



Jellyfish[®]

**Design, Operation
and Maintenance Guidelines**

DRAFT (for site-specific guidelines email maintenance@stormwater360.co.nz)

Stormwater360

INTRODUCTION

This document, and the information within, are provided to be used only as a guide. This document is intended to provide general information for the operation and maintenance of the JellyFish device (“the product”). This document is not intended to be comprehensive health and safety guidelines for the operation and/or maintenance of the JellyFish device, which are the responsibility of the owner of the device. Users of this document are encouraged to consult professional advice before taking any course of action related to information, ideas or opinions expressed in this document. **Disclaimer** Information in this document is subject to change without notice and does not represent a commitment on the part of Stormwater360 New Zealand. Stormwater360 New Zealand makes no representations or warranties, implied or otherwise, that, amongst others, the information available from this document are free from errors or omissions. Nothing in this document should be construed as an expressed warranty or an implied warranty of Merchantability or fitness for any particular purpose.

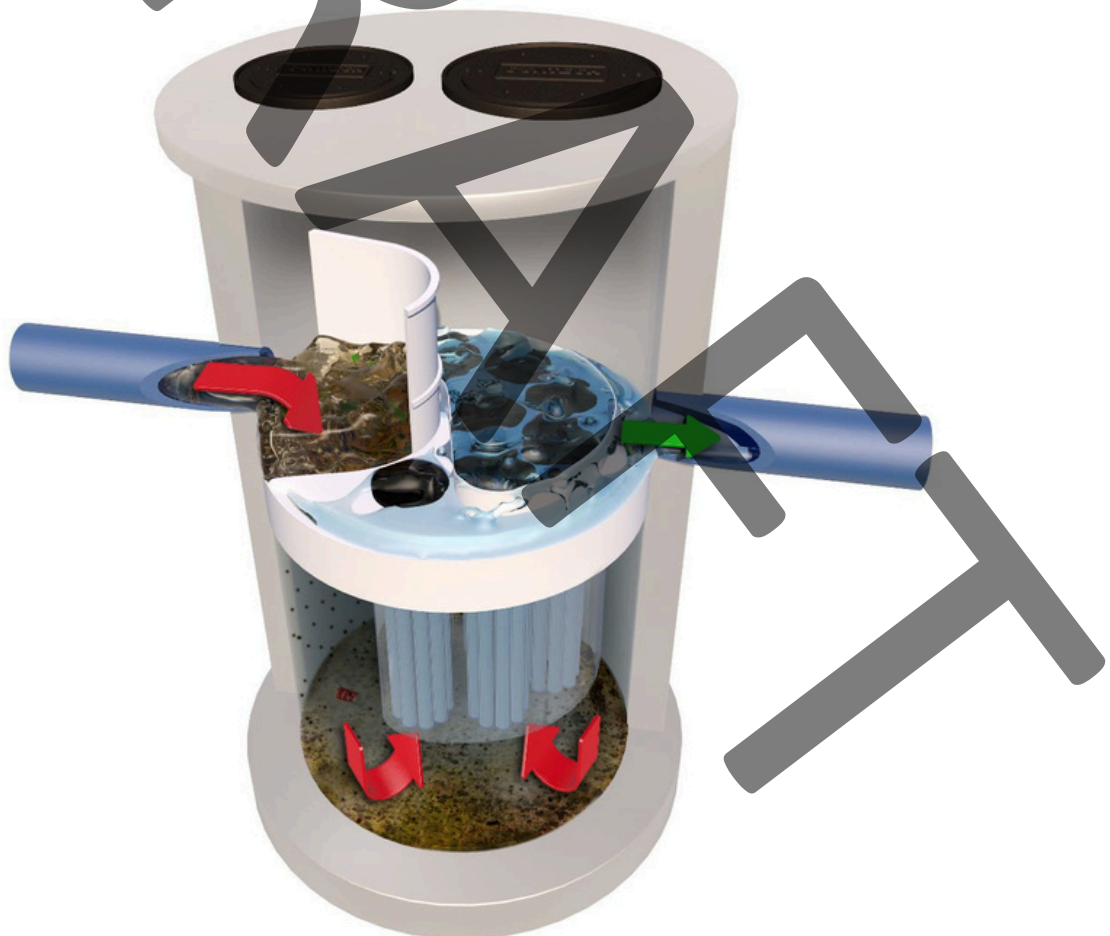


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SECTION A Site Specific Details

This section is to be filled out by the asset owner following installation of JellyFish devices. For assistance in filling out this form please contact our Maintenance Manager via 0800 STORMWATER. Please return completed forms via email to maintenance@stormwater360.co.nz.

Project Name:

Project Address:

Resource Consent Number:

Building Consent Number:

Consent/Site Owner:

Consent/Site Owner Address:

Table 1; Summary of Installed JellyFish

Jellyfish Reference #	Jellyfish Model	Number of Cartridges	Cartridge Height (mm)	DD Orifice Size (mm)	HF Orifice Size (mm)	Catchment Area (m ²)	Estimated Maintenance Frequency (Months)
#5892/JF	JF2300-7-2 (54")	9	1,372	35	70	8,000	12 Months

SECTION B Health and Safety

WARNINGS / CAUTION

1. When entering unit, personnel will need to be confined space trained.
2. **WATCH YOUR STEP** if standing on the Jellyfish Filter Deck at any time; Great care and safety must be taken while walking or maneuvering on the Jellyfish Filter Deck. Attentive care must be taken while standing on the Jellyfish Filter Deck at all times to prevent stepping onto a lid, into or through a cartridge hole or slipping on the deck.
3. The Jellyfish Filter Deck can be **SLIPPERY WHEN WET**
4. If the Top Slab, Covers or Hatches have not yet been installed, or are removed for any reason, great care must be taken to **NOT DROP ANYTHING ONTO THE JELLYFISH FILTER DECK**. The Jellyfish Filter Deck and Cartridge Receptacle Rings can be damaged under high impact loads. This type of activity voids all warranties. All damaged items to be replaced at owner's expense.
5. Maximum deck load 2 persons, total weight 102kg per person.

Safety Notice

Jobsite safety is a topic and practice addressed comprehensively by others. The inclusions here are intended to be reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). WorkSafe NZ, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Contractor's responsibility and outside the scope of Stormwater360.

Confined Space Entry

Secure all equipment and perform all training to meet applicable local and WorkSafe NZ regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to proceed safely at all times.

Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment as necessary. Make sure all equipment is **staffed with trained and/or certified personnel**, and all equipment is checked for proper operation and safety features prior to use.

Fall protection equipment (Tripod, Winch, Harness)

Eye protection

Safety boots

Ear protection

Hard hat

Gloves

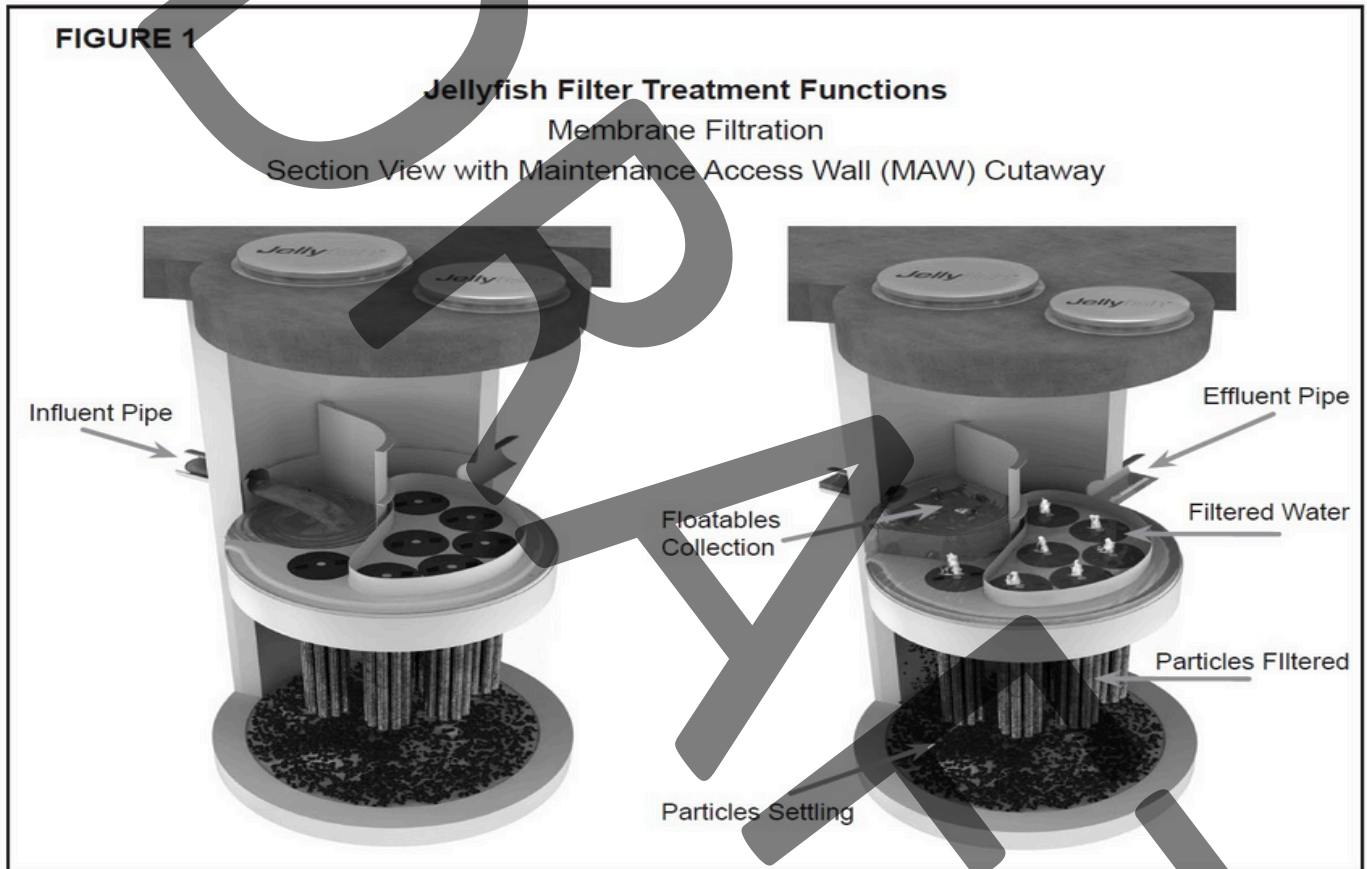
Ventilation and respiratory protection/Gas detector

Maintenance and protection of traffic plan

SECTION C Operation

The Jellyfish® Filter is an engineered stormwater quality treatment technology that removes a high level and wide variety of stormwater pollutants. Each Jellyfish Filter cartridge consists of multiple membrane - encased filter elements ("filtration tentacles") attached to a cartridge head plate. The filtration tentacles provide a large filtration surface area, resulting in high flow and high pollutant removal capacity.

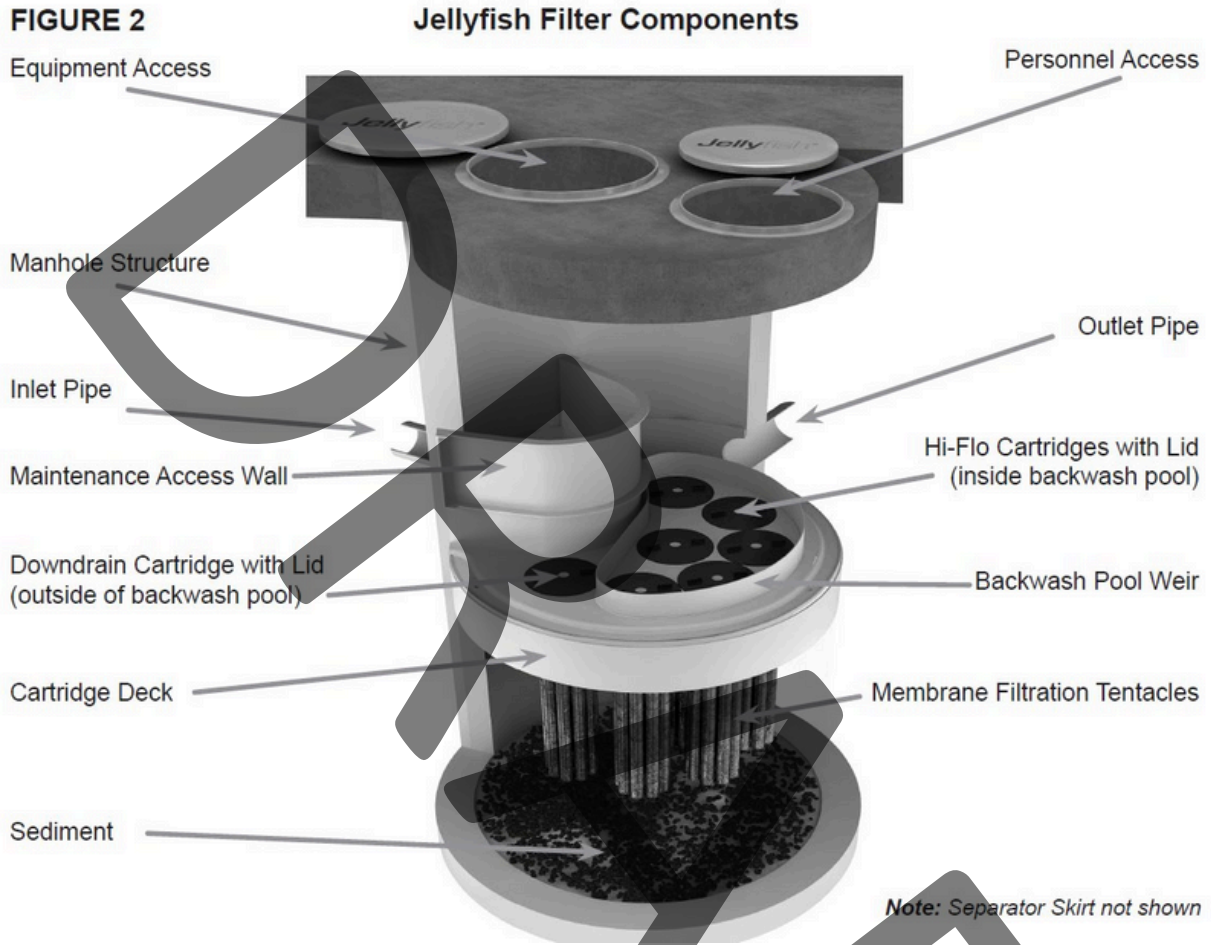
The Jellyfish Filter functions are depicted in Figure 1 below.



Jellyfish Filter cartridges are backwashed after each peak storm event, which removes accumulated sediment from the membranes. This backwash process extends the service life of the cartridges and increases the time between maintenance events.

For additional details on the operation and pollutant capabilities of the Jellyfish Filter please refer to additional details on our website at www.stormwater360.co.nz.

The Jellyfish® Filter and components are depicted in Figure 2 below.

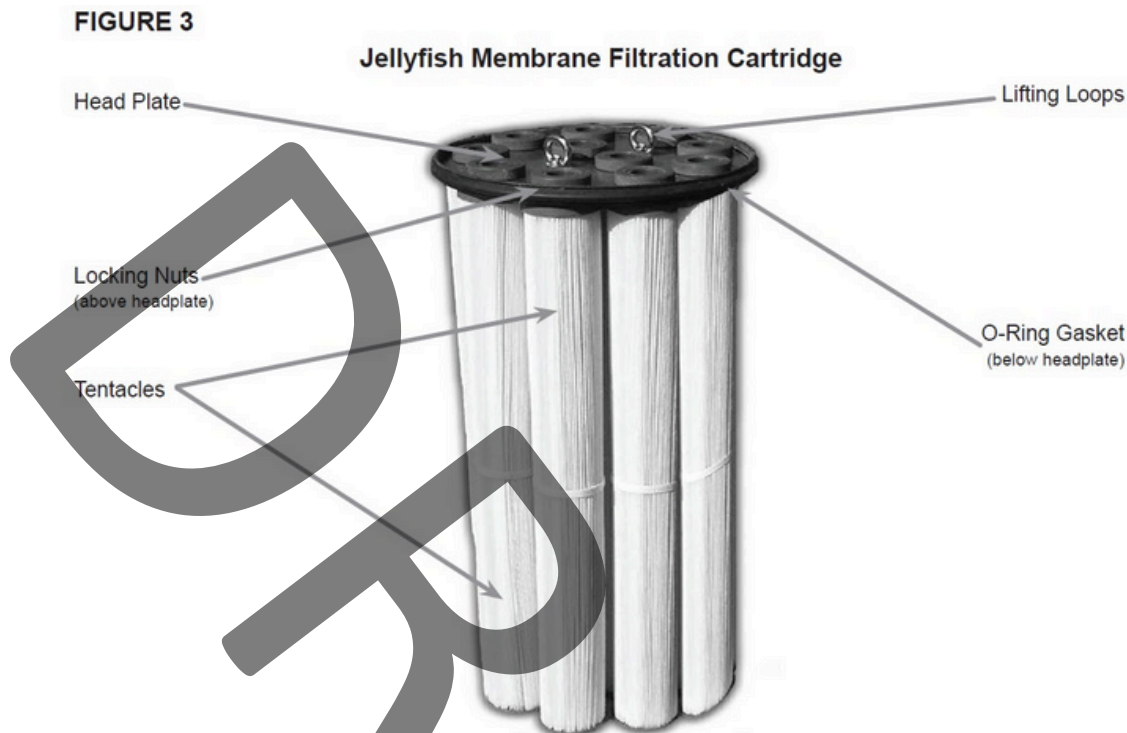


Tentacles are available in various lengths as depicted in Table 1 below.

Table 1 - Cartridge Lengths / Weights and Cartridge Lid Orifice Diameters

Cartridge Lengths	Dry Weight	Hi-Flo Orifice Diameter	Draindown Orifice Diameter
15 inches (381 mm)	10 lbs (4.5 kg)	35 mm	20 mm
27 inches (686 mm)	14.5 lbs (6.6 kg)	45 mm	25 mm
40 inches (1,016 mm)	19.5 lbs (8.9 kg)	55 mm	30 mm
54 inches (1,372 mm)	25 lbs (11.4 kg)	70 mm	35 mm

A Jellyfish membrane filtration cartridge is depicted in Figure 3 below.



Jellyfish Membrane Filtration Cartridge Assembly

The Jellyfish Filter utilizes multiple membrane filtration cartridges. Each cartridge consists of removable cylindrical filtration "tentacles" attached to a cartridge head plate. Each filtration tentacle has a threaded pipe nipple and a-ring. To attach, insert the top pipe nipples with the a-ring through the head plate holes and secure with locking nuts. Locking nuts to be hand tightened and checked with a wrench as shown below.

Jellyfish Membrane Filtration Cartridge Installation

After the upstream catchment and site have stabilized, Remove any accumulated sediment and debris from the Jellyfish Filter structure and upstream diversion structure (if applicable). Failure to address this step completely will reduce the time between required maintenance.

Descend to the cartridge deck (see Safety Notice and page 3).

Lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. A filter cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir. It is possible dependent on the Jellyfish Filter model purchased that not all cartridge receptacles will be filled with a filter cartridge. In that case, a blank headplate and blank cartridge lid (has no orifice) would be installed.

Avoid snagging the cartridge membranes on the receptacle lip when inserting the Jellyfish membrane filtration cartridges into the cartridge receptacles. Use a gentle twisting or sideways motion to clear any potential snag. Do not force the tentacles down into the cartridge receptacle, as this may damage the membranes. Apply downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket surrounding the circumference of the head plate) into the cartridge receptacle.



Cartridge Assembly

Examine the cartridge lids to differentiate lids with a small orifice, a large orifice, and no orifice.

Lids with a **small orifice** are to be inserted into the draindown cartridge receptacles, outside of the backwash pool weir.

Lids with a **large orifice** are to be inserted into the **hi-flo cartridge receptacles** within the backwash pool weir.

Lids with **no orifice** (blank cartridge lids) and a blank headplate are to be inserted into unoccupied cartridge receptacles.

To install a cartridge lid, align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110° to seat the filter cartridge snugly in place, with a proper watertight seal.

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SECTION D Inspection and Maintenance

The primary purpose of the Jellyfish Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, captured pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Maintenance activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments from manhole sump
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed.

It is recommended that Jellyfish Filter inspection and maintenance be performed by professionally trained individuals, with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned entry into the Jellyfish structure. Only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

D.1 - Inspection

D.1.1- Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; or per the approved project stormwater quality documents (if applicable), whichever is more frequent.

Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.

A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.

Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year. Inspection is recommended after each major storm event. Immediately after an upstream oil, fuel or other chemical spill.

D.1.2- Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Jellyfish Filter inspection:

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve) Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves
- Confined Space Equipment



D.1.3- Inspection Procedure

The following procedure is recommended when performing inspections:

Provide traffic control measures as necessary.

Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.

Measure oil and sediment depth by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. **Sediment depth of 12 inches (305mm) or greater indicates maintenance is required.**

Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.

Inspect the MAW, cartridge deck, and backwash pool weir for cracks or broken components. If damaged, repair is required.

Dry weather inspections inspect the cartridge deck for standing water.

No standing water under normal operating condition.

Standing water **inside** the backwash pool, but not outside the filter backwash pool, this condition indicates that the cartridges need to be rinsed.

Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.

- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW
- **Less than 6 inches (150mm)**, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- **Greater than 6 inches (150mm)**, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- **18 inches (460mm) or greater** and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed



The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the Jellyfish Filter's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.

D.2 - Maintenance D.2.1 -Maintenance Requirements

Required maintenance for Jellyfish Filter units is based upon results of the most recent inspection, historical maintenance records, or the site-specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

Sediment removal for depths reaching 12 inches (305mm) or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.

Floatable trash, debris, and oil must be removed.

Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs first.

Replace filter cartridge if rinsing does not remove accumulated sediment from the tentacles, or if tentacles are damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.

Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.

The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

D.2.2- Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Jellyfish Filter maintenance:

Vacuum truck

Ladder

Garden hose and low-pressure sprayer

Rope or cord to lift filter cartridges from the cartridge deck to the surface Adjustable pliers for removing filter cartridge tentacles from cartridge head plate Plastic tub or garbage can for collecting effluent from rinsed filter cartridge tentacles Access cover lifting tool

Sediment probe (clear hollow tube with check valve)

Tape measure Flashlight Camera

Inspection and maintenance log documentation

Safety cones and caution tape

Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers

Proper safety equipment for confined space entry

Replacement filter cartridge tentacles if required

D.2.3- Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish® Filter:

- Provide traffic control measures as necessary.
- Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.

Caution: Dropping objects onto the cartridge deck may cause damage. Perform **Inspection Procedure** prior to maintenance activity. To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck.

Caution: Do not step onto the maintenance access wall (MAVV) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.

D.2.4- Filter Cartridge Rinsing Procedure

Remove a cartridge lid.

Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure.

Caution: Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.

Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.

Disassemble the tentacles from each filter cartridge by rotating counter-clockwise. Remove the tentacles from the cartridge head plate.

Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane.

Caution: Do not use a high-pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane. Turn membrane upside down and pour out any residual rinsewater to ensure center of tentacle is clear of any sediment.

Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.

Slip the o-ring over the tentacle nipple and reassemble onto the cartridge head plate; hand-tighten.



Rinsing of dirty filter cartridge tentacles with a low-pressure garden hose sprayer and using a plastic garbage container to capture rinse water.

If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Stormwater360 to order replacement tentacles. Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle.

Caution: Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.

Replace the cartridge lid on the exposed receptacle. Rinse away any accumulated grit from the receptacle threads if needed to get a proper fit. Align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110° to seat the filter cartridge snugly in place, with a proper watertight seal.

Repeat cartridge installation until all cartridges are installed.

D.2.5- Vacuum Cleaning Procedure

Caution: Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.

To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.

Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.

Remove the sediment from the bottom of the unit through the MAW opening.

For larger diameter Jellyfish Filter manholes 2.3m, 3m, 3.6m diameter, complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.

After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.

Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

D.2.6- Chemical Spills

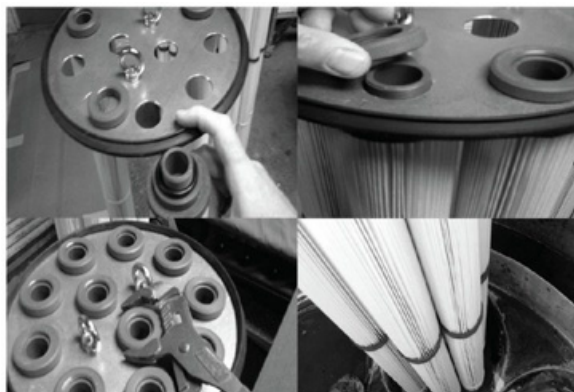
Caution: If a chemical spill has been captured by the Jellyfish Filter, do not attempt maintenance. Immediately contact the local hazard response agency.



A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables from the Jellyfish Filter by inserting the vacuum wand through the maintenance access wall opening.



A view of a Jellyfish Filter cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck (left image), and inspection of the flexible separator skirt from inside the maintenance access wall opening (right image).



Assembly of a Jellyfish Filter cartridge (left) and installation of a filter cartridge into a cartridge receptacle in the deck (right).

D.3 - Disposal Procedures

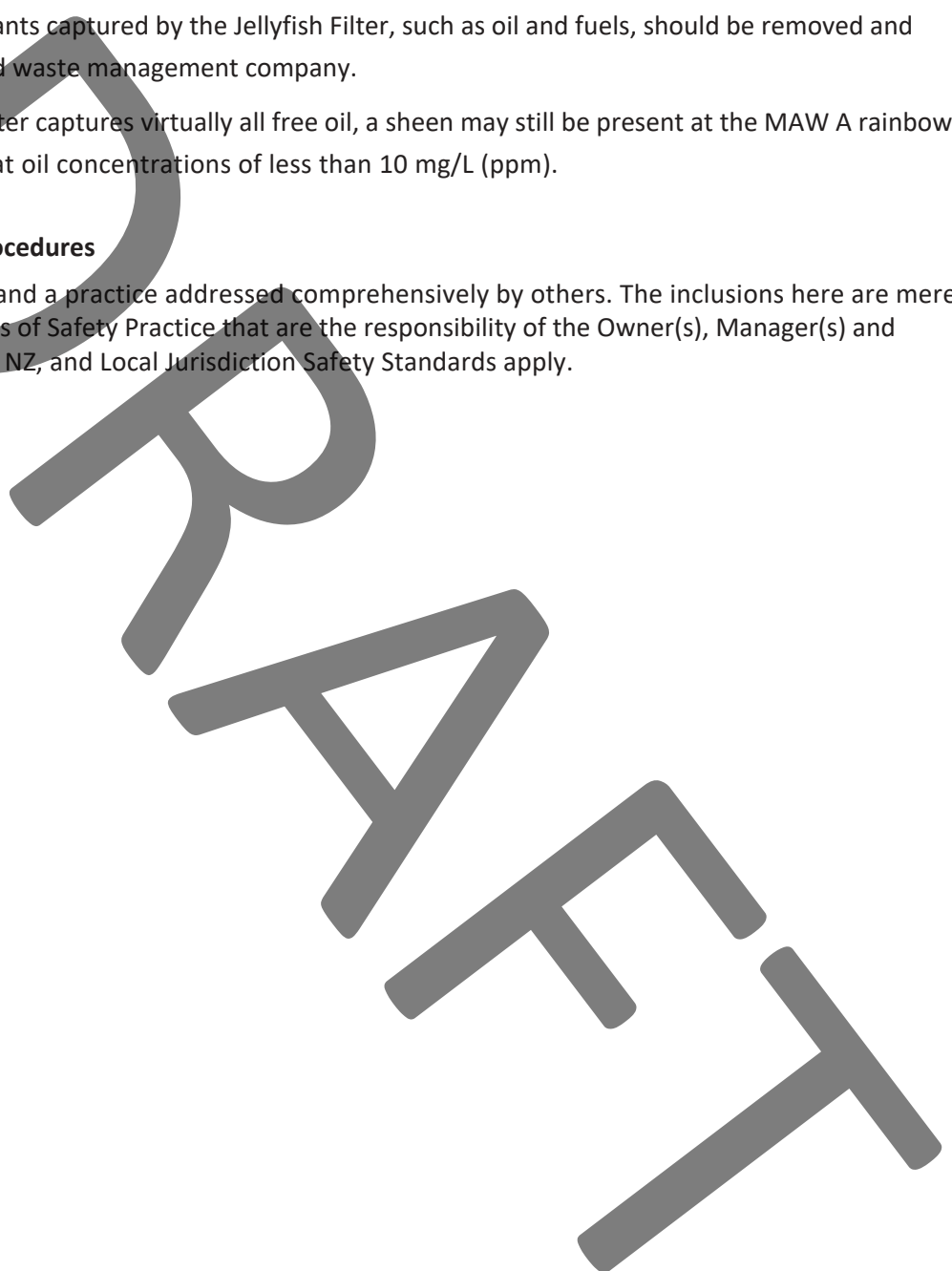
Disposal requirements for recovered pollutants and spent filtration tentacles may vary depending on local guidelines. In most areas the sediment and spent filtration tentacles, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

Petroleum-based pollutants captured by the Jellyfish Filter, such as oil and fuels, should be removed and disposed of by a licensed waste management company.

Although the Jellyfish Filter captures virtually all free oil, a sheen may still be present at the MAW A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

D.4 - Recommended Safety Procedures

Jobsite safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). WorkSafe NZ, and Local Jurisdiction Safety Standards apply.



SECTION E Jellyfish Filter Replacement Parts

E.1 - Jellyfish Filter Replacement Parts

Jellyfish membrane filtration cartridges, cartridge components, cartridge lids, other replacement parts can be ordered by contacting Stormwater360 at:

0800 STORMWATER

+64 9 476 5586

info@stormwater360.co.nz

E.2 - Jellyfish Filter Replacement Parts List

Note: Jellyfish Cartridges and/or Filtration tentacles are available in the following lengths:

15 Inch (381 mm)

27 Inch (686 mm)

40 Inch (1,016 mm)

54 inch (1,372 mm)

Jellyfish Cartridge (specify length). Includes head plate with lifting loops, rim gasket, eleven (11) filtration tentacles, eleven (11) a-rings, and eleven (11) locking nuts

Standard Head plate

Blank head plate

Rim gasket (for head plate)

Locking nuts (for tentacles)

O-rings (for tentacles)

Cartridge lids are available with the following orifice sizes: 70mm, 55mm, 45mm, 35mm, 30mm, 25mm, 30mm, blank lid (no orifice)

Maintenance Access Wall (MAW) extension - 18-inch (457mm) segment

**Nothing in this catalogue should be construed as an expressed warranty or implied warranties, including the warranties of merchantability and of fitness for any particular purpose.*