



August 31, 2018

Long-Term Pollution Prevention Plan Operation & Maintenance Plan

#1672-1726 Canton Avenue, Milton

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LONG TERM POLLUTION PREVENTION PLAN / OPERATION AND MAINTENANCE PLAN

Date: August 31, 2018

**Wolcott Woods
1672-1726 Canton Avenue
Milton, MA**

Responsible Party for Operation and Maintenance Contact Information:

Wolcott Residential, LLC
80 Beharrell Street, Suite E
Concord, Massachusetts 01742
P: 781.229.4700

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

General Conditions

1. The BMP's will be owned and maintained by the Developer until such time that a Homeowner's Association is created, then the Homeowner's Association will own and maintain the BMP's located on the site.
2. All Stormwater BMP's shall be operated and maintained in accordance with the design plans and the following Long-Term Operations and Maintenance Plan.
3. The Responsible Party shall:
 - a. Maintain an Operation and Maintenance Log (see Attachment A). The Log shall include all BMP inspections, repairs, replacement activities and disposal activities (disposal material and disposal location shall be included in the Log);
 - b. Retain inspection and maintenance logs for a period of three years, on an ongoing basis;
 - c. Make the logs available to the Town upon request;
 - d. Allow members and agents of the Milton DPW and Conservation Commission to enter the premises and ensure that the Responsible Party has complied with the Operation and Maintenance Plan requirements for each BMP.
4. An inspection and maintenance schedule should be adhered to at a minimum for the first year of service of all BMP's referenced in this document. After the first year of service, a more accurate inspection/maintenance schedule should be determined based on the level of service for this site.

Operation and Maintenance

1.0 Requirements for Routine Inspections and Maintenance of Stormwater Best Management Practices

Note: The Town shall be notified immediately if a change in ownership or maintenance responsibility occurs at the site.

Drain lines

After construction, the drainlines shall be inspected after every major storm for the first few months to ensure proper functions. Presence of accumulated sand and silt would indicate more frequent maintenance of the pre-treatment devices is required. Thereafter, the drainlines shall be inspected at least once per year.

Deep sump and hooded Catch Basins

Catch basin grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of properly. Deep sump catch basins shall be inspected and cleaned bi-annually of all accumulated sediments. Catch basins with hoods shall be inspected annually to check oil build-up and outlet obstructions. Material shall be removed from catch basins and disposed of in accordance with all applicable regulations.

Pre-treatment Structures – First Defense FD-3HC, FD-4HC and FD-6HC

The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit biannually and following heavy rain events defined as a storm event exceeding one inch of rainfall within a twenty-four hour period to verify that the inlet opening is not clogged by debris.

During the first year of installation, perform inspection regularly, so an accurate maintenance schedule can be established. Perform oil and floatables removal once per year and immediately in the event of a spill. Oil shall be removed by using a small portable pump and disposed of properly. Perform sediment removal once per year or as needed and following a spill event. Sediment shall be removed from the unit using a vacuum truck. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations.

Please refer to the attached manufacturer's maintenance manual for additional detail on proper inspection and maintenance of the First Defense units.

Subsurface Infiltration Chamber Systems

Proper maintenance of the subsurface infiltration systems is essential to the long-term effectiveness of the infiltration function. After construction, the subsurface infiltration chamber systems shall be inspected for proper function after every major storm event until the site is completely developed and stabilized. After the site has been stabilized, the subsurface infiltration chamber systems shall be inspected at least twice per year or if lack of performance is observed and perform

necessary corrective measures to maintain infiltration capacity; as required by the Stormwater Management Policy.

The systems shall have inspection ports for proper inspections. Inspections shall include checking the water level in the system after a major storm event, and performing necessary corrective action if water is observed 72 hours following the storm. The owner shall retain a qualified stormwater professional to assess the cause of this condition and develop a corrective action plan for restoring the infiltration function. The owner shall immediately implement the corrective action to restore the infiltration function. Documentation of these actions shall be maintained in the inspection and maintenance records.

Inspection & Maintenance Steps

Accumulated sediment must be removed from the bottom of the chambers. Material removed from the systems shall be disposed of in accordance with all applicable local, state, and federal regulations.

Step 1. Inspect chamber rows for sediment and water levels

7.0 Inspection Ports

- a. Remove/open lid on nyloplast inspection port
- b. Remove and clean flexstorm filter if installed
- c. Using a flashlight and stadia rod, measure depth of sediment or water level and record on maintenance log
- d. Lower camera into chamber row for visual inspection of sediment or water levels (optional)
- e. If water is observed 72 hours following a storm event, proceed to Step 3. If not, proceed to Step 4

8.0 Clean out locations

- 8.1 Remove clean out cover
- 8.2 Using a flashlight, inspect down the chamber row through the manifold pipe
- 8.3 If sediment is at, or above 3" at inlet chambers, proceed to Step 2. If not, proceed to Step 4.

Step 2. Clean out inlet chambers (first 12.5 ft. only) using the jetvac process if sediment build up is observed

- a. A fixed culvert cleaning nozzle with rear facing spread of 45" or more is preferred
- b. Apply multiple passes of jetvac until backflush water is clean
- c. Vacuum structure sump as required

Step 3. Repair chamber system when water levels do not infiltrate after 72 hours. A corrective action plan shall be prepared by a qualified stormwater professional and immediately implemented.

Step 4. Replace all covers, grates, filters, and lids; record observations and actions.

Step 5. Inspect and clean basins and manholes upstream of the chamber system.

Please refer to the attached manufacturer's maintenance manual for additional detail on proper inspection and maintenance of the StormTech chamber systems.

Stormwater Infiltration Basin

After construction, the stormwater infiltration basin shall be inspected for proper function after every major storm event until the site is completely developed and stabilized. After the site has been stabilized the stormwater infiltration system shall be inspected at least twice per year or if lack of performance is observed and perform necessary corrective measures to maintain infiltration capacity; as required by the Stormwater Management Policy. Inspections shall include checking the water level in the system after a major storm event, and performing necessary corrective action if water is observed 72 hours following the storm.

Disposal of the accumulated sediment must be in accordance with applicable local, state and federal guidelines and regulations.

Inspections shall be performed by qualified professionals of the basin bottoms and outlet control structure. The embankments should also be inspected for signs of settlement, significant erosion, animal burrows, growth of woody vegetation, and other conditions that could affect embankment integrity. Repairs should be made immediately based on these inspections.

The bottoms and sides of the stormwater basin should be mowed, limed, aerated, and overseeded along with the regular maintenance of other loamed & seeded areas on the project site. Liming shall be limited to once per year.

Basin Repair and Renovation Plan

In the event that the time for the stormwater basin to drain exceeds 72 hours, the basin shall be renovated. The following procedure shall be followed:

1. The Conservation Commission shall be notified of the status of the drainage facility.
2. An evaluation and determination for the slow drain time shall be performed by a Professional Engineer. The following shall be considered:
 - a. Higher sediment loading than anticipated
 - b. Extreme hydrologic events
 - c. Poor installation (i.e., excessive compaction of soils and low spots)
 - d. Poor maintenance.
3. In the case of higher than anticipated sediment loading, the schedule for maintenance shall be increased from the recommended yearly cleaning to bi-annual. For all other failures, the repair and renovation shall be made in accordance with the original approved plan and the inspection shall remain the same as specified in the Operation and Maintenance Plan.

4. Prior to construction, the contractor shall secure all necessary State, municipal and other utility permits and verify the existing locations of the utilities with the utility companies.
5. The contractor shall notify “Digsafe” (1.888.344.7233) at least four days prior to construction.
6. The work shall be performed in accordance with the specifications of the appropriate department. The contractor shall notify the Planning Board at least four days prior to construction.
7. Install erosion control barriers along limit of construction and at the following locations:
 - a. At the interface between the silt trap-erosion control pad and the bottom of the basin.
 - b. At the interface between the bottom of the basin and the outlet control structure.
8. A Professional Engineer shall develop a plan for handling stormwater during repair and renovation.
 - a. The plan shall include the use of temporary basins, swales with check dams, additional water quality controls prior to discharge, etc.
 - b. The plan should be based on the specific circumstances of where and how the basin failed
9. The repair and renovation shall proceed as follows:
 - a. Construction shall not take place until the floor of the basin is thoroughly dry
 - b. Prior to tilling, grass clippings and accumulated organic matter should be removed to prevent the formation of an impervious organic mat. Trash and debris should also be removed at this time.
 - c. Light equipment which will not compact the underlying soils should be used to remove the top layer and replace with loam as required. The remaining soils should be deeply tilled and re-vegetated as soon as possible.
10. The basin to be inspected weekly and after every storm event and maintained until grass has stabilized disturbed areas.
11. At the completion of all construction, the contractor is to remove the erosion control barrier and re-establish flows to the drainage basin.

Bioretention Area and Rain Gardens

Inspect pretreatment stone apron/grass slope and bioretention cells regularly for sediment build-up, structural damage, and standing water.

Replace stone on an “as needed” basis when showing signs of clogging and bound with sediment.

Inspect soil and repair eroded areas monthly. Re-mulch void areas as needed. Remove litter and debris monthly. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall.)

Proper selection of plant species and support during establishment of vegetation should minimize-if not eliminate-the need for fertilizers and pesticides. Remove invasive species as needed to prevent these species from spreading into the bioretention area. Replace mulch every two years, in the early spring. Upon failure, excavate bioretention area, scarify bottom and sides, replace the soil, replant, and mulch.

The soil medium filters contaminants from runoff; the cation exchange capacity of the soil media will eventually be exhausted. When the cation exchange capacity of the soil media decreases, change the soil media to prevent contaminants from migrating to the ground water, or from being discharged via an underdrain outlet. Using small shrubs and plants instead of larger trees will make it easier to replace the media with clean material when needed.

Plant maintenance is critical. Concentrated salts in roadway runoff may kill plants, necessitating removal of dead vegetation each spring and replanting.

Never store snow in bioretention areas.

Outlet Protection

All outfall protection structures shall be inspected quarterly and following major storm events defined as a storm event exceeding one inch of rainfall within a twenty-four hour period to check for signs for erosion. Any necessary repairs shall be performed promptly and cleaned to remove accumulated sediment as necessary. Material removed shall be disposed of in accordance with all applicable local, state, and federal regulations. Rip-Rap overflow structure shall be weeded and cleaned on a quarterly basis to ensure that water overflowing the spillway will not become obstructed by debris.

Roadway Pavement Maintenance

Vacuum sweepers shall sweep the roadway periodically during dry weather to remove excess sediments to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping should be conducted four times per year and will be the responsibility of the Developer/Homeowners Association.

Salt used for de-icing on the roadway during winter months should be limited as much as possible as this will reduce the need for removal and treatment.

Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

2.0 Inspections

The responsible party shall secure the services of a Licensed Engineer or similar professional (inspector) on an on-going basis. The inspector shall review the project with respect to the following:

- Proper installation and performance of the Stormwater Management System.
- Review of the controls to determine any damaged or ineffective controls.
- Corrective actions.

The inspector shall prepare a report documenting the findings and should request the required maintenance or repair for the pollution prevention controls when the inspector finds that it is necessary for the control to be effective.

If hydrocarbons or any petroleum products are detected in any stormwater structure during an inspection, immediate measures shall be taken to remove and dispose of the material in accordance with all applicable regulations. The inspector shall notify the Owner to make the changes.

The owner shall be responsible for retaining the inspection and maintenance records for a period of three years, on an ongoing basis.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

Pollution Prevention Plan

Good Housekeeping

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Homeowner education outreach, including promoting recycling through the Town of Milton Transfer Station.

1.0 Storage and Disposal of Household Waste and Toxics

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their

homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the Town of Milton.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:

<http://www.mass.gov/dep/recycle/reduce/househol.htm>

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
..... nickel cadmium batteries
..... (no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and
..... stains
Arts and crafts chemicals
Charcoal lighter fluid

Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish
removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

2.0 Vehicle Washing

This management measure involves educating the general public on the water quality impacts of the outdoor washing of automobiles and how to avoid allowing polluted runoff to enter the storm drain system. Outdoor car washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions in many watersheds, as the detergent-rich water used to wash the grime off our cars flows down the street and into the storm drain. The following management practices will be encouraged:

- Washing cars on gravel, grass, or other permeable surfaces.
- Blocking off the storm drain during car washing and redirecting wash water onto grass or landscaping to provide filtration.
- Using hoses with nozzles that automatically turn off when left unattended.
- Using only biodegradable soaps.
- Minimize the amounts of soap and water used. Wash cars less frequently.
- Promote use of commercial car wash services.

3.0 Landscape Maintenance

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the Town of Milton

- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

4. Integrated Pest Management (IPM)

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chlorpyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban streams is home application of products designed to kill insects and weeds in the lawn and garden.

The following IPM practices will be encouraged:

- Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.
- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.

5. Pet Waste Management

Pet waste management involves using a combination of pet waste collection programs, pet awareness and education, to alert residents to the proper disposal techniques for pet droppings. The following management practices will be encouraged:

- Raise awareness of homeowners that are also pet owners that they are encouraged to pick up after their pets and dispose of the waste either in the trash, including on their own lawns and walking trails.
- Provide signage along walking trails.

6. Proper Management of Deicing Chemicals and Snow

The following deicing chemicals and snow storage practices will be encouraged:

- Select effective snow disposal sites adjacent to or on pervious surfaces in upland areas away from water resources and wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime.
- No roadway deicing materials shall be stockpiled on site unless all storage areas are protected from exposure to rain, snow, snowmelt and runoff.
- Avoid dumping snow into any waterbody, including wetlands, cranberry bogs, detention/infiltration basins, and grassed swales/channels.
- Avoid disposing of snow on top of storm drain catch basins.

7. **Illicit Discharge Statement**

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria or other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

Allowable Non-Stormwater Discharges

The following non-stormwater discharges are authorized provided it has been determined by the permittee that they are not significant contributors of pollutants to the MS4. If these discharges are identified as significant contributors to the MS4, they must be addressed in the Illicit Discharge Detection and Elimination minimum control measure described in Parts II, III, IV and V.

1. water line flushing,
2. landscape irrigation,
3. diverted stream flows,
4. rising ground waters,
5. uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. uncontaminated pumped ground water,
7. discharge from potable water sources,
8. foundation drains,
9. air conditioning condensation,
10. irrigation water, springs,
11. water from crawl space pumps,
12. footing drains,
13. lawn watering,
14. flows from riparian habitats and wetlands,
15. dechlorinated swimming pool discharges,
16. street wash water, and
17. discharges or flows from fire fighting activities occur during emergency situations.
The permittee is not expected to evaluate fire fighting discharges with regard to pollutant contributions. Therefore, these discharges are authorized as allowable non-storm water discharges, unless identified, by EPA, as significant sources of pollutants to Waters of the U.S..

**STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES
INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE**

PROJECT LOCATION: **Wolcott Woods, Canton Ave, Milton, MA**

Latest Revision: _____

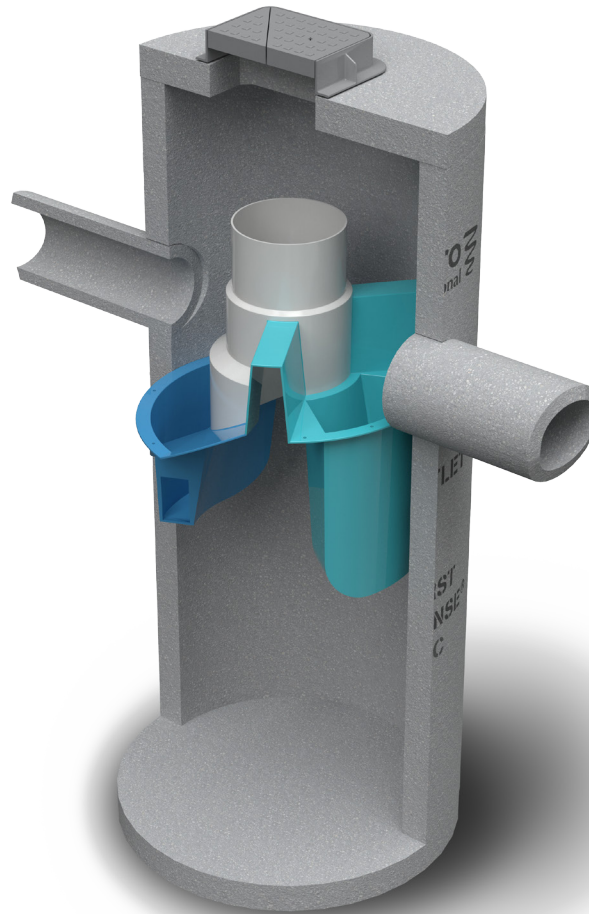
| Best Management Practice | Inspection Frequency (1) | Date Inspected | Inspector | Minimum Maintenance and Key Items to Check | Cleaning/Repair Needed yes/no List items | Date of Cleaning/Repair | Performed By | Water Level in Detention System |
|--|--------------------------|----------------|-----------|--|--|-------------------------|--------------|---------------------------------|
| Drain Lines | Yearly | | | -Sediment build-up -Trash and debris | | | | |
| Deep Sump Hooded Catch Basins | Quarterly | | | -Sediment level exceeds 8" -Trash and debris - Floatable oils or hydrocarbon - Grate or outlet blockage | | | | |
| Pre-Treatment Structure (First Defense Units) | Quarterly | | | -Sediment not to exceed 18" -Floating contaminants shall be removed by vacuum pump prior to sediment removal -Outlet blockages | | | | |
| Bioretention Area and Rain Garden | Twice a Year | | | -Sediment build-up -Trash and debris -Dead vegetation -Standing water greater than 72 hours | | | | |
| Infiltration Basin | Twice a Year | | | -Sediment build-up -Trash and debris -Dead vegetation -Standing water greater than 72 hours | | | | |
| Subsurface Infiltration Chamber Systems | Twice a Year | | | -Sediment buildup -Standing water greater than 48 hours | | | | |
| Outlet Protection | Twice a Year | | | -Check for clogging -Remove sediment buildup -Inspect for signs of settlement or erosion | | | | |
| Roadway Pavement Maintenance | Quarterly | | | | | | | |

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (2008) for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes: (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____

Stamp



Operation and Maintenance Manual

First Defense[®] and First Defense[®] High Capacity

Vortex Separator for Stormwater Treatment

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig. 1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

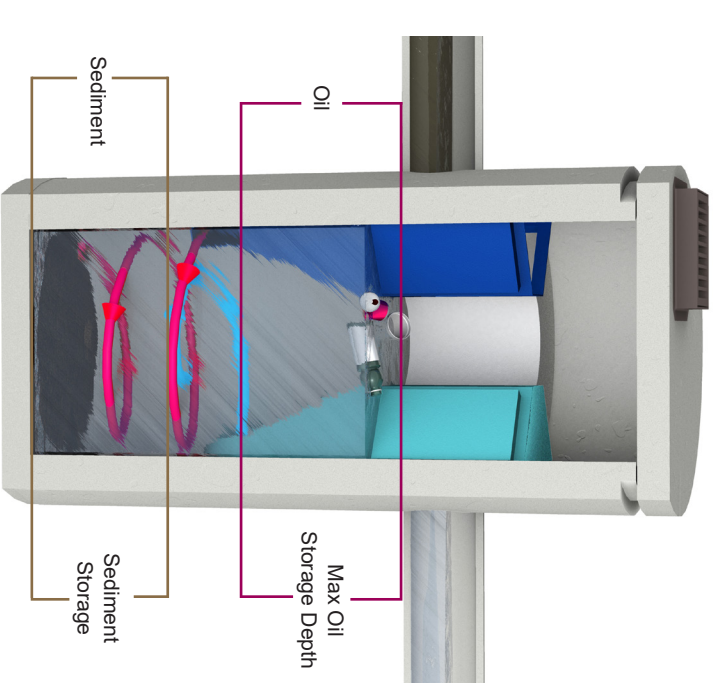


Fig. 1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® Inlet and Internal Bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. Built-In Bypass
2. Inlet Pipe
3. Inlet Chute
4. Floatables Draw-off Port
5. Outlet Pipe
6. Floatables Storage
7. Sediment Storage
8. Inlet Grate or Cover

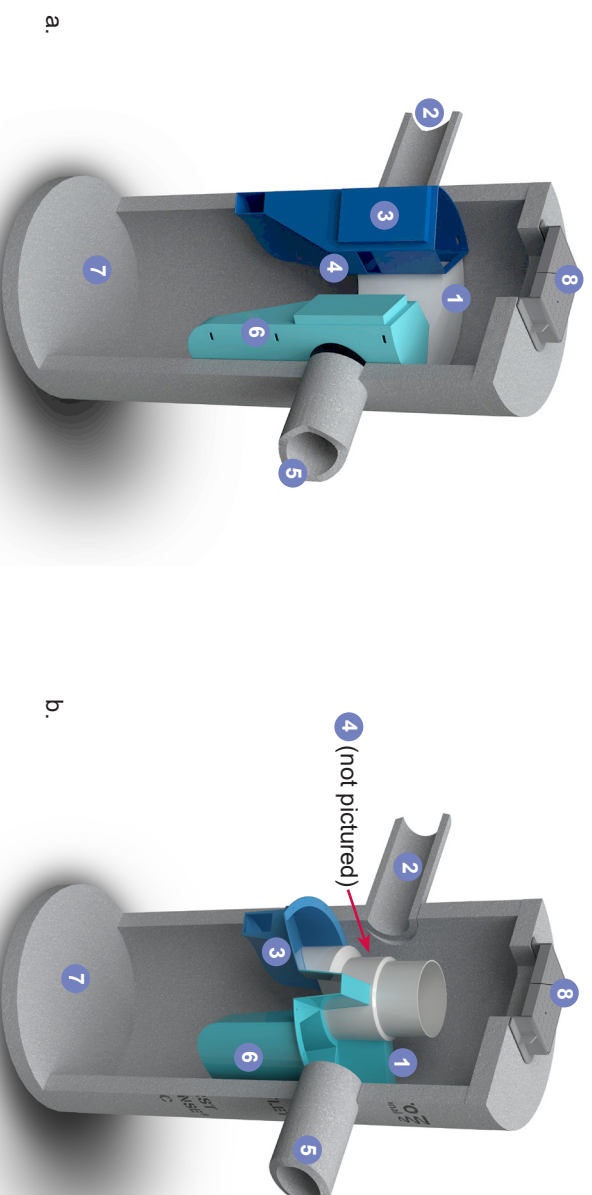


Fig. 2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

| First Defense® High Capacity Model Number | Diameter (ft / m) | Typical TSS Treatment Flow Rates NUDEP Certified | | Peak Online Flow Rate (cfs / L/s) | Maximum Pipe Diameter ¹ (in / mm) | Oil Storage Capacity (gal / L) | Typical Sediment Storage Capacity ² (yds ³ / m ³) | Minimum Distance from Outlet Invert to Top of Rim ³ (ft / m) | Chamber Depth (ft / m) |
|---|-------------------|--|-------------|-----------------------------------|--|--------------------------------|---|---|------------------------|
| | | (cfs / L/s) | (cfs / L/s) | | | | | | |
| FD-3HC | 3 / 0.9 | 0.85 / 24.0 | 15 / 424 | 18 / 457 | 125 / 473 | 0.4 / 0.3 | 2.0 - 3.5 / 0.6 - 1.0 | 3.75 / 1.14 | |
| FD-4HC | 4 / 1.2 | 1.50 / 42.4 | 18 / 510 | 24 / 600 | 191 / 723 | 0.7 / 0.5 | 2.3 - 3.9 / 0.7 - 1.2 | 5.00 / 1.52 | |
| FD-5HC | 5 / 1.5 | 2.35 / 66.2 | 20 / 566 | 24 / 609 | 300 / 1135 | 1.1 / .84 | 2.5 - 4.5 / 0.7 - 1.3 | 5.25 / 1.60 | |
| FD-6HC | 6 / 1.8 | 3.38 / 95.7 | 32 / 906 | 30 / 750 | 496 / 1878 | 1.6 / 1.2 | 3.0 - 5.1 / 0.9 - 1.6 | 6.25 / 1.90 | |
| FD-7HC | 7 / 2.1 | 4.60 / 130.2 | 40 / 1133 | 42 / 1067 | 750 / 2839 | 2.1 / 1.9 | 3.0 - 5.5 / 0.9 - 1.7 | 7.25 / 2.20 | |
| FD-8HC | 8 / 2.4 | 6.00 / 169.9 | 50 / 1,415 | 48 / 1,219 | 1120 / 4239 | 2.8 / 2.1 | 3.0 - 6.0 / 0.9 - 1.8 | 8.00 / 2.43 | |

¹Contact Hydro International when larger pipe sizes are required.

²Contact Hydro International when custom sediment storage capacity is required.

³Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vacor truck is not required. However, a vacor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vacor hose used for maintenance should be less than 15 inches in diameter.

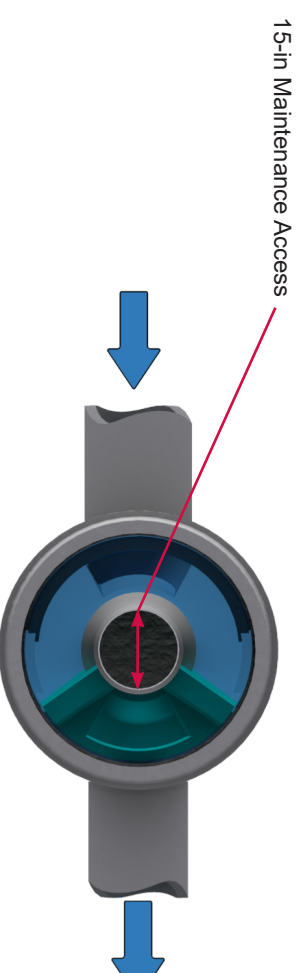


Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vacor procedure, including both sediment and oil / floatables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.
6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.
- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

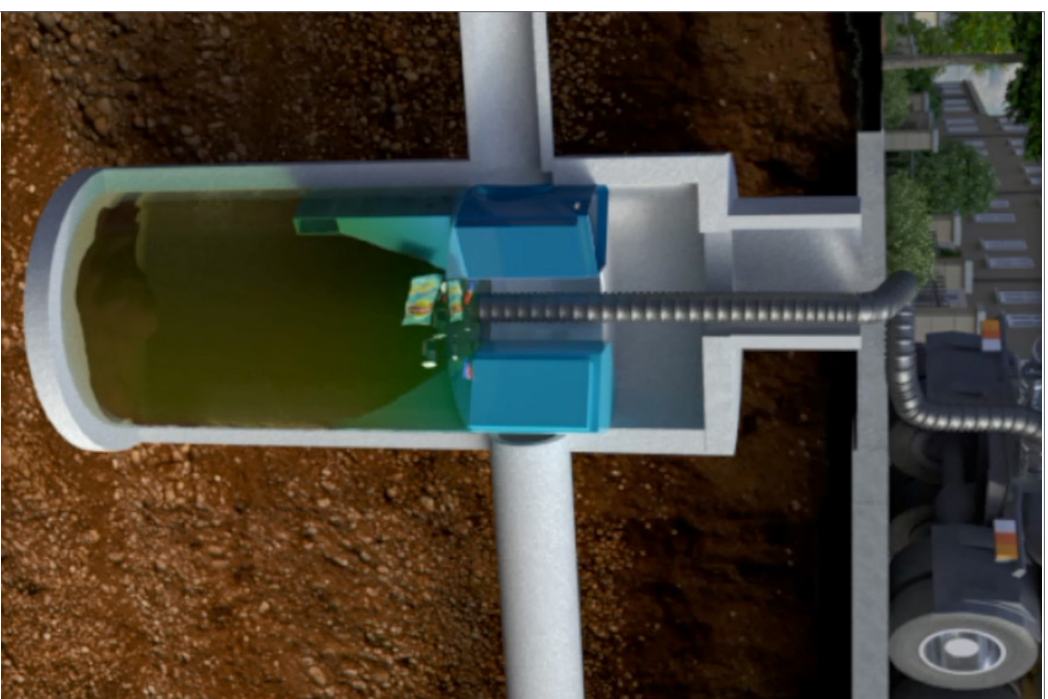


Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.
9. Securely replace the grate or lid.

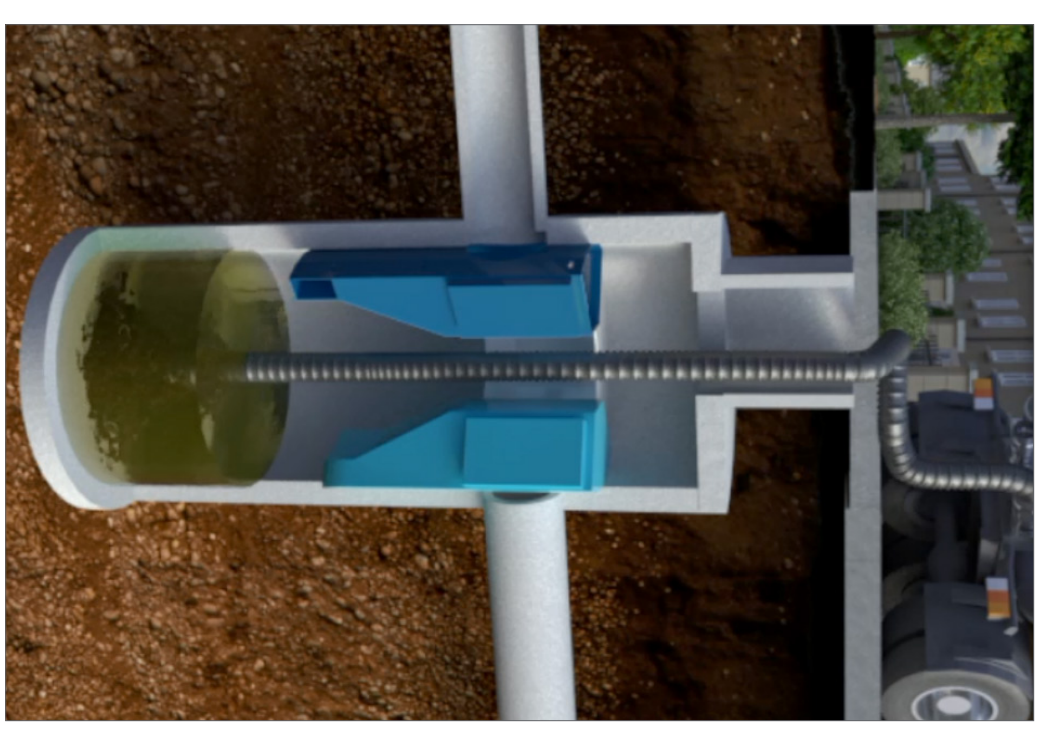


Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

| | |
|----------------------------|--|
| Inspection | <ul style="list-style-type: none"> - Regularly during first year of installation - Every 6 months after the first year of installation |
| Oil and Floatables Removal | <ul style="list-style-type: none"> - Once per year, with sediment removal - Following a spill in the drainage area |
| Sediment Removal | <ul style="list-style-type: none"> - Once per year or as needed - Following a spill in the drainage area |

NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.



First Defense® Installation Log

First Defense® Inspection and Maintenance Log

| | |
|---------------------------------------|---------------|
| HYDRO INTERNATIONAL REFERENCE NUMBER: | |
| SITE NAME: | |
| SITE LOCATION: | |
| OWNER: | CONTRACTOR: |
| CONTACT NAME: | CONTACT NAME: |
| COMPANY NAME: | COMPANY NAME: |
| ADDRESS: | ADDRESS: |
| TELEPHONE: | TELEPHONE: |
| FAX: | FAX: |

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): FD-3HC FD-4 FD-4HC FD-5HC FD-6 FD-6HC

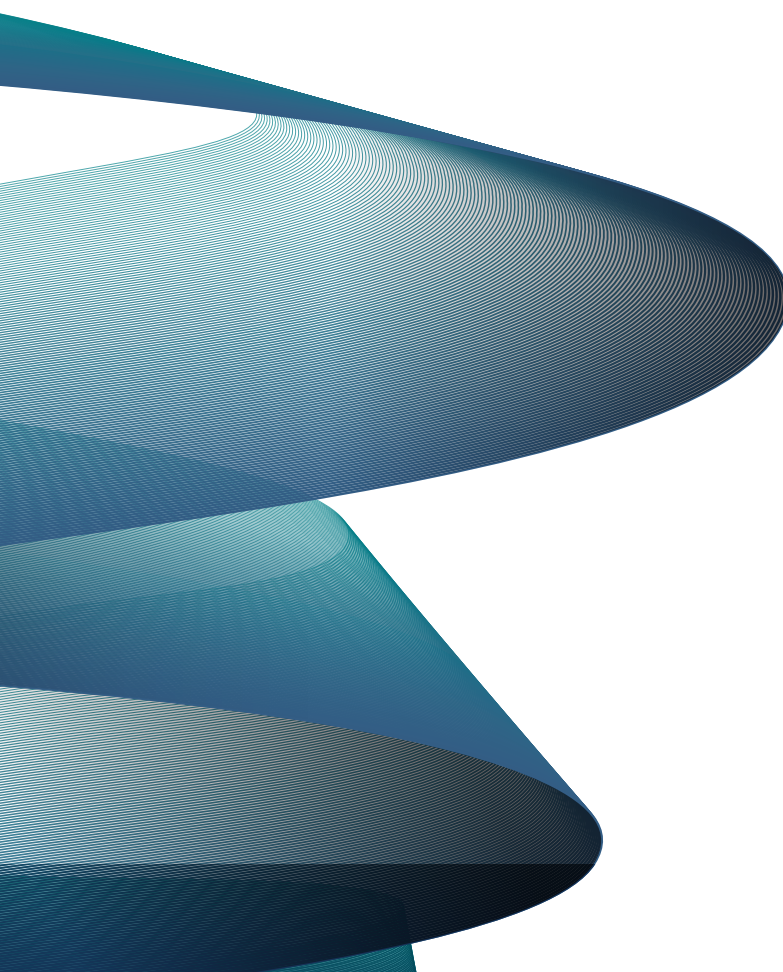
FD-7HC FD-8HC

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

| Date | Initials | Depth of Floatables and Oils | Sediment Depth Measured | Volume of Sediment Removed | Site Activity and Comments |
|------|----------|------------------------------|-------------------------|----------------------------|----------------------------|
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Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com



Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200

Fax: (207) 756-6212

stormwaterinquiry@hydro-int.com

www.hydro-int.com

9.1 ISOLATOR ROW 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. 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" (76 mm), cleanout is required.

A StormTech Isolator Row 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 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.

9.2 ISOLATOR ROW MAINTENANCE

JetVac maintenance is recommended if sediment has been collected to an average depth of 3" (76 mm) inside the Isolator Row. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row 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" (1143 mm) are best. The JetVac process shall only be performed on StormTech Rows that have AASHTO class 1 woven geotextile over their foundation stone (ADS 315WTM or equal).



Looking down the Isolator Row



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



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