and AHD (Australian Height Datum)
- cross-sectional details

Control pit is to be located in an appropriate location and a suitable path is to be designated for stormwater which surcharges from the pit once the design storm has been exceeded.

The proposed development is to provide adequate clearance for overland flow through the property.

For more information, visit:
http://www.boroondara.vic.gov.au/stormwater

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8 Appendix B – OSD Tank size

Below is the advice from the Council regarding OSD tank sizes.

Based on the revised areas given below we advise that the following are to be incorporated into your drainage designs for Council approval;

Northern part
Total area (m^2): 4432
Roof area (m^2): 2276
Paved and driveway area (m^2): 1078
Landscaped area (m^2): 1078

Permissible Site Discharge	**35.7**	litres per second
OSD Volume Required	**41.5**	Cubic Metres

Southern part
Total area (m^2): 5408
Roof area (m^2): 2826
Paved and driveway area (m^2): 1291
Landscaped area (m^2): 1291

Permissible Site Discharge	**43.6**	litres per second
OSD Volume Required	**51.2**	Cubic Metres

For the design of the stormwater Onsite detention system (OSD) system;

- The volume requirement may be achieved by utilising an underground pipe/other approved storage system. Combined RW harvesting/OSD systems are not acceptable. Specifically; above ground rainwater tanks may not be utilised for this purpose.
- A 'sharp edged steel plate orifice' to control the discharge is the preferred method to achieve while not exceeding the permissible site discharge rate under normal conditions.
- All surfaces are to be drained to/and controlled by an orifice control pit (SD999 Revision 'J' as attached) and the site stormwater outlet is to fully 'control' the site.
- A tabulation of pipe & pit volumes demonstrating a final volume as achieving the minimum requirement as per above.
- Make sure to indicate the proposed trees in the drainage plans (as per the endorsed landscape plan).