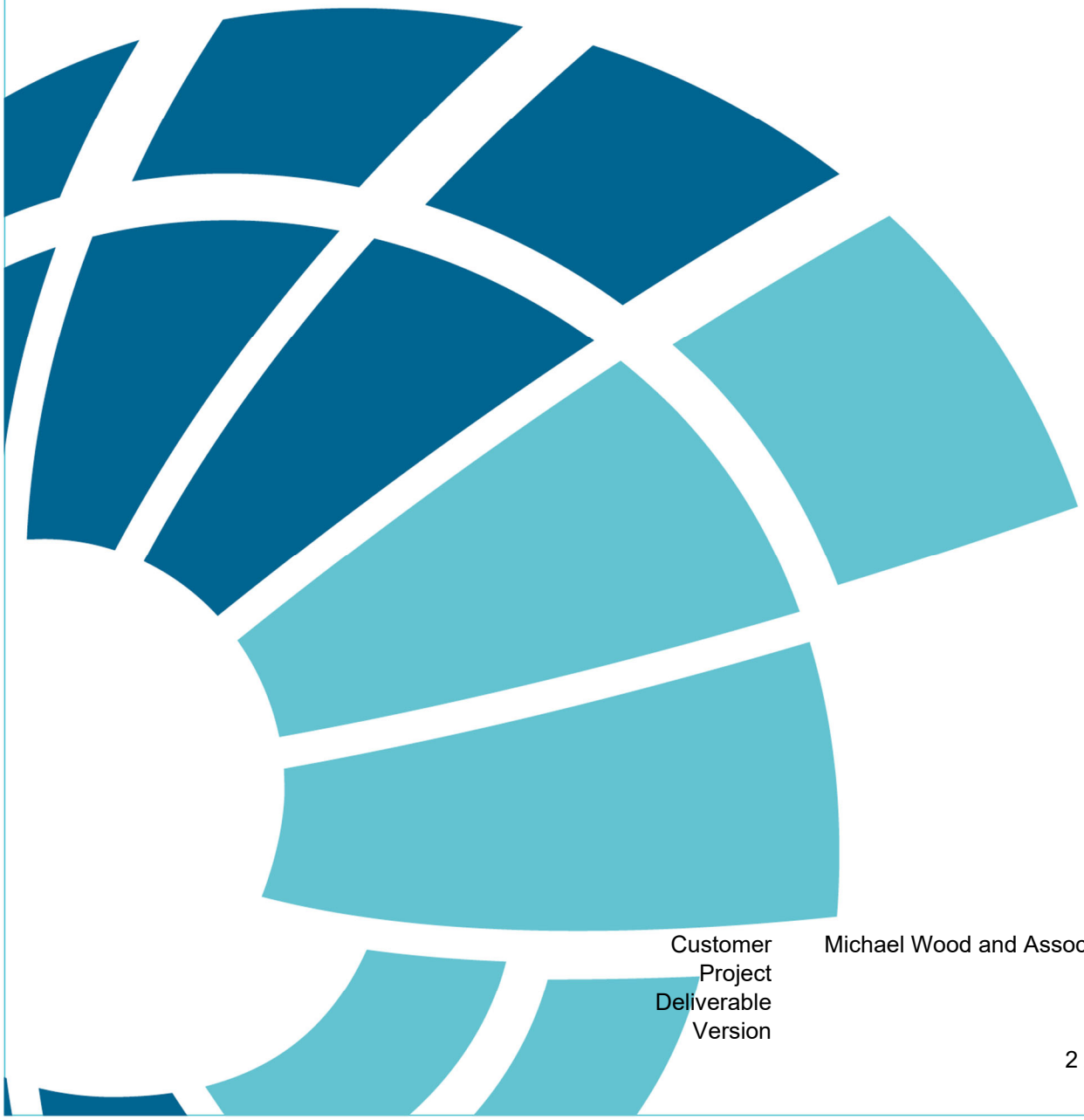
River Street Community Precinct - Stormwater Management Plan



Customer	Michael Wood and Associates Pty Ltd
Project	A11938
Deliverable	001
Version	01
	2 August 2023

Document Control

Document Identification

Title	Stormwater Management Plan
Project No	A11938
Deliverable No	1
Version No	01
Version Date	02 August 2023
Customer	Michael Wood and Associates Pty Ltd
Customer Contact	Michael Wood
Classification	
Synopsis	This document details the stormwater management of the site including stormwater quality, harvesting and reuse

Author	Paul Dubowski, Charmaine Machikiti and Melissa Blum
Reviewed By	Melissa Blum, Nigel Hardie
Project Manager	Melissa Blum

Amendment Record

The Amendment Record below records the history and issue status of this document.

Version	Version Date	Distribution	Record
00	04 May 2023	Michael Wood	Report
01	2 August 2023	Michael Wood	Report

Contents

Tables

1 Introduction

1.1 Background

Clarence Valley Council (CVC) is proposing to develop a new community hall and the creation of adjacent public open space at 48 River Street, Maclean as part of the proposed redevelopment of the River Street Community Precinct.

BMT has been commissioned by Michael Wood and Associates Pty Ltd to undertake stormwater management investigations for the proposed development including assessment of stormwater quality, quantity, harvesting, reuse and flooding. This Stormwater Management Plan (SMP) provides the each of these analyses apart from flooding which is detailed in a sperate report by BMT.

1.2 Objectives of the Report

Objectives for the SMP are outlined in the Project Requirements for Lead Design Consultant RFT 22/10 (Clarence Valley Council 2022). Specifically, Section 6.2, item 15 states:

Landscaped area to incorporate an irrigation system that will utilise harvested rainwater on the site. It is envisioned that the harvested rainwater will also be utilised for other non-potable use throughout the site.

In addition, compliance is necessary with the requirements of Council's '*Sustainable Water Requirements*' (Clarence Valley Council 2022). Consistent with these requirements, a basic SMP is required, and more specific design information related to the treatment systems proposed in this SMP is to be provided on the architectural drawings.

Stormwater management targets required by the '*Sustainable Water Requirements*' are discussed further in Section 3.1.

There is also requirement to adhere to the *D5 - Stormwater Drainage Design Specifications* (AUS-SPEC, 2022). In line with these specifications, the following principle shall be applied:

Redevelopment – Where the proposed development replaces an existing development, the on-site drainage system is to be designed in such a way that the estimated peak flow rate from the site for the design average recurrence interval (ARI) of the receiving minor system is no greater than that which would be expected from the existing development.

2 Site Description

2.1 Land Use

As noted above, the site is located at 48 River Street, Maclean and the real property description includes Lot 1 DP 667217, Lot 8 DP 758631 and Lot 9 DP 758631. The current landuse is the Maclean Civic Hall building which is beset by low levels of patronage due to its dilapidated condition, poor arrangement of performance space and back-stage areas, inadequate internal comfort inside the auditorium and out-of-date street presence.

Key structures on the site are include:

- Existing community hall
- Office buildings south of community hall
- Adjoining structure to rear and side of hall
- Community hall front façade
- Trees and vegetation.

2.2 Proposed Development

This proposed development includes a community hub in the heart of Maclean on a site which borders the eastern edge of the Clarence River. Phase 1 of the project is the first stage of what is envisaged to be a larger site redevelopment which adaptively reuses Council-owned buildings and develops a localised landscape specific to the unique nature of the site.

Phase 1 includes the removal of existing building stock that is either poorly used or no longer fit for purpose, replacement of the existing Maclean Civil Hall, and creation of new open public parkland with visual links to the river and opportunities to create pedestrian links between the site and the river shoreline.

The overall intent is to upgrade facilities for public benefit. New amenities will replace those that are poorly functioning and do not comply with disability access standards. Seating capacity in the auditorium will be increased, kitchen facilities will be upgraded to serve larger numbers with the option of external service access to the newly created public open space adjacent; and the stage and back-stage areas will be made larger and improved for performance artists and props.

The covered deck area and open space will provide an immediately accessible spill-over space during large events at the hall and will also create a visual connection to the Clarence River through the site from the busy River Street frontage. The new facility will serve the day-to-day needs of the community.

The proposed site layout is provided below. The development's new roof area is 1459m^2, landscaping area is 570m^2 and mixed use area is 127m^2 as shown in Figure 2.1. All carparking areas are in the basement level and therefore undercover.

LEGEND

- Site Layout
- Development Roof (1389.8m²)
- Cadastral Boundaries

Title:

Proposed Development Layout showing Extent of Roof Area

Figure: 2.1

Rev: A

N

0 10 20 m

BMT
www.bmt.org

Filepath: I:\A11938.i.bmc_Maclean_Community_Precinct\QGIS\A11938_001_DevelopmentFootprint.qgz

3 Stormwater Quality Modelling

3.1 Stormwater Management Objectives

As mentioned above, compliance is necessary with the requirements of the '*Sustainable Water Requirements'* (Clarence Valley Council 2022). Section 5 of this guideline provides default water quality targets as outlined in Table 3.1 below while Table 3 of the guideline suggests that for such small sites (development 500 m^2 to 1 ha), primary and secondary 'deemed to comply' should be implemented, rather than adherence to these default targets. While strict adherence to the water quality targets is therefore not required where deemed to comply solution are adopted, comparison is still made against the objectives. Given the Council's regulatory requirements, the emphasis of treatment in this SMP is on providing the appropriate deemed to comply solutions and maximising harvesting and reuse opportunities. There are no specific targets for rainwater reuse however, given the project brief requires internal and external reuse of harvested rainwater, both must be integrated into the design and reuse maximised.

Table 3.1 Clarence Valley Council Default Water Quality Targets

Water Quality Parameter	Default Target
Total Suspended Solids (TSS)	85% of average annual load retained
Total Phosphorus (TP)	60% of average annual load retained
Total Nitrogen (TN)	45% of average annual load retained
Gross Pollutants	90% of average annual load retained

3.2 Meteorological Data

The meteorological input parameters have been adopted from the default values required for Clarence Valley Council MUSICLink for the 'north development'. This includes a rainfall period dated 1/01/1972 to 31/12/1976 using a 6-minute timestep.

3.3 Source Node Parameters

As mentioned previously, the proposed development of Stage 1 includes three different areas, roof, landscaping and mixed use shown in Figure 3.1 and summarised in Table 3.2. Nodes were modelled using different impervious percentages. Roof to tank, landscaping area and bypass area were modelled at 100%, 39% and 0% imperviousness, respectively.

Table 3.2 Source Nodes, Sizes and Percentages

Source Node	Size	Percentage of Total
Roof to Tank	1459m^2	67.6
Landscaping to GPT	570m^2	26.4
Mixed Use bypass to Receiving Node	130m^2	6.0

Adopted rainfall runoff parameters (Table 3.3) and base and stormflow concentration parameters (Table 3.4) were also consistent with Council's MUSICLink parameters. Given the 100% imperviousness of the roof source node catchment, the rainfall runoff parameters would have negligible effect on results apart from the rainfall threshold.

Table 3.3 Rainfall Runoff Parameters for Source Nodes

Parameter	Value
Rainfall threshold	1
Soil storage capacity	54
Initial storage	25
Field capacity	51mm
Infiltration capacity coefficient - a	180
Infiltration capacity coefficient – b	3
Initial depth	10mm
Daily recharge rate	25%
Daily baseflow rate	25%
Daily deep seepage rate	0%

Table 3.4 Base and Stormflow Concentration Parameters

Total Suspended Solids (log mg/L)		
Baseflow	Mean	1.10
	Standard Deviation	0.17
Stormflow	Mean	1.30
	Standard Deviation	3.20
Total Phosphorus (log mg/L)		
Baseflow	Mean	-0.82
	Standard Deviation	0.19
Stormflow	Mean	-0.89
	Standard Deviation	0.25
Total Nitrogen (log mg/L)		
Baseflow	Mean	0.32
	Standard Deviation	0.12
Stormflow	Mean	0.30
	Standard Deviation	0.19

LEGEND

- Site Layout
- Roof to Tank
- Landscaping
- Cadastral Boundaries
- Mixed Use

Title:

MUSIC Modelling Source Node Catchment Areas

Figure: 3.1

Rev: A

N

0 10 20 m

BMT
www.bmt.org

Filepath: I:\A11938.i.bmc_Maclean_Community_Precinct\QGIS\A11938_005_RoofDrainageSketch_2214.qgz

3.4 Treatment Node Parameters

Three types of 'deemed to comply' solutions have been adopted for the site including:

- Adopting rainwater harvesting (2 x 20 kL tanks) and reuse (Table 3.5).
- Use of Ocean Protect StormFilter treatment system with 7 x 690 Psorb cartridges (Table 3.6)
- Use of Gross Pollutant Trap (GPT).

Table 3.5 Rainwater Tank Node Parameters

Properties	Adopted Values
Low flow bypass	0 m^3/s
High flow bypass	100 m^3/s
Number of tanks	2
Volume below overflow (total tank property)	40 m^3
Depth above overflow (total tank property)	0.2 m
Surface area (total tank property)	18 m^2
Initial volume (total tank property)	8 m^3
Overflow Pipe Diameter	0.127 m

Table 3.6 Stormfilter Chamber Parameters

Parameters	Adopted Values
Low flow Bypass	0 m^3/s
High Flow Bypass	100 m^3/s
Surface Area	1.8 m^2
Extended Detention Depth	0.77 m
Permanent Pool Volume	0 m^3
Initial Volume	0 m^3
Exfiltration Rate	0 mm/h
Evaporative Loss as % of PET	0 %
Equivalent Pipe Diameter	37 mm
Overflow Weir Width	2 m
Notional Detention Time	0.138 hrs

As noted above, rainwater reuse includes:

- External irrigation of the turfed lawn on the adjacent allotment.
- Internal reuse for toilet flushing.

The combined external irrigation area is 662m^2. To cover this area, the design will include 7,502 drippers @ 2 litres per hour = 15,005 litres/hr which would be spread over 7or 8 zones, so wouldn't be used all at once and allow for irrigation every second day. This brings the demand to 7,500 litres/day, except when there is natural rainfall or moisture is retained in soil.

To determine when there may be adequate rainfall to cease irrigation, assessment of the daily rainfall data from the Grafton South pluviograph (station 58076), for the 1963-1986 rainfall period was undertaken. This assessment indicates that on average, there are 32 days of rainfall per year where rainfall exceeds the assumed rainfall threshold of 5mm. This leaves an average of 333 days/year of potential irrigation. Assuming irrigation every second day, this equates to 1248.75 kL/year.

Assumptions for the toilet reuse demand were based on the number of staff and visitors with the understanding that patronage would significantly vary week-to-week so expected average numbers were assumed. The following assumptions were made:

- Staff: 15 people
- Auditorium capacity: 300 people
- Average patronage per show: 50%
- Average shows per week: 3 shows
- Weeks per year of operation: 50 weeks.
- Toilet flushing: 15 L/person/day

This equates to an internal water demand of 371.25 kL/year

The combined internal and external demand is 1,620 kL/year.

3.5 MUSIC Model Setup

The configuration of the model is shown in Figure 3.2

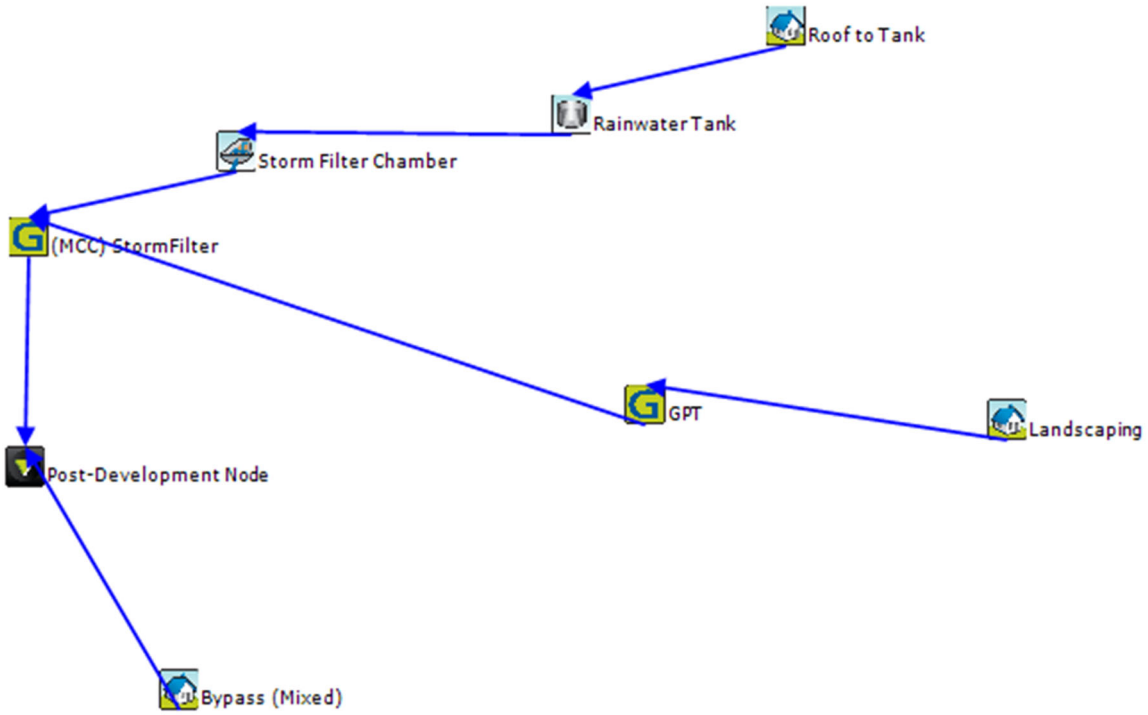


Figure 3.2 MUSIC Model Configuration

4 Model Results

4.1 Stormwater Quality

The stormwater quality modelling results are summarised in Table 4.1. The CVC default water quality targets are predicted to be achieved for total suspended solids (TSS), total nitrogen (TN), total phosphorus (TP) and gross pollutants (GP). Therefore, the proposed treatment meets the required quality targets.

Table 4.1 Compliance with Default Water Quality Targets

Parameter	Sources	Residual Load	% Reduction	CVC Default Water Quality Targets
Flow (ML/yr)	1.98	1.96	9	N/A
TSS (kg/yr)	120.9	18.74	84	85% of average annual load retained
TP (kg/yr)	0.37	0.09	75	60% of average annual load retained
TN (kg/yr)	4.37	1.94	56	45% of average annual load retained
Gross pollutants (kg/yr)	44.89	0.001	100	90% of average annual load retained

4.1 Stormwater Harvesting and Reuse

Based on the above assumptions with respect to water demands, the proposed 2x 20KL tanks are expected to meet 10% of the water demand.

5 Construction and Establishment

5.1 Construction and Establishment

For the construction phase, it will be necessary to complete works in accordance with a detailed Erosion and Sediment Control Plan. It is considered that the completion of construction activities in accordance with the plan will result in compliance to applicable best practice standards.

The bioretention system will need to be constructed and established in accordance with the guideline *Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands* (Water by Design). The appropriate construction and establishment of the proposed bioretention system will be critical to maximise its ability to protect waterway health and minimise operational difficulties (and maintenance requirements).

5.2 Maintenance

Maintenance plans are required to be developed for the proposed stormwater treatment systems. It is recommended that maintenance plans should be developed in accordance with the guideline *Maintaining Vegetated Stormwater Assets* (Water by Design 2012). Rainwater tanks should be maintained in accordance with manufacturers recommendations.

6 Stormwater Quantity

The existing impervious area on-site (roof area plus car parking) is approximately 1,239m^2, which is approximately 57.2% of the total Site.

The proposed developed impervious area on-site is approximately 1,681m^2, which is approximately 77.9%of the total Site.

There is therefore approximately a 20.7%increase in impervious area between the existing and developed case.

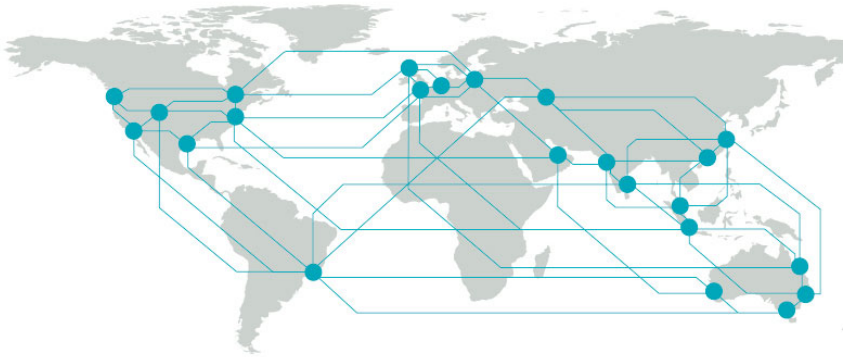
Flow information from the MUSIC modelling indicates that there is a 11.3% reduction in flows from the Site as a result of the mitigation proposed for the stormwater harvesting and reuse. This proposal will adequately mitigate the increase in impervious area as a result of the development.

7 References

AUS-SPEC 2022, Development Design Specification – D5 – Stormwater Drainage Design. Northern Rivers Local Government

Water by Design 2010, Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands. Healthy Waterways, Brisbane.

Water by Design 2012, Maintaining Vegetated Stormwater Assets, Healthy Waterways, Brisbane.



BMT is a leading design, engineering, science and management consultancy with a reputation for engineering excellence. We are driven by a belief that things can always be better, safer, faster and more efficient. BMT is an independent organisation held in trust for its employees.

Level 5
348 Edward Street
Brisbane
QLD 4000
Australia
+61 7 3831 6744

Registered in Australia
Registered no. 010 830 421
Registered office
Level 5, 348 Edward Street,
Brisbane QLD 4000 Australia

For your local BMT office visit www.bmt.org

Contact us

www.bmt.org

Follow us

www.bmt.org/linkedin

www.bmt.org/youtube

www.bmt.org/twitter

www.bmt.org/facebook