

Our Ref: 24-130-DB

DRA Architects Pty Ltd
6-8 Villiers St
Grafton NSW 2460



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ENGINEERING CONSULTING SERVICES

09 September 2025

Stormwater Management Report

RE: Proposed Renovations & Additions at Clarence Valley Conservatorium INC.

1. Introduction

1.1. Background

McKenzie Burridge & Associates has been engaged to prepare a Stormwater Management Plan (SWMP) for the proposed renovation & Addition at 6-8 Villiers St, Grafton, NSW.

1.2. Objectives

This SWMP aims to ensure that the stormwater management plan is in compliance with the Clarence Valley Council (CVC) Development Control Plan (DCP) 2011.

These objectives will be achieved through the implementation of the following:

- The stormwater quantity objective will be achieved using 2 nos of Rainwater tanks (OSD) in the form of roof water storage tanks control the increase in flows resulting from the additional impervious roof areas.
- The stormwater quality targets will be achieved using bioretention basin driveway. The roof water will be directed to tanks and connected to the units for reuse.

1.3. Site Description

The subject site is located at 6-8 Villiers St, Grafton NSW.

The total site area occupies approximately 1502m².

The site consists of a double storey conservatorium.

Bridge | Road | Structural | Civil | Flood

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2. Stormwater Quality

To minimise the potential adverse impacts, the proposed development will reduce contamination in stormwater runoff through the incorporation of WSUD measures.

The CVC Recreation & Special Use DCP outlines sustainable water controls for developments in recreation and special use developments.

The runoff the new roof area is relatively clean. Some treatment is achieved with the provision of rainwater tanks and reuse.

The Guidelines for Filter Media in Biofiltration Systems (Version3.01) by FAWB has been followed while designing the bioretention basin.

The new bioretention basin will be constructed to treat the water from the driveway and pathway areas. The surface area of the bioretention basin required is 31m². The filter depth required is 600mm from NGL. The orthophosphate content of the filter media has been limited to 20mg/kg where plants with moderate phosphorus sensitivity will be used. The Hydraulic conductivity has been considered as 300mm/hr under Temperate climate for Grafton region.

The stormwater treatment has been modelled using the “Music” stormwater software.

The results of the “Music” analysis is included in Appendix B.

3. Stormwater Quantity

This section of the report outlines the measures required to meet the water quantity objectives as per Section I9 of the DCP. To meet these objectives, it is necessary to ensure that post-development discharge from the site will not create a worse situation for inhabitants of downstream property than what existed before the development (i.e. non-worsening).

Due to the increase in impervious areas within the proposed development, peak stormwater flow rates will increase. To mitigate these increased flow rates from the developed site it is proposed to implement 2 nos of OSD system. OSD systems temporarily store stormwater runoff and release flows at a controlled rate that is no greater than the pre-developed peak rate.

The value of storage has been assessed using CVC's stormwater handbook calculations spreadsheet. A copy of the relevant outputs is included in Appendix A.

It is therefore proposed to limit the runoff from the property by implementing 2 nos of point source detention system one on each Northern and Southern side of the building.

The point source detention will be in the form of rainwater tanks connected to the building. A detail of a typical on-site stormwater detention tank is included in Appendix A.

This detention has been incorporated in the "Music" stormwater modelling.

4. Music Modelling

The proposed stormwater system has been modelled using the “Music” stormwater software.

The “Music” model is shown in figure 2 below.

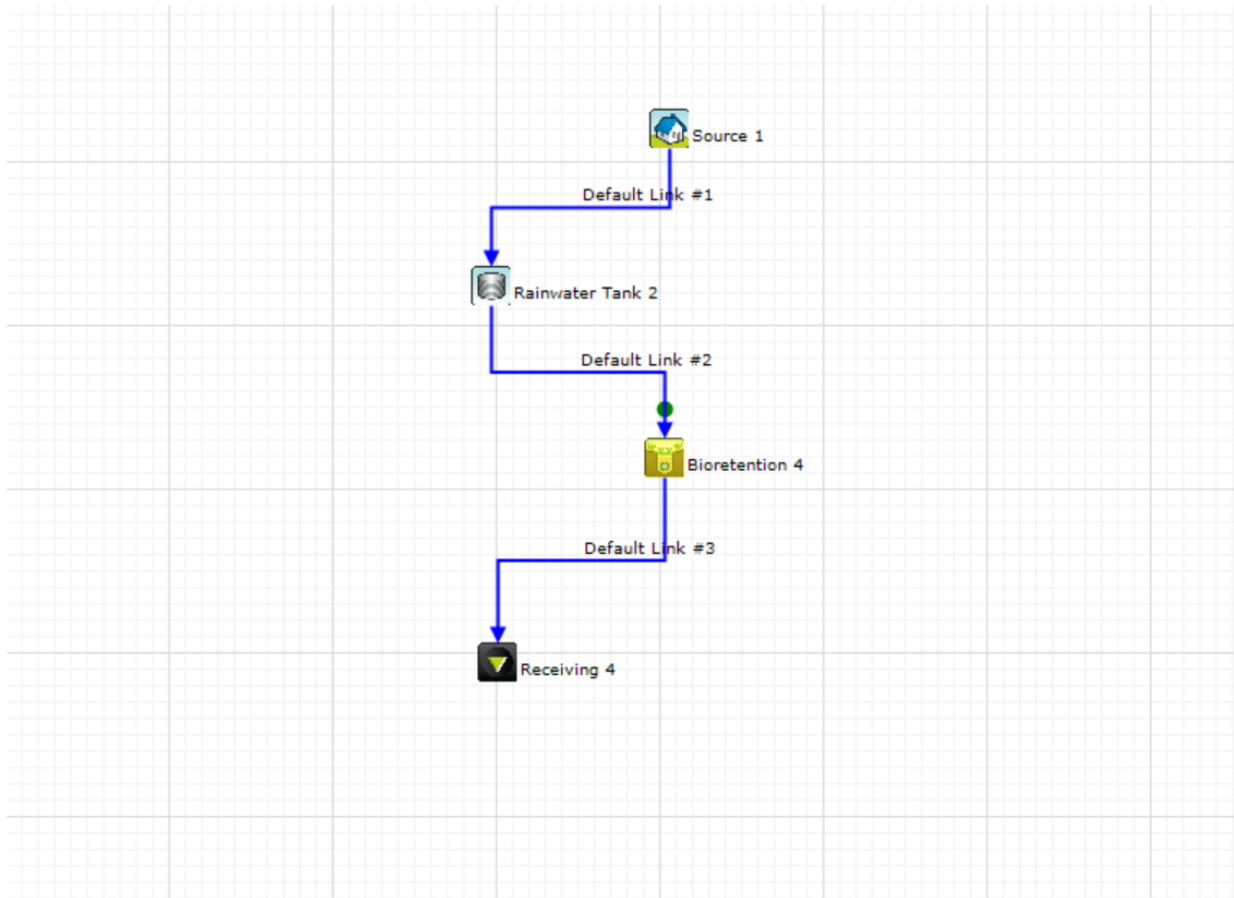


Figure 2: Music network

The results of the “Music” analysis is included as Appendix B.

The results show that the proposed stormwater management treatments comply with Clarence Valleys Music Link and therefore the Clarence Valley Councils Development Control Plan – Development in E and other zones.

5. Summary

This Stormwater Management Plan has been designed following Clarence Valley Councils Development Control Plan – Development in E and other zones.

Specifically, the development will incorporate:

- Stormwater quality targets will be achieved through proposed bioretention basin and stormwater tanks incorporating reuse.
- Stormwater quantity objectives will be achieved through OSD rainwater tanks.

The details of the Stormwater Management Plan are shown on the attached drawing set 24-130-DB.

The “Music” modelling results showing compliance is included as Appendix B.

Signed:



Vinay Rao

B.E., MIEAust, CPEng, NER, RPEQ, APEC Engineer, IntPE(Aus)

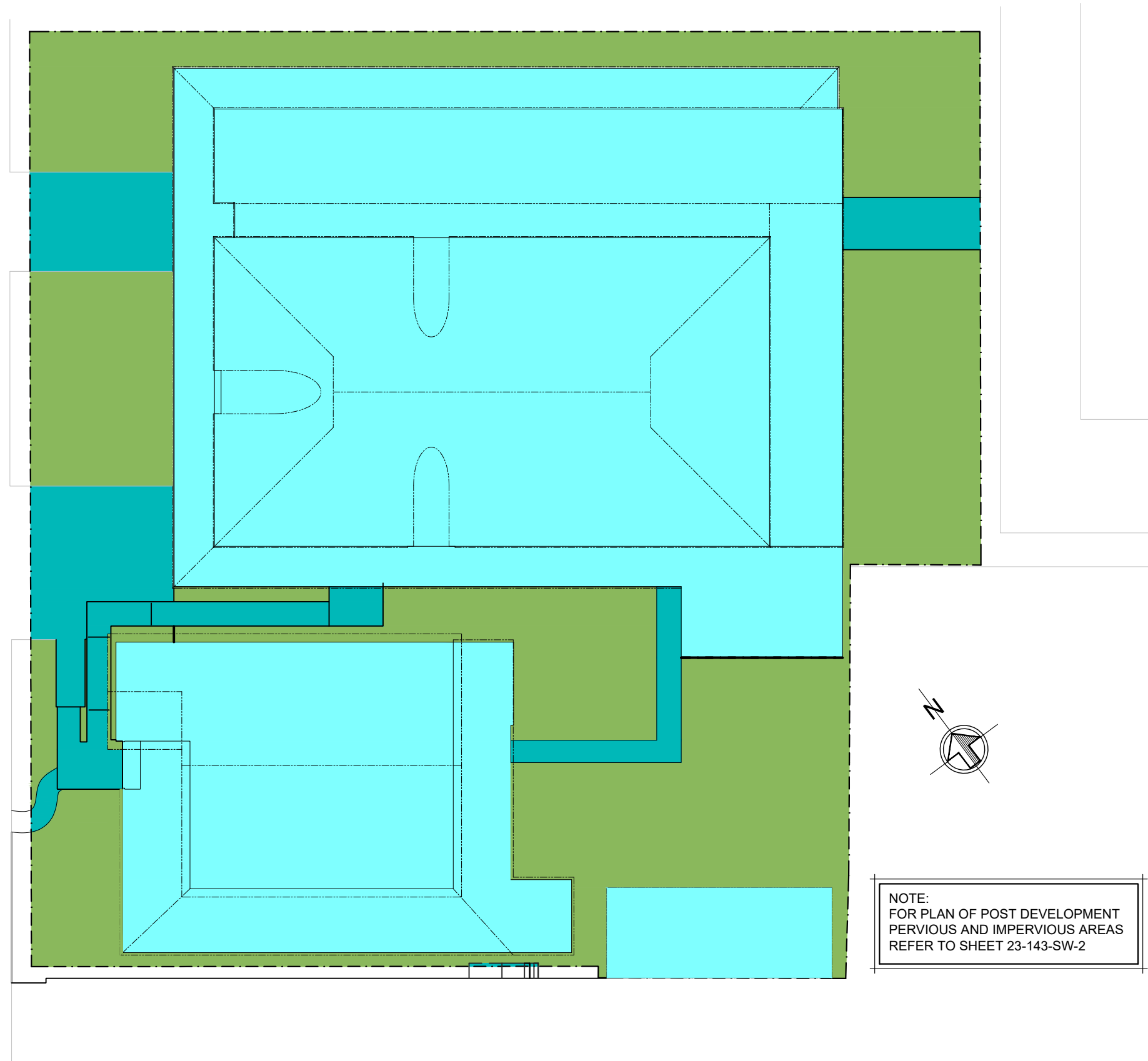
Senior Structural Engineer

For and on behalf of

McKenzie Burridge & Associates

Part of Bridge Knowledge

Appendix A – Stormwater Management Plan



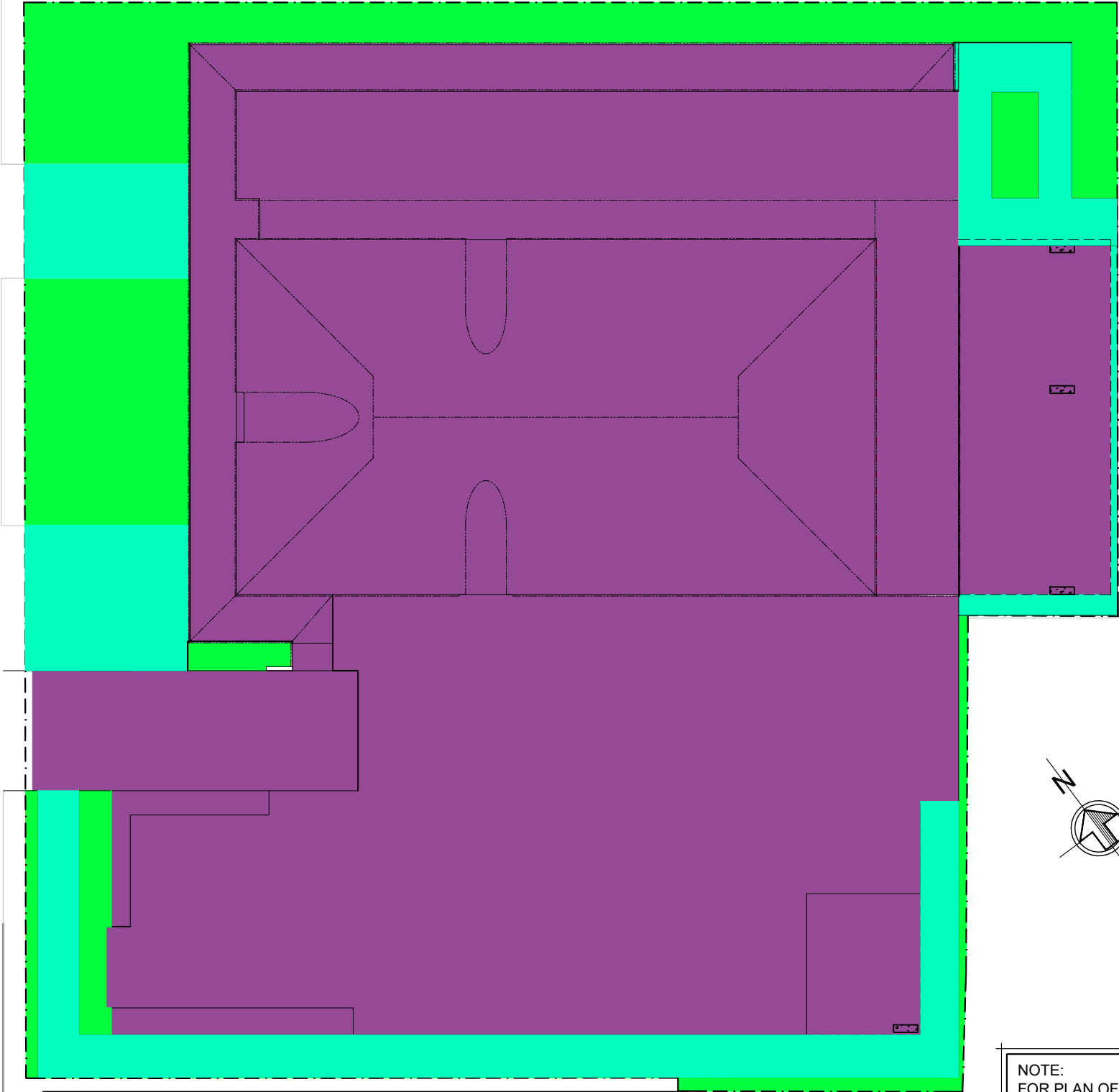
-  - EXISTING IMPERVIOUS AREA
-  - EXISTING BUILDINGS
-  - EXISTING CONCRETE PAVING

PRE DEVELOPMENT SITE DETAILS		
EXISTING PERVIOUS AREA	=	481.8m ²
<u>IMPERVIOUS AREAS</u>		
EXISTING BUILDINGS	=	903.3m ²
EXISTING CONCRETE PAVING	=	116.9m ²
TOTAL IMPERVIOUS AREAS	=	1020.2m ²
TOTAL SITE AREA	=	1502.0m ²
POST DEVELOPMENT SITE DETAILS		
NEW PERVIOUS AREA	=	207.1m ²
<u>NEW IMPERVIOUS AREAS</u>		
NEW BUILDINGS	=	1132.7m ²
NEW CONCRETE PAVING	=	162.2m ²
TOTAL NEW IMPERVIOUS AREAS	=	1294.9m ²
TOTAL SITE AREA	=	1502.0m ²
SUMMARY		
CHANGE IN IMPERVIOUS FROM PRE DEVELOPED	=	274.7m ²

PLAN OF PRE DEVELOPMENT PERVIOUS AND IMPERVIOUS AREAS

					© COPYRIGHT 2025 The design and details shown on these drawings are applicable to this project only and may not be reproduced in whole or in part or be used for any other project or purpose without the written consent of MCKENZIE BURRIDGE & ASSOCIATES with whom copyright resides.	APPROVED I CERTIFY THAT THE WORKS SHOWN ON THIS PLAN HAVE BEEN DESIGNED IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS.  McKenzie Burridge & Associates CIVIL & STRUCTURAL CONSULTING ENGINEERS Proudly part of  bk bridge knowledge ENGINEERING CONSULTING SERVICES	P.O BOX 503 17 WEBBERS ARCADE 133 PRINCE STREET GRAFTON NSW 2460 (02) 6643 2116 www.mckenzieburridge.com.au office@mckenzieburridge.com.au ABN 71 604 638 360	SCALE AS SHOWN	SHEET SIZE A3	JOB DESCRIPTION PROPOSED RENOVATIONS & ADDITIONS AT 8 VILLIERS STREET, GRAFTON. FOR CLARENCE VALLEY CONSERVATORIUM INC	DRAWING TITLE PLAN OF PRE DEVELOP PERVIOUS & IMPERVIOUS AREAS ARCHITECT DRA ARCHITECTS PTY LTD	JOB No. 23-143-SW SHEET No. 1 (of 2) REVISION -
No.	REVISION	DATE	DWN		DO NOT SCALE THE STRUCTURAL DRAWINGS. DIMENSIONAL ERRORS MAY OCCUR DURING COPYING OR REPRODUCTION OF THE DRAWINGS.		(FOR BRIDGE KNOWLEDGE PTY LTD)	DESIGNED MB	BUILD DES. -	APPROVED SB		

VILLIERS STREET



- NEW IMPERVIOUS AREA

- NEW BUILDINGS

- NEW DRIVEWAY, PATHS & PARKING

PRE DEVELOPMENT SITE DETAILS		
EXISTING PERVIOUS AREA	=	481.8m²
IMPERVIOUS AREAS		
EXISTING BUILDINGS	=	903.3m²
EXISTING CONCRETE PAVING	=	116.9m²
TOTAL IMPERVIOUS AREAS	=	1020.2m²
TOTAL SITE AREA	=	1502.0m²
POST DEVELOPMENT SITE DETAILS		
NEW PERVIOUS AREA	=	207.1m²
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TOTAL SITE AREA	=	1502.0m²
SUMMARY		
CHANGE IN IMPERVIOUS FROM PRE DEVELOPED	=	274.7m²

NOTE:
FOR PLAN OF PRE DEVELOPMENT PERVIOUS AND IMPERVIOUS AREAS REFER TO SHEET 23-143-SW-1

PLAN OF POST DEVELOPMENT PERVIOUS AND IMPERVIOUS AREAS
1:200



CONSULTANT _____
DA NO _____
CC NO _____

STORMWATER DETENTION CALCULATOR

DATE : 25/10/2014

LOCATION: GRAFTON

SITE AREA: 1502 m²

DEVELOPMENT AREAS	PRE DEVELOPMENT	POST DEVELOPMENT	OUTLET SIZING	
ROOF AREA	903.0 m²	1133 m²	HEAD	2 m MAX WATER LEVEL TO ORIFICE CENTRE
PAVED AREA	117.0 m²	162 m²	OUT DIA	50 mm PROPOSED
VEGETATED AREA	482.0 m²	207.0 m²		
TOTAL AREA	1502.0 m²	1502 m²	→ ACCEPTABLE	

RESULTS		STORMWATER DETENTION	RESULTS		ACCEPTABLE
PSD = Q _S PRE	56.47 l/s	6.36 m ³	Q _{CALCULATED}	56.47 l/s	
Q ₁₀₀ PRE	93.60 l/s		Q _{PROPOSED}	9.02 l/s	
Q ₂₀ POST	77.66 l/s				
Q ₁₀₀ POST	99.40 l/s				

CALCULATED - Q₁₀₀ POST - Q₂₀ POST + PSD ≤ Q₁₀₀ PRE

Q ₁₀₀ DESIGN CHECK	78.21 l/s	93.60 l/s
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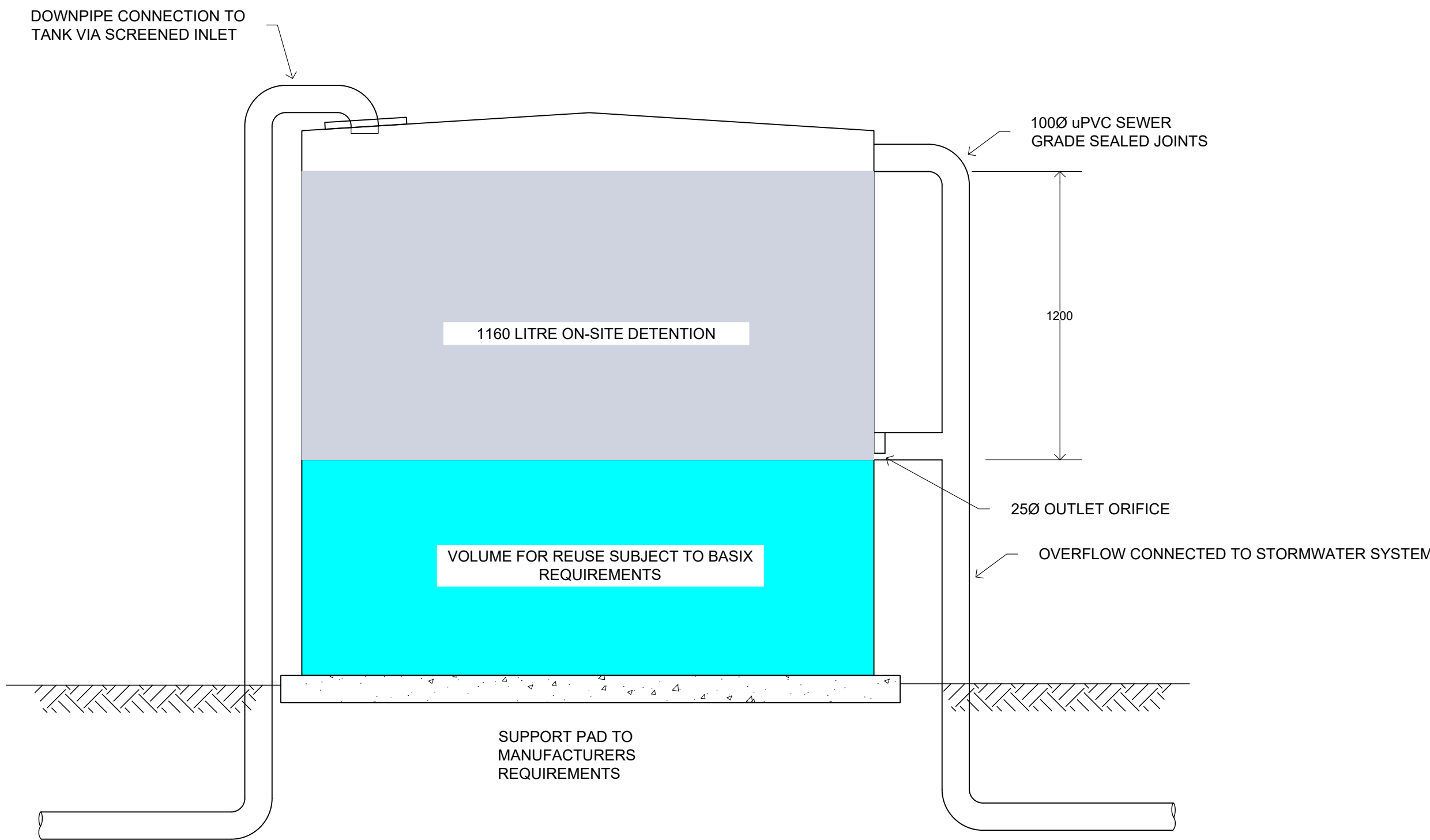
ACCEPTABLE

PROPOSED - Q₁₀₀ POST - Q₂₀ POST + PSD ≤ Q₁₀₀ PRE

Q ₁₀₀ DESIGN CHECK	30.76 l/s	≤	93.60 l/s
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ACCEPTABLE

- NOTES
- BASED ON APPENDIX E2 OF THE DRAINAGE HANDBOOK
 - FOR LOTS UP TO 2,500 SQM (SUBJECT TO CVC APPROVAL)



TYPICAL TANK ELEVATION
1:20

STORMWATER DETENTION REQUIREMENTS

TOTAL STORAGE REQUIRED 6360L.
PROVIDE 2 NOS OF 3180 LITRES.

Appendix B – Music results

MUSIC-link Report

Project Details		Company Details	
Project:	23-143-DB	Company:	BK Engineering Consulting Services
Report Export Date:	10/09/2025	Contact:	Vinay Rao
Catchment Name:	Receiving 4	Address:	17/133 Prince St, Grafton NSW 2460
Catchment Area:	0.1132ha	Phone:	0474735558
Impervious Area*:	100%	Email:	vinay@bridgeknowledge.com.au
Rainfall Station:	58076 GRAFTON		
Modelling Time-step:	Six minutes		
Modelling Period:	01/01/72 - 31/12/1976 11:54:00 PM		
Mean Annual Rainfall:	1159.405mm		
Evapotranspiration:	1327.44mm		
MUSICX Version:	1.50.0.13769 (5.50.0.13769)		
MUSIC-link data Version:	5.1		
Study Area:	Clarence Valley Council		
Scenario:	CVC Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node:	Reduction	Node Type	Number	Node Type	Number
Flow	6.357%	Rainwater Tank Nodes	1	Urban_Roof Nodes	1
TSS	85.108%	Bioretention Nodes	1		
TP	81.177%				
TN	66.589%				
GP	100%				

Comments

Orthophosphate content in the filter media is limited to 20mg/kg as per FAWB guideline.

Hydraulic Conductivity is considered as 200mm/hr with a FOS of 2.0 for Temperate climate condition as per FAWB guideline.

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bioretention	Bioretention 4	Exfiltration Rate	None	None	0 mm/h
Bioretention	Bioretention 4	Extended Detention Depth	None	None	0.6 m
Bioretention	Bioretention 4	Filter Depth	None	None	0.6 m
Bioretention	Bioretention 4	High Flow Bypass	None	None	100 m³/s
Bioretention	Bioretention 4	PET Scaling Factor	2.1	2.1	2.1 proportion
Bioretention	Bioretention 4	Saturated Hydraulic Conductivity	100	100	100 mm/h
Bioretention	Bioretention 4	TN Content of Filter Media	800	800	800
Rainwater	Rainwater Tank 2	% Reuse Demand Met	None	None	0.634 %
Receiving	Receiving 4	Flow Reduction	None	None	6.357 %
Receiving	Receiving 4	GP Reduction	90	None	100 %
Receiving	Receiving 4	TN Reduction	45	None	66.589 %
Receiving	Receiving 4	TP Reduction	60	None	81.177 %
Receiving	Receiving 4	TSS Reduction	85	None	85.108 %
Urban_Roof	Source 1	Impervious Area	None	None	0.113 ha
Urban_Roof	Source 1	Pervious Area	None	None	0 ha
Urban_Roof	Source 1	Total Area	None	None	0.113 ha

Only certain parameters are reported when they pass validation

NOTE: A successful self-validation check of your model does not constitute an approved model by Clarence Valley Council
MUSIC-*link* now in MUSICX by eWater – leading software for modelling stormwater solutions

Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bioretention	Bioretention 4	Orthophosphate Content of Filter Media	50	50	20
Urban_Roof	Source 1	Ground Water Initial Depth	10	10	1 mm

Only certain parameters are reported when they pass validation

NOTE: A successful self-validation check of your model does not constitute an approved model by Clarence Valley Council
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