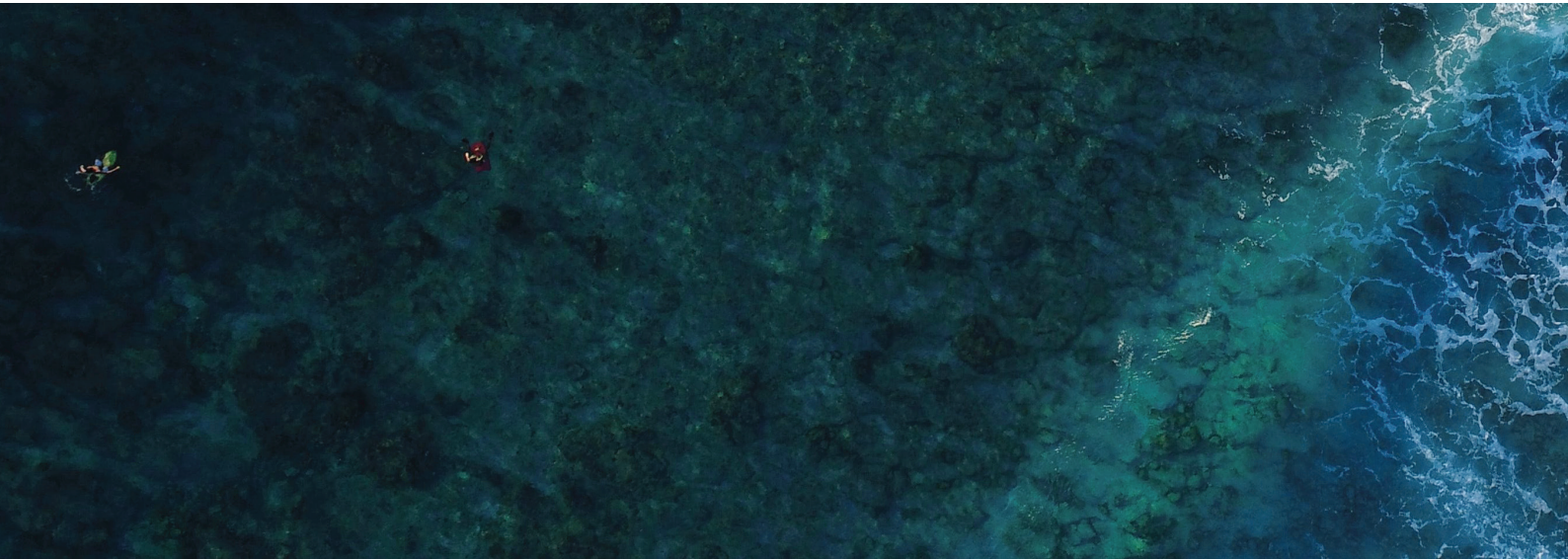


Vortechs™

Operations & Maintenance Manual



Stopping Pollution Entering Waterways



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Introduction	3
Health and Safety	4
How does it work?	5
Maintenance Procedures	6
Maintenance Services	7



Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, and 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 for the Vortechs™, as recommended by the manufacturer (Ocean Protect).

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

Why do I need to perform maintenance?

Adhering to the maintenance schedule of any 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's 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 Vortechs™ requires removing heavy access covers/grates. Additionally, it might become necessary to enter a confined space. Pollutants collected by the Vortechs™ 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 Vortechs™ 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 Vortechs™, 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 Vortechs™ can be performed from surface level, there may 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?

Stormwater enters the swirl chamber at a tangent, creating a swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floating pollutants are stopped at the floatables baffle wall. During larger storms, the water level rises above the low flow control and begins to flow through the high flow control.

As a storm event increases in intensity, the swirling action increases proportionately, this assists in the prevention of re-suspension. When flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs™ should be sized so that previously captured pollutants are retained in the system even during these infrequent events. As a storm subsides, treated runoff decants out of the Vortechs™ system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet and outlet pipes.

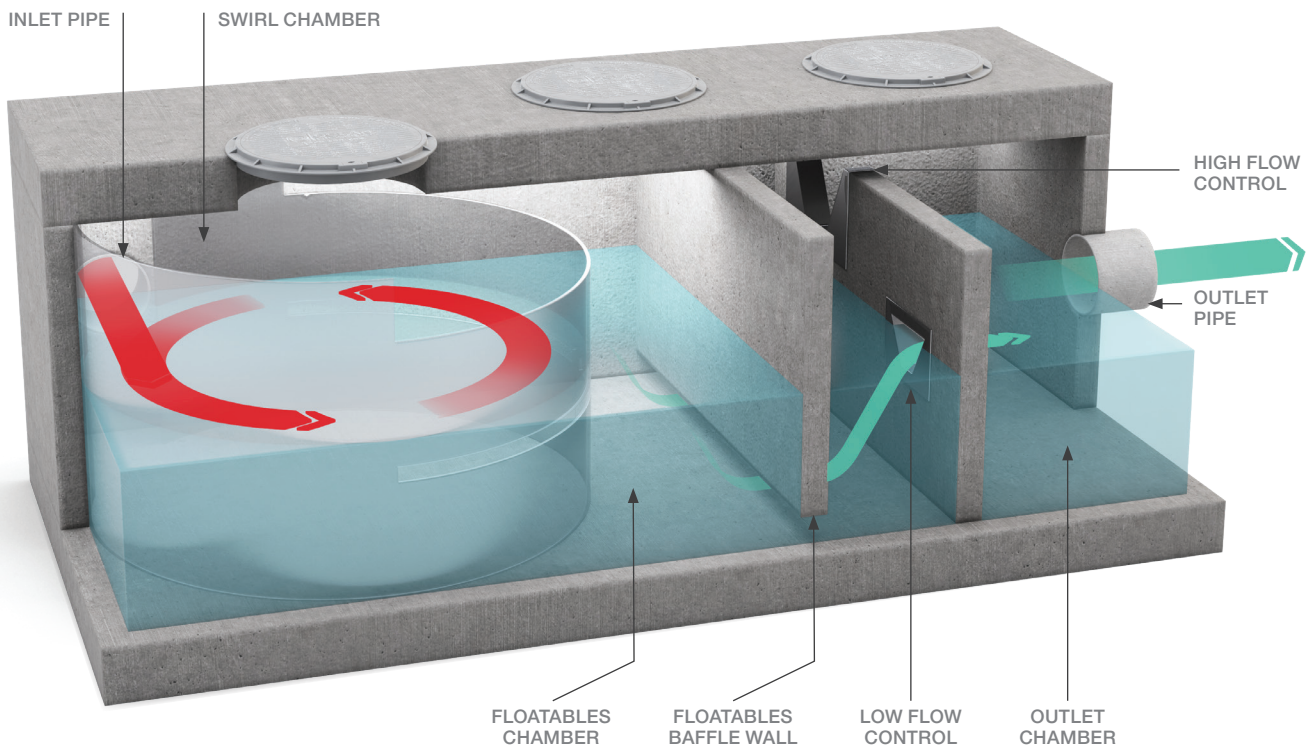


Figure 1: Vortechs™ components

Maintenance Procedures

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

Service Type	Description of Typical Activities	Frequency
Minor Service	Visual inspection of swirl, floatables and outlet chambers Removal of large floatable pollutants Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants Inspection of the swirl chamber, baffle wall and outlet controls	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 over the swirl chamber
- 3 Visually inspect the chamber
- 4 Remove large floatable pollutants with a net
- 5 Measure and record sediment depth
- 6 Replace access cover
- 7 Repeat steps 2-6 for floatable and outlet chambers

Major Service

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

- 1 Establish a safe working area around the access point
- 2 Remove access cover over the swirl chamber
- 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 Repeat steps 2-5
- 7 Inspect the swirl chamber, baffle wall and outlet controls
- 8 Use high pressure water to clean sump area (if required)
- 9 Replace access covers

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

Model	Swirl Chamber Diameter (m)	Sediment Storage Capacity (m³)
VX1000	0.9	0.5
VX2000	1.2	0.9
VX3000	1.5	1.4
VX4000	1.8	1.8
VX5000	2.1	2.4
VX7000	2.4	3.1
VX9000	2.7	3.7
VX11000	3.0	4.3
VX16000	3.7	5.4

Additional Types of Maintenance

The standard maintenance approach is designed to work towards keeping the Vortechs™ 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 Vortechs™ unit that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants and liquids 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

In the unlikely event that flooding occurs upstream of the Vortechs™ system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

- 1 Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
- 2 Decant water from Vortechs™ in preparation for confined space entry
- 3 Inspect the high flow and low flow control elements 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 Vortechs™ after a 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

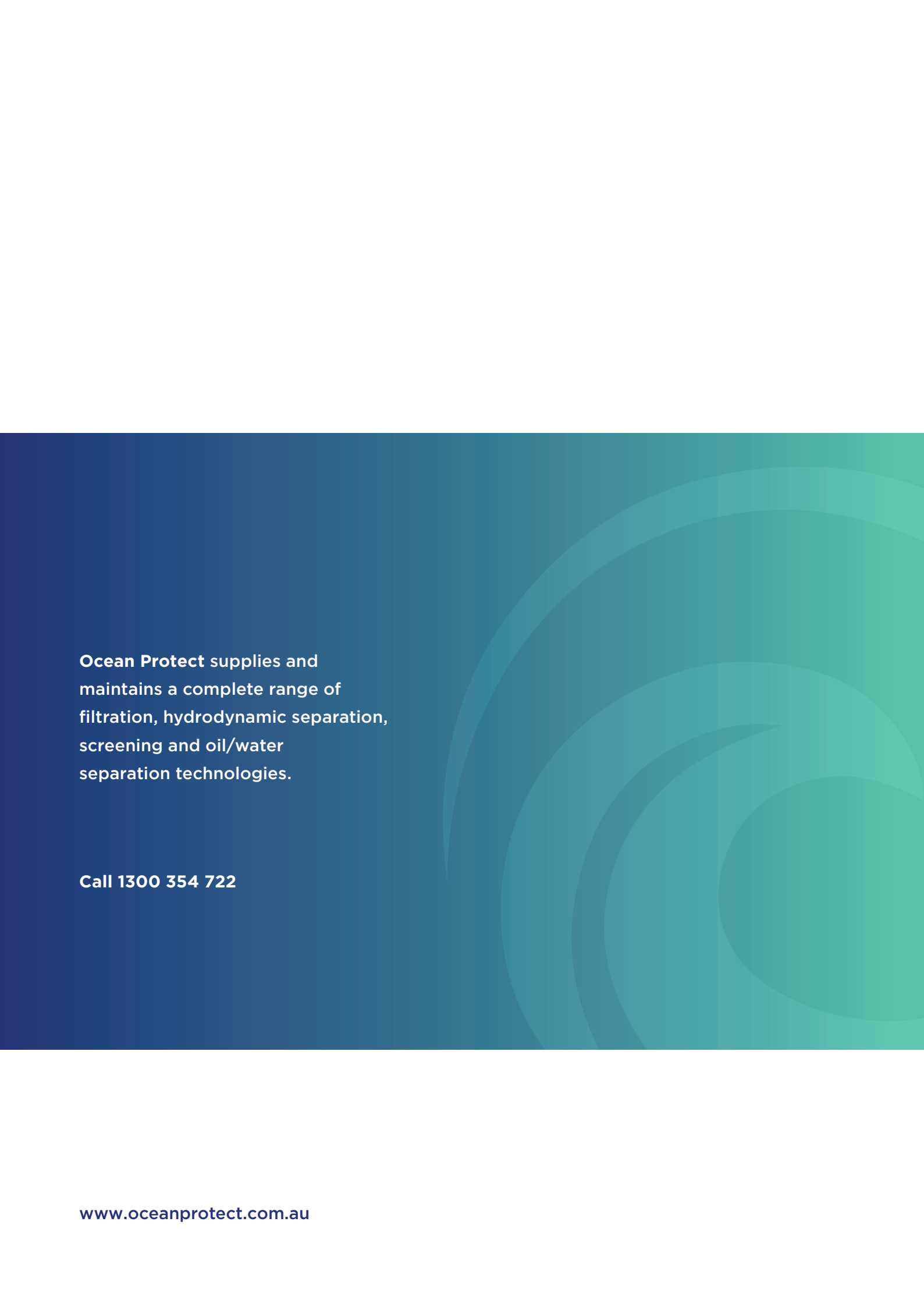
The accumulated pollutants found in the Vortechs™ must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the system has been exposed to any 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 the Vortechs™, we offer long term pay-as-you-go contracts and pre-paid once off servicing.

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



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

Call 1300 354 722