



**ENGINEERING  
& SURVEY INC.**



CHARLTON, MA

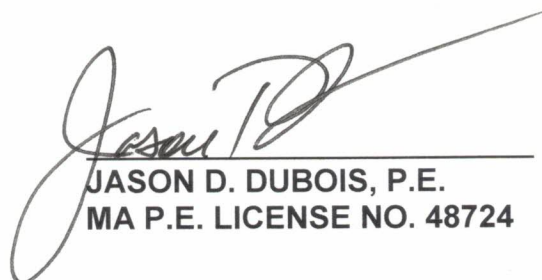
508-769-6659  
508-341-2127

## STORMWATER DRAINAGE ANALYSIS

**760 Pleasant Street  
Charlton, MA  
JOB NUMBER 2022-177**

**DATE : October 28, 2022**

**Developer:  
760 Pleasant Street Realty Limited Partnership  
PO Box 99  
Paxton, MA 01610**



**JASON D. DUBOIS, P.E.  
MA P.E. LICENSE NO. 48724**

## **Existing Conditions**

The existing site contains an existing commercial building and an existing parking lot, partially paved with gravel areas. The site is considered an AUL with the Massachusetts Department of Environmental Protection. The overall site contains approximately 11.2 acres, which is mostly wooded.

## **The Project**

The proposed project is to re pave areas that were previously paved. There will be approximately 0.52 acres of paved area once complete. The existing area currently has catch basins which ultimately route to a culvert under Pleasant Street and discharge to a swale on the opposite side of the road. As can be seen on the site plan, there is minor grading proposed to promote better water flow to the two proposed deep sump hooded catch basins. These catch basins flow to a proprietary treatment unit before flowing through the existing culvert under Pleasant Street for an overall improvement in the water quality leaving the site.

## **STORMWATER MANAGEMENT CALCULATIONS**

### **Standard #1, No New Untreated Discharges:**

No new untreated discharges are proposed to existing wetland resources. The proposed site development will follow the same drainage patterns as the existing.

### **Standard #2, Post-development peak Discharge Rates:**

Post-development peak discharge rates do not exceed pre-development rates on the site at the points of discharge.

### **Standard #3, Recharge to groundwater**

No recharge is proposed

### **Standard #4, 80% TSS Removal**

TSS removal is achieved through the deep-sump hooded catch basins and a water quality unit.

### **Standard #5, Land Uses With Higher Potential Pollutant Loads (LUHPPLs)**

The proposed Land Use is listed as a Higher Potential Pollutant Load.

**Standard #6, Critical Areas**

The site does not discharge to a critical area

**Standard #7, Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable**

The site is considered a redevelopment project

**Standard #8, Construction Period Pollution Prevention and Erosion and Sedimentation Control**

A Site Plan that shows stormwater controls has been provided under the title of "Site Plan".

**Standard #9, Operation/maintenance plan**

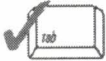
See Attached Operation/maintenance plan



# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

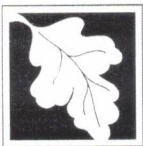
In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

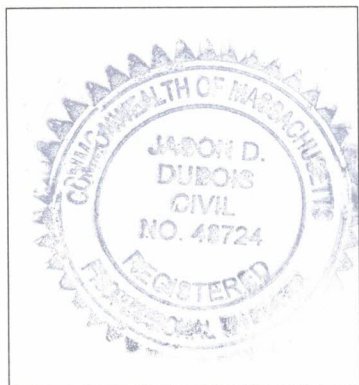
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



*Jason D. Dubois*  
Signature and Date

### Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
  - Credit 1
  - Credit 2
  - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - Static
  - Simple Dynamic
  - Dynamic Field<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - is within the Zone II or Interim Wellhead Protection Area
    - is near or to other critical areas
    - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - involves runoff from land uses with higher potential pollutant loads.
  - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.





# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
  - The ½" or 1" Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior to* the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
- Limited Project
  - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - Bike Path and/or Foot Path
  - Redevelopment Project
  - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - Name of the stormwater management system owners;
  - Party responsible for operation and maintenance;
  - Schedule for implementation of routine and non-routine maintenance tasks;
  - Plan showing the location of all stormwater BMPs maintenance access areas;
  - Description and delineation of public safety features;
  - Estimated operation and maintenance budget; and
  - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

**Illicit Discharge Compliance Statement**  
**October 28, 2022**

This statement is to document that there are no and will be no Illicit Discharges for the repaving of the parking lot located at 760 Pleasant Street, Leicester, MA operated by 760 Pleasant Street Realty Limited Partnership.

\_\_\_\_\_  
760 Pleasant Street Realty Limited Partnership

\_\_\_\_\_  
Date

Tributary to Infiltration Basin

Location: 760 Pleasant St., Leicester, MA

# TSS Removal Calculation Worksheet

B BMP	C TSS Removal 0	D Starting TSS Load	E Amount Removed (C*D)	F Remaining Load (D-E)
Catch Basin	0.25	1.00	0.25	0.75
Contech CS-4	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Separate Form  
Needs to be  
Completed for  
Each Outlet or  
BMP Train

85%

**Total TSS Removal =**

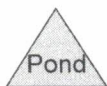
2021-220
J. Dubois
2/18/2022

Project No.

\*Equals remaining load from previous BMP (E)  
which enters the BMP



# Water Quality Volume



**Existing**

Prepared by Microsoft

HydroCAD® 10.00-16 s/n 09355 © 2015 HydroCAD Software Solutions LLC

Type III 24-hr Rainfall=1.27"

Printed 10/20/2022

Page 2

**Summary for Subcatchment 2S: Water Quality Volume**

Runoff = 0.61 cfs @ 12.07 hrs, Volume= 0.043 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=1.27"

	Area (sf)	CN	Description
*	22,772	98	Asphalt
	22,772		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					<b>Direct Entry,</b>

## Hydrodynamic Separation Product Calculator

760 Pleasant St

760 Pleasant St

CASCADE SEPARATOR CS-4

Project Information					
Project Name	760 Pleasant St			Option #	A
Country	UNITED_STATES	State	Massachusetts	City	Leicester

Contact Information					
First Name	Jason		Last Name	Dubois	
Company	DC Engineering & Survey Inc.		Phone #	508-769-6659	
Email	jdub862001@yahoo.com				

Design Criteria					
Site Designation	760 Pleasant St			Sizing Method	Net Annual
Screening Required?	No	Drainage Area (ac)	0.52	Peak Flow (cfs)	0.61
Groundwater Depth (ft)	0 - 5	Pipe Invert Depth (ft)	0 - 5	Bedrock Depth (ft)	10 - 15
Multiple Inlets?	No	Grate Inlet Required?	No	Pipe Size (in)	12.00
Required Particle Size Distribution?	No	90° between two inlets?	N/A	180° between inlet and outlet?	No
Runoff Coefficient	0.90	Rainfall Station	70 - East Brimfield Lake, MA	TC (Min)	5

Treatment Selection					
Treatment Unit	CASCADE SEPARATOR	System Model	CS-4		
Target Removal	80%	Particle Size Distribution (PSD)	110	Predicted Net Annual Removal	99.22%

\*Treatment flow rate calculated using annualized weighted calculation.



## Hydrodynamic Separation Product Calculator

760 Pleasant St

760 Pleasant St

### CASCADE SEPARATOR CS-4

CASCADE SEPARATOR ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity <sup>1</sup> (in/hr)	% Rainfall Volume <sup>1</sup>	Cumulative Rainfall Volume	Rainfall Volume Treated	Total Flowrate (cfs)	Treated Flowrate (cfs)	Hydraulic Loading Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.0400	15.20%	15.20%	15.20%	0.0200	0.0200	%	100.00%	15.15%
0.0800	24.60%	39.80%	24.60%	0.0400	0.0400	%	100.00%	24.57%
0.1200	13.70%	53.50%	13.70%	0.0600	0.0600	%	100.00%	13.70%
0.1600	9.40%	62.90%	9.40%	0.0700	0.0700	%	100.00%	9.41%
0.2000	6.60%	69.50%	6.60%	0.0900	0.0900	%	100.00%	6.63%
0.2400	5.20%	74.70%	5.20%	0.1100	0.1100	%	100.00%	5.24%
0.2800	4.80%	79.50%	4.80%	0.1300	0.1300	%	100.00%	4.78%
0.3200	3.10%	82.60%	3.10%	0.1500	0.1500	%	100.00%	3.14%
0.3600	2.70%	85.30%	2.70%	0.1700	0.1700	%	100.00%	2.71%
0.4000	2.10%	87.40%	2.10%	0.1900	0.1900	%	100.00%	2.10%
0.4800	2.50%	89.90%	2.50%	0.2200	0.2200	%	100.00%	2.47%
0.5600	2.00%	91.90%	2.00%	0.2600	0.2600	%	100.00%	2.02%
0.6400	1.40%	93.30%	1.40%	0.3000	0.3000	%	100.00%	1.42%
0.7200	1.00%	94.30%	1.00%	0.3400	0.3400	%	100.00%	1.00%
0.8000	1.10%	95.40%	1.10%	0.3700	0.3700	%	99.48%	1.06%
1.0000	1.70%	97.10%	1.70%	0.4700	0.4700	%	96.13%	1.59%
1.2000	0.90%	98.00%	0.90%	0.5600	0.5600	%	93.10%	0.87%
1.4000	0.60%	98.60%	0.60%	0.6600	0.6600	%	89.74%	0.54%
1.6000	0.50%	99.10%	0.50%	0.7500	0.7500	%	86.73%	0.42%
1.8000	0.50%	99.60%	0.50%	0.8400	0.8400	%	83.71%	0.40%
								99.22%
Removal Efficiency Adjustment <sup>2</sup> =								
Predicted % Annual Rainfall Treated =								99.60%
Predicted Net Annual Load Removal Efficiency =								99.22%
1 - Based on 14 years of 15-minute rainfall data from NCDC Station 2107, East Brimfield Lake, Worcester County, MA								
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.								

\*Treatment flow rate calculated using annualized weighted calculation.

SECTION (\_\_\_\_)  
STORM WATER TREATMENT DEVICE

1.0 GENERAL

- 1.1 This item shall govern the furnishing and installation of the Cascade Separator™ by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.
- 1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.
- 1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a Cascade Separator™ device manufactured by:

Contech Engineered Solutions LLC  
9025 Centre Pointe Drive  
West Chester, OH, 45069  
Tel: 1 800 338 1122

1.4 Related Sections

- 1.4.1 Section 02240: Dewatering
  - 1.4.2 Section 02260: Excavation Support and Protection
  - 1.4.3 Section 02315: Excavation and Fill
  - 1.4.4 Section 02340: Soil Stabilization
- 1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.
  - 1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.
  - 1.7 The SWTD manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certification” certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications. The certification shall be supported by independent third-party research

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

## 2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
- 2.2.2 Support brackets shall be manufactured of 5052 Aluminum
- 2.2.3 Fiberglass components shall conform to applicable sections of ASTM D-4097
- 2.2.4 Access system(s) conform to the following:
- 2.2.5 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.

## 3.0 PERFORMANCE

3.1 The SWTD shall be capable of achieving an annualized weighted reduction of at least 80% of the OK-110 particle distribution having particles ranging from 53 microns to 212 microns with a  $d_{50}$  of approximately 110 microns unless otherwise stated.

3.2 The SWTD shall be designed with a sump chamber for the storage of captured sediments and other negatively buoyant pollutants in between maintenance cycles. The minimum storage capacity provided by the sump chamber shall be in accordance with the volume listed in Table 1. The boundaries of the sump chamber shall be limited to that which do not degrade the

SWTD's treatment efficiency as captured pollutants accumulate. In order to not restrict the Owner's ability to maintain the SWTD, the minimum dimension providing access from the ground surface to the sump chamber shall be 16 inches in diameter.

- 3.3 The SWTD shall be designed to capture and retain Total Petroleum Hydrocarbons generated by wet-weather flow and dry-weather gross spills and have a capacity listed in Table 1 of the required unit.
- 3.4 The SWTD shall convey the flow from the peak storm event of the drainage network, in accordance with required hydraulic upstream conditions as defined by the Engineer. If a substitute SWTD is proposed, supporting documentation shall be submitted that demonstrates equal or better upstream hydraulic conditions compared to that specified herein. This documentation shall be signed and sealed by a Professional Engineer registered in the State of the work. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

4.0 EXECUTION

- 4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.
- 4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.
- 4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.
- 4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

**TABLE 1: Storm Water Treatment Device Storage Capacities**

Cascade Model	Minimum Sump Storage Capacity (yd <sup>3</sup> )	Minimum Oil Storage Capacity (gal)
CS-4	0.70	141.0
CS-5	1.09	269.3
CS-6	1.57	475.9
CS-8	2.79	1128.0
CS-10	4.36	2203.2
CS-12	6.28	3807.1

**END OF SECTION**

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part





































Soil Map may not be valid at this scale.

Map Scale: 1:2,750 if printed on A landscape (11" x 8.5") sheet.



## MAP LEGEND

 Area of Interest (AOI)	 C
 Soils	 C/D
 Soil Rating Polygons	 D
 A	 Not rated or not available
 A/D	 Streams and Canals
 B	<b>Transportation</b>
 B/D	 Rails
 C	 Interstate Highways
 C/D	 US Routes
 D	 Major Roads
 Not rated or not available	 Local Roads
<b>Soil Rating Lines</b>	<b>Background</b>
 A	 Aerial Photography
 A/D	
 B	
 B/D	
 C	
 C/D	
 D	
 Not rated or not available	
<b>Soil Rating Points</b>	
 A	
 A/D	
 B	
 B/D	

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Southern Part  
Survey Area Data: Version 15, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	B/D	0.5	1.4%
300C	Montauk fine sandy loam, 8 to 15 percent slopes	C	9.1	24.7%
302B	Montauk fine sandy loam, 0 to 8 percent slopes, extremely stony	C	6.0	16.3%
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	C	14.2	38.4%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	0.2	0.5%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	6.3	17.0%
651	Udorthents, smoothed	A	0.6	1.6%
<b>Totals for Area of Interest</b>			<b>36.9</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

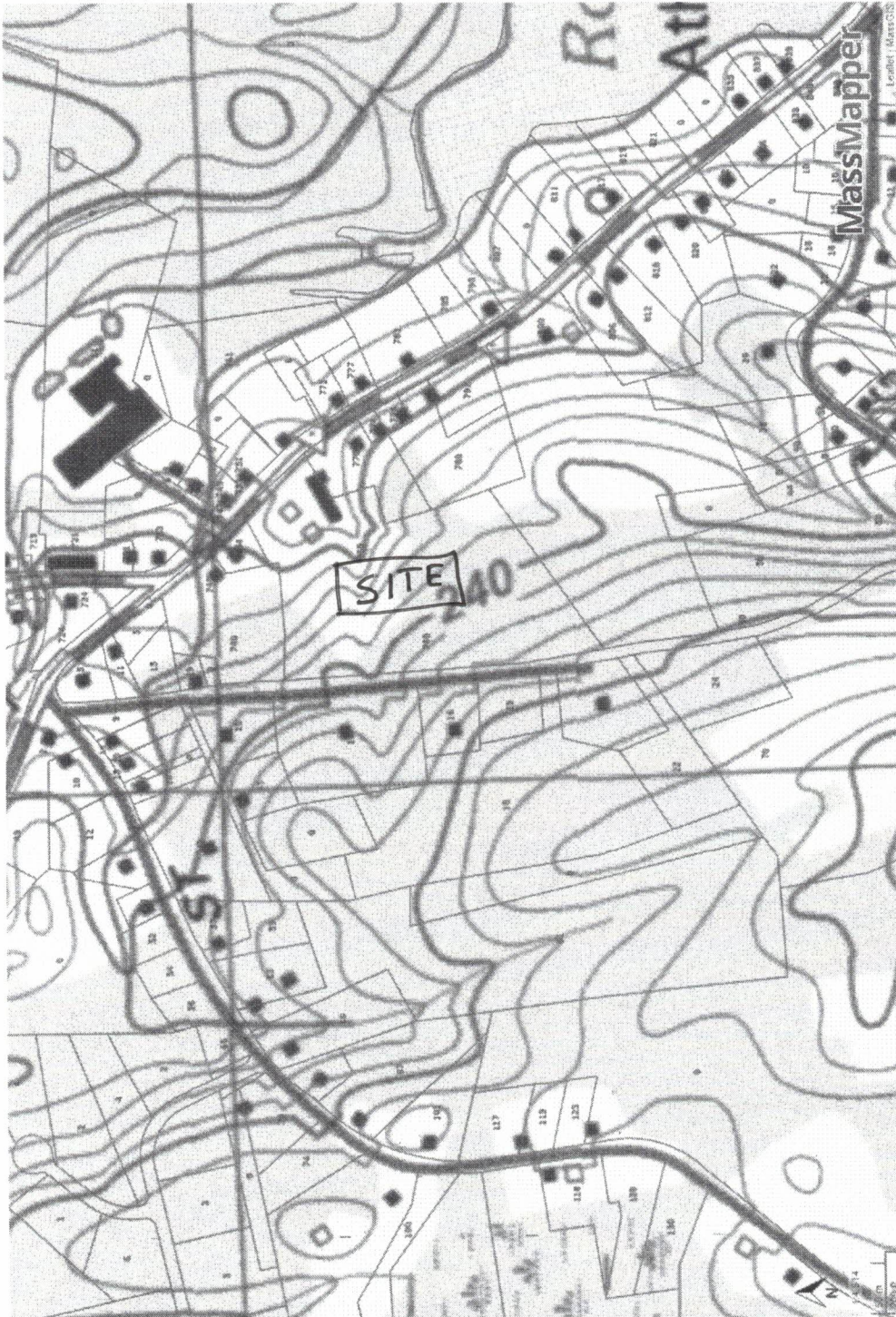
*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



Property Tax Parcels  
USGS Topographic Maps  
2021 Aerial Imagery



**Stormwater Operation and Maintenance Plan  
& Long-term Pollution Prevention Plan  
for  
760 Pleasant Street  
Leicester, MA  
Job #2022-177**

**October 28, 2022**

**Prepared by**

**DC Engineering & Survey, Inc.  
32 Cranberry Meadow Road  
Charlton, MA 01507**

**Stormwater Operation and Maintenance Plan**  
**for**  
760 Pleasant Street  
Leicester, MA

This is an Operation and Maintenance Plan for the Definitive Subdivision plan.

Current Operator:

760 Pleasant Street Realty Limited Partnership  
PO Box 99  
Paxton, MA 01610

Long term Operator of Stormwater System:

Owner of the site

**Stormwater Management Systems**

The stormwater management system for the site is as follows:

- Deep Sump Hooded Catch Basin
- Proprietary Unit – Contech CS-4

**Inspection Schedule**

**The inspection log shall be completed after every inspection of each component listed below. (See attached Inspection Log sheet)**

Catch Basins

Check for sediment accumulation quarterly, maintenance required when the depth of deposits is greater than or equal to one half of the sump depth.

Proprietary Unit

Check for sediment accumulation twice per year.

**Maintenance Procedures**

**Maintenance log shall be completed after any maintenance is performed on any component listed. (See attached Maintenance Log sheet)**

### *Catch Basins*

After winter sand is removed from the parking lot, use a clamshell to remove sediment from the sump of catch basins and inspect hoods to ensure proper use. Remove sediment more frequently if needed.

### *Proprietary Unit*

See attached Maintenance guide

### **Plans:**

Plans indicating the location and features of the stormwater management system can be found on the Definitive Subdivision Plan for History Estates.

### **Description of Public Safety Features:**

All features associated with the stormwater controls are located above ground and are designed with a maximum of 3:1 slopes so should not pose any danger to the public.

### **Operation and Maintenance Budget:**

The owner will have to pay for a service to perform the operation and maintenance described above; therefore the budget is mainly for labor and disposal of sediment collected.

The estimated yearly cost is approximately \$1,000.00



**Long-term Pollution Prevention Plan**  
**for**  
760 Pleasant Street  
Leicester, MA

This is a Long-term Pollution Prevention Plan for the above-mentioned site.

Current Operator:

760 Pleasant Street Realty Limited Partnership  
PO Box 99  
Paxton, MA 01610

Long term Operator of Plan:

Owner of the Site

**Good Housekeeping:**

Good housekeeping practices, outlined below, will be used on site:

An effort will be made to store only enough products that will be needed.

All materials stored on site will be stored neatly, in their appropriate containers, and, if possible, under a roof or other enclosure.

Products will be kept in their original containers with the original manufacturer's label.

Substances will not be mixed with one another unless recommended by the manufacturer.

Whenever possible, all of a product will be used up before disposing of the container.

Manufacturer's recommendations for proper use and disposal will be followed.

**Routine Inspections:**

Routine inspections and procedures are outlined in the Stormwater Operation & Maintenance Plan.

**Waste Materials:**

All waste materials will be collected and stored in a metal dumpster. All trash and debris from the site will be deposited in the dumpsters. Dumpsters will be emptied weekly or more often if necessary, and the trash will be hauled off-site to an approved waste facility. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal. Individual(s) managing day-to-day operations will be responsible for seeing that these procedures are followed.

**Hazardous Waste:**

All hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Site personnel will be instructed in these practices and the individual managing day-to-day operations will be responsible for implementing these practices.

### **Hazardous Materials:**

These practices will be used to reduce the risks associated with hazardous materials.

Products will be kept in original containers unless they are not re-sealable. Original labels and material safety data sheets (MSDS) will be retained; they contain important product information. Manufacturers' and local and/or state recommended methods for proper disposal of excess materials will be followed.

### **Spill Control Practices:**

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be used for spill prevention and cleanup:

Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be familiar with the procedures and location of the information and cleanup supplies.

Materials and equipment necessary for spill cleanup will be kept in the material storage area on site. Equipment and materials will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

All spills will be cleaned up immediately upon discovery.

Spill areas will be kept well ventilated, and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size of the spill.

The spill prevention plan will be adjusted to include measures to prevent this type of spill from re-occurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.

### **Snow and Ice Management:**

Any deicing materials will be stored indoors and used per manufacturer's recommendations. Site personnel will be instructed in these practices and the individual managing day-to-day operations will be responsible for implementing these practices.

**Grass Cutting:**

The grass shall be cut to a depth of no less than 3 inches and should be cut as needed during the growing season.

**Supporting Plans & Analyses:**

Definitive Subdivision and Detail Drawings

Stormwater Operation and Maintenance Plan, Stormwater Drainage Analysis



## Cascade Separator<sup>®</sup> Inspection and Maintenance Guide



CASCADE  
separator<sup>®</sup>

## Maintenance

The Cascade Separator<sup>®</sup> system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects sediment and debris will depend upon on-site activities and site pollutant characteristics. For example, unstable soils or heavy winter sanding will cause the sediment storage sump to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

## Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall). However, more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment wash-down areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

A visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet chamber, flumes or outlet channel. The inspection should also quantify the accumulation of hydrocarbons, trash and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided in this Inspection and Maintenance Guide.

Access to the Cascade Separator unit is typically achieved through one manhole access cover. The opening allows for inspection and cleanout of the center chamber (cylinder) and sediment storage sump, as well as inspection of the inlet chamber and slanted skirt. For large units, multiple manhole covers allow access to the chambers and sump.

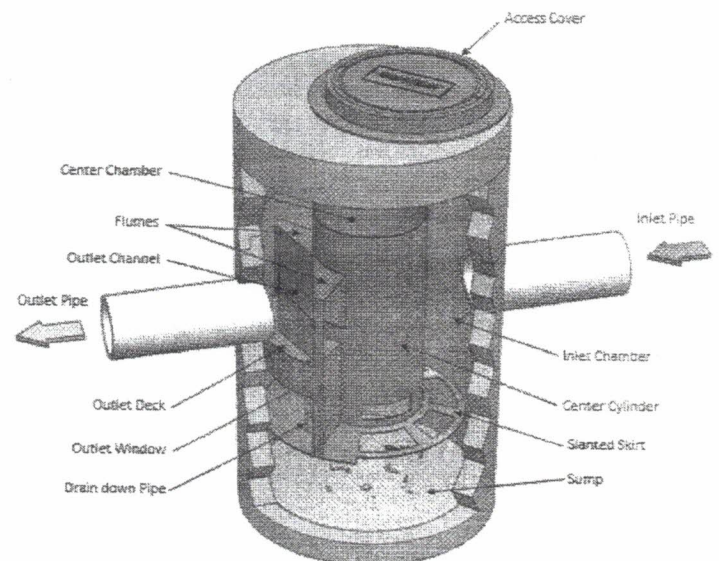
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance may be impacted when maximum sediment storage capacity is exceeded. Contech recommends maintaining the system when sediment level reaches 50% of maximum storage volume. The level of sediment is easily determined by measuring the distance from the system outlet invert (standing water level) to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the chart in this document to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage.

## Cleaning

Cleaning of a Cascade Separator system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole cover and insert the vacuum tube down through the center chamber and into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The areas outside the center chamber and the slanted skirt should also be washed off if pollutant build-up exists in these areas.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. Then the system should be power washed to ensure it is free of trash and debris.

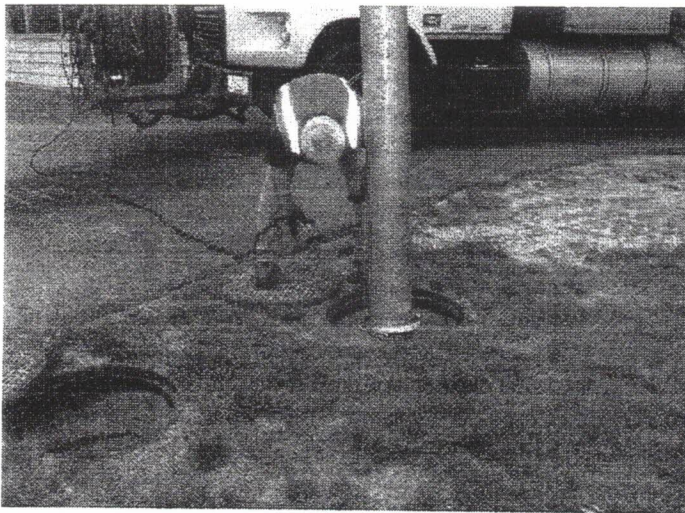
Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and to ensure proper safety precautions. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the Cascade Separator system must be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal. If any components are damaged, replacement parts can be ordered from the manufacturer.



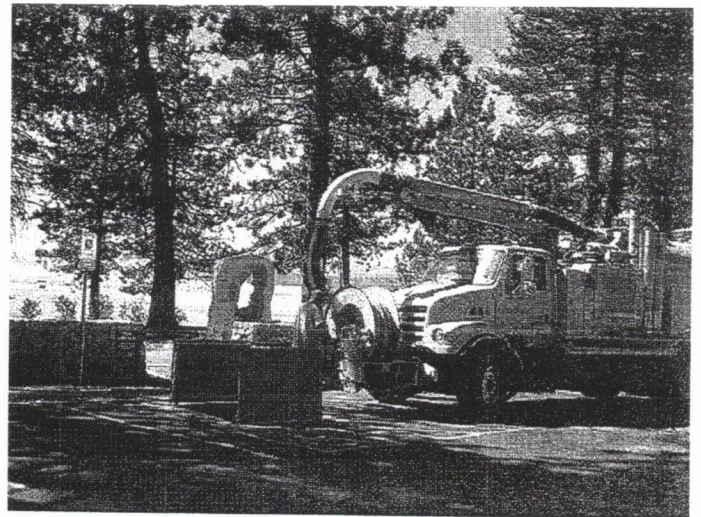
# Cascade Separator® Maintenance Indicators and Sediment Storage Capacities

Model Number	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y <sup>3</sup>	m <sup>3</sup>
CS-3	3	0.9	1.5	0.5	0.4	0.3
CS-4	4	1.2	2.5	0.8	0.7	0.5
CS-5	5	1.3	3	0.9	1.1	0.8
CS-6	6	1.8	3.5	1	1.6	1.2
CS-8	8	2.4	4.8	1.4	2.8	2.1
CS-10	10	3.0	6.2	1.9	4.4	3.3
CS-12	12	3.6	7.5	2.3	6.3	4.8

Note: The information in the chart is for standard units. Units may have been designed with non-standard sediment storage depth.



A Cascade Separator unit can be easily cleaned in less than 30 minutes.



A vacuum truck excavates pollutants from the systems.

