PLC Sports, Aquatic, Fitness and Function Centre (SAFFC) Stormwater Management Plan

Civil Report

Prepared for: Root Partnerships

Attention: Eleanor Duffy

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Stantec Australia Pty Ltd
Level 22, 570 Bourke Street, Melbourne VIC 3000
Tel: +61 3 8554 7000 Web: www.stantec.com

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Revision

Revision	Date	Comment	Prepared By	Approved By
A	**02/04/20**	**DRAFT**	**ELP**	**DMCG**
B	**12/05/20**	**DRAFT**	**ELP**	**ZC**
C	**22/10/21**	**FINAL**	**DM**	**ZC**

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Glossary of Terms

Catchment	Area draining to a site. It always relates to a particular location and may include the catchment of tributaries as well as the main stream.
Discharge	The rate of flow of water measured in terms of volume over time.
Overland Flow	Excess rainfall runoff from a catchment that runs across the land. In urban areas overland flows typically occur when the runoff from the catchment exceeds the capacity of the underground or piped drainage system. In general, area affected by overland flows are referred to as *overland flow paths*.
Peak flow	The maximum discharge occurring during a flood event.
Runoff	The amount of rainfall that actually ends up as stream or pipe flow, also known as rainfall excess.

1. Introduction

Stantec have been commissioned by Root Partnerships to prepare this Stormwater Management Plan (SWMP) for the proposed development at 141 Burwood highway, Burwood.

This SWMP outlines the conceptual DA level stormwater design for the proposed redevelopment of the sports, aquatic, fitness and function centre (SAFFC) at Presbyterian Ladies College (PLC).

This SWMP has been prepared to accompany a development application for the site being lodged with the City of Whitehorse Council.

This stormwater management plan demonstrates the application of suitable Water Sensitive Urban Design (WSUD) principles and illustrates that the proposed development complies with the City of Whitehorse Council Standards and Guidelines for stormwater and is in accordance with the City of Whitehorse Planning Scheme Clause 53.18 for water quality.

2. Purpose and Scope

2.1 Purpose

The purpose of this SWMP is to evaluate the quality of stormwater associated with the proposed development plan so as to demonstrate to the City of Whitehorse that an appropriate stormwater management strategy has been adopted.

The SWMP specifically addresses the following items for both the construction and operational phases of the development:

- Stormwater quality treatment measures (Stormwater Quality); and
- Maintenance of water quality treatment devices.

The following will be achieved with the correct application of this SWMP report:

- Appropriate standards to be maintained for stormwater quality within the site.
- Pollution control to be maintained.
- Establishment of a unified, clear and concise stormwater management strategy for water quality.

3. Reference Documents

The following standards and guidance documents were referred to in preparation of the SWMP.

Relevant Australian Standards:

Guidance documents:

- CSIRO, Urban Stormwater: Best Practice Environmental Management Guidelines, 1999.
- Melbourne Water, WSUD Engineering Procedures – Stormwater, 2005.
- Melbourne Water, MUSIC Guidelines

4. Existing Site Characteristics

4.1 Property Detail

Address:	141 Burwood highway, Burwood
Real Property Description:	Lot 1 TP77772
Total Site Area:	12,464m^2 (1.25Ha)

As presented in Figure 1, the site is bounded by Burwood Highway to the south, Parer Street to the east, Elgar Road to the west and by Daniel Street to the north.

Figure 1 Existing Site Plan (Source: Nearmap)

5. Proposed Site Development

The proposed development can be seen in Figure 2. The development will consist of the construction of SAFFC at PLC.

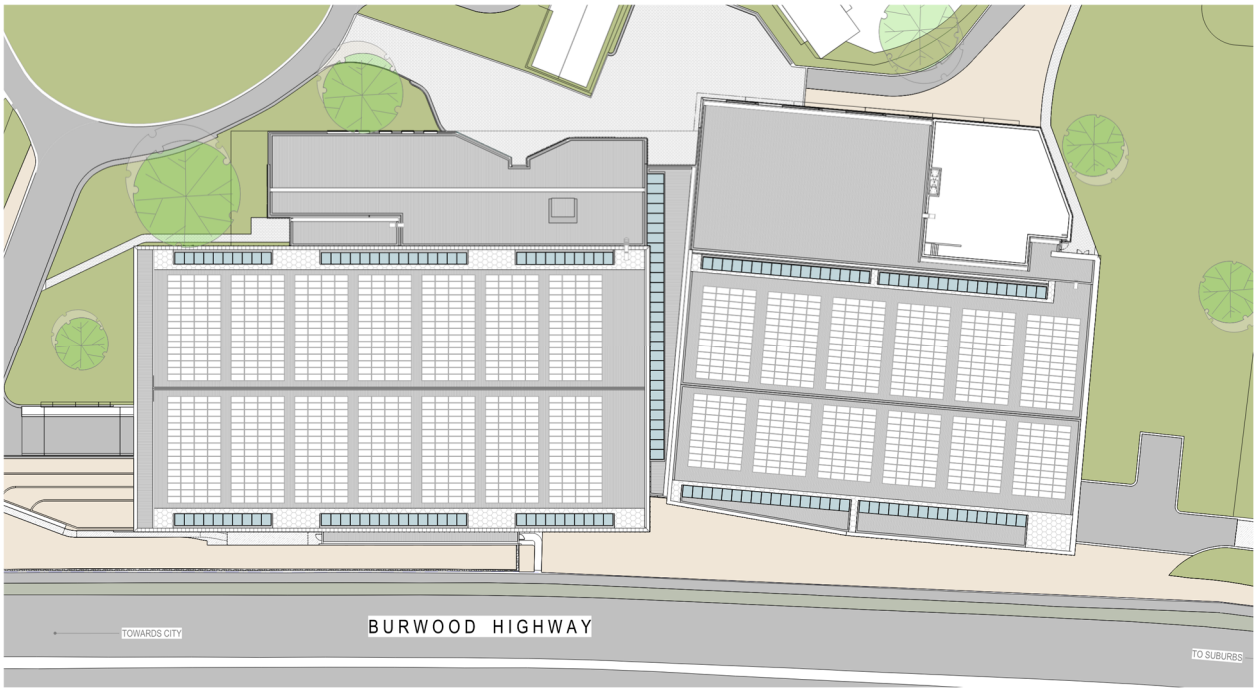


Figure 2 Proposed Development Plan (Source: Warren & Mahoney)

6. Relevant Authority Requirements

6.1 Legal Point of Discharge

As per advice received from the Civil engineers (Rimmington & Associates), the Legal Point of Discharge (LPD) for the SAFFC building and access road is into a junction pit located on Elgar Road.

Refer to Rimmington & Associates civil documentation for further details.

6.2 Local Council

The stormwater analysis will be undertaken in accordance with the City of Whitehorse guidelines, with reference to water quality:

- Integrated Water Management on development Sites principles

7. Stormwater Management Plan

7.1 Catchment Analysis

The pre and post-development catchment areas are seen in Table 3 below. For environmental purposes, although the existing site is a developed property, the pre-development site is being treated as a landscape area with a runoff coefficient of 0.3. Refer to Appendix A for the post-development catchment plan.

CATCHMENT NAME	PRE-DEVELOPMENT (M^2)	POST-DEVELOPMENT (M^2)	CHANGE (M^2)
ROOF CATCHMENT	0	8,371	+8,371
PAVEMENT CATCHMENT	0	1,897	+1,897
PERMEABLE PAVEMENT CATCHMENT	0	894	+894
LANDSCAPE CATCHMENT	12,464	1,302	-11,162
TOTAL	12,464	12,464	-

Table 1 - Catchment Analysis

7.2 Rain Water Tanks & Re-use

In accordance with best practice water quality performance objectives there will be one 350kL re-usable water tank capable of reusing 4746kL/annum for pool use installed in the basement of the development.

8. Stormwater Quality

The stormwater management plan has been developed to achieve current best practice water quality objectives, complying with the City of Whitehorse requirements.

8.1 Stormwater Performance Objectives

The objectives for on-site treatment of stormwater are in accordance with values set out in the Victorian Stormwater Committee (1999) *Urban Stormwater Best Practice Environmental Management Guidelines* that have been reproduced in Table 2 below.

POLLUTANT	POLLUTION REDUCTION TARGET
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	45%
Total Nitrogen (TN)	45%
Total Gross Pollutants >5mm (GP)	70%

Table 2 Objectives of Environmental Management of Stormwater

To achieve the stormwater performance objectives it is proposed to incorporate current best practice water sensitive urban design (WSUD) principals into the drainage scheme that is discussed in the following sections.

8.2 Stormwater Treatment

The proposed development has a total stormwater catchment area of approximately 12,464m². It is proposed that:

- The runoff from the roof catchment of the SAFFC building will be discharged to the nominated Legal Point of Discharge (LPD) on Elgar Rd via a 350KL rainwater tank and the GPT (Ocean Protect Cascade Separator)
- 30% of the standard pavement area will discharge via a bioretention raingarden before entering the GPT (Ocean Protect Cascade Separator), prior to discharging at the nominated LPD on Elgar Rd
- The remaining portion of the standard pavement area will discharge solely via GPT (Ocean Protect Cascade Separator), prior to the LPD on Elgar Rd
- The permeable access road, will also discharge via the GPT (Ocean Protect Cascade Separator), prior to the LPD on Elgar Rd
- The entirety of the landscape catchment will discharge via the GPT (Ocean Protect Cascade Separator), prior to the LPD on Elgar Rd

CATCHMENT	TREATMENT SYSTEM	CAPACITY/AREA	QTY	DISCHARGE
Roof Catchment	Rainwater tank	350KL with 4746kL/yr re-use	1	Overflow to LPD (Elgar Rd)
	GPT (Ocean Protect Cascade Separator)	1200mm nom. internal dia.	1	
Pavement Catchment	Bioretention Raingarden	11m2	1	To LPD via detention tank (Elgar Rd)
	GPT (Ocean Protect Cascade Separator)	1200mm nom. internal dia.	1	
Pavement Catchment – No Raingarden Treatment	GPT (Ocean Protect Cascade Separator)	1200mm nom. internal dia.	1	To LPD via detention tank (Elgar Rd)
Permeable Access Road Pavement Catchment	GPT (Ocean Protect Cascade Separator)	1200mm nom. internal dia.	1	To LPD via detention tank (Elgar Rd)
Landscape Catchment	GPT (Ocean Protect Cascade Separator)	1200mm nom. internal dia.	1	To LPD via detention tank (Elgar Rd)

Table 3 Runoff Treatment Scheme

The stormwater treatment train schematic as modelled in MUSIC is shown below:

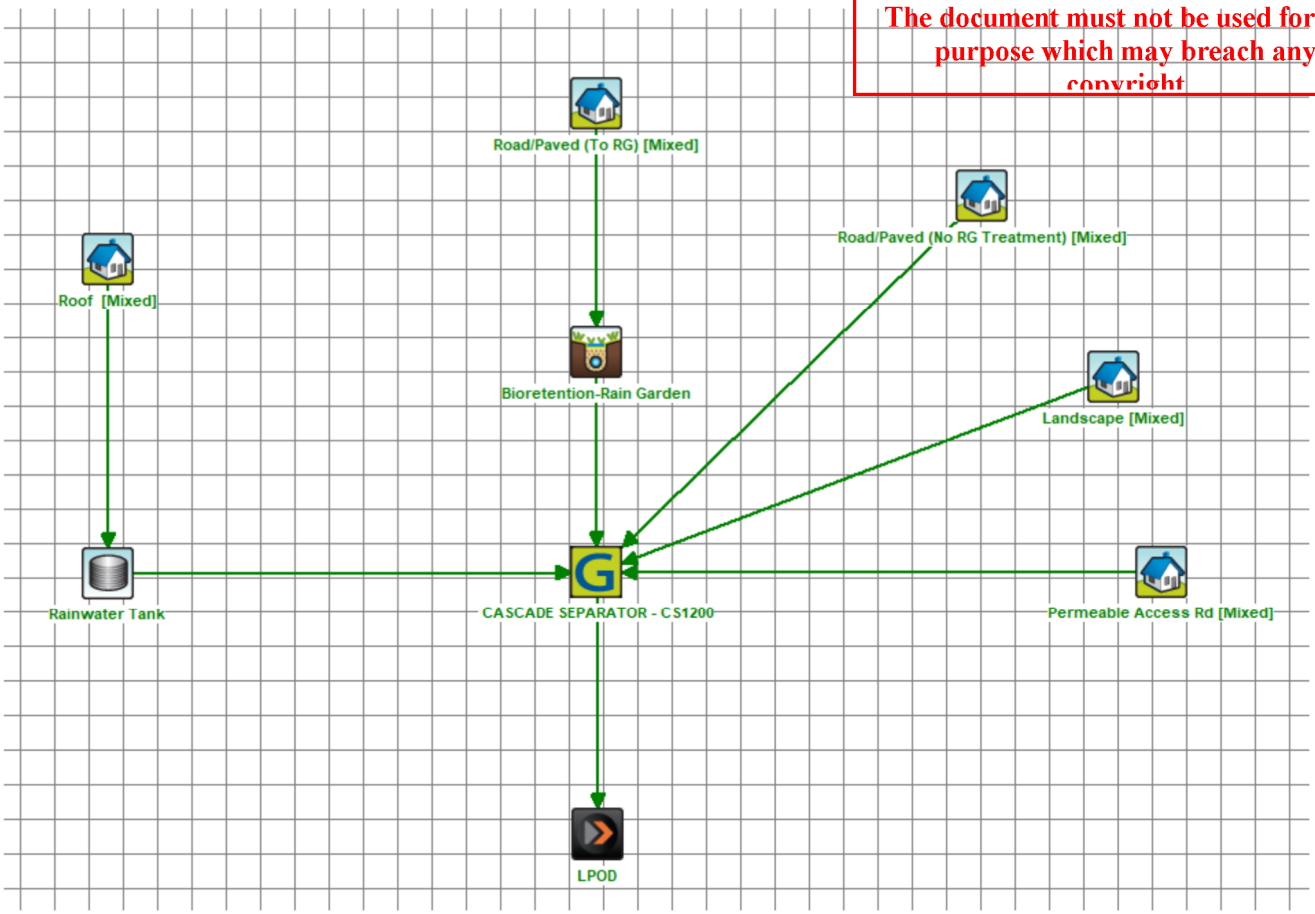


Figure 3 WSUD MUSIC Model

In order to meet the water quality objectives, pollutant export modelling software (MUSIC) has been used to confirm the proposed treatment measures and average pollutant load reduction from the site.

8.3 Stormwater Treatment Train Effectiveness

The effectiveness of the treatment device proposed in the above section has been modelled using MUSIC with the overall treatment train efficiency results shown in **Table 4** below.

OUTPUT DATA FROM MUSIC SOFTWARE					
	SOURCES	**RESIDUAL LOAD**	**REDUCTION (%)**	**TARGET (%)**	**TARGET ACHIEVED**
FLOW (ML/YR)	7.16	4.11	42.7	-	-
TOTAL SUSPENDED SOLIDS (KG/YR)	685	95.3	86.1	**80**	**YES**
TOTAL PHOSPHORUS (KG/YR)	1.73	0.746	56.9	**45**	**YES**
TOTAL NITROGEN (KG/YR)	16.5	5.73	65.2	**45**	**YES**
GROSS POLLUTANTS (KG/YR)	284	3.65	98.7	**70**	**YES**

Table 4 Treatment Train Effectiveness

From the results presented in **Table 4** it can be seen that the proposed WSUD treatment train provides effective mitigate the water quality impacts of the development and meet the required Water Quality Objectives thus ensuring stormwater quality is appropriately managed.

9. Site Management Plan

It is expected that the construction phase works will comprise of:

- Clearing
- Bulk Earthworks
- Trimming and Profiling
- Road boxing and construction
- Site Drainage & Services construction
- Landscaping and associated drainage

During the construction phase, the management of stormwater runoff from the exposed earthworks surfaces will be based on containment, diversion and retention. Throughout the stages of construction these include:

- Erosion controls such as sediment fences surrounding stripped earth
- Sediment fences surrounding stockpiles of soil and debris
- Construction of perimeter bunding at toe and/or top of earthworks batters
- Catch drains, including check dams, though the site to catch direct runoff.
- The containment of runoff from the site into a temporary sediment basin during the construction works.
- Diversion drains to re-direct clean water around the site.

An Erosion and Sediment Control plan will be included with the Contractor's building permit application and will be implemented during the construction phase. This will be prepared in accordance with the latest International Erosion Control Association (IECA) standards and applicable Council standards. A suitably qualified person will inspect construction works to ensure compliance.

During the construction phase the maintenance and monitoring of erosion and sediment control measures remains the responsibility of the Contractor. Details of the inspection frequency expected will be noted within the Contractor's Erosion and Sediment Control Drawings. If during the construction phase it is deemed required, monitoring will also be undertaken by qualified consultants to determine the impact of activities on the subject site.

10. Maintenance Plan

10.1 Maintenance Tasks & Responsibilities

The following maintenance schedules are proposed for the various Stormwater Quality Improvement Devices to ensure they continue to operate as planned.

Stormwater Quality Improvement Devices	Maintenance Responsibility	
	On Maintenance period	Off Maintenance period
Rainwater Tanks	School Maintenance	School Maintenance
GPT (Ocean Protect Cascade Separator)	Ocean Protect	Ocean Protect
Raingarden	School Maintenance	School Maintenance

Table 5 Summary of WSUD Maintenance Responsibility

10.1.1 Rainwater Tank

The responsibility to maintain the rainwater tank to the manufacturer's specifications will be the responsibility of school maintenance.

10.1.2 GPT – Ocean Protect Cascade Separator (or Approved Equivalent)

The responsibility to maintain the Ocean Protect Cascade Separator to the manufacturer's specifications will be the responsibility of school maintenance and Ocean Protect.

A guide to the Ocean Protect Cascade Separator maintenance requirements are included in Appendix B.

10.1.3 Raingarden

Raingardens are proposed to be incorporated within the open space of each lot or courtyard. Raingardens act in the same way as large bio-retention systems and discharge to the roof water pit within each lot / unit. Raingardens are positioned to receive rainwater from hard surfaces such as from roof downpipes, paved areas or road surfaces. They include a combination of native plants, shrubs and grasses that soak up rainfall collected from the roof or driveway. In doing so, raingardens reduce the amount of stormwater that would otherwise wash pollutants from hard surfaces into the stormwater system and waterways.

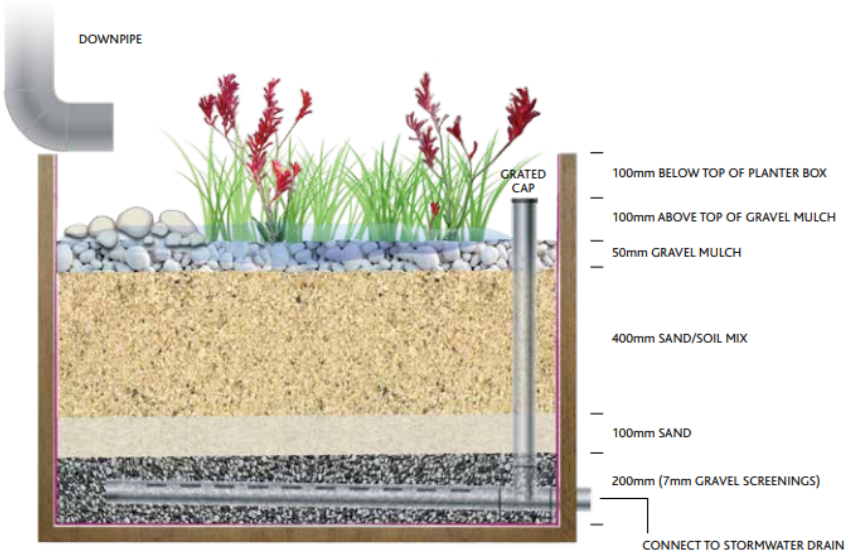


Figure 4: Typical Raingarden Cross section (Source: Melbourne Water 2013)

11. Summary and Conclusion

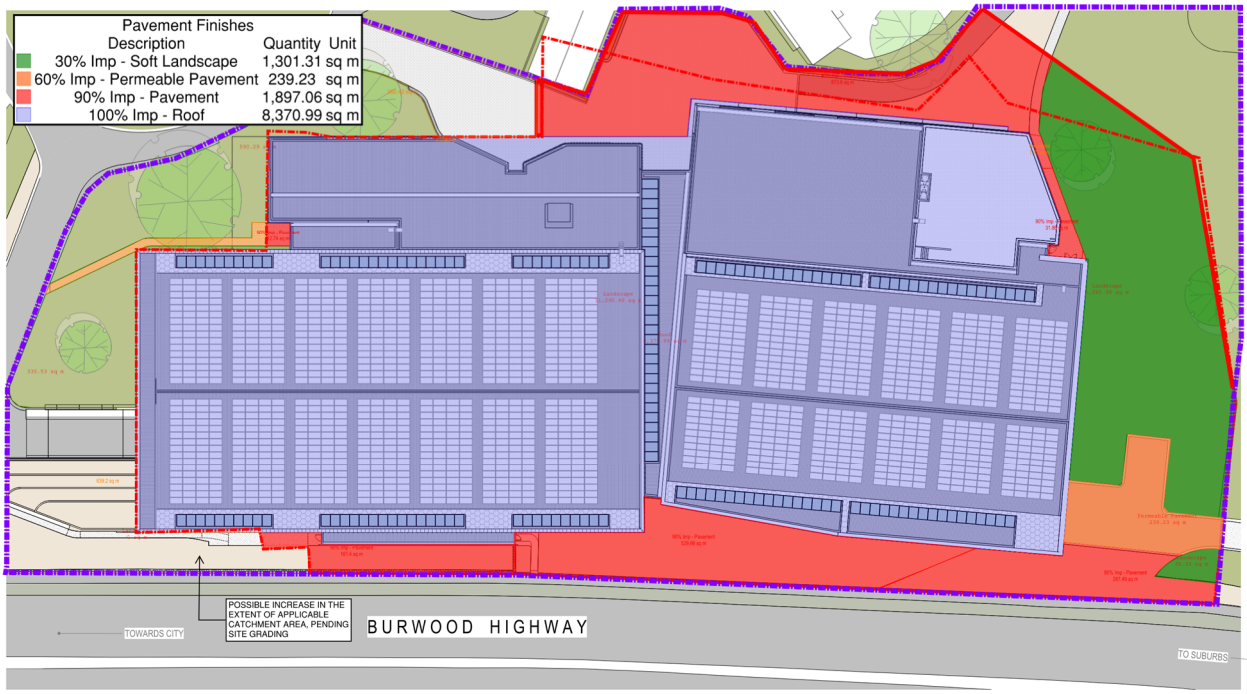
This Site Based Stormwater Management Plan has been prepared for the proposed development at 141 Burwood Highway, Burwood. The proposed development comprises the construction of the SAFFC at PLC. If unmitigated, the proposed development will have an effect on runoff water quality from the site.

Stormwater treatment devices have been proposed in this report to minimise the impact the development has on the external environment.

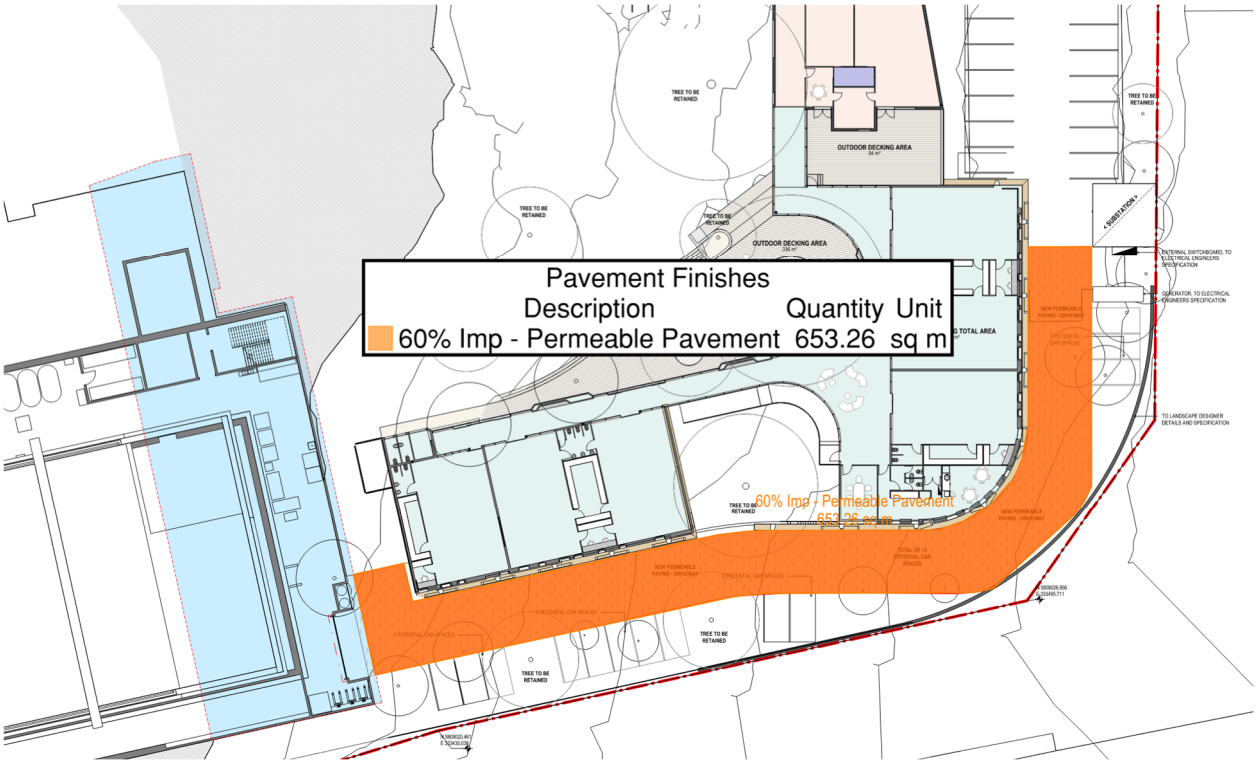
This report has demonstrated that the recommended devices exceed the required WQO's by incorporating Water Sensitive Urban Design into the proposed stormwater drainage system for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants.

As such from a stormwater management perspective, we believe that the proposed development complies with the City of Whitehorse Planning Scheme Clause 53.18 (for water quality requirements) and drainage guidelines, and should be endorsed for approval.

Appendix A – Catchment Plans



Proposed Catchment Plan – SAFFC Building



Proposed Catchment Plan – SAFFC Access Road

Appendix B – Ocean Protect Cascade Separator Maintenance Guide

OCEAN PROTECT

Cascade Separator™

Operations & Maintenance Manual

Table of Contents

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The Cascade Separator™ is a vortex type engineered stormwater management device designed to remove hydrocarbons and sediment with associated pollutants from stormwater runoff. It removes all particles 5 mm and greater from stormwater flows, including neutrally buoyant material such as rubbish and debris.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each stormwater treatment device is essential to ensuring that it works properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up).

Health and Safety

Access to a Cascade Separator™ unit requires removing heavy access covers/grates, additionally it might become necessary to enter into a confined space. Pollutants collected by the Cascade Separator™ will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your OceanSave require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the Cascade Separator™, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots,
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst the minor maintenance for the Cascade Separator™ can be performed from surface level, there will be a need to enter the pit (confined space) during major services. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification in confined space entry requirements.

How does it Work?

The internal flow controls of the Cascade Separator™ are illustrated in Figure 1. Low, frequently occurring storm flows enter the device via one or more inlet pipes, or a surface grate. Once inside the device, water is directed to two separate inlet flumes. As a result of the directional flow into the centre tube via the flumes, vortices are created operating in opposite directions. This innovative design unlike any other device on the market facilitates enhanced particle separation. The downward swirling vertical water column allows for sediment to settle into the sump and water to exit through an outlet window. Flow that eventually exceeds the capacity of the flumes can also exit over the flume without re-suspending previously captured pollutants. The system incorporates a partially perforated slanted skirt that equalizes the pressure between the storage and treatment zone while reducing the potential for scour. The skirt also allows transport of sediment and debris into the sump zone which improves ease of maintenance since all captured material can be removed through the centre tube.

The outlet deck incorporates two drain down pipes that extend downward and allow the system to drain to the outlet pipe invert elevation after the storm event has subsided, while preventing captured hydrocarbons from leaving the system.

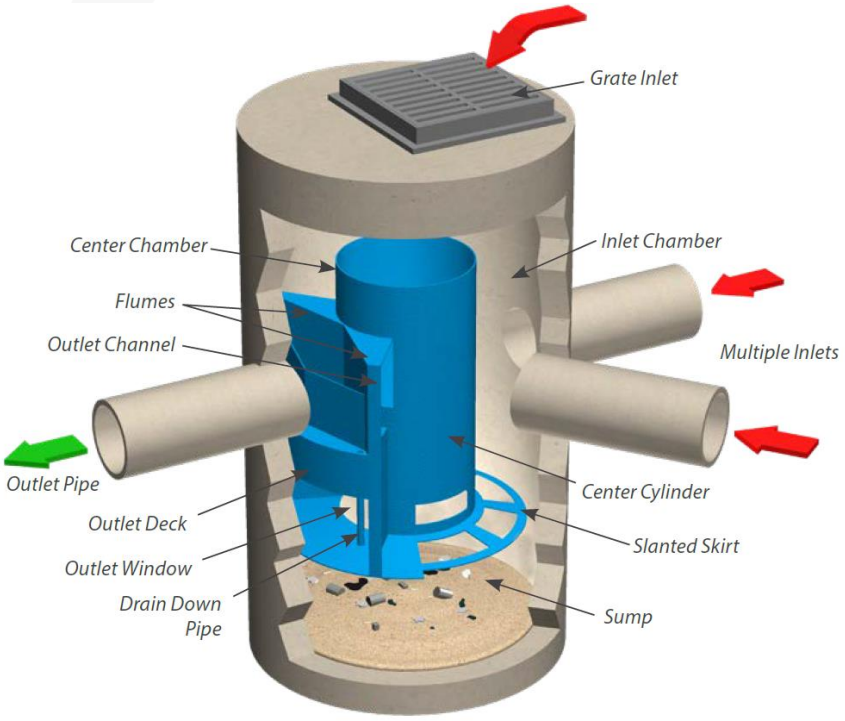


Figure 1: Cascade Separator™ *Components*

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the Cascade Separator™ requires a minor service every 6 months and a major service every 12 to 24 months.

Primary Types of Maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the Cascade Separator™.

	Description of Typical Activities	Frequency
Minor Service	Visual inspection of inlet aperture Removal of large floatable pollutants Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants.	At 12 Months

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to assess the condition of the device and record necessary information that will inform the activities to be undertaken during a major service.

1. Establish a safe working area around the access point
2. Remove access cover
3. Visually inspect the inlet aperture
4. Remove large floatable pollutants with a net
5. Measure and record sediment depth
6. Replace access cover

Major Service

This service is designed to return the Cascade Separator™ device back to optimal operating performance.

1. Establish a safe working area around the access point
2. Remove access cover
3. Using a vacuum unit remove any floatable pollutants
4. Decant water until water level reaches accumulated sediment
5. Remove accumulated sediment and gross pollutants with vacuum unit (if required)
6. Use high pressure water to clean flumes, centre tube and sump area (if required)
7. Replace access cover

When determining the need to remove accumulated sediment from the Cascade Separator™ unit, the specific sediment storage capacity for the size of unit should be considered (see table below).

Model	Diameter (m)	Sediment Storage Capacity (m^3)	Oil Storage Capacity (litre)
CS1200	1.2	0.5	530
CS1500	1.5	0.8	1040
CS2250	2.25	2.4	4270
CS3250	3.25	4.4	8340

Additional Types of Maintenance

The standard maintenance approach is designed to work towards keeping the Cascade Separator™ system operational during normal conditions. From time to time events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the Cascade Separator™ unit that potentially received flow should be inspected and cleaned. Specifically all captured pollutants from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event.

Blockages

The Cascade Separator™ internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. In the unlikely event that flooding occurs around or upstream of the device location the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the inlet aperture, ensuring that it is free of debris and pollutants
2. Decant water from Cascade Separator™ unit in preparation for confined space entry
3. Inspect the screen and flume as well as both inlet and outlet pipes for obstructions, if present remove any built up pollutants or blockages.

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the Cascade Separator™ after a significant major storm event. The focus is to inspect for higher than normal sediment accumulation that may result from localised erosion, where necessary accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the Cascade Separator™ must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the system has been exposed to any hazardous or unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanSave system we offer long term pay-as-you-go contracts and pre-paid once off servicing.

For more information please visit www.OceanProtect.com.au

Design with
community in mind

Stantec
Level 22
570 Bourke Street
Melbourne VIC 3000
Tel +61 +61 3 8554 7000

For more information please visit
www.stantec.com

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