January 20, 2026

Cestoil Chemical Inc.
1726 Baseline Road West
Courtice, ON L1E 2S8

Attention: Mr. Samuel L. Xiong

Re: Stormwater Management Letter / Report
1726 Baseline Road West
Courtice, ON
Our File: 115160

Dear Mr. Xiong,

In support of the Site Plan Application for the above referenced proposal, we herewith submit the following Operations and Maintenance Manual. This manual will provide the required information to facilitate maintenance of the specified on-site stormwater quality infrastructure.

Please contact our office at your convenience, should you have any questions or require additional information on the enclosed report.

Yours truly,

D.G. Biddle & Associates Limited

S.L. Armstrong, BASc
Intermediate Designer
Civil Group

D.G. BIDDLE & ASSOCIATES
CONSULTING ENGINEERS & PLANNERS

OSHAWA
200-481 Taunton Road West
Oshawa, ON L1J 0G3
905-576-8500

PETERBOROUGH
402-150 King Street
Peterborough, ON K9J 2R9
705-201-0272

dgbiddle.com

OPERATIONS AND MAINTENANCE MANUAL

FOR

STORMWATER MANAGEMENT CONTROLS

CESTOIL CHEMICAL INC.

1726 BASELINE ROAD WEST

COURTICE, ONTARIO

PROJECT NO. 115160

DATE: September 2025

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

As part of the Stormwater Management (SWM) strategy for 1726 Baseline Road West, this Operations and Maintenance Manual has been prepared to satisfy the conditions of Site Plan Approval. This operations and maintenance report will provide the required information to facilitate maintenance of the specified on-site stormwater quality infrastructure.

1.1 Study Area

The subject property is located on the north side of Baseline Road West, Part of Lot 29, Concession 1 in the Municipality of Clarington, Regional Municipality of Durham. The site is bounded on the north by Cigas Road, on the west and east sides by an existing industrial property, and on the south by Baseline Road West.

The site location plan is illustrated in **Figure 1**.

1.2 Previous Documentation

This stormwater quality infrastructure operations and maintenance manual, in conformance with the guidelines prescribed in the Central Lake Ontario Conservation Authority (CLOCA) Technical Guidelines for Stormwater Management Submissions (October 2020), was based on the following report:

- Functional Servicing and Stormwater Management and Report, Site Plan Application No. SPA-2025-0012 1726 Baseline Road West, Courtice, Regional Municipality of Durham, dated September 5, 2025, and prepared by D.G. Biddle and Associates Ltd.

1.3 Stormwater Quality Infrastructure

Quality control is proposed by use of two catch basin shields, a sediment row located in a 10-unit Armtec Hydrostor HS-75 Chamber Bed, and a CDS Technologies Unit 2015-5-C System. The CB Shield provides an environmental benefit of controlling sediment wash off at upstream locations. The CB shield deflects flow into catch basins thereby dissipating energy and allowing for the settling of suspended solids. The CB Shield is an ETV Canda recognized product and is acknowledged by the Municipality of Clarington to provide 53% TSS removal. Refer to Appendix A for the CB Shield Information. The sediment row consists of a series of chambers installed directly on top of two layers of woven geotextile. The geotextile acts as a filter and prevents sediment from accumulating in the voids of the clear stone bedding. Refer to Appendix A for the Hydrostor Inspection and Maintenance Guide. The CDS unit is a continuous deflective separation technology, the CDS system screens, separates, and traps debris, sediment, and oil and grease from stormwater runoff. A CDS unit is an ETV Canada recognized product and is acknowledged by the Municipality of Clarington to provide 50% TSS removal. Refer to Appendix A for the CDS Operation, Design, Performance and Maintenance. Together, these three systems will provide an Enhanced level of water quality treatment for the site.

Many factors influence the operations and maintenance requirements. For the stormwater quality infrastructure serving the proposed development, maintenance is generally the responsibility of the developer/owner during the construction period and thereafter.

The following sections outline recommendations for the general operations and maintenance of the proposed stormwater quality infrastructure.

2.0 CDS UNIT – 2015-5-C System

A CDS Unit is currently downstream of the parking area catch basins, Hydrostor Chamber Bed, and stormwater detention tank internal to the proposed building. It will be situated in the drive aisle on the south side of the building and will be accessible via the drive aisle.

2.1 Inspections & Maintenance

The developer is to coordinate with the manufacturer to adhere to the recommended inspections and sediment cleaning, as outlined in the attached CDS Guide: Operation, Design, Performance and Maintenance (See Appendix A).

3.0 CB SHIELDS

A total of two CB Shields are proposed to be inserted into the existing catch basin manholes on site, CBMH-3 and CBMH-4. Both structures capture surface runoff from asphalt and gravel driving surfaces and convey rooftop runoff from the existing building. One structure is upstream of the Hydrostor Chamber Bed. Both structures are upstream of the stormwater detention tank internal to the proposed building, therefore being upstream of the CDS Unit described in section 2.0.

3.1 Inspections & Maintenance

The developer is to coordinate with the manufacturer to adhere to the recommended inspections and sediment cleaning, as outlined in the attached CB Shield Operations Manual (See Appendix A).

4.0 SEDIMENT ROW

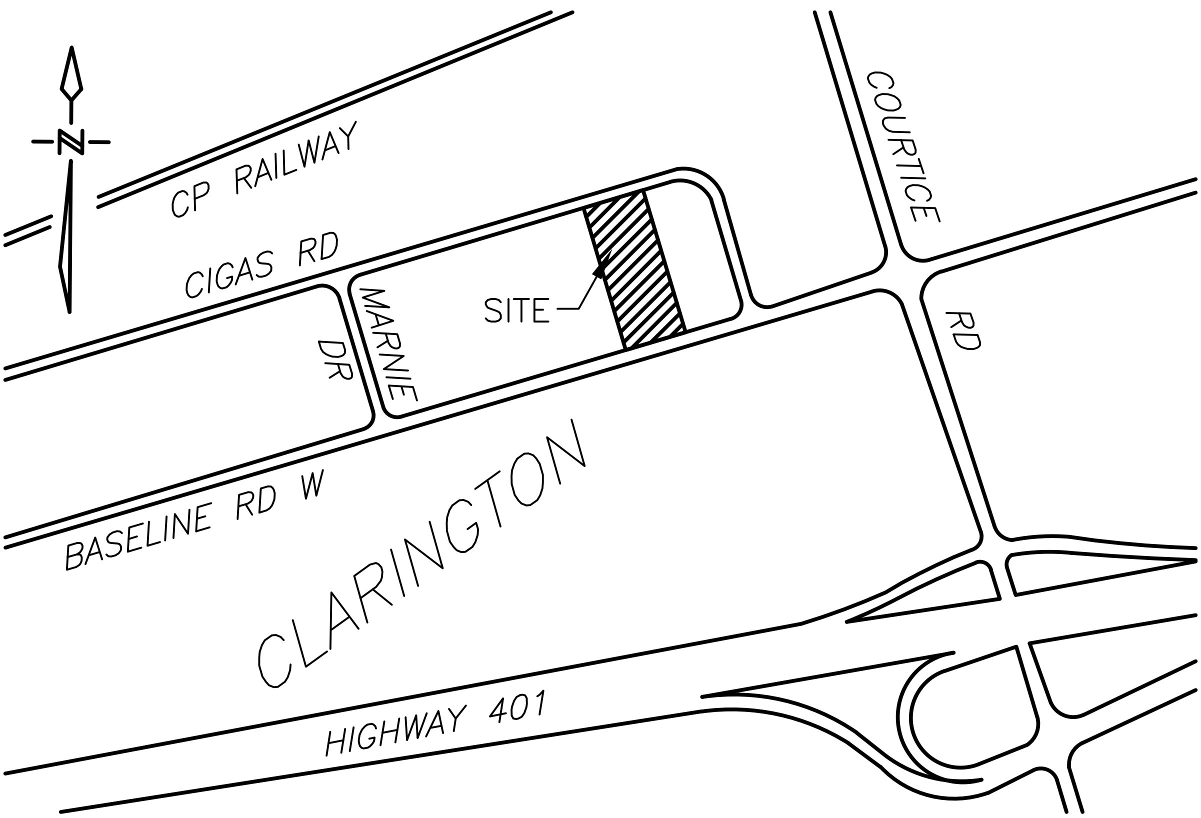
The sediment row is proposed to span 5 units of the 10-unit chamber bed. Upstream of the sediment row there shall be a PVC cleanout structure with a sump, and a 200mm inspection port located along the sediment row.

4.1 Inspections & Maintenance

The developer is to coordinate with the manufacturer to adhere to the recommended inspections and sediment cleaning, as outlined in the attached Hydrostor Inspection and Maintenance Guide (See Appendix A).

Respectfully Submitted:

D.G. Biddle and Associates Ltd.



1726 BASELINE ROAD WEST, COURTICE, ON FOR: CESTOIL CHEMICAL INC.

SITE LOCATION PLAN

D.G. BIDDLE & ASSOCIATES
CONSULTING ENGINEERS & PLANNERS

481 Taunton Rd W, Oshawa ON
150 King St, Peterborough ON

Phone: 905-576-8500

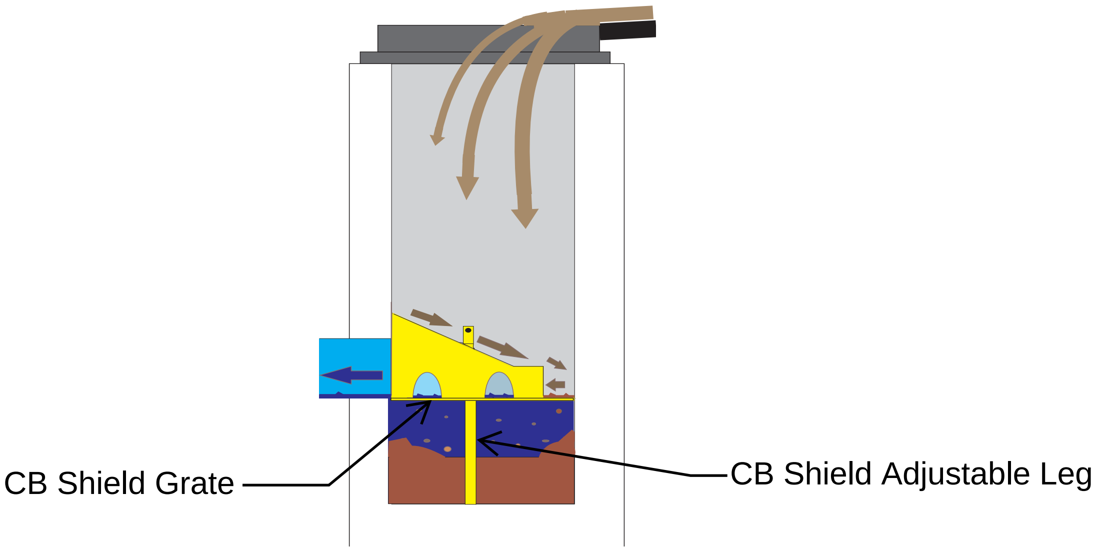
info@dgbiddle.com
dgbiddle.com

PROJECT NO.	115160
DRAWING NO.	FIGURE 1
DRAWN BY:	S.L.A.
CHECKED BY:	R.M.L.
DATE:	AUGUST 2025
SCALE:	N.T.S.

CB Shield Operations Manual

Installing CB Shield

It is important the catch basin frame and cover is aligned properly with the catch basin below
If it is misaligned it may be difficult to install the CB Shield insert
Determine the depth of the sump (i.e. the distance from the invert of the outlet pipe to the bottom of the catch basin). If the catch basin is in service the sump depth will be the depth of the water. The grate section of the CB Shield insert should be the same elevation as the water depth in the sump.



Adjust the leg of the CB Shield to achieve the appropriate elevation
The CB Shield is lowered into place with the rope attached to the top of the leg. The high side of the sloped plate should face the wall with the outlet pipe. (The incoming water should be directed to the wall furthest from the outlet)
The flexible plastic skirt around the outer edges of the CB Shield insert may interfere with some misaligned frame and grates. If so a slice can be cut into the skirt with a utility knife at the point of interference.
Make sure the grate is at the desired level or remove CB Shield and re-adjust the leg length.

Inspecting a CB Shield Enhanced Catch Basin

Open grate
A lifting rope is attached to the top of the centered leg of the CB Shield insert. Lift and remove the insert.
Inspect CB Shield for any possible damage. Quite often leaves will accumulate on the grate. This can actually improve the Shield's ability to capture sediment and assist in preventing leave litter from being washed down stream.
Use a Sludge Judge to measure the sediment depth in 4 - 6 locations of the sump.
If the sediment depth is 300mm – 600mm deep it is recommended that the unit be cleaned.

Cleaning a CB Shield Enhanced Catch Basin

Open grate and remove CB Shield with lift rope.
Clean catch basin as usual with a Vacuum truck.
Clean CB Shield (if needed) and re-install into catch basin.
If there is any significant damage to a CB Shield please send a picture and its location to CB Shield Inc. (info@cbshield.com).

CONTECH®
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

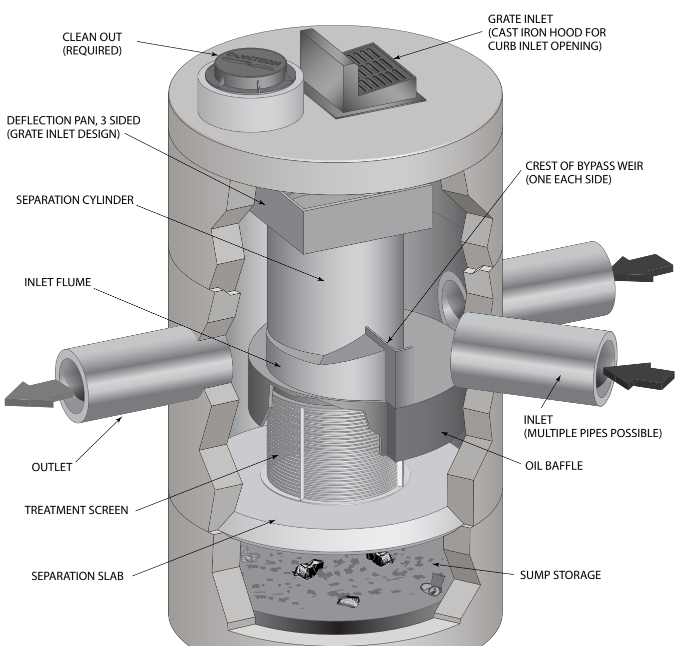
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

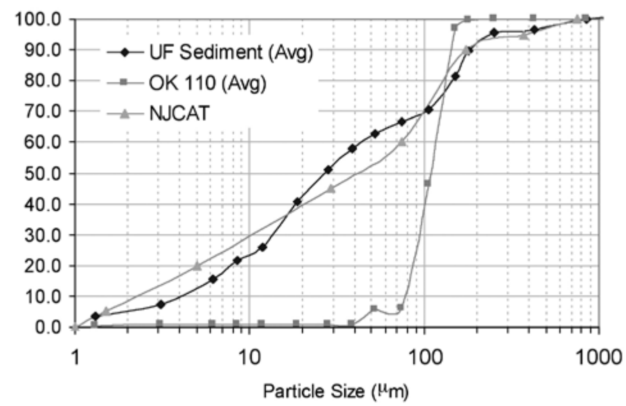


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

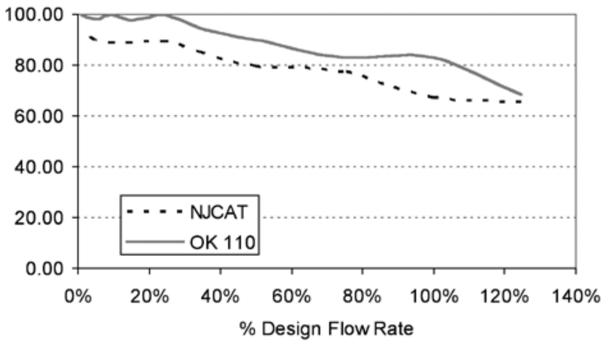


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

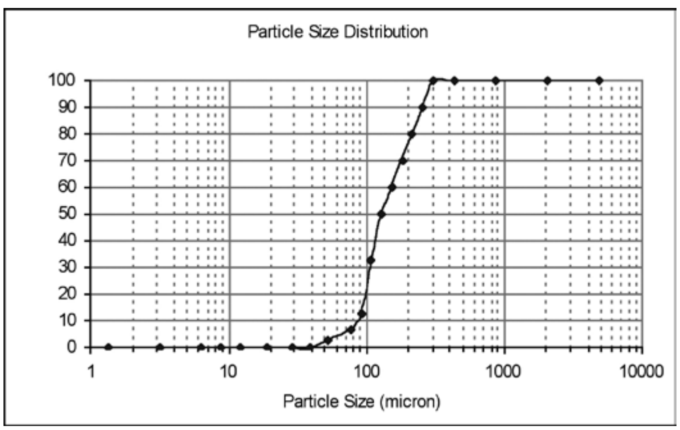


Figure 3. WASDOE PSD

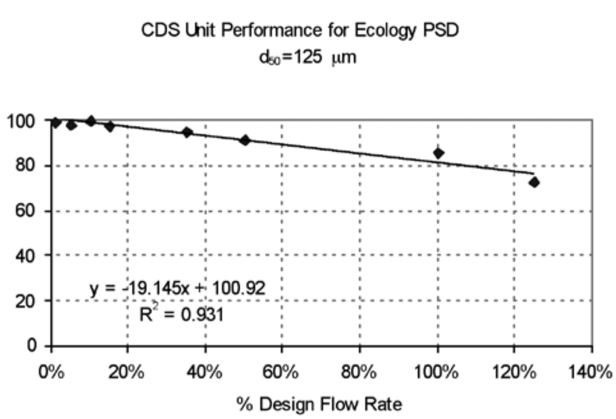


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber 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 (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. 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.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down 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. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems 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 covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

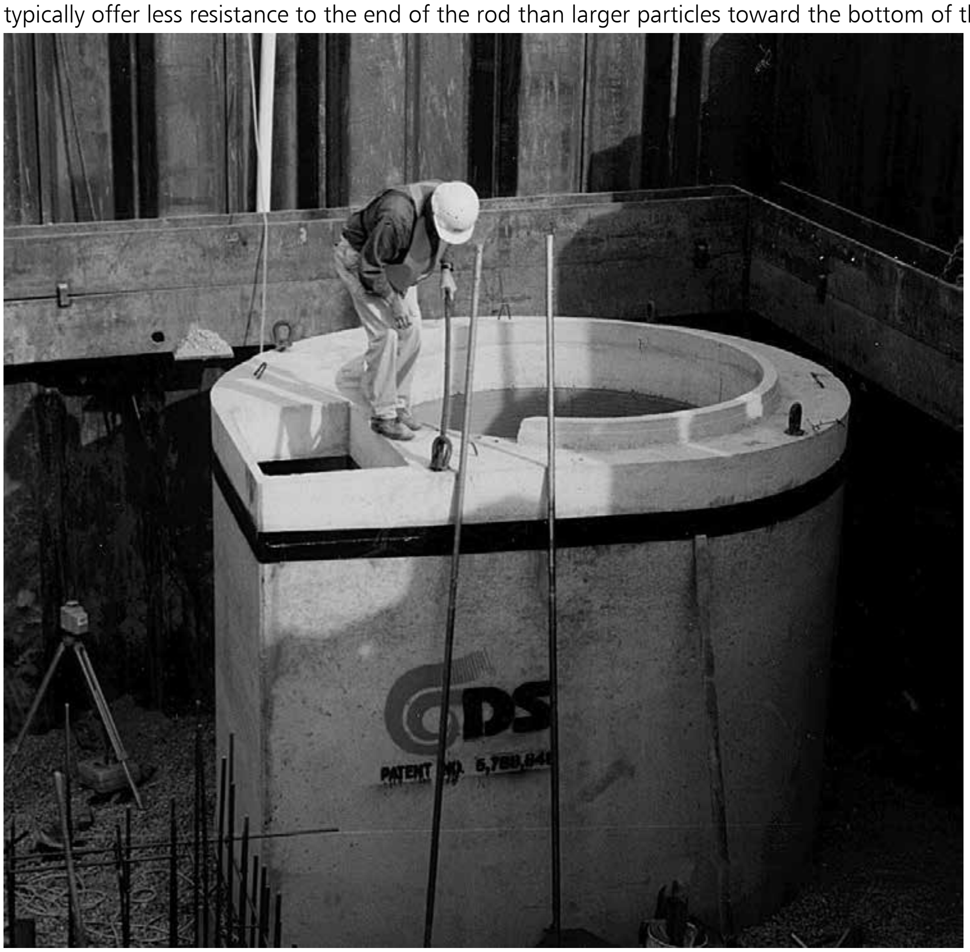
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should 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. The screen should be cleaned 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 also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: ______________________________ Location: ______________________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile**.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

• Drawings and specifications are available at www.ContechES.com.
• Site-specific design support is available from our engineers.

CONTECH®
ENGINEERED SOLUTIONS
800-338-1122
www.ContechES.com

Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, earth stabilization and stormwater treatment products. For information on other Contech division offerings, visit www.ContechES.com or call 800.338.1122

cds_manual 3/17 PDF

Introduction

Prinsco's HydroStor chamber systems provide a solution to effectively manage and store stormwater runoff utilizing a pipe manifold system to distribute the stormwater to rows of chambers and end caps. As stormwater flows to the chamber system, it carries sediment and debris that tend to collect within the system. Given that chambers are an open bottom system it is essential to capture the sediment and debris before it enters the chamber rows with the use of a pre-treatment device.

Pre-Treatment System Devices

The use of a pre-treatment unit is recommended for all HydroStor chamber systems as debris and sediment buildup in the system will clog the stone void space under the chambers. If the stone becomes clogged with sediment, the storage performance and service life of the system will be compromised. A pre-treatment unit is designed to capture a majority of sediment and debris before it is able to enter the entire chamber system. Therefore, the maintenance and cleaning of the system will be limited to only the pre-treatment and not the entire chamber system. It is crucial to ensure that the pre-treatment device(s) are maintained regularly. For chamber systems, there are two options for a pre-treatment device: a Stormwater Quality Unit (SWQU) or a sediment row.

Sediment Row

One option available for HydroStor chamber systems, which can be used in conjunction with a SWQU or by itself, is a sediment row. The sediment row consists of a series of chambers installed directly on top of two layers of woven geotextile. The geotextile serves as a filter and prevents the sediment from clogging the bedding stone. The specified geotextile is also durable enough to withstand cleaning and maintenance procedures using water jet technology. The sediment row will typically be located in the first row of chambers and connected to the control structure(s). This connection is made with a short stub of 18: (450 mm) pipe for HS75 chambers or 24" (600 mm) pipe for HS180 chambers and will be the point of access for cleaning and maintenance procedures. A 24" (600 mm) connection to HS75 chambers is possible, but a pipe adapter will be required to make the connection to the end cap.

Inspection Ports

Inspection ports are not required for the entire chamber system but may be installed to monitor the sediment levels, particularly in the sediment row. Inspection ports are typically 4"-8" (100-200 mm) PVC risers and are to be installed in the valley between the corrugations on the HS180 chambers or in the circular cut out point at the center of HS75 chambers.

Initial System Inspection

An initial inspection of the pre-treatment device should be performed before the chamber system is put into operation. It is best to create an Inspection and Maintenance log sheet at this time. The Inspection and Maintenance Log Sheet can be found at the end of this technical note. Included with the log sheet should be a layout of the system and/or pre-treatment devices with the invert elevations at the inspection ports prior to sediment accumulation. Initial measurements can be taken with a stadia rod or other measurement techniques. These measurements will allow for future sediment height measurements to be taken from outside of the system, eliminating the need for a manned entrance.

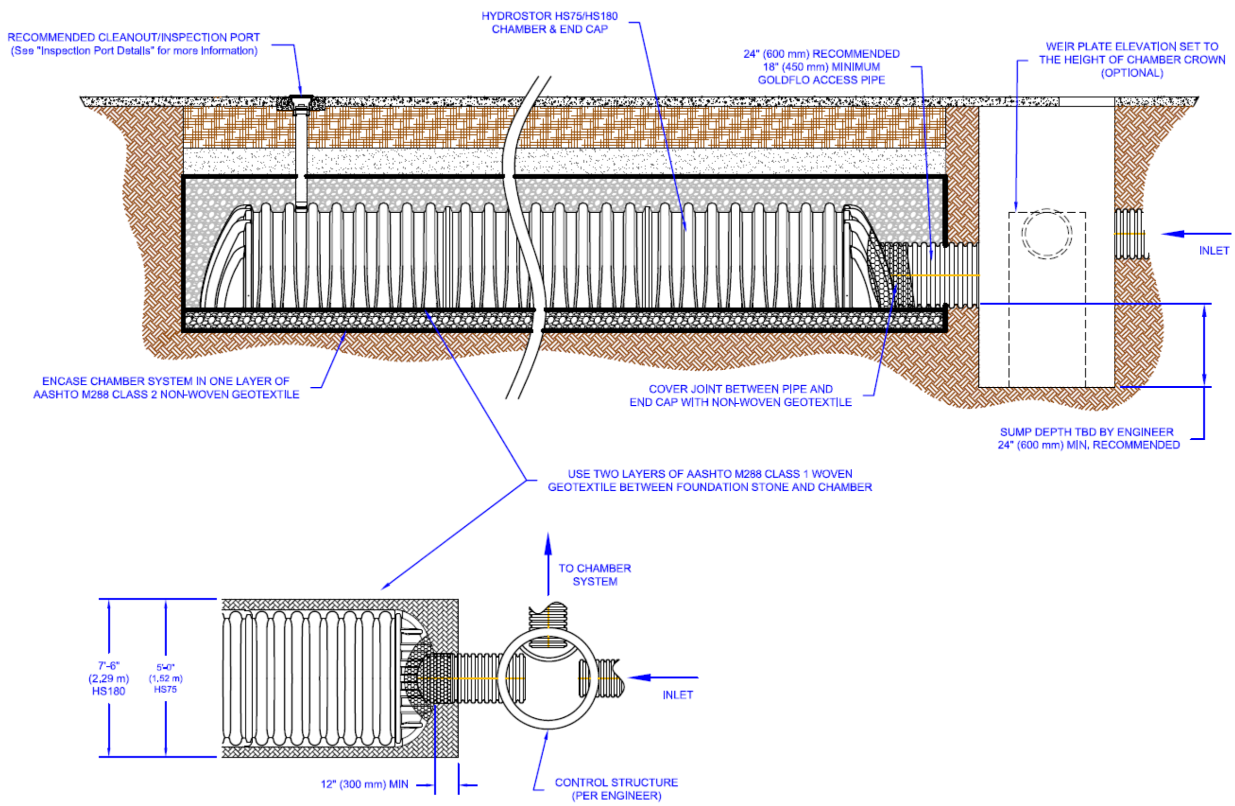


Figure 1: Chamber Sediment Row

Inspection Frequency

Inspection frequency will vary based on the system design and requirements. A system inspection schedule should be developed for each individual system, with the industry standard being a minimum of once per year. After the inspection schedule is established for the system, it should be tracked on the Inspection and Maintenance Log Sheet.

During the first year of operation, more frequent inspections should be done due to construction activities. Construction sediment and debris loading can be minimized if the Stormwater Pollution Prevention Plan (SWPP) for the construction site is followed. After the first year of operation, the rate at which the pretreatment system collects soil/pollutants will be heavily dependent on the site activities. During winter months, in geographical areas where sand is applied to road surfaces, systems may see increased sediment loading. Other increased loading areas are present with vehicle or equipment wash-down areas.

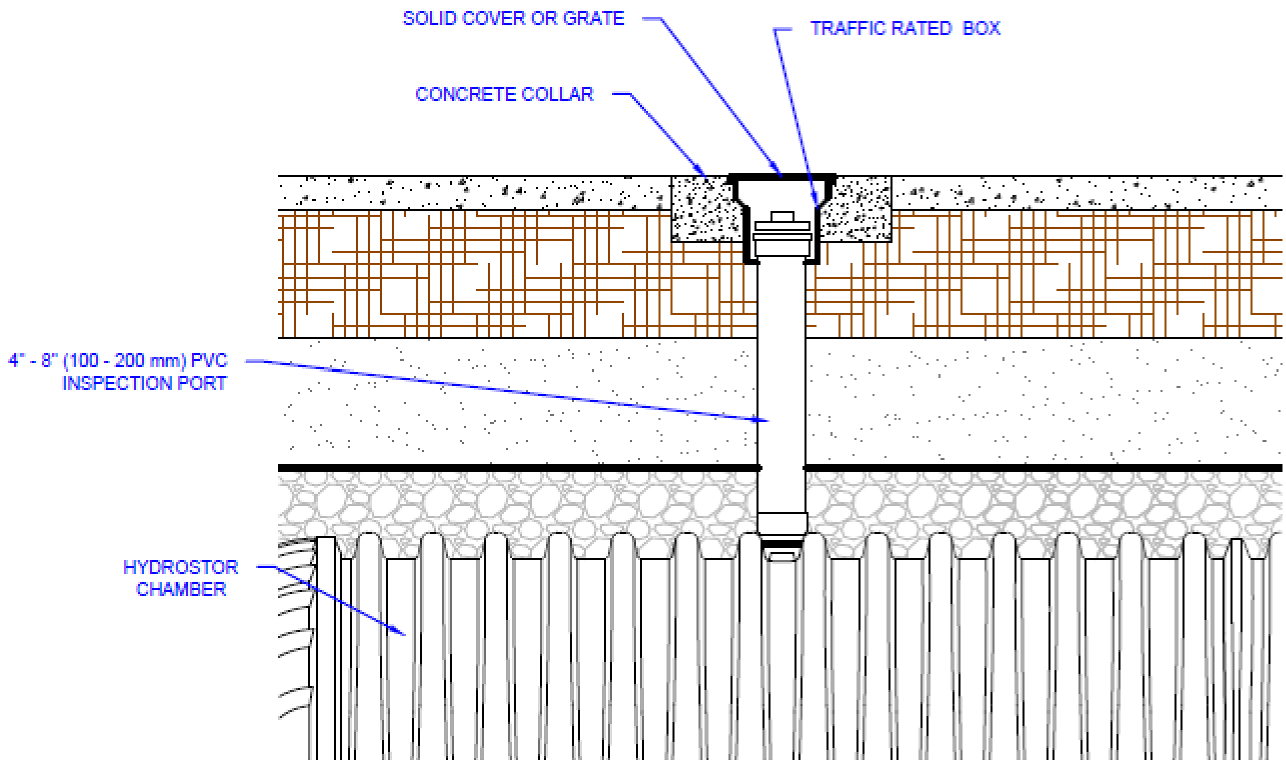


Figure 2: Inspection Ports for Chamber System

Inspection for a sediment row can either be done through an inspection port or by examining the chamber row through the upstream control structure. During inspections, elevations of sediment height should be taken from each riser, cleanout, or inspection port. These elevations should be recorded on the Inspection and Maintenance Log Sheet. During the inspection, personnel should be looking for blockages to inlet or outlet stubs or any other evidence of system malfunction.

Maintenance Frequency

Cleaning frequency will vary for each pre-treatment device based on the system design. It is at the sole discretion of the inspector to determine if or when the device will require cleaning. The following are recommendations of when the device should be cleaned:

- If the system is experiencing an unusual amount of silt and soil build up, the pre-treatment device should be investigated and/or cleaned.
- If the chamber sediment row reaches a sediment height between 1”-3” (25-76 mm), the inspector should recommend cleaning.
- If the system reaches a sediment height greater than 3” (76 mm) in the chamber sediment row, the system should be cleaned at the soonest opportunity.

System Cleaning

The most common method of cleaning is done by using a vacuum truck. For the sediment row, a high-pressure nozzle with rear facing jets is used to direct the sediment and debris to the inlet control structure where it can then be vacuumed out. Care needs to be taken to ensure damage to the geotextile fabric does not occur when removing sediment and debris.

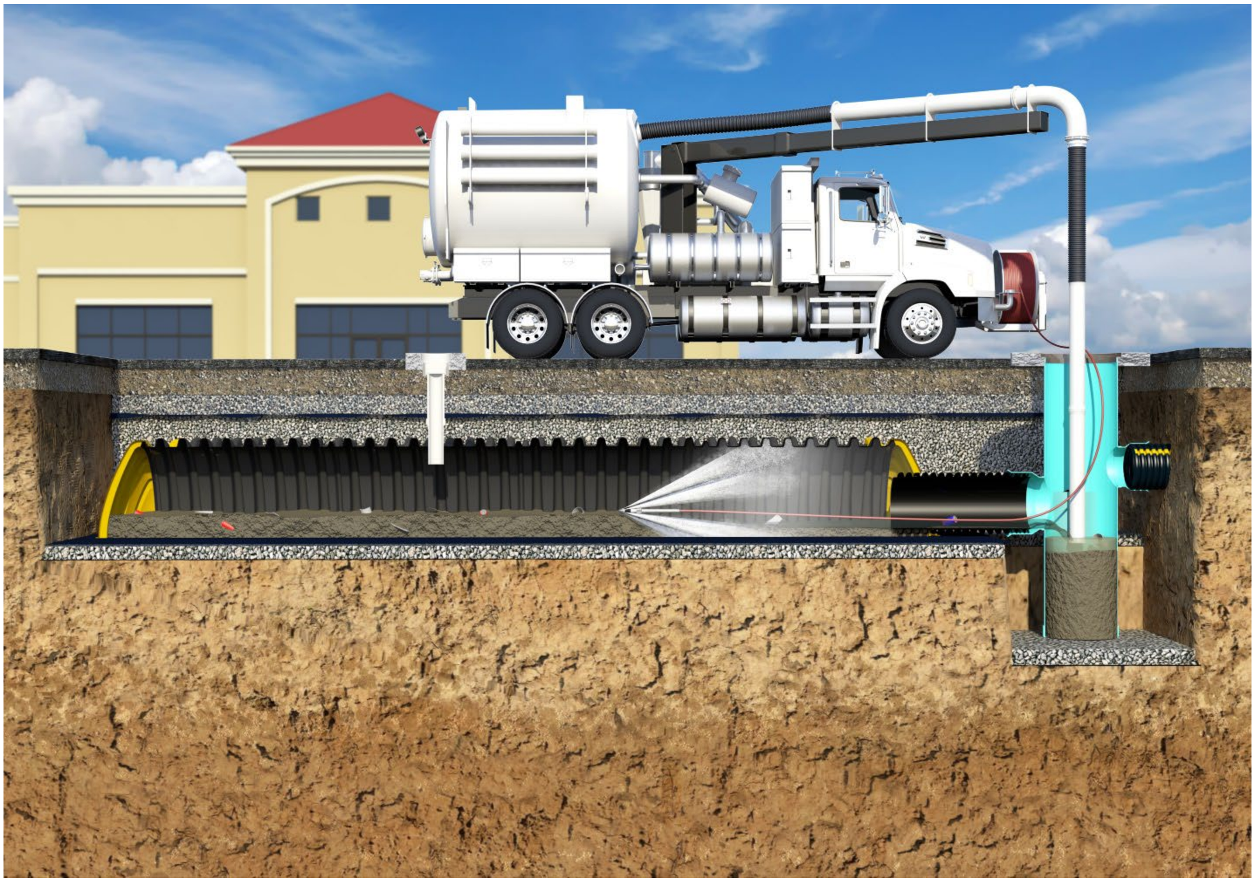


Figure 3: Sediment Row Cleaning

Before the system is cleaned, the following considerations should be made:

- The system will be much easier to clean when there is little to no flow into the system and when the system does not have any standing water. For this reason, system cleaning should be scheduled around dry weather.
- Before cleaning begins, all outlet stubs should be blocked off. This includes the outlet from the diversion structure to the chamber system. If this is not done, sediment loading could back up or plug downstream pipelines adding to cleaning expenses. This is also done to prevent any of the debris or pollutants from washing into downstream waterways.
- When beginning the cleaning process, all upstream pipelines and pre-treatment units should be cleaned first.

Safety

Before entering a retention or detention system, ensure all OSHA and local safety regulations are being followed. Only personnel with appropriate confined space permits and personal protective equipment should be allowed to enter the system.

Material Disposal

After the maintenance and cleaning, dispose of sediment, as directed, in accordance with local regulations. Water and sediment from cleanout procedures should not be dumped into a sanitary sewer. In some locations, proper disposal of sediments from the sediment row can be compared to the disposal of sediments from manholes or catch basins.

Table 1: Example Inspection & Maintenance Log Sheet

Inspection & Maintenance Log Sheet									
Type of System: HS180 Chambers with SWQU & Sediment Row					**Location**: Minneapolis, MN				
Notes/Comments: Contact owner when sediment level reaches 8" (203 mm) or outlet stub is restricted. Scheduled cleaning should be done through SB's JET/VAC									
Ports / Cleanouts / Manholes		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Initial Inspection									
Date: 3/10/13	Invert Depth	84" (2134 mm)	84" (2134 mm)	86" (2184 mm)	87" (2210 mm)	88" (2235 mm)	89" (2261 mm)	90" (2286 mm)	91" (2311 mm)
	Sediment Depth	----	----	----	----	----	----	----	----
	Inspector Name:	Inspector 1		**Maintenance Performed/Notes:**					
Inspection and Maintenance									
Date: 8/10/13	Depth to Sediment	81" (2057 mm)	81" (2057 mm)	81" (2057 mm)	82" (2083 mm)	84" (2134 mm)	84" (2134 mm)	85" (2159 mm)	85" (2159 mm)
	Sediment Depth	3" (76 mm)	3" (76 mm)	5" (127 mm)	5" (127 mm)	4" (102 mm)	5" (127 mm)	5" (127 mm)	6" (152 mm)
	Inspector Name:	Inspector 2		**Maintenance Performed/Notes:**		excess amounts of sediment, upon further inspection pre-treatment unit was full			
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					

Inspection & Maintenance Log Sheet

Type of System: | **Location**:

Notes/Comments:

Ports / Cleanouts / Manholes		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Initial Inspection									
Date:	Invert Depth								
	Sediment Depth	----	----	----	----	----	----	----	----
	Inspector Name:	Inspector 1		**Maintenance Performed/Notes:**					
Inspection and Maintenance									
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					

Inspection & Maintenance Log Sheet

Type of System:					**Location**:				
Notes/Comments:									
Ports / Cleanouts / Manholes		Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Point 8
Initial Inspection									
Date:	Invert Depth								
	Sediment Depth	----	----	----	----	----	----	----	----
	Inspector Name:	Inspector 1		**Maintenance Performed/Notes:**					
Inspection and Maintenance									
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					
Date:	Depth to Sediment								
	Sediment Depth								
	Inspector Name:			**Maintenance Performed/Notes:**					

prinsco.com | 1717 16th St NE Willmar MN | toll free 800.992.1725 | phone 320.222.6800 | fax 320.222.6820