Stormwater Management Report

Proposed Residential & Retail Development

387-403 Macquarie St, Liverpool

Prepared by

Abel & Brown Pty. Ltd.

Abel & Brown Pty. Ltd.

SUSTAINABLE BUILDING SERVICES CONSULTANTS

CIVIL, FIRE PROTECTION & HYDRAULIC DESIGN SERVICES
FIRE HYDRANTS, HOSEREEL , SPRINKLER & ESSENTIAL SERVICES DESIGN
FORENSIC INVESTIGATION, EXPERT WITNESS & LITIGATION SUPPORT SERVICES
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GAS CO-GENERATION AND AIR CONDITIONING SYSTEMS
HYDRONIC UNDERFLOOR HEATING SYSTEMS DESIGN
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BUSHFIRE PROTECTION & SPRINKLER CONSULTING
SIPHONIC DRAINAGE SYSTEMS DESIGN
BASIX STORMWATER DRAINAGE SYSTEMS
GREY & RAINWATER REUSE SYSTEMS DESIGN
ON SITE SEWAGE TREATMENT, DISPOSAL & REUSE SYSTEMS
EDITORS OF THE AUSTRALIAN PLUMBING COST GUIDE

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Monday, 12 October 2015

Mosca Pserras Architects
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Suite 501 / 7, Secant Street
LIVERPOOL NSW 2170

Attention Mr. Greg Koutoulas

RE: Proposed Residential & Retail Development
387-403 Macquarie St, Liverpool
Stormwater Management Plan

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Document Status				
Rev No.	**Author**	**Reviewer**	**Issue**	**Date**
A	SB	RB	Issued for DA	Thursday, 22 May 2014

THE AUTHOR OF THIS REPORT

This report has been written by Stuart Brown. I am a Civil Engineer.

INSTRUCTIONS

Instructing Party: Mr Greg Koutoulas of Mosca Pserras Architects

I was instructed by Mr Greg Koutoulas to report on the methods of stormwater disposal from the proposed bulky goods and retail development. This report is wholly based upon information able to be gained from the architectural plans provided by Mosca Pserras Architects, and design works undertaken by our office.

My instructions comprised

a) To prepare a report outlining the proposed stormwater concept as part of the submitted stormwater concept plan.

1. DOCUMENTS

I have been provided with the following documents relating to this matter.

- Architectural Plans provided by Mosca Pserras Architects.
- Stormwater Concept Plan compiled by our office.
- Pollution removal calculations file (utilising MUSIC) compiled by Stormwater360.

2. SCOPE OF THE REPORT

This report outlines the proposed concept for the collection, retention of roof and ground water and discharge of stormwater from the proposed site.

This report should be read in conjunction with the submitted stormwater concept plans.

Should you require further information please do not hesitate to contact our office in the first instance.

Regards,

Stuart Brown

Abel & Brown Pty Ltd
B.Eng Civil
Dip. Plumbing Services
Plumber, Drainer and Gasfitter

3. INTRODUCTION

The report has been prepared for the proposed development located at 387-403 Macquarie St, Liverpool

The proposed works comprise the construction of a two story retail building and alterations to the catch basin to allow for parking. The stormwater drainage design is required to be in accordance with the Liverpool City Council DCP and the documents listed below

The predevelopment site discharges to the existing council stormwater system. The proposed drainage system will drain to the same discharge point via on site retention and pollutant removal equipment.

4. Overview

The proposed new development provides the opportunity to develop sustainable water management systems.

Broad outline of the possible measures are;

- Stormwater Drainage System
- On Site Stormwater Treatment

Each of these items will be addressed separately in this report.

5. REGULATORY ENVIRONMENT APPLYING TO THE INSTALLATION AT THE TIME OF DESIGN

Where a stormwater system is located within the Liverpool City Council area, it will be necessary for the design to comply with the following requirements.

a) AS 3500 2003.3 Part 3 Stormwater Drainage

b) Liverpool City Council On Site Stormwater Detention Policy

c) Liverpool City Council On site stormwater detention technical specifications

d) Liverpool City Council Handbook for drainage design criteria

6. STORMWATER DRAINAGE SYSTEM AND ON SITE DETENTION

A stormwater drainage system consisting of a network of pits and pipework strategically located to integrate into the council drainage system and all drainage provided to serve the proposed development will cater for all flows up to the 100yr ARI storm event.

On site detention has not been provided for this development as the predevelopment site is currently entirely impervious. This has been confirmed with Liverpool City Council Development Engineer Charlie Caraballo.

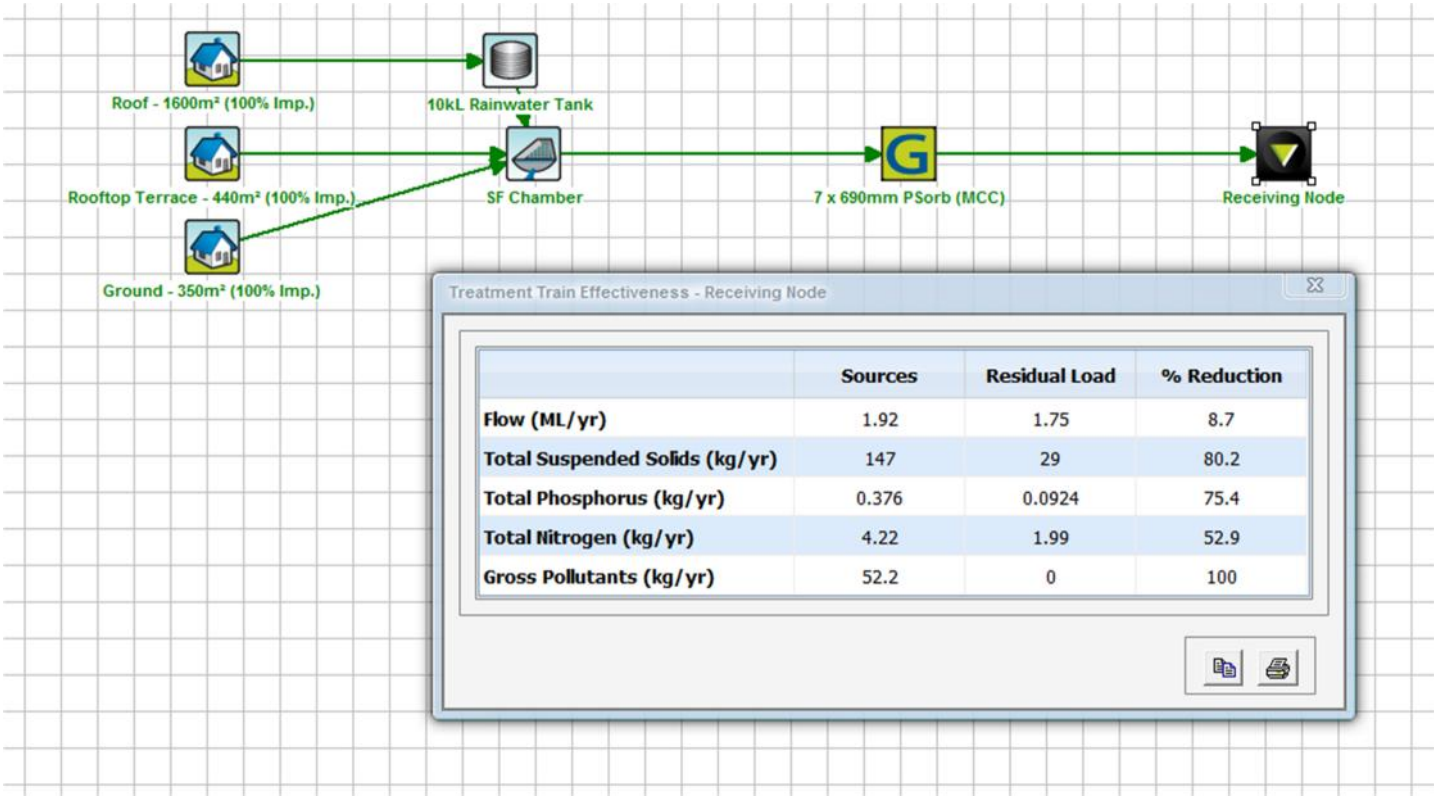
A 10kilolitre rainwater tank has been provided for BASIX requirements. As part of the construction design and documentation, a water balance would be carried out to assess the resource potential of rainwater for the development. From this assessment, the optimum solution for the development can be made that is both water and energy efficient, economically viable and more importantly, sustainable. This involves:

7. ON SITE STORMWATER TREATMENT

On site pollution removal is to be achieved using proprietary filters manufactured by Stormwater360 located in upstream of the site. The pollution removal effectiveness has been modelled using the 'MUSIC" package based on the following parameters:

- Stormwater360 Phosphosorb Treatment Nodes
- Rainfall Station 67035 Liverpool(Whitlam), 6 Minute Time Step From 1967 To 1976 Modified Specifically For Blacktown City Council
- Sydney Catchment Management Authority (CMA) Source Node(s) utilizing modified % impervious area, rainfall threshold, soil properties & pollutant concentrations
- No drainage routing between nodes.

The calculation file is enclosed with this report. A summary of the results and the model is shown below:



	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.92	1.75	8.7
Total Suspended Solids (kg/yr)	147	29	80.2
Total Phosphorus (kg/yr)	0.376	0.0924	75.4
Total Nitrogen (kg/yr)	4.22	1.99	52.9
Gross Pollutants (kg/yr)	52.2	0	100

Figure 1 - MUSIC Modelling results.

The systems has been modeled to meet Liverpool City Council water quality objectives (Liverpool Development Control Plan 2008) to provide pollutant removal rates greater than

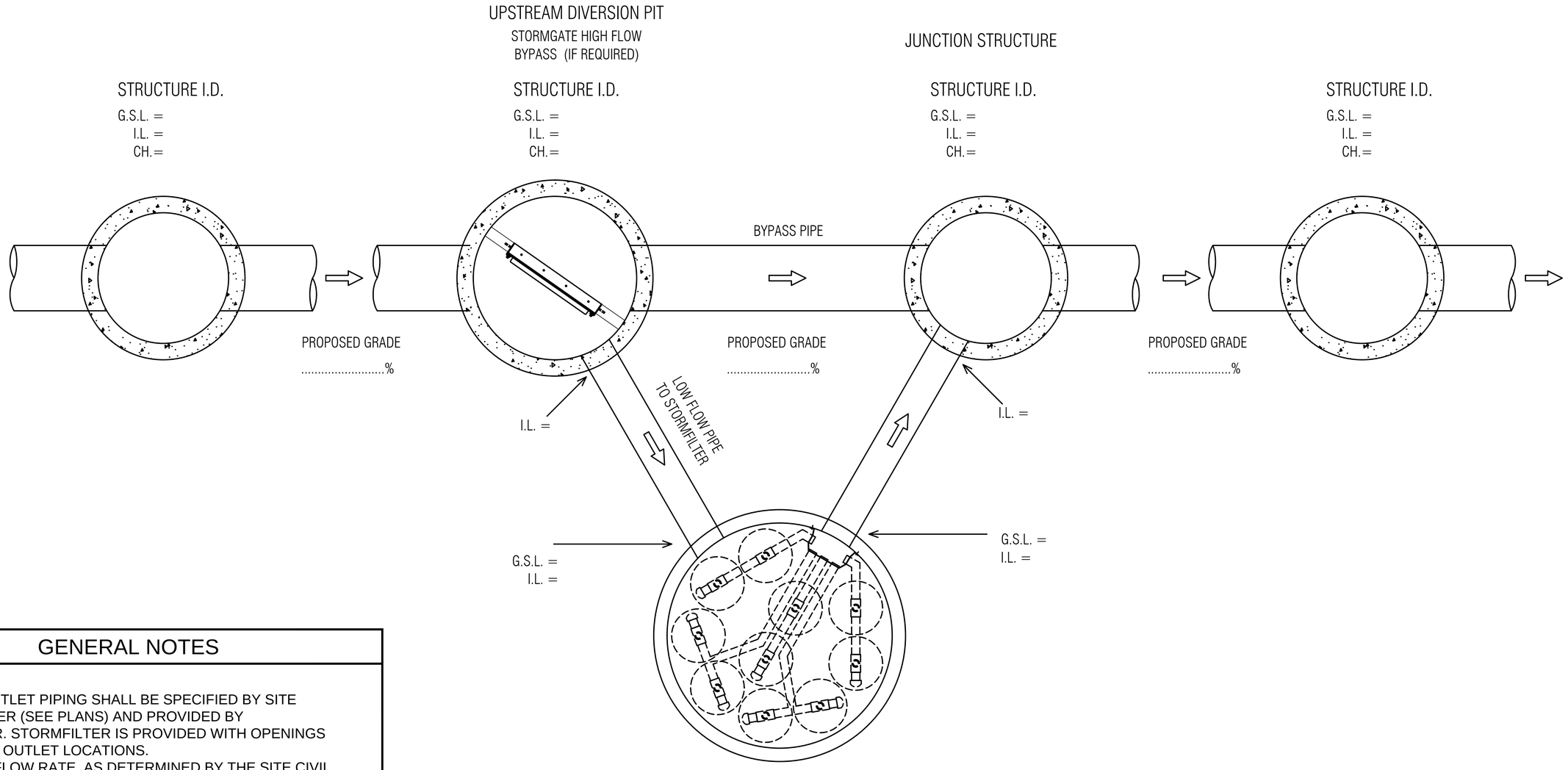
- 80% TSS Reduction
- 45% TP Reduction
- 45% TN Reduction

Manufacturers data sheets have been incuded with this report.

8. CONCLUSION

The proposed drainage and pollution removal system system will operate to collect and filter the stormwater generated in the proposed development and discharge it safely away from the development area to the council drainage system system.

Stormwater360 Equipment Data Sheets



STRUCTURE I.D.

STORMFILTER CHAMBER
BY STORMWATER 360

REFER TO PRODUCT DRAWING .....
FOR SYSTEM DETAILS

PLAN OF TYPICAL OFFLINE LAYOUT

GENERAL NOTES

1. INLET AND OUTLET PIPING SHALL BE SPECIFIED BY SITE CIVIL ENGINEER (SEE PLANS) AND PROVIDED BY CONTRACTOR. STORMFILTER IS PROVIDED WITH OPENINGS AT INLET AND OUTLET LOCATIONS.
2. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE PEAK HYDRAULIC CAPACITY OF THE PRODUCT, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED. PLEASE CONTACT STORMWATER360 FOR OPTIONS.
3. THE FILTER CARTRIDGE(S) ARE SIPHON-ACTUATED AND SELF-CLEANING. THE STANDARD DETAIL DRAWING SHOWS THE MAXIMUM NUMBER OF CARTRIDGES. THE ACTUAL NUMBER SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER ON SITE PLANS OR IN DATA TABLE BELOW. PRECAST STRUCTURE TO BE CONSTRUCTED IN ACCORDANCE WITH AS3600.
4. FOR SHALLOW, LOW DROP OR SPECIAL DESIGN CONSTRAINTS, CONTACT STORMWATER360 FOR DESIGN OPTIONS.
5. ALL WATER QUALITY PRODUCTS REQUIRE PERIODIC MAINTENANCE AS OUTLINED IN THE O&M GUIDELINES. PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS.
6. STRUCTURE AND ACCESS COVERS DESIGNED TO MEET AUSTROADS T44 LOAD RATING WITH 0-2m FILL MAXIMUM.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES AND VARY REGIONALLY.
8. ANY BACKFILL DEPTH, SUB-BASE, AND OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY SITE CIVIL ENGINEER.
9.. STORMFILTER BY STORMWATER360:
SYDNEY (AU) PHONE: (02) 9525 5833,
BRISBANE (AU) PHONE: (07) 3272 1872.

Stormwater360

STORMWATER360

TYPICAL OFFLINE LAYOUT
STORMGATE HIGH FLOW BYPASS (OPTIONAL)
WITH PRECAST MANHOLE STORMFILTER

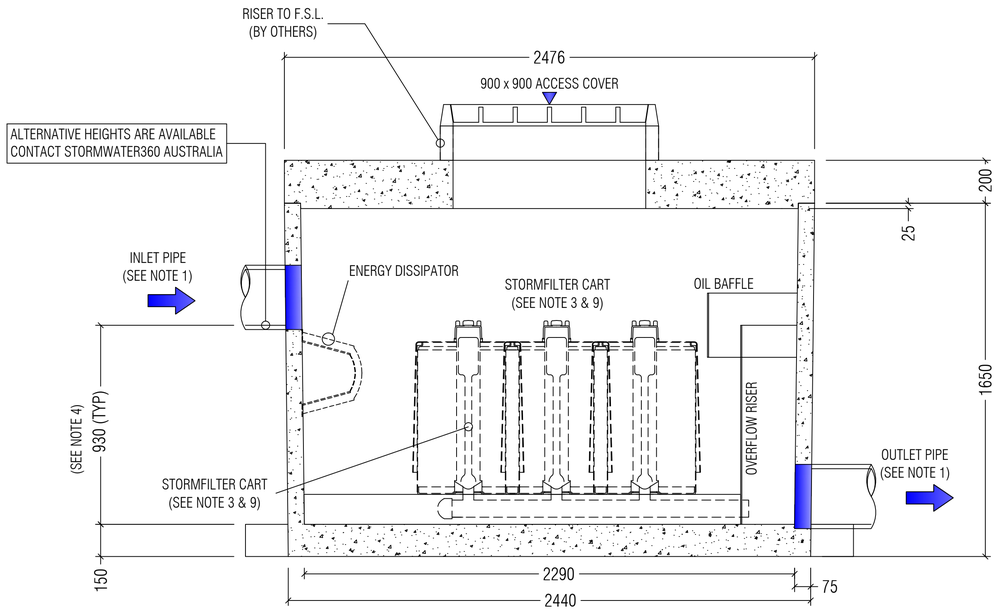
DRAWING 1 A

DATE: 09.03.08 | SCALE: N.T.S. | FILE NAME: SFMH_OFFLINE_TYP | DRN: R.P. | CHK: M.W.

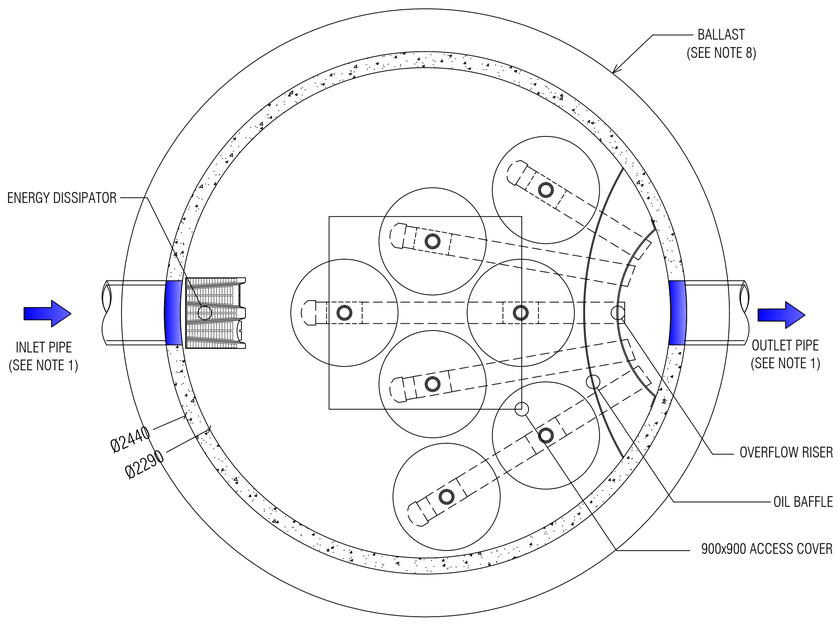
STORMFILTER DESIGN TABLE

- STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED AND BY REGION SPECIFIC INTERNAL FLOW CONTROLS. CONVEYANCE CAPACITY IS RATED AT 80L/S.
- THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CIVIL ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).
- ALL PARTS PROVIDED AND INTERNAL ASSEMBLY BY STORMWATER360 AUSTRALIA UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	690		460		310	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	930		700		550	
TREATMENT BY MEDIA SURFACE AREA L/S/m2	1.4	0.7	1.4	0.7	1.4	0.7
CARTRIDGE FLOW RATE (L/s)	1.42	0.71	0.95	0.47	0.63	0.32



MANHOLE STORMFILTER SECTION



MANHOLE STORMFILTER PLAN

GENERAL NOTES

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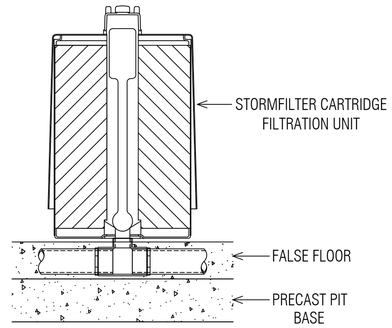
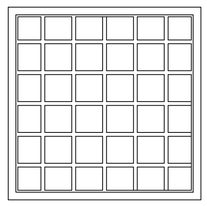
2. IF THE PEAK FLOW RATE, AS DETERMINED BY THE SITE CIVIL ENGINEER, EXCEEDS THE PEAK HYDRAULIC CAPACITY OF THE PRODUCT, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED. PLEASE CONTACT STORMWATER360 AUSTRALIA FOR OPTIONS.
3. THE FILTER CARTRIDGE(S) ARE SIPHON-ACTUATED AND SELF-CLEANING. THE ACTUAL NUMBER SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER ON SITE PLANS OR IN DATA TABLE BELOW. PRECAST STRUCTURE TO BE CONSTRUCTED BY STORMWATER360 AUSTRALIA IN ACCORDANCE WITH AS3600.
4. SEE STORMFILTER DESIGN TABLE FOR REQUIRED HYDRAULIC DROP. FOR SHALLOW, LOW DROP OR SPECIAL DESIGN CONSTRAINTS, CONTACT STORMWATER360 AUSTRALIA FOR DESIGN OPTIONS.
5. ALL WATER QUALITY PRODUCTS REQUIRE PERIODIC MAINTENANCE AS OUTLINED IN THE O&M GUIDELINES. PROVIDE MINIMUM CLEARANCE FOR MAINTENANCE ACCESS.
6. STRUCTURE AND ACCESS COVERS DESIGNED TO MEET AUSTROADS T44 LOAD RATING WITH 0.0m TO 2.0m FILL MAXIMUM (CLASS D).
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES AND VARY REGIONALLY.
8. ANY BACKFILL DEPTH, SUB-BASE, AND OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY SITE CIVIL ENGINEER.
9. CARTRIDGE HEIGHT IS 690mm (SHOWN). CARTRIDGE HEIGHT AND ASSOCIATED DESIGN PARAMETERS PER STORMFILTER DESIGN TABLE.
10. STORMFILTER BY STORMWATER360 AUSTRALIA: PHONE: 1300 354 722 OR www.stormwater360.com.au



STORMFILTER CARTRIDGE DETAIL



900 x 900 ACCESS COVER

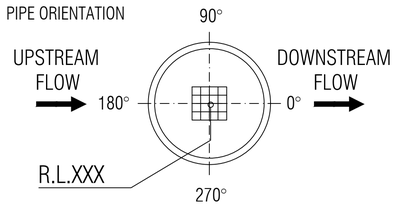
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	XXX
WATER QUALITY FLOW RATE (L/S)	XXX
PEAK FLOW RATE (L/S)	XXX
RETURN PERIOD OF PEAK FLOW (yrs)	XXX
# OF CARTRIDGES REQUIRED (8-22)	7
CARTRIDGE HEIGHT (310, 460 or 690mm)	690
MEDIA TYPE (PERLITE, PERLITE/ZEOLITE OR ZPG)	XXX

PRECAST VAULT WEIGHT	XXX kg
PRECAST LID WEIGHT	XXX kg

PIPE DATA:	I.L.	MATERIAL	DIAMETER
INLET PIPE #1	XXX	XXX	XXX
INLET PIPE #2	N/A	N/A	N/A
OUTLET PIPE	XXX	XXX	XXX

PIPE ORIENTATION



LADDER		YES/NO
ANTI-FLOTATION BALLAST	N/A	N/A
	N/A	N/A

NOTES/SPECIAL REQUIREMENTS:

Stormwater360

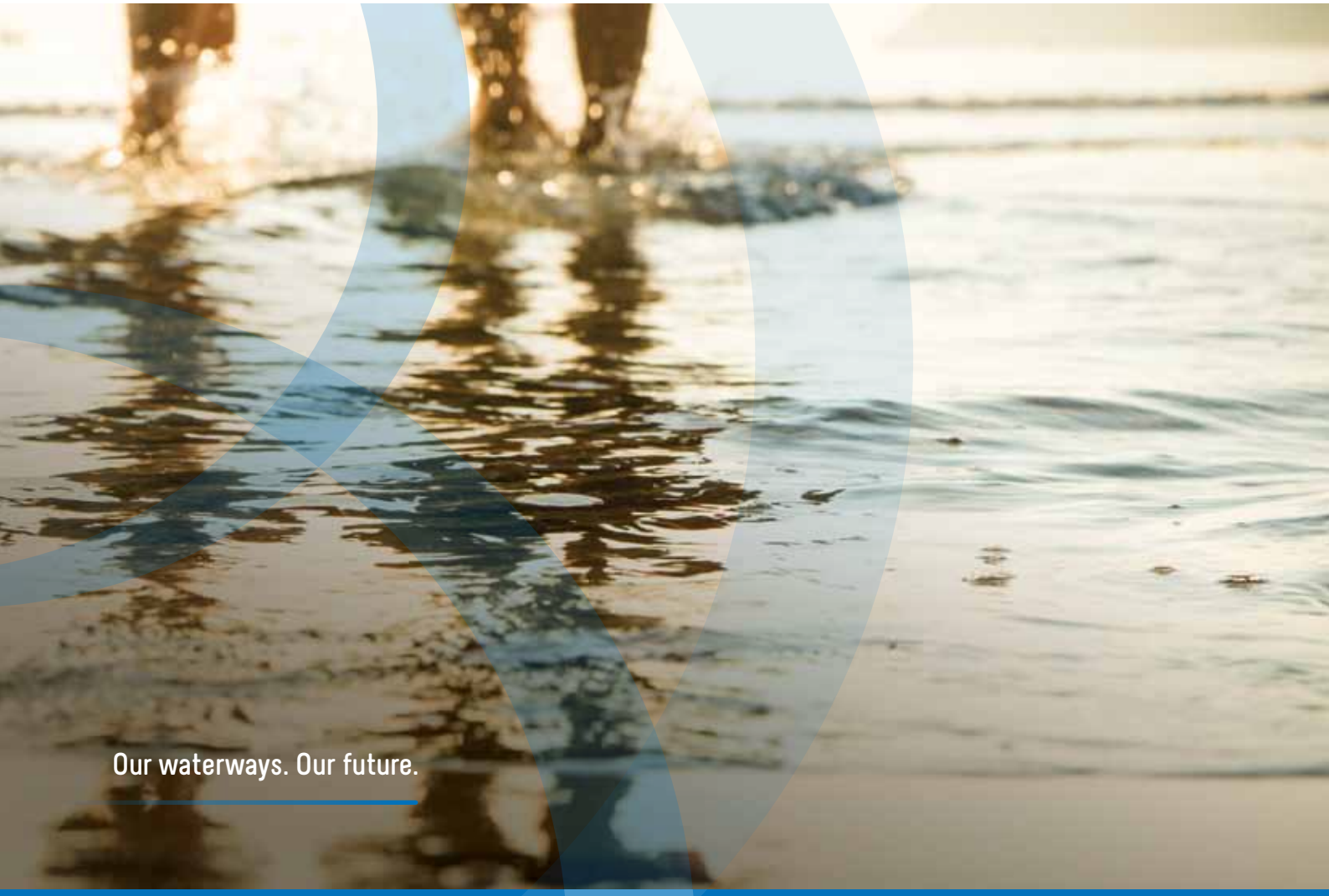
STORMWATER360 AUSTRALIA
7 CARTRIDGE STORMFILTER SYSTEM
Ø 2290 CONCRETE MANHOLE
GENERAL ARRANGEMENT

DRAWING 1 A

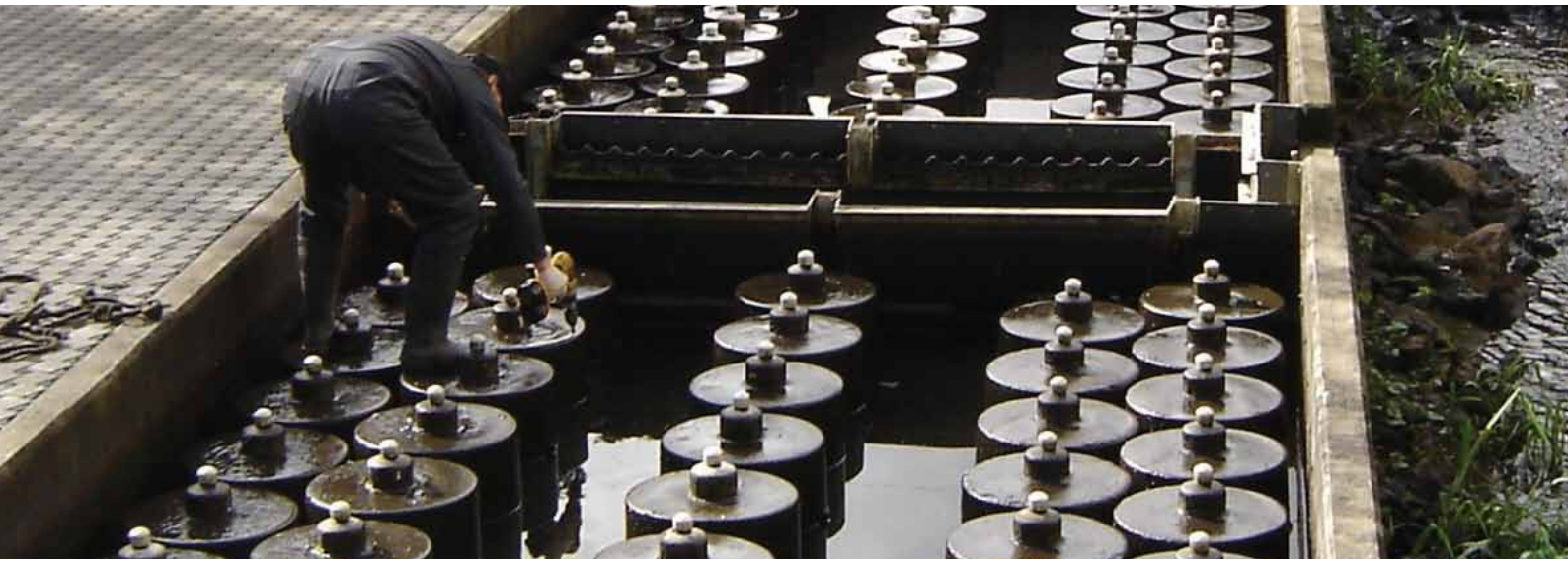
DATE: 05.05.14 | FILE NAME: 7C690SFMH_PS | DRN: W.J. | CHK: M.W.

SFEP Treatment Train

Screening and enhanced filtration treatment in series



Stormwater360
AUSTRALIA



Screening and enhanced filtration treatment in series

Most consent authorities within Australia have established targets for the removal of pollutants including debris, coarse and fine sediments, and soluble nutrients from stormwater runoff before it is discharged into urban catchments. In general each pollutant is removed from the water column using a specific physical, chemical or biological process. Arranging these processes in sequence provides a “treatment train” approach that addresses and treats the whole spectrum of stormwater pollutants.

In order to meet these demands, Stormwater360 provides the StormFilter and EnviroPod (SFEP) as a series of products within a treatment train. The EnviroPod filter is a gully pit insert designed to be easily retrofitted into new and existing stormwater gully pits, requiring no construction and no land take. Located at the source of stormwater contaminants the EnviroPod filter has a interchangeable and reusable bag with 200 micron pore size. The EnviroPod (gully pit basket) is designed to remove gross pollutants, coarse sediment and associated pollutants (hydrocarbons, metals and nutrients) at high flows and is typically located within each gully inlet pit. The EnviroPod filter also holds captured material dry thereby reducing the amount of nutrient leachate from the organic material stored within the bag.

StormFilter operates at a much lower flow rate than the EnviroPod insert – this is necessary in order to achieve extremely high levels of removal efficiency of fine and soluble contaminants. StormFilter cartridges are located typically within a concrete storage structure with the type and media determined by configuration and design. The StormFilter technology is designed to remove both particulate bound and soluble pollutants, and is located near the outlet of the catchment. The SFEP StormFilter technology utilises Stormwater360’s patented ZPG media blend containing both zeolite and carbon. This blend specifically targets ammonium and soluble organic nitrogen typically found within stormwater flows and any nitrogen leachate from organic material held upstream within the EnviroPod filters. The ability of the StormFilter cartridge to retain nitrogen is further enhance as the captured material is again stored dry reducing the amount of nutrient leachate.

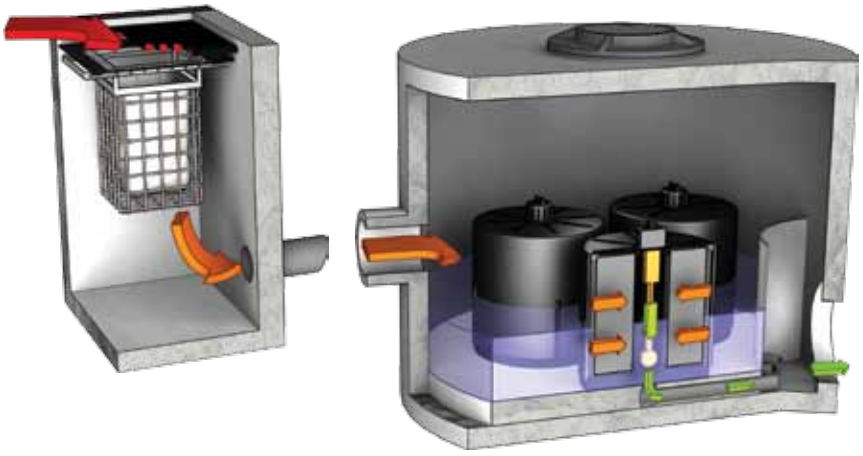
> The SFEP Treatment Train has undergone an extensive peer-reviewed field evaluation program conducted under local conditions that demonstrates reductions in nutrients (including soluble), which meet current best practice guidelines.

Features and benefits

- Turnkey solution – modelling, design, supply and service/maintenance contracts available
- Immediate activation – no need for system “maturity”; starts treating stormwater after filters and cartridges are installed
- Field proven technologies – installations within local conditions for 10 years
- Field proven removal capability – performance data peer reviewed and published in a scientific journal
- Cost effective – comparative cost to traditional vegetated systems
- Simple, cost effective and recognised maintenance practices
- Increases development yield – can be located under carparks and roads. Reduces the need for batters or special maintenance access which further decrease development yield
- Multiple configurations available – meets site specific needs
- Ideal solution for infield developments – can be housed close to building footings, pavements and embankments. Reduces the need for ancillary structures such as retaining walls
- Flexible payment options – system can be supplied with zero capital cost up-front on a service inclusive lease with flexible payment options

Screening

Multiple EnviroPods would be required for a typical site



Enhanced Filtration

Comprehensive Strategic Pollutant Removal Sequence

Gross Pollutants

- Majority of flows treated by EnviroPod with all debris removed from stormwater and held dry, reducing nutrient leachate.

Coarse Sediment

- Majority of flows treated by EnviroPod whilst removing most sediment above 100µm.
- Significantly reduces load and maintenance costs on StormFilter system downstream.

Fine Sediment

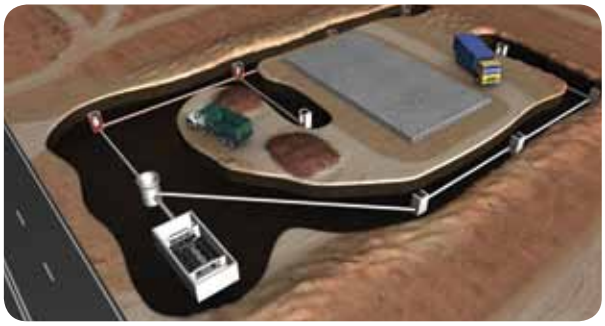
- Custom or specific lower flows treated, targeting particles down to 10µm.
- Cartridge back-flush prevents surface clogging avoiding unnecessary maintenance.
- Pollutants stored dry reducing nitrogen leachate.

Soluble Pollutants

- Enhanced filtration by chemical processes (e.g. cation exchange, absorption and adsorption) deep within the cartridge away from the initial screening surface of the StormFilter cartridge.

How to use your SFEP Treatment Train?

Typical site with Biofiltration



SFEP Treatment Train

Screening EnviroPod – located with each gully pit

Enhanced filtration through StormFilter

SFEP can provide additional carparks

SFEP can maximise building platforms and increase development yields

Designing and configuring your SFEP system

From 2006 the SFEP system was evaluated within the field over four years through extensive testing protocols undertaken by or in conjunction with some of Australia's leading universities. This field data is used as the basis from modelling the SFEP in system in order to obtain a cost effective and succinct SFEP system. Stormwater360 recommends and uses the widely endorsed Model for Urban Stormwater Improvement Conceptualisation (MUSIC) which makes it easy for sizing the correct StormFilter system for your site. Stormwater360 provide an obligation free design service completed by our qualified engineering team. Simply go to www.stormwater360.com.au and complete the design request form and send it back to Stormwater360. We will then provide you with a cost effective design containing the quantity and type of components required to meet your water quality goals together with a quotation, product drawing and MUSIC (*.sqz) file. Conversely, register your details at www.stormwater360.com.au where you can download the MUSIC treatment nodes for the SFEP products in order to complete your own design. Other details such as drawings, specifications and maintenance manuals can also be downloaded for integration into your project's documentation. Regardless of the design approach, your friendly Stormwater360 engineering team is always available for assistance.

Stormwater360 can also work with you to integrate your EnviroPod and StormFilter systems into your project. For example, once the MUSIC design is finalised, Stormwater360 can provide guidance on the appropriate cartridge size and quantity for your project and then provide site specific AutoCAD drawings for pre-cast gully pit, manhole, vault or detention type StormFilter systems to specifically suit the needs of your project.

Maintaining your SFEP system

Like your motor vehicle, every stormwater improvement device needs maintenance to operate as efficiently as the day it was installed. Stormwater360 document the GPS location of every SFEP system. Stormwater360 also provide their qualified technicians, within 12 months from the installation of the system, to inspect the SFEP system. This inspection is invaluable in confirming the system's maintenance frequency and can provide the owner of the system with ways in which they can potentially reduce future maintenance frequency intervals. Again this service is complimentary for all purchasers of the SFEP technology.

Maintenance of the SFEP is straight-forward and cost effective. Essentially all filter bags and StormFilter components are washable and reusable. Cleaning of both the EnviroPod and StormFilter systems requires washing of the components, removal of spent StormFilter filtration media and disposal of the stored contaminants. As both systems drain dry, only the water used in the cleaning process needs to be disposed of, thus reducing the costs of waste tipping. For detailed information on SFEP maintenance contact Stormwater360.

Next steps

Learn more

For more detailed technical information about Stormwater360 products and solutions, visit **www.stormwater360.com.au**

Connect with us

With more than 12 years experience in developing, installing and maintaining innovative and efficient site-specific stormwater management solutions, Stormwater360's highly qualified engineers and consultants can assist you with every aspect of your stormwater project.

Whether it's an initial in-house technical presentation, a request to inspect and clean your existing facility, or assistance with designing a specific stormwater management solution for your site, simply complete the enquiry form at **stormwater360.com.au** or call **1300 354 722** to speak to a Stormwater360 consultant.

Start a project

If you are ready to begin a project, our engineering team will provide you with everything you need, from a free preliminary design to MUSIC modelling, CAD drawings to maintenance frequency and associated costs schedules. To find out more, simply visit **www.stormwater360.com.au/custom-solutions** and complete the Design Information Request form.

Stormwater360 supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au

Filtration

StormFilter® | SFEP Treatment Train

Our waterways. Our future.

Stormwater360
AUSTRALIA

www.stormwater360.com.au

> For almost two decades the Stormwater Management StormFilter® has helped meet the most stringent stormwater requirements. The system has been continually tested and refined to ensure maximum reliability and performance.

Stormwater Filtration

The right stormwater solution for every site

The Stormwater360 UrbanGreen Staircase simplifies the process of integrating a water sensitive urban design (WSUD) that achieves your runoff goals. Its aims are to manage stormwater runoff close to the source and to replicate the site's pre-development hydrology, as much as possible.

The first step in the design process is to select the runoff management practices that best suit your site, such as infiltration and harvesting. Particular attention also needs to be given to pre-treatment needs. If the entire design storm cannot be retained through runoff reduction methods, a best management practice (BMP) is required to manage the balance. Finally, a detention system is selected to address any outstanding downstream erosion.

Highly effective pollutant removal

Meeting pollutant reduction goals for stormwater runoff typically requires a technology that is highly effective at removing solids and associated pollutants. In most cases, the technology must also be capable of removing dissolved pollutants such as metals, nitrogen and phosphorus.

By combining a variety of media and filtration systems, Stormwater360 can help you meet these pollutant removal objectives through products such as the Stormwater Management StormFilter, which has helped meet the most stringent stormwater requirements of hundreds of sites in urbanised areas of countries such as Australia, New Zealand and the United States of America.

Selecting an appropriate filtration system

The performance and longevity of media filtration systems is governed by a number of variables that must be carefully considered when evaluating systems. These variables include the type of media used and its gradation as well as its hydraulic loading rate. Understanding these variables requires careful testing and the development of performance and longevity data to support proper filter design.

Media surface area

Filtration flow rates are typically expressed as a surface area specific operating rate such as L/s/m^2 of surface area. Lower specific operating rates translate to better performance and longer maintenance cycles. Specific operating rates higher than 2 L/s/m^2 of media surface area negatively impact performance and longevity.

Surface versus radial cartridge filtration

When assessing filtration systems, it is important to consider whether filtration occurs primarily at the media surface or throughout a bed of media, such as with radial-cartridge filters. All else equal, radial-cartridge filters are longer lasting, since pollutants are captured and stored throughout the bed, as opposed to predominantly on the media surface. Radial cartridge filters capture more mass of pollutants per unit area of filter surface. Surface filters, such as sand or flat bed media filters, are prone to rapid failure through clogging. Pollutants are prone to occluding the media surface, which will then require frequent back washing or more costly and intensive maintenance.

> Understanding the hydraulics of the media selected is a key factor in determining the effectiveness of the filtration system in achieving site-specific pollutant removal objectives.

Media hydraulic conductivity and flow control

Filtration media is able to pass more flow per unit of media when it is new than when it has been in operation for a while. With time, pollutants accumulate in the media bed and reduce its hydraulic capacity. It is critical that filtration devices are designed with excess hydraulic capacity to account for this loss. Also, while finer media gradations remove finer particles, they have a lower hydraulic capacity and occlude more rapidly. High performance and superior longevity can be achieved by controlling the flow through a more coarse media bed.

Performance: Laboratory testing

While laboratory testing provides a means to generate hydraulic and basic performance data, it should also be complemented with long-term field data. Laboratory performance trials should be executed with a fine sediment gradation such as Sil-Co-Sil 106, which has a median particle size of 22 microns. Testing with coarser gradations is not likely to be representative of field conditions.

Performance: Field testing

Long-term field evaluations should be conducted on all filtration devices. As a minimum, field studies should generally comply with the Technology Acceptance Reciprocity Partnership (TARP) or the Technology Assessment Protocol – Ecology (TAPE) in the USA, as no recognised protocols exist within Australia. To be considered valid, all field monitoring programs should replicate local pollutant concentrations including soluble fractions together with rainfall, and should be peer reviewed by a reputable third-party.

Stormwater360 has undertaken such field testing in Kuranda, Australia, with the assistance of Queensland University of Technology and James Cook University.

Longevity

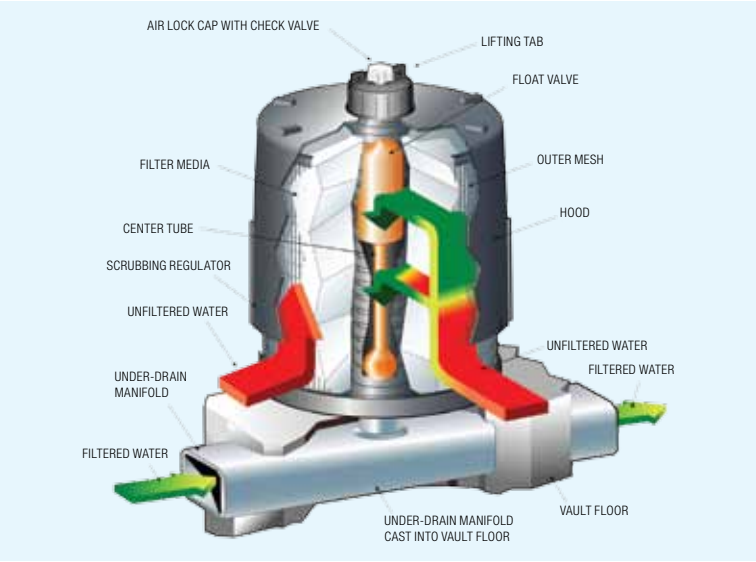
It is essential that loading trials be conducted to evaluate the longevity of a media filter. These trials must be executed with “real” stormwater solids and not silica particles. Reliance on silica particles to assess longevity grossly overstates the loading capacity of the media and the results of such trials should not be relied on. Knowing how much mass a media filter can capture before failure allows it to be sized for a desired maintenance interval by estimating the pollutant load that will be delivered to the filter.

Maintenance

The primary purpose of the media filtration system is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be periodically removed to restore the system to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. Similarly, the system should be inspected after major storm events.

Stormwater360 offers a number of suitable maintenance plans for all our stormwater products. Visit www.stormwater360.com.au or call us on 1300 354 722 to discuss the most suitable plan for your system.

The Stormwater Management StormFilter



Removing the most challenging target pollutants

The Stormwater Management StormFilter is a best management practice (BMP) designed to meet stringent regulatory requirements. It removes the most challenging target pollutants – including fine solids, soluble heavy metals, oil, and total nutrients (inc. soluble) – using a variety of media. For more than two decades, StormFilter has helped clients meet their regulatory needs and through product enhancements the design continues to be refined for ease of use.

Why StormFilter is the best filter available

Superior hydraulics

- External bypass – protects treatment chamber from high flows and ensures captured pollutants are not lost during low frequency, high intensity storm events
- Multiple cartridge heights – minimises head loss to fit within the hydraulic grade line and shrink system size, reducing installation costs
- Multiple StormFilter configurations in use across the country

Reliable longevity

- One-of-a-kind self-cleaning hood – prevents surface blinding, ensures use of all media, and prolongs cartridge life
- Customised maintenance cycles – fewer maintenance events compared to similar products, which reduces costs over the lifetime of the system
- 12 years of maintenance experience – predictable long-term performance comes standard

Proven performance

- Only filter on the Australian market tested within Australia achieving best practice guidelines, for TSS, TP and TN
- Qualifies for a minimum 2 EMI 5 Green star credits
- Achieve water quality goals with confidence – easy approval speeds development assessment process
- 8th generation product – design refined and perfected over two decades of research and experience

Maximising your land use and development profitability

StormFilter systems are utilised in below ground systems. The advantages this offers over above ground systems includes:

- Land space saving that enable an increase in development density and reduce sprawl
- The potential to add car parking, increase building size, and develop out parcels

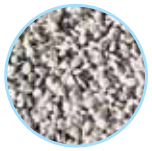
In addition, StormFilter's compact design reduces construction and installation costs by limiting excavation.

Media options

Our filtration products can be customised using different filter media to target site-specific pollutants. A combination of media is often recommended to maximise pollutant removal effectiveness.

PhosphoSorb™ is a lightweight media built from a Perlite-base that removes total phosphorus (TP) by adsorbing dissolved-P and filtering particulate-P simultaneously.

Perlite is naturally occurring puffed volcanic ash. Effective for removing TSS, oil and grease.



Zeolite is a naturally occurring mineral used to remove soluble metals, ammonium and some organics.

GAC (Granular Activated Carbon) has a micro-porous structure with an extensive surface area to provide high levels of adsorption. It is primarily used to remove oil and grease and organics such as PAHs and phthalates.

	PhosphoSorb	Perlite	ZPG	Zeolite	GAC
Sediments	•	•	•		
Oil and Grease	•	•	•		
Soluble Metals	•		•	•	
Organics			•	•	•
Nutrients	•	•	•	•	•
Total Phosphorus	•		•		

Note: Indicated media are most effective for associated pollutant type. Other media may treat pollutants, but to a lesser degree.

ZPG™ media, a proprietary blend of zeolite, perlite, and GAC.

Cartridge options

With multiple cartridge heights available, you now have a choice when fitting a StormFilter system onto your site.

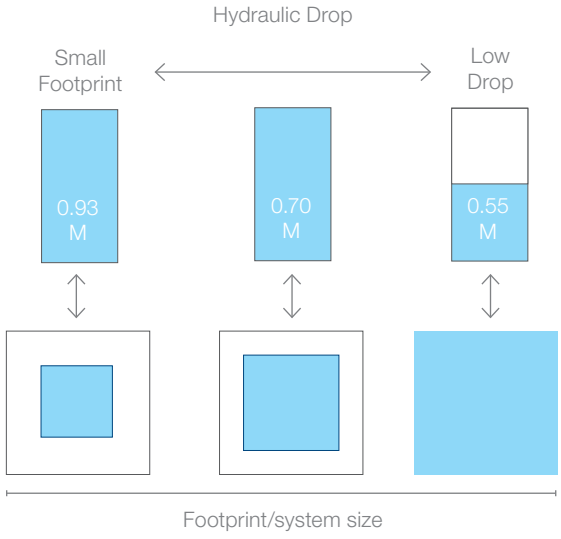
The 69cm cartridge provides 50% more treatment than the previously standard 46cm cartridge, which enables you to meet the same treatment standards with fewer cartridges, and via a smaller system.

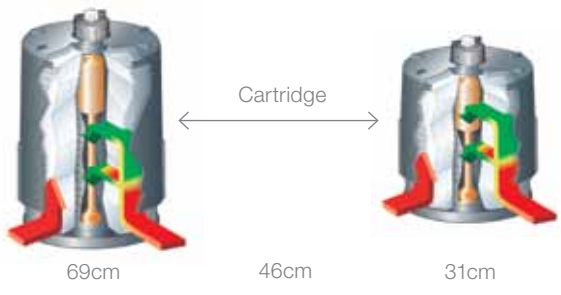
If you are limited by hydraulic constraints, the low drop cartridge provides filtration treatment with only 0.55m of headloss.

Cartridge flow rates

Cartridge Type	Hydraulic Drop	Treatment Capacity (l/sec)	
		0.7 l/s/m²	1.4 l/s/m²
StormFilter 69cm	0.93 m	0.71	1.42
StormFilter 46cm	0.70 m	0.47	0.95
StormFilter Low Drop	0.55 m	0.32	0.63

Selecting cartridge height





Configurations and applications

The StormFilter technology can be configured to meet your unique site requirements. Here are a few of the most common configurations, however many other configurations are available. A Stormwater360 engineer can assist you evaluate the best options for your site or you can find out more by downloading the StormFilter Configuration Guide from www.stormwater360.com.au

Upstream treatment configurations

The following suite of StormFilter configurations are easily incorporated on sites where WSUD is recommended. These low-cost, low-drop, point-of-entry systems also work well when you have a compact drainage area.

GullyPit StormFilter

Combines a gullypit, a high flow bypass device, and a StormFilter cartridge in one shallow structure.

- Treats sheet flow
- Uses drop from the inlet grate to the conveyance pipe to drive the passive filtration cartridge
- No confined space required for maintenance

Gully inlet

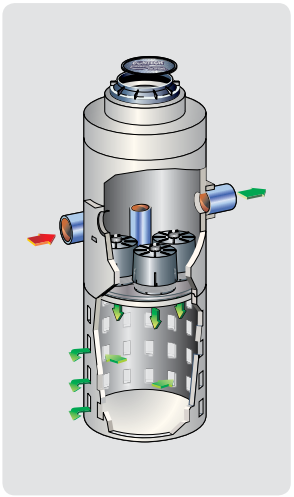
- Accommodates kerb inlet openings from 900 to 3000mm long
- Uses drop from the kerb inlet to the conveyance pipe to drive the passive filtration cartridges

Linear grate

- Can be designed to meet volume based sizing requirements
- Can be installed in place of and similar to a typical gullypit
- No confined space entry required for maintenance
- Accommodates up to 29 StormFilter cartridges

Infiltration/retrofit configuration infiltration

- Provides treatment and infiltration in one structure
- Available for new construction and retrofit applications
- Easy to install
- Re-charge groundwater and reduces run-off



Roof runoff treatment configuration

Down pipe

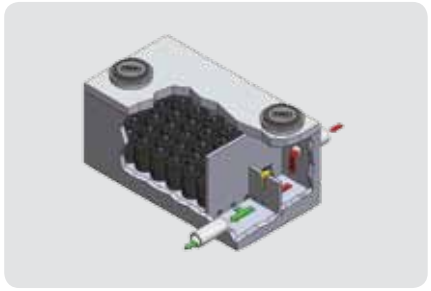
- Easily integrated into existing gutter systems to treat pollution from rooftop runoff
- Fits most downpipe configurations and sizes; single or dual-cartridge models available
- Treats up to 1300m^2 of rooftop area per dual-cartridge system

Downstream treatment configurations

Conventional stormwater treatment involves collecting, conveying and treating stormwater runoff with an end-of-pipe treatment system before discharging off-site. StormFilter configurations suitable for these applications are listed below and can be engineered to treat a wide range of flows.

Peak diversion

- Provides off-line bypass and treatment in one structure
- Eliminates material and installation cost of additional structures to bypass peak flows
- Reduces the overall footprint of the treatment system, avoiding utility and right-of-way conflicts
- Internal weir allows high peak flows with low hydraulic head losses
- Accommodates large inlet and outlet pipes (up to 900mm) for high flow applications



Vault / manhole

- Treats small to medium sized sites
- Simple installation – arrives on-site fully assembled
- May require off-line bypass structure

High flow

- Treats flows from large sites
- Consists of large, precast components designed for easy assembly on-site
- Configurations available, include, Panel Vault and Cast-In-Place

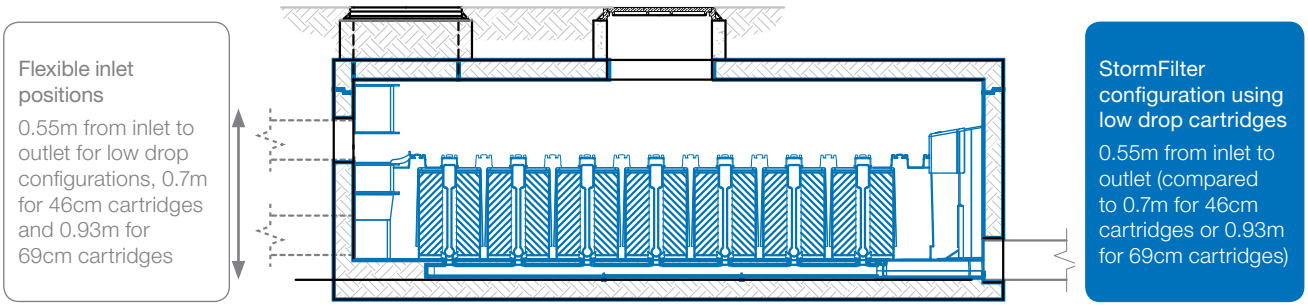
Volume

- Meets volume-based stormwater treatment regulations
- Captures and treats specific water quality volume (WQv)
- Provides treatment and controls the discharge rate
- Can be designed to capture all, or a portion, of the WQv

Filtration for low drop sites

Designing for limited drop

In some cases, site constraints limit the hydraulic drop that is available to drive the passive filtration cartridges. Following are a variety of solutions to either create the required drop or work around the limited drop without impacting the performance of the system.



Solutions for Low Drop Sites

Site modifications

Reduce pipe slope

Use an alternate pipe material with a lower Manning's n value for a portion of the site and reduce the pipe slope.

Reduce pipe cover

Use controlled density fill (CDF) at the front-end of the conveyance system to minimise pipe cover and raise the conveyance system. CDF, a method of pouring concrete with fine aggregate (sand vs. gravel) around pipe, allows the use of most pipe materials with limited cover.

Drain inlet treatment

Substitute several shallow inlet configurations for the single end-of-pipe system. Shallow options include the Catchpit/Gullypit StormFilter, CurbInlet StormFilter, Manhole StormFilter and the Linear StormFilter. These systems still require the normal drop (0.7m for 46cm cartridges) but utilise the drop into the conveyance system to drive the cartridges.

Provide pumping system

Stormwater360 offers the Integrated Pumping System (IPS), which can be designed in tandem with filtration system sizing.

Treatment system modifications

Use low drop cartridges

The StormFilter can be configured with low drop cartridges that activate at 31cm, reducing the overall head loss to only 0.55m, compared to 0.7m for the 46cm cartridge or 0.93m for the 69cm cartridge.

Surcharge the inlet pipe

Backing-up water into the conveyance system can create the necessary drop to drive the StormFilter cartridges. This will affect the HGL and increase the volume of water required to activate the cartridges, which could have a detrimental effect on system longevity. The following design modifications mitigate these risks:

- Confer with a Stormwater360 design engineer before surcharging the inlet pipe
- Verify this is an acceptable practice in your local jurisdiction
- Modify the overall system design to accommodate the increased HGL
- Calculate the additional treatment volume and consider using more cartridges

SFEP Treatment Train

Screening and enhanced filtration treatment in series

Most consent authorities within Australia have established pollution removal targets be achieved prior to discharge from urban catchments for an array of pollutants from debris coarse & fine sediments down soluble nutrients. In general each pollutant is removed from the water column using a specific physical, chemical or biological process. Arranging these processes in sequence provides a “treatment train” approach that addresses and treats the whole spectrum of stormwater pollutants.

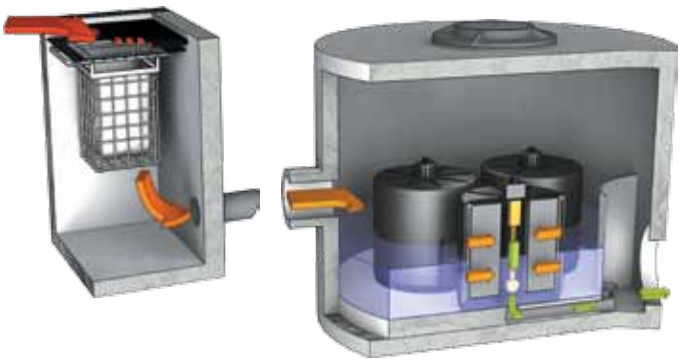
In order to meet these demands, Stormwater360 provides the StormFilter and EnviroPod (SFEP) as a series of products within a treatment train. The EnviroPod Filter is a gully pit insert designed to be easily retrofitted into new and existing stormwater gully pits, requiring no construction and no land take. Located at the source of stormwater contaminates the EnviroPod Filter has a interchangeable and re-useable bag with 200 micron pore size. The EnviroPod (gully pit basket) is designed to remove gross pollutants, coarse sediment and associated pollutants (hydrocarbons, metals and nutrients) at high flows and is typically located within each gully inlet pit. The EnviroPod filter also holds captured material dry thereby reducing the amount of nutrient leachate from the organic material stored within the bag.

StormFilter operates at a much lower flow rate than the EnviroPod insert – this is necessary in order to achieve extremely high levels of removal efficiency of fine and soluble contaminants. StormFilter cartridges are located typically within a concrete storage structure with the type and media determined by configuration and design. The StormFilter technology is designed to remove both particulate bound and soluble pollutants, and is located near the outlet of the catchment. The SFEP StormFilter technology utilises Stormwater360’s patented ZPG media blend containing both zeolite and carbon. This blend specifically targets ammonium and soluble organic nitrogen typically found within Stormwater flows and any nitrogen leachate from organic material held upstream within the EnviroPod filters. The ability of the StormFilter cartridge to retain nitrogen is further enhance as the captured material is again stored dry reducing the amount of nutrient leachate.

Screening

Multiple EnviroPods would be required for a typical site

Enhanced filtration



Features and benefits:

- Turnkey solution – modelling, design, supply and service/maintenance contracts available
- Immediate activation – no need for system “maturity”; starts treating stormwater after filters and cartridges are installed
- Field proven technologies – installations within local conditions for 10 years
- Field proven removal capability – performance data peer reviewed and published in a scientific journal
- Cost effective – comparative cost to traditional vegetated systems
- Increases Development Yield – can be located under carparks and roads. Reduces the need for batters or special maintenance access which further decrease development yield
- Multiple configurations available – meets site specific needs
- Simple, cost effective and recognised maintenance practices
- Ideal solution for infield developments – can be housed close to building footings, pavements and embankments. Reduces the need for ancillary structures such as retaining walls
- Flexible payment options – system can be supplied with zero capital cost upfront on a service inclusive lease with flexible payment options

Comprehensive strategic pollutant removal sequence

Gross pollutants

- Majority of flows treated by EnviroPod with all debris removed from stormwater and held dry, reducing nutrient leachate

Coarse sediment

- Majority of flows treated by EnviroPod whilst removing most sediment above 100µm
- Significantly reduces load and maintenance costs on StormFilter system downstream

Fine sediment

- Custom or specific lower flows treated, targeting particles down to 10µm
- Cartridge back-flush prevents surface clogging avoiding unnecessary maintenance
- Pollutants stored dry reducing nitrogen leachate

Soluble pollutants

- Enhanced filtration by chemical processes (e.g. cation exchange, absorption & adsorption) deep within the cartridge away from the initial screening surface StormFilter cartridge

How to use SFEP Treatment Train?

Typical site with Biofiltration

SFEP Treatment Train

Screening EnviroPod – located with each gully pit

Enhanced Filtration through StormFilter

SFEP can provide additional space for carparks

SFEP can maximise building platforms and increase development yields

Next steps

Learn more

For more detailed technical information about Stormwater360 products and solutions, visit **www.stormwater360.com.au**

Connect with us

With more than 12 years experience in developing, installing and maintaining innovative and efficient site-specific stormwater management solutions, Stormwater360's highly qualified engineers and consultants can assist you with every aspect of your stormwater project.

Whether it's an initial in-house technical presentation, a request to inspect and clean your existing facility, or assistance with designing a specific stormwater management solution for your site, simply complete the enquiry form at **stormwater360.com.au** or call **1300 354 722** to speak to a Stormwater360 consultant.

Start a project

If you are ready to begin a project, our engineering team will provide you with everything you need, from a free preliminary design to MUSIC modelling, CAD drawings to maintenance frequency and associated costs schedules. To find out more, simply visit **www.stormwater360.com.au/custom-solutions** and complete the Design Information Request form.

Stormwater360 supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au

Gross pollutant removal

Vortechs® | VortSentry HS® | VortSentry® | EnviroPod® | VortCapture™

Our waterways. Our future.

Stormwater360
AUSTRALIA

www.stormwater360.com.au

> Our high-performance gross pollutant removal technologies reliably remove sediment, litter debris and total suspended solids from stormwater.

The right stormwater solution for every site

The Stormwater360 UrbanGreen Staircase simplifies the process of integrating a water sensitive urban design (WSUD) that achieves your runoff goals. Its aims are to manage stormwater runoff close to the source and to replicate the site's pre-development hydrology, as much as possible.

The first step in the design process is to select the runoff management practices that best suit your site, such as infiltration and harvesting. Particular attention also needs to be given to pre-treatment needs. If the entire design storm cannot be retained through runoff reduction methods, a best management practice (BMP) is required to manage the balance. Finally, a detention system is selected to address any outstanding downstream erosion.

Hydrodynamic separation

Harnessing the tangential forces of flowing stormwater to capture and remove pollutants

Hydrodynamic separators (HDS) are flow-through structures that utilise a settling or separation unit to remove sediments and other pollutants from stormwater runoff. They are amongst the first technologies developed for treating stormwater, with many of the Stormwater360 hydrodynamic separation products having demonstrated their effectiveness and reliability for more than 20 years.

The efficacy of our hydrodynamic separators at removing solids from stormwater has not only been proven through rigorous laboratory testing, but also through their extensive use in the field at sites across the country. They are an optimal choice as the first component of treatment trains, and especially efficient in removing gross solids, litter and debris, while also capable of removing total suspended solids (TSS).

> **Hydrodynamic separators are widely accepted as a first-line pre-treatment system for the effective removal of solids.**

Fundamentals of Stormwater360 HDS

Hydrodynamic separators use the force of the incoming flow of stormwater to create a low velocity vortex action to:

- Increase efficiency by increasing length of flow path and eliminating short circuiting
- Concentrates solids in a stable, low velocity flow field

They incorporate flow controls to:

- Minimise turbulence and velocity
- Prevent flow surges and re-suspension
- Retain floating pollutants

Other benefits of HDS include:

- They provide easy access to captured pollutants, which simplifies maintenance
- Have low head loss requirements, which makes siting easier
- Are suitable for sites with limited space
- Harness the flow of water in their operation, and therefore require no external energy source
- Can be easily retrofitted into existing storm drain systems

Applications

HDS products work well as standalone or end-of-pipe treatment systems and can be easily implemented in a retrofit scenario. They are particularly effective for the removal of solids, trash and debris – and can help you meet load-based reduction requirements for these pollutants.

HDS are also optimal pre-treatment systems – and an important building block in a WSUD. By removing solids, litter and debris prior to detention, infiltration or re-use systems, you can significantly increase their service life.

Water quality

HDS products provide high-performance stormwater pollutant removal. These systems are effective in removing solids to meet water quality goals and can be designed to achieve site treatment goals for TSS or oil.

Pre-treatment for other Water Sensitive Urban Design (WSUD) treatment measures

Installing hydrodynamic separation systems as pre-treatment device lessens downstream loading to reduce maintenance.

Inlet and outlet pollution control

Our HDS products are especially effective for capturing and removing solids, trash and debris. They can be installed at either the inlet or outlet-end of a drainage system to prevent pollutants from being discharged into lakes, streams or the ocean.

Maximising your land use and development profitability

Hydrodynamic separator systems are utilised in below ground systems. The advantages this offers over above ground systems includes:

- Land space saving that enable an increase in development density and reduce sprawl
- The potential to add car parking, increase building size, and develop outparcels

In addition, their compact design reduces construction and installation costs by limiting excavation.

Maintenance

The primary purpose of hydrodynamic separation systems is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be periodically removed to restore the system to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. Similarly, the system should be inspected after major storm events.

Stormwater360 offers a number of suitable maintenance plans for all our stormwater products. Visit www.stormwater360.com.au or call us on 1300 354 722 to discuss the most suitable plan for your system.

Vortechs®

High performance hydrodynamic separation

The Vortechs system is a high-performance hydrodynamic separator that effectively removes fine sediment, oil and grease, as well as floating and sinking debris. Its swirl concentrator and flow controls work together to minimise turbulence and provide stable storage of captured pollutants. The design also allows for easy inspection and unobstructed maintenance access.

Pre-cast models can treat peak design flows up to 700 L/s; cast-in-place models handle even greater flows. A typical system is sized to provide an 80% load reduction based on field and laboratory-verified removal efficiencies for varying particle size distributions such as 50-micron sediment particles.

The Vortechs system's swirl concentrator and flow controls work together to create a low energy environment, ideal for capturing and storing fine particles and other pollutants of concern.

Features and benefits

Shallow profile

- Easy and cost-effective installation, especially on sites with high groundwater or bedrock
- Typical invert only one metre below inlet/outlet pipe

Effective fine solids removal

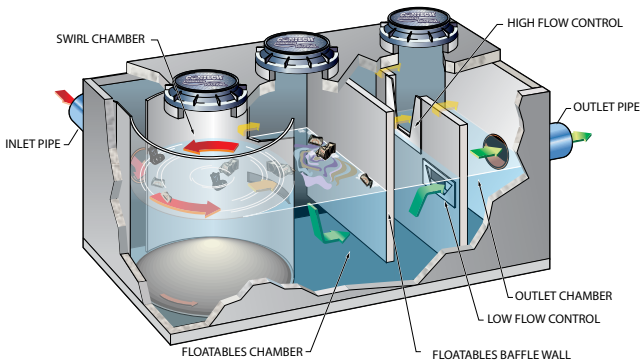
- Large swirl chamber – enhances very fine particle removal (down to 50 microns)
- Flow controls reduce inflow velocity and increase residence time
- Largest treatment zone surface area of any swirl concentrator system available

Easy maintenance

- Unobstructed access to stored pollutants
- Sealed swirl chamber decreases clean-out volume and liquid disposal

Proven performance

- Performance verified by NJCAT and WA Department of Ecology



VortSentry® HS

Engineered performance and installation simplicity

The VortSentry HS system employs a helical flow pattern that enhances containment of pollutants and provides effective removal of settleable solids and floating contaminants from urban runoff.

With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The design of the VortSentry HS minimises adverse velocities and turbulence in the treatment chamber. This helps to prevent washout of captured pollutants even during peak conditions.

The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofits.

Features and Benefits

Helical flow pattern

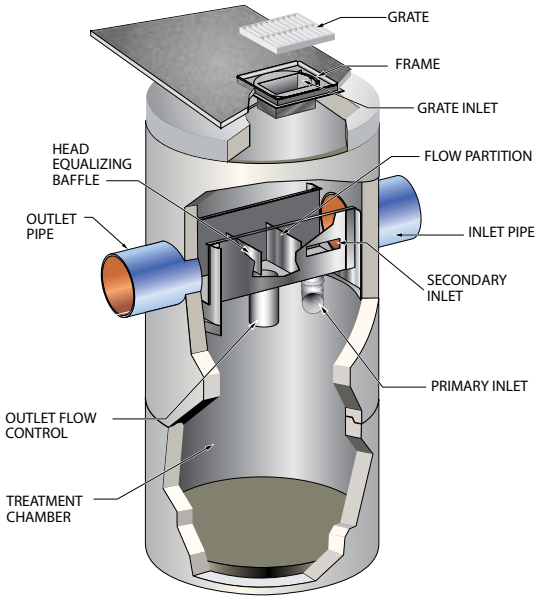
- Enhances trapping and containment of pollutants
- Provides effective removal of settleable solids and floating contaminants

Unique internal bypass

- Accepts a wide range of pipe sizes to treat and convey a wide range of flows
- Higher flows can be diverted without the use of external bypass structures
- Secondary inlet enhances floatable debris capture

Flexible, compact design

- Small manhole footprint
- Pipe Inlet and grated inlet configuration available
- Round, lightweight construction for easy installation



VortSentry®

Hydrodynamic separation with internal bypass

With its small footprint, the VortSentry hydrodynamic separator is an effective treatment option for projects where space is at a premium and effective removal of floating and sinking pollutants is critical. The internal bypass ensures treatment chamber velocities remain low, which improves performance and eliminates the risk of re-suspension.

In addition to standalone applications, the VortSentry is an ideal pre-treatment device. The system is housed inside a lightweight concrete manhole structure for easy installation (often without the use of a crane) and unobstructed maintenance access.

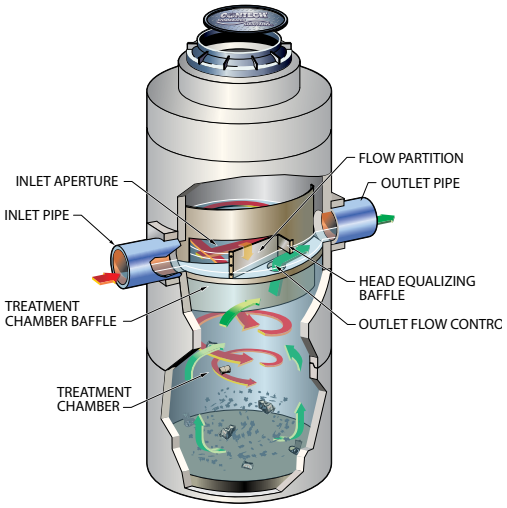
Features and benefits

- Treatment and internal bypass in one structure
- Compact design ideal for congested sites
- Unobstructed maintenance access
- Round, lightweight construction for easy installation

How does it work?

Stormwater runoff enters the unit tangentially to create a gentle swirling motion in the treatment chamber. As stormwater circles within the chamber, settleable solids fall into the sump and are retained. Buoyant debris, as well as oil and grease, rise to the surface and are separated from the water as it flows under the baffle wall. Treated water exits the treatment chamber through a flow control orifice located behind the baffle wall.

During low-flow conditions all runoff is diverted into the treatment chamber by the flow partition. At higher flow rates, a portion of the runoff spills over the flow partition and is diverted around the treatment chamber, filling the head equalisation chamber. This collapses the head differential between the treatment chamber and the outlet, resulting in a relatively constant flow rate in the treatment chamber even with a substantial increase in total flow through the system. This further reduces the potential for re-suspension or washout of captured pollutants.



EnviroPod®

Cost-effective, easily maintained gullypit insert

The EnviroPod is a proven gullypit insert that's been designed for easy retrofitting into new and existing stormwater gullypits, requiring no construction or land take. It removes a significant portion of sediment, litter, debris and other pollutants from water entering the stormwater system, and can be installed in either kerb inlet, standard pre-cast gullypits or manhole gullypits. Using low-cost passive screening and optional oil-adsorbent media, the EnviroPod can be customised to meet site-specific requirements with interchangeable polyester mesh screens ranging from 200 to 1600 micron pore size. Unless specified otherwise, 1600 micron filter mesh screening bags are supplied as standard.

> **"Designed for easy fit into new or existing gully pits, the EviroPod® is a simple and effective solution for preventing gross pollutants from entering the stormwater system.**

The EnviroPod is also effective as a pre-treatment device for use in a treatment train with hydrodynamic separators, filtration devices, ponds and wetlands. In many cases, it is often the most practical solution for retrofits.

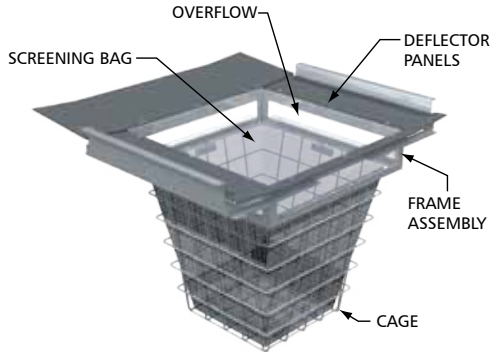
Independently trialled and tested by city councils throughout Australia and New Zealand, and with installation of over 15,000 units including North America, the EnviroPod filter is the premier gully pit insert.

How does it work?

As stormwater enters a storm grate or gullypit, it passes over the oil adsorbent pillows (optional) and into the screening bag. Litter, debris, and other pollutants larger than the screening bag aperture are captured and retained, while the oil adsorbent pillows reduce oil and grease. If the screening bag is full, or during high flows, overflow is released through the overflow apertures in the frame assembly.

Design and operation

The EnviroPod consists of a screening bag supported by a filter box and structural cage. Modular plastic deflector panels attach to the filter box and guide the flow of water to the screening bag. The screening bag captures pollutants and allows the water to pass through to the outlet pipe. Optional absorbent material inside the screening bag captures oil and grease. Openings in the filter box allow water to bypass the screening bag during high flow conditions to prevent surface flooding.



Capabilities

- Captures sediment, litter, debris and other pollutants before they enter the drainage system
- Fits a range of gullypit sizes – ideal for retrofits
- Easy access – maintenance friendly design, generally no confined space entry required
- Bypasses high flows with no moveable parts
- Adjustable panels allow fine-tuning during installation for a perfect fit

Configurations

The kerb entry EnviroPod is inserted through the pit access cover and is supported by aluminium arms fixed to the kerb channel/pit wall.

The Drop-In EnviroPod is designed to simply insert into the gullypit below the grate, again supported by aluminium arms fixed to the kerb channel/wall pit. Plastic deflector panels seal against the pit walls and direct flow into the filter box and through the mesh screens. There are two standard sizes to fit most pre-cast regular and kerb entry gullypits. Custom designs can be fabricated for non-standard pits.

Installation, inspection and maintenance

Traffic control must be well planned when installing, inspecting or maintaining EnviroPod Filters. All standard rules and regulations governing traffic control and safety while working on the road must be rigidly followed at all times. All potential hazards must be identified and control methods put in place prior to installing, inspecting or maintaining filters.

VortCapture™

Superior debris capture

The VortCapture is a full capture, high-capacity litter and debris removal solution designed to remove particles greater than 5 mm. It combines the proven sediment removal capabilities of our other hydrodynamic separators, with superior litter and organic debris capture. The result is a system that effectively captures and retains a broad range of pollutants.

How does it work?

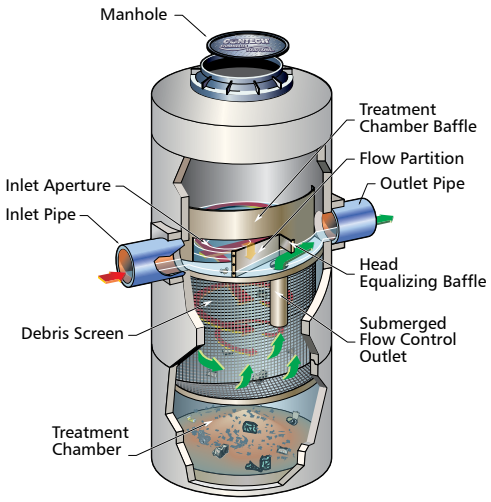
Stormwater runoff enters the unit tangentially to promote a swirling motion in the screened treatment chamber. High relative tangential velocities (across the screen face versus through the screen) indirectly screen the pollutants while also scouring the screen to prevent blinding.

Treatment continues as polluted water circles within the chamber and settleable solids fall into, and are retained, in the sump. Treated water exits the treatment chamber through a flow control orifice located behind the baffle wall. A flow partition and head equalising baffle reduce the potential for re-suspension or washout of captured pollutants during higher flow conditions. VortCapture systems are housed in concrete manhole structures, commonly available in diameters from 1.2 to 3.0m, with larger sizes available.

Features and benefits

VortCapture traps 100% of incoming material larger than 5mm, including neutrally buoyant material.

- Submerged outlet traps floating oil and grease
- Compact manhole-based design is ideal for utility conflicts and congested sites
- Available in convenient concrete manhole structures of variable diameters
- Unobstructed maintenance access
- Inline, offline, grate inlet and drop inlet
- Internal and external bypass available
- High treatment flow capacity up to 300 L/s



Hydrodynamic separation available models

Vortechs model	Swirl chamber diameter m	Internal length wm	Water quality flow[1] 50 µm	110 µm	200 µm	Peak treatment flow[2] L/s	Sediment storage m^3
1000	0.9	2.7	5.9	16.7	27.8	45.3	0.5
2000	1.2	3.0	10.2	28.3	48.1	79.3	0.9
3000	1.5	3.4	16.7	48.1	76.5	127.4	1.4
4000	1.8	3.7	22.1	62.3	104.8	169.9	1.8
5000	2.1	4.0	31.1	87.8	147.2	240.7	2.4
7000	2.4	4.3	39.6	116.1	189.7	311.5	3.1
9000	2.7	4.6	51.0	147.2	240.7	396.4	3.7
11000	3.0	4.9	65.1	184.1	303.0	495.5	4.3
16000	3.7	5.5	93.4	263.3	433.2	707.9	5.4

1. Water Quality Flow is based on 80% removal for a particle size distribution (PSD) with an average particle size as listed. Particle size should be chosen based on anticipated sediment load.
2. Peak Treatment Flow is maximum flow treated for each unit listed. This flow represents an infrequent storm event such as a 5, 10 or 20 year storm.
   Standard Vortechs System depth below invert is nominal 900mm for all precast models.
   Cast-in-place systems are available to treat higher flows. Check with your local representatives for specifications.

Vortsentry model	Swirl chamber diameter m	Typical depth below invert m	Water quality flow[1] 110 µm L/s	Max. Size inlet/outlet mm	Sediment storage m^3
VS30	0.9	1.8	7.4	300	0.6
VS40	1.2	2.1	16.4	450	1.1
VS50	1.5	2.4	31.1	450	1.7
VS60	1.8	2.7	51.0	600	2.4
VS70	2.1	3.0	76.5	750	3.3
VS80*	2.4	3.1	110.4	900	4.3

* Denotes models may not be manufactured in your area. Check with your local representative for availability.

1. Water Quality Flow is based on 80% removal for a particle size distribution with an average particle size of 110 microns. This flow also represents the maximum flow prior to which bypass occurs.

VortSentry HS Model	Swirl Chamber Diameter m	Typical Depth Below Invert m	Water Quality Flow[1] 240 µm L/s	Max. Size Inlet/Outlet mm	Sediment Storage m^3
HS09	0.9	1.7	15.6	450	0.4
HS12	1.2	2.1	34.0	600	0.7
HS15	1.5	2.4	62.3	750	1.1
HS18	1.8	2.8	104.8	900	1.6
HS21	2.1	3.2	158.6	1050	2.1
HS24*	2.4	3.5	229.4	1200	2.8

* Models may not be manufactured in your area. Check with your local representative for availability.

1. Water Quality Flow is based on 80% removal for a particle size distribution with an average particle size of 240 microns.
   This flow also represents the maximum flow prior to which bypass occurs.

Notes: Systems can be sized based on a water quality flow or on a net annual basis depending on the local regulatory requirement.

When sizing based on a water quality storm, the required flow to be treated should be equal or less than the listed water quality flow for the selected system. Systems sized based on a water quality storm are generally more conservatively sized.

Additional particle size distributions are available for sizing purposes upon request.

Depth below invert is measured to the inside bottom of the system. This depth can be adjusted to meet specific storage or maintenance requirements.

Contact our support staff for the most cost effective sizing for your area.

Screening available models

VortCapture	Diameter	Typical depth below invert	Max. Pipe size inlet/outlet	Water quality flow rate	Debris storage capacity	Sediment storage capacity
	mm	m	mm	L/s	m^3	m^3
VC40 & VC40HF†	1.2	2.4	450 (900†)	39	0.8	0.5
VC50 & VC50HF†	1.5	2.7	450 (1050†)	69	1.5	0.8
VC60 & VC60HF†	1.8	3.0	600 (1200†)	109	2.3	1.2
VC70 & VC70HF†	2.1	3.2	750 (1500†)	185	3.4	1.6
VC80 & VC80HF†	2.4	3.7	900 (1800†)	283	4.7	2.1

Note: Larger models may be available in your area.

EnviroPod**	Gullypit size Width min-max	Length min-max	Pollutant storage	Bypass capacity	Treated flow
	mm	mm	L	L/s	L/s
Australia					
Epod - A	500-1200	730-1200	up to 135L	200+	20-100
Epod - C	400-650	450-700	up to 60L	130+	20-100

** Above models available with either 200 micron nylon, 1600 micron burn-resistant (standard) or 5000 micron Stainless steel options.

† Standard VortCapture system with offline diversion chamber.

Next steps

Learn more

For more detailed technical information about Stormwater360 products and solutions, visit **www.stormwater360.com.au**

Connect with us

With more than 12 years experience in developing, installing and maintaining innovative and efficient site-specific stormwater management solutions, Stormwater360's highly qualified engineers and consultants can assist you with every aspect of your stormwater project.

Whether it's an initial in-house technical presentation, a request to inspect and clean your existing facility, or assistance with designing a specific stormwater management solution for your site, simply complete the enquiry form at **stormwater360.com.au** or call **1300 354 722** to speak to a Stormwater360 consultant.

Start a project

If you are ready to begin a project, our engineering team will provide you with everything you need, from a free preliminary design to MUSIC modelling, CAD drawings to maintenance frequency and associated costs schedules. To find out more, simply visit **www.stormwater360.com.au/custom-solutions** and complete the Design Information Request form.

Stormwater360 supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au

Stormwater360 maintenance service

Inspect. Clean. Report.

Stormwater360
AUSTRALIA

Stormwater360

Integrated end-to-end stormwater management solutions.

Stormwater360 is a leader in developing innovative and efficient site-specific solutions that manage the impact of urban stormwater runoff on the built environment and prevent contaminants in the runoff from entering aquatic ecosystems.

Our turnkey solutions cover every aspect of stormwater management from conceptual design and product supply, through to implementation, construction and ongoing infrastructure or facility management.

Just as importantly, with stormwater regulations and water quality standards becoming increasingly complex and onerous, our best management practice filtration, screening and treatment systems meet the most stringent regulatory requirements, while our comprehensive maintenance services ensure optimal performance and ongoing regulatory compliance.

> The Stormwater360 Maintenance Service has been designed to assist you achieve a cost-effective turnkey solution for maintaining your stormwater system while also ensuring ongoing regulatory compliance.

Total stormwater system maintenance

Optimising performance and ensuring ongoing regulatory compliance

The effectiveness of stormwater management systems is largely based on three factors:

- the suitability of the implemented solution to deal with the site's stormwater runoff
- the ability of the installed products (such as screening, filtration and treatment devices) to remove the pollutant load
- the existence of a comprehensive maintenance regime that includes regular inspection and cleaning.

While many stormwater management facilities meet the first two criteria, the failure to conduct timely maintenance is one of the leading causes of inadequate performance, system malfunction and a failure to achieve acceptable standards in water quality. It can also lead to the degradation of the downstream aquatic ecosystem's health.

The Stormwater360 Maintenance Service has been designed to assist you achieve a cost-effective turnkey solution for maintaining your stormwater system whilst also ensuring ongoing regulatory compliance.

Why maintenance matters

Maintenance is as integral to every stormwater management system as it is to any other item of machinery or equipment. While the capital costs of constructing and installing a stormwater facility are usually given careful consideration, it is important to ensure that there is also an ongoing allocation of funds for operational costs, including a system-specific maintenance schedule for the life of the facility.

A lack of proper maintenance can lead to:

- Stormwater structures or storage facilities becoming clogged with debris or sediment, leading to reduced flow or storage capacity, which in turn may result in flooding of the site and damage to Stormwater assets and nearby infrastructure
- A reduction in the ability of stormwater treatment devices to efficiently and effectively remove and prevent pollutants from entering waterways
- A failure to comply with local authority regulations relating to stormwater quality standards, which may result in penalties for the site's owners or property managers
- The likelihood of costly repairs, increased ongoing maintenance costs and the potential of damage to other infrastructure or drainage assets
- An erosion of the asset's capital value.

Comprehensive service across all stormwater systems

The Stormwater360 Maintenance Service covers all major types of stormwater systems, and is not limited to those we have designed and installed.

The maintenance solutions we develop are tailored to the specific needs and attributes of each site, including its usage, the type and quantity of pollutants, as well as the frequency and extent of storm activity and its associated stormwater runoff. We also take into account the primary focus of the installation, such as flood mitigation, water quality, runoff management or stormwater harvesting.

While we design our own tertiary filter systems to meet the requirements of a minimum 12-month maintenance frequency, primary and secondary pollution control devices will require more frequent inspection and cleaning.

How maintenance is carried out

Stormwater360 has developed a systematic maintenance approach to inspecting, cleaning and repairing different types of stormwater systems. We utilise fully trained experts who are familiar with the characteristics of each type of system, and the processes required to optimise its efficiency and performance.

Catch basins with gross pollutant traps

Indirect maintenance can help minimise the build up of trash and sediments, which is usually best achieved by simply cleaning the surrounding areas regularly. An example of this would be a public car park that is cleared of debris daily by using an industrial sweeper.

In many stormwater systems, gully pits form the front-line defence for controlling stormwater pollution. Gully pits can be fitted with gross pollutant traps such as litter baskets that prevent trash and debris in the stormwater runoff from entering the attached drainage system. They can also be fitted with fine mesh screens and absorbent material that will help trap products such as oil and nutrients like phosphorous.

Our regular maintenance of these devices includes inspection, recording and reporting, and is accompanied by periodic cleaning to remove accumulated debris and ensure optimal performance. Depending on the size of the system, it may be cleaned from the surface by hand, or may need to be accessed via a manhole and the debris removed using a large vacuum hose attached to an inductor truck.

> With more than 12 years experience in maintaining stormwater management assets, we can inspect the system and determine the key issues that need to be addressed for effective ongoing maintenance.

Stormwater treatment systems

A gully pit litter basket is usually one element of a stormwater treatment train, and depending on the facility may include a siphon-actuated cartridge-based filtration product (such as the StormFilter) that can target the full spectrum of Stormwater pollutants, or a hydrodynamic separator (such as the Vortechs System), which removes suspended sediment, hydrocarbons and floating debris.

In other facilities, such as public reserves along roadways, bio-filtration methods provide small-scale, at-source treatment of runoff that blends biological processes and engineered media filtration to create the perfect balance for the removal of pollutants.

As the primary purpose of these stormwater treatment trains is to remove and prevent pollutants from entering waterways and impacting on aquatic ecosystems, it is important that these pollutants are periodically removed to restore the device to its full efficiency and effectiveness.

The Stormwater360 Maintenance Service carries out every aspect of this cleaning process, which may involve sediment removal and disposal (following regulatory mandates), cleaning of the vault or manhole, and replenishing cartridges or components. A visual inspection and comprehensive data tracking of the system is also undertaken to assist with the ongoing management of the infrastructure. Data identifying the pollutant type and load can be fed back to the client to ultimately help reduce pollutant build up and the cost of maintenance.

Vegetated assets

In addition to the above systems, Stormwater360's services can extend to the management of other treatment systems. We utilise the expertise of our specialists in inspecting and maintaining vegetated assets and bioretention systems, which help reduce stormwater impacts and create buffers that arrest the flow of nutrients into waterways.

With more than 12 years experience in maintaining stormwater management assets, we can inspect the system and determine the key issues that need to be addressed for effective ongoing maintenance. We are also able to provide a cost-benefit analysis for retrofitting devices that will increase the efficiency of the overall WSUD design.

The Stormwater360 difference

Driven by a passion for better stormwater solutions

Stormwater360 has widespread experience and expertise in managing every aspect of stormwater management. We are focussed on mitigating the impacts of stormwater run-off on infrastructure and built environments, but equally passionate about protecting Australia's waterways, estuaries, coastline and marine life from the rising levels of harmful containments found in stormwater runoff. We view stormwater within the context of delivering one of the earth's most precious commodities – water – and have the products to cover every aspect of harnessing this resource, including rainwater harvesting, retention and detention.

Maintenance of your stormwater system not only ensures the facility operates in the manner for which it was designed, but also lies at the core of maintaining downstream water quality health. For our own designed and installed applications we always offer an ongoing operations and maintenance service. Now, we have extended that service to all site owners and property mangers, regardless of their systems origins.

Online maintenance tracker

With many local authorities implementing complex and onerous stormwater regulations and water quality standards, compliance is an increasingly important issue for asset owners.

The Stormwater360 Maintenance Service designs a site-specific maintenance plan for each facility and through proper documentation and reporting provides evidence that all relevant procedures have been adhered to.

In addition, Stormwater360 offers the unique service of online tracking for your maintenance and reporting, which enables you to access up-to-date images and reports of your system's maintenance.

Benefit from the Stormwater360 Maintenance Service today

The ongoing efficiency and reliability of all stormwater management systems relies on reliable, effective and repeatable maintenance regimes.

Outsourcing your system's maintenance program – including inspection, reporting, cleaning and repairs – to Stormwater360 delivers you the most cost-effective solution for optimising the performance of your asset and provides the assurance of compliance with the current regulatory environment.

For more information about the Stormwater360 Maintenance Service, simply visit stormwater360.com.au or call 1300 354 722

With more that 12 years of expertise in maintaining stormwater devices, Stormwater360 can also provide advice on ways that may reduce the pollutant load coming off your site and assist you reduce the overall cost of stormwater infrastructure maintenance.

A Stormwater360 Maintenance Service contract also includes a warranty on all filter parts serviced. Should any filter part be damaged, Stormwater360 will replace it free-of-charge at the time of servicing.

With maintenance such a key component to the effective operation of a stormwater management system, a Stormwater360 Maintenance Service contract makes sound economic and environmental sense. Such ongoing maintenance not only ensure the optimal functioning of the system, but also provides you with the peace of mind that you are protecting the built infrastructure from the impacts of stormwater damage, while also maintaining the quality of water flowing into downstream aquatic ecosystems.

Stormwater360 supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722

www.stormwater360.com.au