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February 25, 2025

Andover Conservation Commission
Andover Planning Board
Andover Town Offices
36 Bartlet Street
Andover, MA 01810

RE: 140 Haverhill Street, Amended Plan #2
DEP File # 090-1387 Response to Peer Review Comments

Dear Conservation Commission and Planning Board Members,

Please accept this letter and the attached plans as a response to the review comments provided by Horsley Whitten Group in a letter dated February 17, 2025. Our responses to comments are located below. Comments that did not require any response are not included.

Standard 2 requires that post-development runoff does not exceed pre-development runoff off-site.

- a. The callout on Sheet CS1501 and the details on Sheet CS6003, for the detention system, Pond 3P, reference StormTech SC-310 chambers. HW recommends that the Applicant revise the plans to avoid confusion.

The call outs have been revised.

- b. It appears that the Applicant has not provided the proposed 98 contour between the two proposed buildings. HW recommends that the Applicant provides the proposed grading in this area as well as over the proposed subsurface infiltration system.

The 98 Contour has been added to the plan.

- c. HW recommends that the Applicant clarify the outlet pipe from Jellyfish Filter JF4-1-1 located on the east side of the site near wetland series A.

The existing outlet pipe which is being re-used has been added to the plan

- d. The Applicant has provided the closed drainage system sizing calculations in the Additional Drainage Documents. Several of the slopes listed on the spreadsheet do not match the proposed drainage plan. The pipe between CB6 and DMH 10 is not consistent between the calculations and the plans, and the pipe from the Outlet Control Structure (OCS) to DMH10 has not been included. HW recommends that the Applicant revisit the 10-year Pipe Capacity Calculations and revise accordingly.

The 10 year Pipe Capacity calculations have been revised

- e. HW recommends that the Applicant match the crowns of the pipes at a manhole instead of the inverts whenever feasible. For example, DMH 5 calls out an 18-inch inlet and an 18-inch outlet at elevation 82.60. The 12-inch inlet is also set at elevation 82.60. If feasible the 12-inch inlet should be raised 6 inches.

The 12" pipe has been raised 6".

- f. HW recommends that the Applicant clarify the limit of clearing around the site. HW recommends that the limit of work be clearly shown on all the plans in the set.

The limit of clearing has been clarified and added to all plan sheets

2. *Standard 3 requires that the annual recharge from post-development shall approximate annual recharge from pre-development conditions.*
- a. The Applicant has increased the impervious area from 93,800 sf to 98,400 sf. An increase of 4,600 sf that will require recharge. The proposed subsurface infiltration system should provide the required recharge volume. The Applicant has conducted three test pits. TP1 is in the location of the proposed infiltration system. The soil profile indicates Sandy Loam which may have an exfiltration rate of 1.02 inches per hour (iph). It is not clear why the Applicant has not included exfiltration in the HydroCAD model for the proposed infiltration system. HW recommends that the Applicant provide the recharge calculations as well as the drawdown calculations for the proposed subsurface infiltration system or provide a justification for why infiltration was not considered.

The infiltration system has been sized to retain and infiltrate a minimum of 0.35 “ of runoff from the new day care building roof which is 8,884 square feet. The volume required to be infiltrated is $8,884 \times 0.35/12 = 230$ cubic feet. The volume below the lowest invert in the infiltration system which is the horizontal orifice set at elevation 89.83 is 877 cubic feet as shown on the stage storage table in the drainage report. This volume exceeds the recharge volume required for the increase in impervious area for the site. This is also outlined in the compliance section of the drainage report.

This engineer takes a conservative approach to using infiltration to control peak flows. Although the infiltration area will have infiltration during the storm, it is usually not included in our models for determining compliance with peak flow requirements. The report has been revised to show the peak flows with and without infiltration in Pond 2. Additional information has been added to the drainage report regarding the recharge and system draining within 72 hours as required by Standard 3.

One benefit of adding recharge is the reduction in runoff volume. A volume table has been added to the drainage report.

- b. It appears that the proposed infiltration system could be raised. The existing surface is between elevations 92 and 98. The current design indicates a minimum surface elevation of approximately 90 with the bottom of the system set at elevation 86.5. HW recommends that the Applicant revisit the design of the proposed infiltration system and raise it to the maximum extent practicable.

The infiltration system has been raised and the invert callouts have been revised on the plans and details.

- c. The Estimated Seasonal High Groundwater (ESHGW) was determined to be at elevation 83.83 within TP1. The bottom of the system is set at elevation 86.50, a separation of
-

2.67 feet. In accordance with Volume 3, Chapter 1, page 28 a mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet *and* the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm. If the proposed system is designed to infiltrate and the bottom of the system remains at elevation 86.5, HW recommends that the Applicant provide the required mounding analysis.

The infiltration system has been raised to provide a 4' separation between the ground water and the bottom of the infiltration system.

3. *Standard 4 requires that the stormwater system be designed to remove 80% Total Suspended Solids (TSS) and to treat 1.0-inch of volume from the impervious area for water quality.*
 - a. The Applicant is proposing Jellyfish Filters to provide the required TSS removal. The details provided on Sheet CS6004 are not consistent with the Rim and Invert information provided on Sheet CS1501. HW recommends that the Applicant revisit the plans and details and revise accordingly.

The rim and invert elevations have been adjusted to match the Jellyfish details

- b. The Applicant has provided a third-party documentation listing 89% TSS removal for the Jellyfish Filter. HW notes that the Jellyfish Filter requires specific long-term maintenance to maintain the removal capacity. The Town of Andover may choose to require receipt of the annual maintenance of the Jellyfish Filter as a condition of approval.

No response required

4. *Standard 7 is related to projects considered Redevelopment. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*
 - a. The proposed project is considered a mix of new development and redevelopment. The Applicant is increasing the impervious cover by 4,600 sf. HW recommends that the Applicant documents how it is meeting the standards for the proposed increase in impervious surface.

See response to item 2(a) above.

5. *Standard 8 requires a plan to control construction related impacts including erosion, sedimentation or other pollutant sources.*
 - a. The Applicant has provided an Erosion and Sediment Control Plan. HW recommends that the erosion control barrier on the north side of the proposed infiltration system be extended east to the edge of the driveway.

Additional erosion control has been shown

- b. The Applicant has previously provided a Stormwater Pollution Prevention Plan (SWPPP). The Planning Board and /or Conservation Commission may choose to require receipt of the final SWPPP signed by the contractor as a condition of approval.

No response required

6. *Standard 9 requires a Long-Term Operation and Maintenance (O&M) Plan be provided.*
- a. The Applicant has provided a Stormwater Operation and Maintenance (O&M) Plan, which includes instructions for maintenance of stormwater control measures, an O&M budget, and an O&M log. HW has the following comments in relation to the O&M Plan provided by the Applicant:

- i. The Applicant has included a simple sketch with the O&M Plan. However, the sketch needs to be updated to correlate to the amended design.

The sketch has been revised

- ii. HW recommends that the Applicant locate the inspection ports for both subsurface stormwater systems.

The inspection ports have been identified on the plans

- iii. HW recommends that the Applicant includes the manufacturers' O&M directives on long term maintenance for the subsurface detention system as well as the subsurface infiltration system.

The manufacturers' O&M directives have been added to the O&M plan.

- iv. HW recommends that the Applicant include the manufacturer's O&M directives for long term maintenance of the Jellyfish filters and confirm that the Owner is aware of its responsibilities.

The manufacturers' O&M directives have been added to the O&M plan.

- v. Per Andover Stormwater Regulations Section VI.C.1.b.5, HW recommends that the Applicant provide a standalone copy of the O&M Plan signed by the property owner. The Town may choose to require receipt of the final signed O&M Plan with all appendices attached as a Condition of Approval.

No response required

Several other plan revisions have been made to address various comments received during public hearings and review meetings which are as follows.

1. The hydrant location has been moved to the island located on the lot line between the two lots. An additional in-line water gate valve has been added in the loop line around the buildings.
 2. A grease trap has been added to the day care building to accommodate the proposed kitchen flow.
 3. The landscape plan has been revised to include additional screening between the medical office property and the day care playground.
 4. The lighting plan has been revised and will be included in a subsequent submittal.
-

I will be in attendance at the March 11 Planning Board meeting and the March 18, 2025 conservation commission meeting to discuss this matter. If you have questions prior to the meeting, please do not hesitate to contact this office.

Sincerely,

A handwritten signature in blue ink that reads "Ben C Osgood Jr." in a cursive style.

Benjamin C Osgood Jr. PE
President

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LONG TERM POLLUTION PREVENTION PLAN 140 HAVERHILL STREET, ANDOVER, MA

As part of the development of 140 Haverhill Street, Andover, MA a stormwater system is being constructed as required by State and Local Stormwater Regulations. It is the responsibility of the property owner to properly maintain the drainage systems and structures, including drain pipes. The current property owner is Medico 140, LLC, and therefore will oversee long term maintenance of the stormwater system and will be responsible for compliance with the Long-Term Pollution Prevention Plan upon completion of the construction. Maintenance requirements are for both lots 1 and 2 will be the responsibility of the property owner.

Regular maintenance is to include the following:

1. Pavement Sweeping

Pavement surfaces shall be swept a minimum of twice per year, preferably just after snow melt and late in the fall.

2. Catch Basin Sumps, Drain Manhole and Outlet Control Structures

Inspect quarterly for the evidence of structural damage, silt accumulation and improper function. Remove accumulated sediments and debris from catch basin sump when sump is more than 25% full, minimum annually just after snow melt.

3. Drain Pipes

Inspect annually for the evidence of structural damage, silt accumulation and improper function. Clean pipes when sediment occupies more than 20% of pipe diameter.

4. Buried Pipe Detention System

Inspect inlet and outlet structures quarterly for damage and silt accumulation. Remove silt buildup and debris.

5. Buried StormTech infiltration/ Detention System

Inspect inlet and outlet structures quarterly for damage and silt accumulation. Remove silt buildup and debris. Inspect chambers through inspection ports, clean per the attached stormTech inspection requirements.

6. Jellyfish Treatment Systems - 2

Inspect quarterly per the attached Jellyfish System Owners Manual.

7. Graded Slopes and Rip Rap outlets

Inspect every spring for erosion. Repair any erosion by placing rip-rap or loam and seed. Nurtured freshly seeded areas to ensure proper germination and establishment of turf.

Each of the stormwater structures listed above is shown on a plan attached as Attachment A.

Inspections shall be performed by a qualified person with knowledge of stormwater structures and conveyance systems. A report of inspections shall be submitted to the Town of Andover on an annual basis within 30 days of the end of each calendar year.

The requirement and responsibility for the inspection and maintenance of the stormwater system will continue to any subsequent owners of the property.

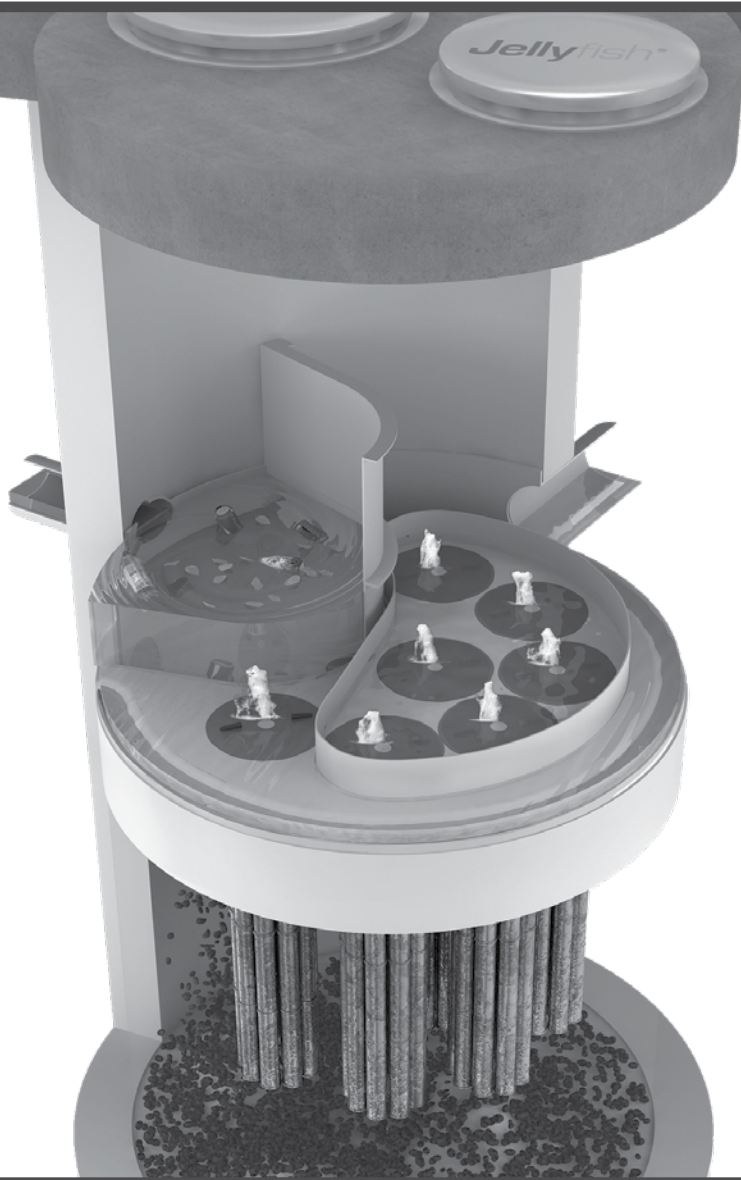
Current Property Owner who will be responsible for the operation, maintenance, and emergency repairs of the stormwater system.

Medico 140, LLC
Paul Kneeland, Manager
355 Middlesex Ave, Suite 7
Wilmington, MA 01887

Signature

Date

Jellyfish[®] Filter Maintenance Guide





JELLYFISH® FILTER INSPECTION & MAINTENANCE GUIDE

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

TABLE OF CONTENTS

Inspection and Maintenance Overview	3
Inspection Procedure.....	3
Maintenance Procedure.....	4
Cartridge Assembly & Cleaning.....	5
Inspection Process	7

1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these 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.

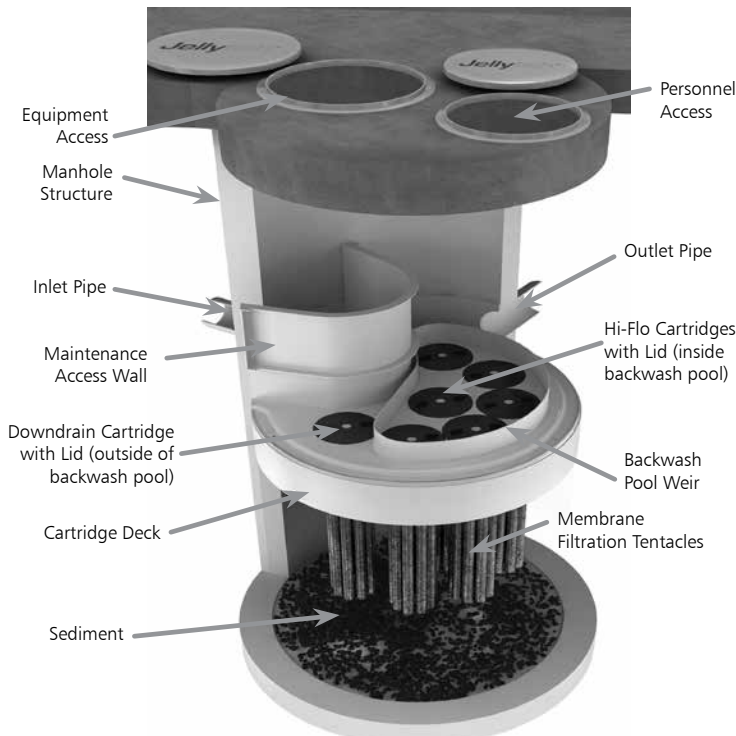
Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion 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) or inlet bay for vault systems

Maintenance activities include:

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



Note: Separator Skirt not shown

2.0 Inspection 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.*

1. A minimum of quarterly inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
2. 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.
3. Inspection is recommended after each major storm event.
4. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

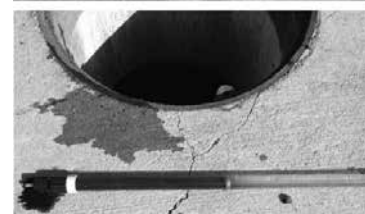
3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW or inlet bay for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW (where appropriate), cartridge deck and receptacles, and backwash pool weir, for damaged or broken components.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates, that the filter cartridges need to be rinsed.



Inspection Utilizing Sediment Probe

- Standing water outside the backwash pool is not anticipated and may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment ($\geq 1/16''$) accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW or inlet bay.
- Less than 6 inches, 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, 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 or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges need to be rinsed.

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter 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:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. 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 sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. 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 or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

1. Provide traffic control measures as necessary.
2. 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.

3. Perform Inspection Procedure prior to maintenance activity.
4. To access the cartridge deck for filter cartridge service, descend into the structure and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
5. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. **Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs.**
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to lose or damage the O-ring seal as well as the plastic threaded nut and connector.



Cartridge Removal & Lifting Device



2. Position tentacles in a container (or over the MAW), with the threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.
3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray 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.**

4. Collected rinse water is typically removed by vacuum hose.
5. Reassemble cartridges as detailed later in this document. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Sediment and Floatables Extraction

1. 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. Be careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck on manhole systems. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening or inlet bay. Alternatively, floatable solids may be removed by a net or skimmer.



Vacuuming Sump Through MAW

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW or inlet bay.
5. Remove the sediment from the bottom of the unit through the MAW or inlet bay opening.



Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥ 8 -ft) and some vaults 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.

5.4 Filter Cartridge Reinstallation and Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. **Caution: Do not force the cartridge downward; damage may occur.**
3. Replace the cartridge lid and check to see that both male threads are properly seated before rotating approximately 1/3 of a full rotation until firmly seated. Use of an approved rim gasket lubricant may facilitate installation. See next page for additional details.
4. 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 Contech to order replacement tentacles.

5.5 Chemical Spills

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

5.6 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge Assembly and Installation

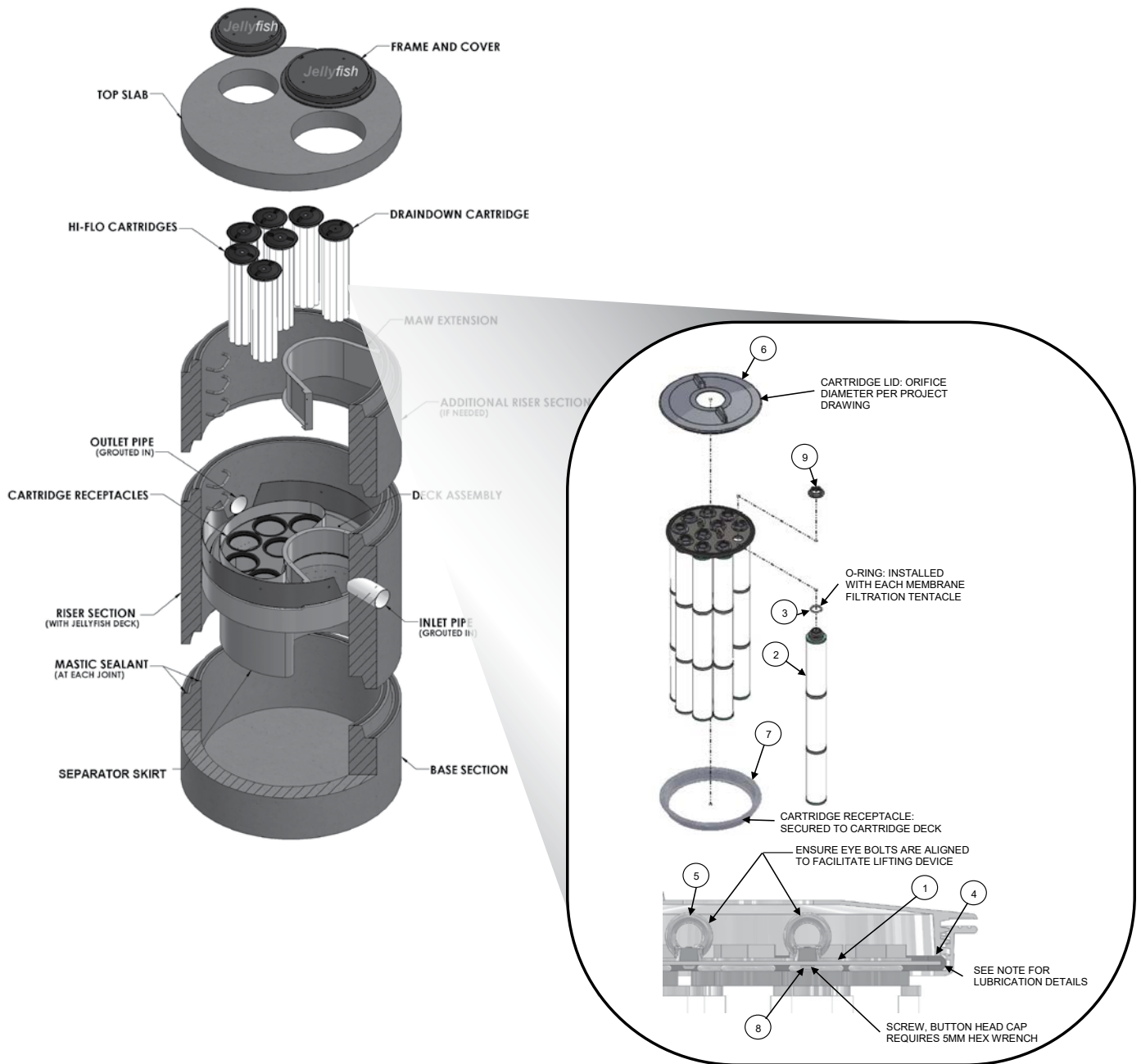


TABLE 1: BOM

ITEM NO.	DESCRIPTION
1	JF HEAD PLATE
2	JF TENTACLE
3	JF O-RING
4	JF HEAD PLATE GASKET
5	JF CARTRIDGE EYELET
6	JF 14IN COVER
7	JF RECEPTACLE
8	BUTTON HEAD CAP SCREW M6X14MM SS
9	JF CARTRIDGE NUT

TABLE 2: APPROVED GASKET LUBRICANTS

PART NO.	MFR	DESCRIPTION
78713	LA-CO	LUBRI-JOINT
40501	HERCULES	DUCK BUTTER
30600	OATEY	PIPE LUBRICANT
PSLUBXL1Q	PROSELECT	PIPE JOINT LUBRICANT

NOTES:

Head Plate Gasket Installation:

Install Head Plate Gasket (Item 4) onto the Head Plate (Item 1) and liberally apply a lubricant from Table 2: Approved Gasket Lubricants onto the gasket where it contacts the Receptacle (Item 7) and Cartridge Lide (Item 6). Follow Lubricant manufacturer's instructions.

Lid Assembly:

Rotate Cartridge Lid counter-clockwise until both male threads drop down and properly seat. Then rotate Cartridge Lid clock-wise approximately one-third of a full rotation until Cartridge Lid is firmly secured, creating a watertight seal.

Jellyfish Filter Inspection and Maintenance Log

Owner:		Jellyfish Model No:	
Location:		GPS Coordinates:	
Land Use:	Commercial:	Industrial:	Service Station:
	Roadway/Highway:	Airport:	Residential:

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Draindown Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						



Support

- Drawings and specifications are available at www.conteches.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.
- Find a Certified Maintenance Provider at www.conteches.com/ccmp

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12.0 Inspection and Maintenance

12.1 Isolator Row Plus Inspection

Regular inspection and maintenance are essential to assure a properly functioning stormwater system. Inspection is easily accomplished through the manhole or optional inspection ports of an Isolator Row PLUS. Please follow local and OSHA rules for a confined space entry.

Inspection ports can allow inspection to be accomplished completely from the surface without the need for a confined space entry. Inspection ports provide visual access to the system with the use of a flashlight. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding 3" (75 mm), cleanout is required.

A StormTech Isolator Row PLUS should initially be inspected immediately after completion of the site's construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter any stormwater system. Inspection and maintenance, if necessary, should be performed prior to passing responsibility over to the site's owner. Once in normal service, a StormTech Isolator Row PLUS should be inspected bi-annually until an understanding of the sites characteristics is developed. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

12.2 Isolator Row Plus Maintenance

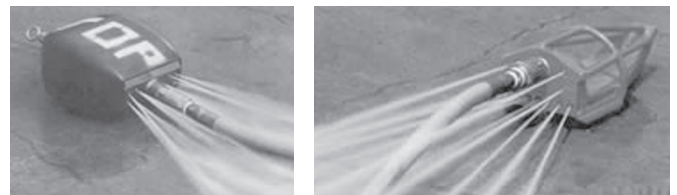
JetVac maintenance is recommended if sediment has been collected to an average depth of 3" (75 mm) inside the Isolator Row PLUS. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row PLUS. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediments. As the nozzle is retrieved, a wave of suspended sediments is flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/ JetVac combination vehicles. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" (1125 mm) are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. The JetVac process shall only be performed on StormTech Rows that have ADS PLUS fabric over the foundation stone.



Looking down the Isolator Row PLUS



A typical JetVac truck (This is not a StormTech product.)



Examples of culvert cleaning nozzles appropriate for Isolator Row PLUS maintenance. (These are not StormTech products).

12.0 Inspection & Maintenance

StormTech Isolator Row Plus - Step-by-Step Maintenance Procedures

Step 1: Inspect Isolator Row PLUS for sediment

- A) Inspection ports (if present)
 - i. Remove lid from floor box frame
 - ii. Remove cap from inspection riser
 - iii. Using a flashlight and stadia rod, measure depth of sediment
 - iv. If sediment is at, or above, 3" (76 mm) depth proceed to Step 2. If not proceed to Step 3.
- B) All Isolator Plus Rows
 - i. Remove cover from manhole at upstream end of Isolator Row PLUS
 - ii. Using a flashlight, inspect down Isolator Row PLUS through outlet pipe
 - 1. Follow OSHA regulations for confined space entry if entering manhole
 - 2. Mirrors on poles or cameras may be used to avoid a confined space entry
 - iii. If sediment is at or above the lower row of sidewall holes [approximately 3" (76 mm)] proceed to Step 2. If not proceed to Step 3.

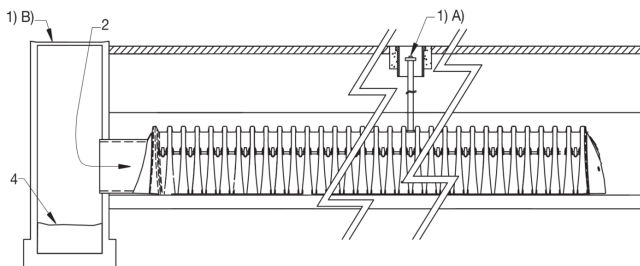
Step 2: Clean out Isolator Row PLUS using the JetVac process

- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45" (1125 mm) or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required during jetting

Step 3: Replace all caps, lids and covers

Step 4: Inspect and clean catch basins and manholes upstream of the StormTech system following local guidelines.

Figure 18 – StormTech Isolator Row Plus (not to scale)



12.3 Eccentric Pipe Header Inspection

These guidelines do not supercede a pipe manufacturer's recommended I&M procedures. Consult with the manufacturer of the pipe header system for specific I&M procedures. Inspection of the header system should be carried out quarterly. On sites which generate higher levels of sediment more frequent inspections may be necessary. Headers may be accessed through risers, access ports or manholes. Measurement of sediment may be taken with a stadia rod or similar device. Cleanout of sediment should occur when the sediment volume has reduced the storage area by 25% or the depth of sediment has reached approximately 25% of the diameter of the structure.

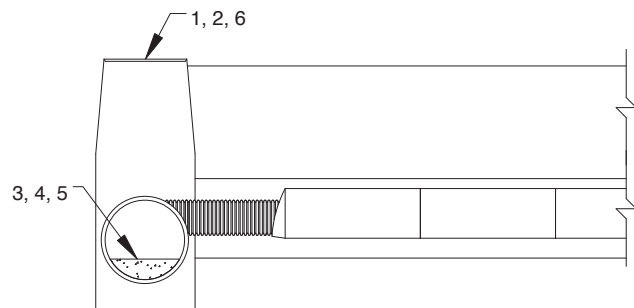
12.4 Eccentric Pipe Manifold Maintenance

Cleanout of accumulated material should be accomplished by vacuum pumping the material from the header. Cleanout should be accomplished during dry weather. Care should be taken to avoid flushing sediments out through the outlet pipes and into the chamber rows.

Eccentric Header Step-by-Step Maintenance Procedures

1. Locate manholes connected to the manifold system
2. Remove grates or covers
3. Using a stadia rod, measure the depth of sediment
4. If sediment is at a depth of about 25% pipe volume or 25% pipe diameter proceed to step 5. If not proceed to step 6.
5. Vacuum pump the sediment. Do not flush sediment out inlet pipes.
6. Replace grates and covers
7. Record depth and date and schedule next inspection

Figure 19 – Eccentric Manifold Maintenance



Please contact StormTech's Technical Services Department at 888-892-2894 for a spreadsheet to estimate cleaning intervals.

REACH NUMBER	UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	PEAK FLOW CFS	PIPE SIZE	SLOPE '/'	PIPE CAPACITY CFS	STRUCTURE RIM ELEVATION	PEAK WATER ELEVATION
--------------	--------------------	----------------------	---------------	-----------	-----------	-------------------	-------------------------	----------------------

NORTH DRAINAGE SYSTEM

1R	CB2	DMH8	2.59	12"	0.0059	2.72		
2R	DMH8	DMH1	2.59	12"	0.0132	8.29		
3R	CB1	DMH1	1.2	12"	0.0094	3.46		
4R	DMH1	DMH2	1.98	12"	0.0147	4.32		
5R	DMH2	DMH3	2.16	15"	0.0032	3.67		
6R	CB3A	DMH3	1.5	12"	0.0072	3.02		
7R	CB3	DMH3	1.49	12"	0.0077	3.12		
8R	DMH3	DMH4	6.12	18"	0.0066	7.43	87.75	85.19
10R	CB4	DMH4	3.81	8"	0.0055	0.9		PARKING LOT PONDING WILL OCCUR
12R	CB5	DMH4	1.51	12"	0.0618	8.86		
9R	DMH4	DMH5	6.84	18"	0.0046	7.15	87.4	85.81
11R	CB6	DMH10	1.53	12"	0.125	12.6		
16R	OCS2	DMH10	1.42	12"	0.0299	6.16		
18R	DMH10	DMH5	2.59	12"	0.0542	8.29		
13R	DMH5	JELLYFISH FILTER	9.44	18"	0.0045	7.08	87.35	84.81
19R	JELLYFISH FILTER	FES	9.44	18"	0.005	7.43		

SOUTH DRAINAGE SYSTEM

14R	CB10	DMH9	1.1	8"	0.0048	0.83	102.84	101.79
15R	DMH9	JELLYFISH FILTER	1.82	12"	0.0046	2.41		
17R	CB9	DMH9	0.99	8"	0.0229	1.83		

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Page 3

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10 YEAR	Type II 24-hr		Default	24.00	1	5.10	2

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Page 7

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1R	86.39	86.00	67.0	0.0058	0.013	0.0	12.0	0.0
2	2R	86.00	85.00	76.0	0.0132	0.013	0.0	12.0	0.0
3	3R	85.50	85.00	53.0	0.0094	0.013	0.0	12.0	0.0
4	4R	85.00	84.50	34.0	0.0147	0.013	0.0	12.0	0.0
5	5R	84.25	84.15	31.0	0.0032	0.013	0.0	15.0	0.0
6	6R	84.08	83.90	25.0	0.0072	0.013	0.0	12.0	0.0
7	7R	84.45	84.35	13.0	0.0077	0.013	0.0	12.0	0.0
8	8R	83.78	83.10	102.0	0.0067	0.013	0.0	18.0	0.0
9	9R	83.10	82.60	108.0	0.0046	0.013	0.0	18.0	0.0
10	10R	83.55	83.30	45.0	0.0056	0.013	0.0	8.0	0.0
11	11R	86.00	84.50	12.0	0.1250	0.013	0.0	12.0	0.0
12	12R	85.79	83.50	37.0	0.0619	0.013	0.0	12.0	0.0
13	13R	82.60	82.55	11.0	0.0045	0.013	0.0	18.0	0.0
14	15R	99.91	99.55	79.0	0.0046	0.013	0.0	12.0	0.0
15	16R	88.30	84.50	127.0	0.0299	0.013	0.0	12.0	0.0
16	17R	100.40	100.01	17.0	0.0229	0.013	0.0	8.0	0.0
17	18R	84.40	83.10	24.0	0.0542	0.013	0.0	12.0	0.0
18	19R	82.05	82.00	10.0	0.0050	0.013	0.0	18.0	0.0
19	14R	100.52	100.01	107.0	0.0048	0.013	0.0	8.0	0.0
20	P1	85.00	84.80	20.0	0.0100	0.013	0.0	12.0	0.0
21	P10R	83.55	83.30	45.0	0.0056	0.013	0.0	8.0	0.0
22	P13R	82.60	82.55	11.0	0.0045	0.013	0.0	18.0	0.0
23	P8R	83.71	83.20	102.0	0.0050	0.013	0.0	18.0	0.0
24	P9R	83.10	82.60	108.0	0.0046	0.013	0.0	18.0	0.0

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Page 8

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: CB2 TO DMH8	Avg. Flow Depth=0.38'	Max Vel=3.04 fps	Inflow=0.84 cfs	0.038 af
12.0" Round Pipe n=0.013	L=67.0'	S=0.0058 '/'	Capacity=2.72 cfs	Outflow=0.81 cfs 0.038 af
Reach 2R: DMH8 TO DMH1	Avg. Flow Depth=0.30'	Max Vel=4.04 fps	Inflow=0.81 cfs	0.038 af
12.0" Round Pipe n=0.013	L=76.0'	S=0.0132 '/'	Capacity=4.09 cfs	Outflow=0.79 cfs 0.038 af
Reach 3R: CB1 TO DMH 1	Avg. Flow Depth=0.41'	Max Vel=3.99 fps	Inflow=1.20 cfs	0.069 af
12.0" Round Pipe n=0.013	L=53.0'	S=0.0094 '/'	Capacity=3.46 cfs	Outflow=1.19 cfs 0.069 af
Reach 4R: DMH1 TO DMH2	Avg. Flow Depth=0.47'	Max Vel=5.36 fps	Inflow=1.98 cfs	0.107 af
12.0" Round Pipe n=0.013	L=34.0'	S=0.0147 '/'	Capacity=4.32 cfs	Outflow=1.97 cfs 0.107 af
Reach 5R: DMH2 TO DMH3	Avg. Flow Depth=0.69'	Max Vel=3.09 fps	Inflow=2.15 cfs	0.194 af
15.0" Round Pipe n=0.013	L=31.0'	S=0.0032 '/'	Capacity=3.67 cfs	Outflow=2.16 cfs 0.194 af
Reach 6R: CB3A TO DMH3	Avg. Flow Depth=0.50'	Max Vel=3.84 fps	Inflow=1.50 cfs	0.076 af
12.0" Round Pipe n=0.013	L=25.0'	S=0.0072 '/'	Capacity=3.02 cfs	Outflow=1.48 cfs 0.076 af
Reach 7R: CB3 TO DMH3	Avg. Flow Depth=0.49'	Max Vel=3.93 fps	Inflow=1.49 cfs	0.076 af
12.0" Round Pipe n=0.013	L=13.0'	S=0.0077 '/'	Capacity=3.12 cfs	Outflow=1.48 cfs 0.076 af
Reach 8R: DMH3 to DMH4	Avg. Flow Depth=0.93'	Max Vel=5.24 fps	Inflow=6.12 cfs	0.421 af
18.0" Round Pipe n=0.013	L=102.0'	S=0.0067 '/'	Capacity=8.58 cfs	Outflow=5.96 cfs 0.421 af
Reach 9R: DMH4 TO DMH5	Avg. Flow Depth=1.18'	Max Vel=4.60 fps	Inflow=6.86 cfs	0.618 af
18.0" Round Pipe n=0.013	L=108.0'	S=0.0046 '/'	Capacity=7.15 cfs	Outflow=6.82 cfs 0.618 af
Reach 10R: CB4 TO DMH4	Avg. Flow Depth=0.67'	Max Vel=2.86 fps	Inflow=3.81 cfs	0.197 af
8.0" Round Pipe n=0.013	L=45.0'	S=0.0056 '/'	Capacity=0.90 cfs	Outflow=0.90 cfs 0.197 af
Reach 11R: CB6 TO DMH5	Avg. Flow Depth=0.24'	Max Vel=10.85 fps	Inflow=1.53 cfs	0.077 af
12.0" Round Pipe n=0.013	L=12.0'	S=0.1250 '/'	Capacity=12.60 cfs	Outflow=1.53 cfs 0.077 af
Reach 12R: CB5 TO DMH4	Avg. Flow Depth=0.28'	Max Vel=8.41 fps	Inflow=1.51 cfs	0.076 af
12.0" Round Pipe n=0.013	L=37.0'	S=0.0619 '/'	Capacity=8.86 cfs	Outflow=1.50 cfs 0.076 af
Reach 13R: DMH5 TO JELLYFISH	Avg. Flow Depth=1.50'	Max Vel=4.57 fps	Inflow=9.39 cfs	0.762 af
18.0" Round Pipe n=0.013	L=11.0'	S=0.0045 '/'	Capacity=7.08 cfs	Outflow=7.08 cfs 0.762 af
Reach 15R: DMH9 TO JELLYFISH	Avg. Flow Depth=0.71'	Max Vel=3.44 fps	Inflow=2.09 cfs	0.104 af
12.0" Round Pipe n=0.013	L=79.0'	S=0.0046 '/'	Capacity=2.41 cfs	Outflow=2.00 cfs 0.104 af
Reach 16R: ocs-2 to dmh5	Avg. Flow Depth=0.33'	Max Vel=6.34 fps	Inflow=1.42 cfs	0.066 af
12.0" Round Pipe n=0.013	L=127.0'	S=0.0299 '/'	Capacity=6.16 cfs	Outflow=1.40 cfs 0.066 af
Reach 17R: CB9 TO DMH9	Avg. Flow Depth=0.35'	Max Vel=5.34 fps	Inflow=0.99 cfs	0.049 af
8.0" Round Pipe n=0.013	L=17.0'	S=0.0229 '/'	Capacity=1.83 cfs	Outflow=0.99 cfs 0.049 af

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Page 9

Reach 18R: DMH10 to DMH5 Avg. Flow Depth=0.38' Max Vel=9.26 fps Inflow=2.59 cfs 0.143 af
12.0" Round Pipe n=0.013 L=24.0' S=0.0542 '/' Capacity=8.29 cfs Outflow=2.58 cfs 0.143 af

Reach 19R: Jellyfish to outlet Avg. Flow Depth=1.17' Max Vel=4.79 fps Inflow=7.08 cfs 0.762 af
18.0" Round Pipe n=0.013 L=10.0' S=0.0050 '/' Capacity=7.43 cfs Outflow=7.10 cfs 0.762 af

Summary for Reach 1R: CB2 TO DMH8

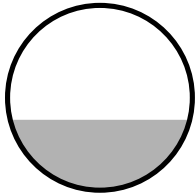
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.154 ac, 0.00% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 0.84 cfs @ 11.95 hrs, Volume= 0.038 af
Outflow = 0.81 cfs @ 11.96 hrs, Volume= 0.038 af, Atten= 3%, Lag= 0.5 min
 Routed to Reach 2R : DMH8 TO DMH1

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 1.2 min

Peak Storage= 18 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 0.97'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.72 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 67.0' Slope= 0.0058 '/
Inlet Invert= 86.39', Outlet Invert= 86.00'



Summary for Reach 4R: DMH1 TO DMH2

[52] Hint: Inlet/Outlet conditions not evaluated

[62] Hint: Exceeded Reach 2R OUTLET depth by 0.18' @ 12.00 hrs

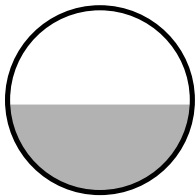
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.07' @ 12.00 hrs

Inflow Area = 0.324 ac, 52.58% Impervious, Inflow Depth > 3.97" for 10 YEAR event
Inflow = 1.98 cfs @ 11.97 hrs, Volume= 0.107 af
Outflow = 1.97 cfs @ 11.97 hrs, Volume= 0.107 af, Atten= 1%, Lag= 0.2 min
Routed to Reach 5R : DMH2 TO DMH3

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.36 fps, Min. Travel Time= 0.1 min
Avg. Velocity= 1.57 fps, Avg. Travel Time= 0.4 min

Peak Storage= 12 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.32 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0147 '/'
Inlet Invert= 85.00', Outlet Invert= 84.50'



Summary for Reach 8R: DMH3 to DMH4

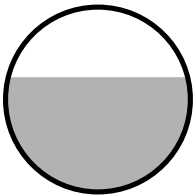
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 5R outlet invert by 0.55' @ 11.90 hrs
[63] Warning: Exceeded Reach 6R INLET depth by 0.17' @ 11.95 hrs
[61] Hint: Exceeded Reach 7R outlet invert by 0.35' @ 11.90 hrs
[62] Hint: Exceeded Reach 12R OUTLET depth by 0.93' @ 11.95 hrs

Inflow Area = 1.105 ac, 86.08% Impervious, Inflow Depth > 4.57" for 10 YEAR event
Inflow = 6.12 cfs @ 11.91 hrs, Volume= 0.421 af
Outflow = 5.96 cfs @ 11.92 hrs, Volume= 0.421 af, Atten= 3%, Lag= 0.7 min
Routed to Reach 9R : DMH4 TO DMH5

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.24 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 1.0 min

Peak Storage= 117 cf @ 11.92 hrs
Average Depth at Peak Storage= 0.93' , Surface Width= 1.46'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.58 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 102.0' Slope= 0.0067 '/'
Inlet Invert= 83.78', Outlet Invert= 83.10'



Summary for Reach 10R: CB4 TO DMH4

- [52] Hint: Inlet/Outlet conditions not evaluated
- [55] Hint: Peak inflow is 423% of Manning's capacity
- [76] Warning: Detained 0.043 af (Pond w/culvert advised)
- [85] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area = 0.487 ac, 100.00% Impervious, Inflow Depth > 4.86" for 10 YEAR event
Inflow = 3.81 cfs @ 11.90 hrs, Volume= 0.197 af
Outflow = 0.90 cfs @ 11.70 hrs, Volume= 0.197 af, Atten= 76%, Lag= 0.0 min
Routed to Reach 9R : DMH4 TO DMH5

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.42 fps, Avg. Travel Time= 0.5 min

Peak Storage= 16 cf @ 11.65 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.90 cfs

8.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 45.0' Slope= 0.0056 '/
Inlet Invert= 83.55', Outlet Invert= 83.30'

