Town of Wallingford, Connecticut

CT DEEP MS4 General Permit for the Discharge of Stormwater from Municipal Separate Storm Sewer Systems (MS4s)

GSM000050

Post-Construction Stormwater Management Facilities

Operation & Maintenance Manual

Post-Construction Stormwater Management Facilties

Operation & Maintenance Manual

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Introduction

This operation and maintenance manual is intended to apply to a broad range of stormwater management practices which a municipality typically has in place as a result of evolving stormwater management methodologies and evolving stormwater management developments over a number of decades.

It is recommended that a binder of all stormwater management facilities be kept for reference at the Department of Public Works and/ or Engineering Office. Where possible, "As-Built Drawings" should be utilized. When "As-Built Drawings" were not prepared, design and permitting drawings should be utilized. In that is it relatively common for substitute units to be utilized during the construction process of a subdivision road project, field investigations should be conducted to verify the actual stormwater treatment facility unit that was installed. It is also recommended that specific unit operation and maintenance manuals be kept in the binder.

If no stormwater management facility mapping exists, it is recommended that the stormwater management facility location be determined using a handheld GPS unit. Identification of stormwater management facility locations by coordinates is the easiest methodology when repeatability is needed.

When initially setting up the handheld GPS the correct horizontal datum must be selected for integration of the mapping into existing GIS mapping. Most GIS mapping systems use the World Geodetic System of 1984 (WGS-84) and this is the default horizontal datum to use. It is recommended that the waypoints be obtained in the decimal degree system.

It is preferable that an initial field inventory of stormwater management practices be developed before operation and maintenance plan activities occur. It is also preferable to make structure measurements concurrently with the vactoring of the structure, so that the complete depth of from the tank, manhole, or chamber to the outlet pipe and the base of the tank to the top of the tank or frame or grate can be determined for future reference. The vertical measurement reference datum must be identified for each structure. A consistent vertical reference datum methodology should be utilized whenever possible for consistency to reduce error.

Before conducting any work in areas of inland wetlands, it is recommended that the Department of Public Works, or Highway Department, contact the appropriate municipal official (usually the Wetlands Enforcement Officer or the Environmental Planner) prior to initiation of any repair activities in or adjacent to inland wetlands unless the department has a general municipal-wide authorization to conduct work in the regulated area of inland wetlands or tidal wetlands.

Dispose of all structure vactoring material either at a site designated by the Town Engineer, Director of Public Works, or Road Foreman. All disposal sites should be located in a level to gently sloping area upland area a minimum of 100 feet from an inland wetland, watercourse or waterbody. If a suitable area does not exist geotextile silt fence, hay bales of wood chips should be installed along the entire downgradient perimeter of the material stockpile.

Some inspection and repair work may require access to areas that may qualify as confined space entry. No such work shall be conducted unless the personnel conducting the work has the appropriate confined space training and certifications and the appropriate confined space entry safety measures are in place.

It is preferable to have an employee of the Department of Public Works or Highway Department witness all vactoring operations to ensure the structures are adequately cleaned of accumulated sediment, debris and trash.

It should be noted that this manual was prepared for utilization of town-owned MS4 stormwater facilities. When stormwater management facilities are owned by private entities which have a potential to impact downgradient stormwater management facilities, through lack of maintenance, or structural failure, the municipality is encouraged to make the private entity aware of the MS4 stormwater facility maintenance requirements and the potential financial implications of downgradient off-site impacts if timely maintenance activities are not implemented.

If there are stormwater management operation and maintenance measures that are not contained in this manual it is recommended that the 2004 Connecticut Stormwater Quality Manual be reviewed for maintenance recommendations.

For proprietary stormwater management measures, it is recommended that the manufacturer's operation and maintenance recommendations be followed with the caveat that some current stormwater management measures are not contained in the 2004 Connecticut Stormwater Quality Manual.

It should also be understood that the maintenance requirements contained herein are based on a review of current manufacturer's literature recommendations based in some instances on third party recommendation (NJCAT for instance). Manufacturer's inspection and maintenance recommendations may be subsequently revised based on development of a larger installation database and experience. Inspection frequencies for stormwater management facilities in well vegetated settings may be adjusted based on observed conditions.

Any of the following stormwater management facilities may evidence an illicit discharge. Any unusual discharges containing odors or colors should be assessed using the Possible Illicit Discharge Assessment Inspection Form which is Attachment F of this plan.

Catch Basins and Storm Manholes

Accurately determine the location of the stormwater management practice by a handheld GPS unit or other method. In the case of paired catch basins notation should be added to the Catch Basin Inspection Form which side of the road the catch basin is located on (i.e. north, south, east or west) as typical handheld GPS units do not have the accuracy to differentiate paired catch basins, particularly when located near, or beneath, tree canopies

Confirm the catch basin location (northing and westing) with the handheld GPS unit.

Check the integrity of the catch basin frame and grate and note evidence of deteriorating conditions particularly in the instance of non-galvanized frames and grates which are more susceptible to corrosion from road salt. Replace all catch basin heads and grates which evidence corrosion of the grate supports. If the grate supports are severely corroded place a traffic cone over the grate until the catch basin head can be replaced.

Measure and record the depth to accumulated sediment in the catch basin sump and the depth to the pipe invert out of the catch basin and check the integrity of the concrete for evidence of spalling or cracking. Note any unusual odors or materials in the catch basin as they may be indicative of an illicit discharge. Record the potential illicit discharge using the Potential Illicit Discharge Data Sheet. After the accumulated material in the sump has been vactored, or otherwise removed, measure the depth from the bottom of the sump to the outlet pipe invert to determine the depth of the sump. Also measure the depth from the bottom of the sump to the top of frame or grate.

When the accumulated sediment in the sump is one half the depth of the sump or greater, schedule the catch basin for more frequent cleaning. Conversely, when the accumulated sediment in the sump is less than one half the depth of the sump, less frequent cleaning may be in order. The CT DEEP MS4 recommendation is annual catch basin cleaning unless measurements and observations substantiate more infrequent cleaning.

Check the condition of all pipes for evidence of corrosion particularly in the instance of corrugated metal pipe which typically first evidence corrosion at the pipe invert. Record a corrosion condition on the Catch Basin Inspection Form if corrosion is noted.

Check the catch basin pipe penetrations for evidence of inadequate annular sealing and check the condition of all pipes for evidence of corrosion particularly in the instance of corrugated metal pipe which typically first evidence corrosion at the pipe invert. Inspect the annulus of the pipe for evidence of soil piping from the backfill around the catch basin into the catch basin sump. Record a soil piping condition on the catch basin inspection form if a soil piping condition is noted.

If the catch basin structure was constructed of concrete block and mortar, check the integrity of the mortar joints if possible. Inspect the joints for evidence of soil piping of backfill into the catch basin sump. Record a soil piping condition on the catch basin inspection form if a soil piping condition is noted.

In the absence of adequate documentation catch basins should be vactored at least one time per year preferably in late Spring. Catch basin cleaning less than one time per year shall be substantiated by at least one year of field measurements. At least two years of field measurements is preferred.
Check the pavement surrounding the catch basin for signs of backfill settlement. Check the ground surface behind the catch basin for signs of settlement. Record backfill settlement on the catch basin inspection form if settlement is noted.

The Catch Basin/Storm Manhole/Dry Well/Gallery and Sedimentation Structure Inspection Form is Attachment A of the plan.

Precast Concrete Dry Wells or Precast Concrete Gallery Facilities

The Town of Wallingford has utilized a significant number of dry wells for stormwater management due to the high infiltrative capacity of the stratified drift soil deposits of the glacial valleys.

Based on available town stormwater mapping more than 200 dry wells have been inventoried. It is not known at this time how many of the dry wells are town owned and therefore MS4.

While dry wells used for wastewater disposal are typically set on a layer of crushed stone and are surrounded by crushed stone it is not clear if dry wells installed for infiltration of stormwater were set on a layer of crushed stone and surrounded by crushed stone.

Dry wells of indeterminate depth should be vactored carefully to ensure that the soil underlying the base of the precast concrete dry well is not undermined which could lead to dry well structure settlement. Therefore, jetting should never be used in the cleaning of dry wells.

It is preferred that vactoring of dry wells be performed during seasonal low groundwater conditions which are typically occur during low water stages of streams and rivers of Fall.

Vactoring operations should be terminated when groundwater is encountered.

The Catch Basin/Storm Manhole/Dry Well/Gallery and Sedimentation Structure Inspection Form is Attachment A of the plan.

Sedimentation Structures

Inspect the structure a minimum of two times per yearly. Ideally, inspections should be conducted at the end of the road deicing season (April or May) and in late Fall (November or early December) before road deicing operations commence to determine if significant road sand (sediment) or leaves have accumulated in the structure, respectively.

Pull off all manhole covers and measure the depth of accumulated sediment.

Structures should be cleaned when the depth of accumulated sediment is one third or greater than the height from the structure bottom to the invert of the outlet pipe.

Vactoring of the structures should be done at all manhole risers.

Check the structure pipe penetrations for evidence of inadequate annular sealing and check the condition of all pipes for evidence of corrosion particularly in the instance of corrugated metal pipe which typically first evidence corrosion at the pipe invert.

Inspect the annulus of the pipe for evidence of soil piping from the backfill around the catch basin into the catch basin sump.

Record a soil piping condition on the structure inspection form if a soil piping condition is noted.
Check the pavement/ground surrounding the structure for signs of backfill settlement.

Record backfill settlement on the Structure Inspection Form if settlement is noted.

Inspect the outlet pipe discharge area to determine if the accumulated sediment in the structure has been resuspended and displaced. Most sedimentation tanks are designed in-line and are therefore prone to negative sediment removal efficiency during intense rainfall events. If sediment resuspension, transport and sedimentation at the pipe outlet is observed, the structure will require more frequent cleaning or the sedimentation tank.

Alternately, the sedimentation tank can be retrofitted to be off-line during intense rainfall events be addition of two storm manholes and adequately sized bypass piping. It is recommended that the bypass piping be designed for a 10-year design storm as a minimum. However, the sediment capture and retention efficiency of the sedimentation tanks most likely will not justify the retrofit costs.

The Catch Basin/Storm Manhole/Dry Well/Gallery and Sedimentation Structure Inspection Form is Attachment A of the plan.

Hydrodynamic Separators

Hydrodynamic separators are very effective in capturing of floating debris, trash and sediment. However, if the units are not sufficiently maintained they may become ineffective and in some cases may be prone to scour and resuspension of fine sediments if not cleaned periodically.

The hydrodynamic separator unit should be cleaned when the depth of sediment in the chamber exceeds the following manufacturer recommendations:

CONTECH® CDS®

CDS Model No.	1515	2015	2015	2020	2025	3020	3025	3030
Diameter (ft)	3	4	5	5	5	6	6	6
Water Surface to Sediment (ft)	3.0	3.0	3.0	3.5	4.0	4.0	4.0	4.6
CDS Model No.	3035	4030	4040	4045	5640	5653	5668	5678
Diameter (ft)	6	8	8	8	10	10	10	10
Water Surface to Sediment (ft)	5.0	4.6	5.7	6.2	6.3	7.7	9.3	10.3

CONTECH® Stormceptor® STC- Typical Units

STC Model No.	450	900	1200	1800	2400	3600	4800	6000
Maintenance Sediment Depth (in)	8	8	10	15	12	17	15	18
STC Model No.	11000	13000	16000					
Maintenance Sediment Depth (in)	17	20	17					

CONTECH® VortSentry® HS

VortSentry® HS Model No.	HS36	HS48	HS60	HS72	HS84	HS96
Diameter (ft)	3	4	5	6	7	8
Rated Treatment Capacity (cfs)	0.55	1.2	2.2	3.7	5.6	8.1
Maintenance Sediment Depth (in)	24	24	24	24	24	24

CONTECH® Vortechs®

Vortechs® Model No.	1000	2000	3000	4000	5000	7000	9000
Diameter (ft)	3	4	5	6	7	8	9
Rated Treatment Capacity (cfs)	1.6	2.8	4.5	6.0	8.5	11.0	14.0
Water Surface to Sediment (in)	12-18	12-18	12-18	12-18	12-18	12-18	12-18
Vortechs® Model No.	11000	16000					
Diameter (ft)	10	12					
Rated Treatment Capacity (cfs)	17.5	25.0					
Water Surface to Sediment (in)	12-18	12-18					

Hydroworks® HG Series

Hydroworks HG® Model No.	HG 4	HG 5	HG 6	HG 7	NG 8	HG 9	HG 10	HG 12
Diameter (ft)	4	5	6	7	8	9	10	12
ConnDOT Maximum WQF (cfs)	1.1	1.7	2.6	3.6	4.9	6.4	8.2	12.5
Inner Chamber Maintenance Sediment Depth (in)	14	14	14	14	14	14	14	14

Or floatables greater than 50% of the open water surface of the Middle Chamber.

Hydro International Downstream Defender®

Downstream Defender®Diameter (ft)	4.0	6.0	8.0	10.0
ConnDOT Maximum WQF (cfs)	1.1	3.0	6.3	11.2
Maintenance Sediment Depth (in)	<18	<24	<30	<36

Oldcastle Infrastructure Dual Vortex Flogard Separator

Flogard® Model No.	DVS 36	DVS-48	DVS-60	DVS-72
Diameter (ft)	3.0	4.0	5.0	6.0
ConnDOT Maximum WQF (cfs)	0.6	1.2	2.1	3.6
Maintenance Sediment Depth (in)	12	12	12	12
Flogard® Model No.	DVS 84	DVS-96	DVS-120	DVS-144
Diameter (ft)	7.0	8.0	10.0	12.0
ConnDOT Maximum WQF (cfs)	5.2	6.3	13.6	22.3
Maintenance Sediment Depth (in)	12	12	12	12

Due to the nature of hydrodynamic separators accurate measurement of accumulated sediment depth can be difficult as the accumulated sediment in the middle is not very compact and therefore the transit rod or other measurement device encounters the accumulated sediment before it is discernible.

Manufacturer's recommendations should be consulted as to the proper cleaning procedure as there are many models of hydrodynamic separators and all have their own cleaning frequency recommendation methodologies based on the type of stormwater debris accumulations.

The Hydrodynamic Separator Inspection Form is Attachment B of the plan.

Subsurface Detention/Infiltration System Facilities

Monthly measurements of sediment accumulation should be conducted for a duration of one year after construction of a subsurface stormwater systems particularly when the design does not have an Isolator Row, Containment Row or "Separator Row" (hereinafter referred to as a pretreatment row).

The pretreatment row serves to trap total suspended solids to reduce the volume of solids conveyed to the remainder of the retention/infiltration or detention/infiltration system.

If the subsurface stormwater detention/infiltration facility does not have a pretreatment row, maintenance activities should include vactoring only as the jetting process can undermine stormwater storage structures which could lead to soil piping and possible structure settling in the instance of precast concrete structures or structure settlement and collapse in the instance of plastic structures.

Most subsurface stormwater storage unit manufacturers recommend removal of accumulated sediment when the thickness varies from three inches to four inches. Following is a list of common structure manufacturer's recommendations:

ADS®/StormTech® - "Isolator® Row" - Clean using the JetVac process when the average depth of the sediment exceeds 3 inches throughout the entire row length.

Contech® ChamberMaxx®-"Containment Row™" - Clean using the JetVac process when the average depth of the sediment exceeds 4 inches throughout the entire row length.

Cultec - "Separator Row™" - Clean every six months for the first year of service and as adjusted based on inspection observations. Clean using the JetVac process when the average depth of the sediment exceeds 3 inches throughout the entire row length.

The pretreatement row is effectively contained within woven and non-woven geotextile, which, if properly constructed with sufficient geotextile fabric overlap, will allow cleaning by a JetVac truck with a sledge dredging tool which provides for a jetting backflush of clean water to mobilize sediment to the access storm manhole for vactoring.

The access manhole pipe out to the remainder of the subsurface stormwater system should be temporarily blocked during vactoring and/or jetting operations to preclude sediment carryover to the downgradient subsurface stormwater structures.

The Subsurface Stormwater Detention/Infiltration Facility Inspection Form is Attachment C of the plan.

Detention Pond/Basin Facilities

Appendix E, Maintenance Inspection Checklist of the 2004 Connecticut Stormwater Quality Manual contains a worksheet on pages E-1 through E-3 which are useful in stormwater pond and wetland operation and maintenance.

Post-Storm Inspections

Newly constructed stormwater detention facility inspections should be conducted after rainfall events of one inch or greater for the first year after completion of construction.

Existing stormwater detention facilities should be inspected at least one time per year.

If possible, existing stormwater detention facility site inspections should be conducted after storm events exceeding a 24-hour storm rainfall of 2.50 inches (a one-year 24-hour recurrence interval storm is approximately 2.60 inches). It is preferable to conduct the facility inspections in late Winter or early Spring prior to revegetation.

The post-storm inspections should be conducted no later than 48 hours after the storm event.

Inspections should be focused on the following

1. structural integrity of the detention basin outlet structure, evidence of embankment overtopping which may be indicative of a clogged detention basin outlet structure grate or trash rack or plugged outlet structure outlet pipe
2. evidence of soil erosion and/or sedimentation and soil erosion of the embankment
3. evidence of piping on the exterior embankment slopes and evidence of soil piping along the outlet structure outfall pipe.

It is recommended that a digital photo inventory be maintained for visual reference and comparison of all major structural components. It is recommended that a minimum of 100 digital photos be taken during the inspection and that all digital photos be downloaded to a server or hard drive for future reference.

Embankment Fill Inspection

Inspect the exterior of the fill embankment slopes for evidence of erosion associated with basin overtopping.

Inspect the interior and exterior vegetated slopes of the embankment fill to discourage establishment of woody vegetation and accompanying root penetration into the fill embankment slopes. Cut all woody vegetation that is established on the fill embankment and within 10 feet of the exterior fill embankment slope. If trees have become well established on the fill embankment slope, cut the trees flush to the ground and allow the root system to rot in place. Inspect the flush cut tree roots annually to determine if placement of earthen fill is required to preclude development of soil piping.

Semi-Annual inspections of interior and exterior embankments should be conducted for evidence of animal burrowing. If necessary, hire a trained trapper to humanly trap the burrowing animal(s) and relocate the animal(s) to an allowable location as determined by appropriate CT DEEP wildlife personnel. Detention Basin Outlet Structure.

All eroded areas and burrows should be backfilled with inorganic substratum soils or imported low permeability backfill with at least 20% by weight passing the No. 200 Sieve. Backfill shall be placed in 12-inch maximum depth loose lifts and compacted to a minimum of 90% of Modified Proctor field density.

Where backfilling and compaction of a horizontal burrow is not possible, mix bentonite pellets with the inorganic substratum soil at 50% by volume and place and compact in the burrow as deeply as possible.

Bare areas on embankments should be reseeded with the appropriate New England Wetland Plants, Inc, seed mix.

Outlet Structure Inspection

Evidence of frost heave of the precast concrete structures should be assessed.

The outlet structure grate or pyramidal trash rack shall be assessed. Evidence of frequent basin embankment overtopping may be indicative of a clogged catch basin grate or trash rack, particularly in the instance where the outlet structure is a Type "C-L" Catch Basin Frame and Grate, which is susceptible to clogging with leaf and other organic debris.

The outlet structure grate or pyramidal trash rack shall be inspected to ensure the grate or rack is securely fastened to the structure.

The structural integrity of the outlet structure shall be determined. All pipe penetrations shall be inspected to ensure that the structure is watertight to preclude formation of piping along the exterior of the pipe during intense storm events. Any gaps or voids along the pipe perimeter should be sealed with non-shrink mortar and concrete bricks if needed. The entire perimeter of the pipe shall be neatly and completely parged with non-shrink mortar.

Outfall Piping Inspection

Evidence of frost heave of the pipe(s) and flared end section(s) should be assessed.

Where soil piping along the detention basin outlet structure outlet pipe is evidenced investigations should be conducted to ensure the pipe was installed with properly sized and spaced anti-seep collars as shown in the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*. If no anti-seep collars were installed, or the integrity of the installed anti-seep collars has been compromised due to improper installation, damage, or corrosion, new adequately sized and spaced anti-seep collars should be installed. Care should be taken during anti-seep collar removal and installation to ensure that the outlet pipe is not damaged.

All excavation shall be backfilled with inorganic substratum soils or imported low permeability backfill with at least 20% by weight passing the No. 200 Sieve. Backfill shall be placed in 12-inch maximum depth loose lifts and compacted to a minimum of 90% of Modified Proctor field density.

Detention basin structure metal pipes that have corroded inverts should be replaced whenever the corrosion results in perforation of the pipe. The existing anti-seep collar spacing should be measured so that the anti-seep collar spacing can be replicated when they are reinstalled after the pipe replacement.

If the existing anti-seep collar size and spacing does not meet the minimum requirements for dimensions and spacing as shown in the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control,* new anti-seep collars should be provided.

It is recommended that the detention basin outlet structure outlet pipe replacement be smooth invert dual wall high density polyethylene pipe if possible.

Basin Plantings When Applicable

A copy or compilation of the original basin planting schedule should be made for reference.

In areas that have been planted with several plant species, assess planting mortality and replant as needed by observed well colonizing species. A diverse plant stand is preferable to monocultures.

Assess wetland seed mix grass establishment to determine the species which are adapting to the hydrologic regime and reseed with the species when possible.

Eradicate invasive species wherever possible to avoid development of invasive species monocultures such as Japanese Knotweed particularly in newly constructed basins.

Chain Link Fence

Walk the perimeter of the chain link fence on a semi-annual basis (April and October) to determine if any backfill erosion, soil piping or soil disturbance by animal burrowing has occurred around the concrete bases. Probe the area of soil settlement or piping to determine the depth of soil loss and inspect the interior base of the wall for evidence of sediment deposition. If the settlement is relatively minor (less than 1-2 feet) backfill the depression with 3/4-inch minus processed aggregate to six inches below grade and place topsoil and seed with New England Wetland Plants Erosion Control/Restoration Mix for Dry Sites.

Replace sections of chain link fence that have been damaged by downed trees with similar chain link fence.

Lubricate and exercise all gate mechanisms and locks with Boeshield, WD-40 or similar lubricant.

The Detention Basin/Pond Facility Inspection Form is Attachment D of the plan.

Outfall Outlet Protection/Level Spreaders

Inspect newly constructed stormwater outfall outlet protection or level spreader after rainfall events of one-half inch or greater for the first year after completion of construction.

Inspect existing stormwater outfalls outlet protection or level spreader at least one time per year, preferably in late Winter or early Spring prior to revegetation.

New erosion problems associated with an established storm drainage system outfall may be indicative of new development within the storm drainage system watershed or clogging or plugging of another storm drainage system which is diverting flow from the original outfall to the eroded storm drainage system outfall.

When site inspection evidences signs of outlet protection erosion, the properties of the erosion should be noted on the Inspection Form.

New sediment deposition in a well-established storm drainage system outfall may be indicative of an upgradient soil piping condition. Significant rainfall events, particularly during frozen ground conditions can cause smaller precipitation events to produce significant runoff due to the lack of soil infiltration. Such events can in turn lead to soil piping condition particularly if road underdrain pipe and/or sanitary sewer pipe was installed in crushed stone envelope entirely wrapped in non-woven geotextile. Typically, the soil piping will start in areas where insufficient geotextile overlap was provided, or the geotextile was damaged during installation.

Check the integrity of the seal between the pipe and the flared end section particularly in outfalls which discharge to steep slopes where erosion at the outfall can result in headward erosion which can undermine the outlet protection, flared end section and pipe.

Separation of the flared end section from the pipe can also occur in areas where the pipe and flared end section are underlain by unsuitable soils subject to scour erosion. The early stages of separation are evidenced by formation of small sinkholes around the defective joint due to soil piping.

Areas evidencing significant erosion at the outlet should be assessed for scour. The outlet protection should be compared to the design criteria contained in Chapter 5, 10-Energy Dissipators, Outlet Protection (OP), of the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. In the absence of original design computations, a pipe full discharge can be used for the Q (cfs) for the existing reported soil texture and outlet protection dimensions. On the basis of this analyses, the outlet protection dimensions may have to be revised or the stone size and thickness may need to be increased.

If the outlet protection needs to be reconstructed a heavy non-woven geotextile (Mirafi 180N or equivalent) should be provided. If the subgrade contains large sharp rocks a cushion layer of 3/8" crushed stone should be placed under the geotextile to prevent damage to the geotextile. The riprap should be placed with care to preclude damage to the geotextile.

Inspect newly constructed outfall protection after rainfall events of one-half inch or greater for the first year after completion of construction.

The Outfall Outlet Protection/Level Spreader Form Inspection Form is Attachment E of the plan.

References

This Operation & Maintenance Manual consists of a compilation of recommended practices contained in the following reference documents:

ADS StormTech® Isolator Row O&M Manual, 03/17.

CONTECH ENGINEERED SOLUTIONS CDS® Inspection and Maintenance Guide, 7/18.

CONTECH ENGINEERED SOLUTIONS ChamberMaxx® Open-Bottom Infiltration, Contech Engineered Solutions LLC, 2019.

CONTECH ENGINEERED SOLUTIONS ChamberMaxx® Inspection and Maintenance Guide, Contech Engineered Solutions LLC, 2016.

CONTECH ENGINEERED SOLUTIONS Stormceptor® STC Owner's Manual 1/19.

CONTECH ENGINEERED SOLUTIONS VortSentry® HS Guide, Operation, Design, Performance and Maintenance 06/14.

CONTECH ENGINEERED SOLUTIONS Vortechs® Guide, Operation, Design, Performance and Maintenance 04/17.

Connecticut Department of Transportation Guidelines for the Use of Hydrodynamic Separators on ConnDOT Projects, Hydraulics and Drainage Section, April 2010.

Connecticut DEP Soil Erosion and Sediment Control Manual, 2002.

Connecticut DEP Stormwater Quality Manual, 2004.

Cultec Separator™ Row Water Quality System Operation & Maintenance Guide for CULTEC Stormwater Management Systems.

East of Hudson Watershed Corporation, Stormwater Retrofit Program: Operation and Maintenance Manual

NJCAT Technology Verification, V2B1® Stormwater Treatment System, Environment 21, LLC, March, 2009.

New York State Stormwater Management Design Manual. Prepared by: Center for Watershed Protection. August 2010.

Oldcastle Infrastructure, Dual Vortex Separator Installation and Maintenance Guide

Post-Construction Stormwater Management Plan - Attachment A
Operation, Maintenance and Management Inspection Checklist
Catch Basin/Storm Manhole/Dry Well and Sedimentation Struture Inspection Form

Date: _____

Time: _____

Weather Conditions: _____

Location (Street & No.): _____

GPS Waypoint No.: _____

Northing (WGS-84 Datum and Decimal Degree Format): N _____

Westing (WGS-84 Datum and Decimal Degree Format): W _____

Inspector: _____

Contractor (if Applicable): _____

Catch Basin Frame and Grate

Type:	Single			Double		
Type:	C	C-L	C-G	C	C-L	C-G

Frame and Grate Condition:	Excellent	Good	Fair	Poor	Very Poor
Structure Condition:	Excellent	Good	Fair	Poor	Very Poor

Comments: _____

Storm Manhole

Frame and Cover Condition:	Excellent	Good	Fair	Poor	Very Poor
Structure Condition:	Excellent	Good	Fair	Poor	Very Poor

Comments: _____

Field Measurements (Top of Grate Reference)	Inv. In.	Bottom	Water	Sediment	Inv. Out
Depth (in)					
Depth (ft)					

Comments: _____

_____

_____

Inlet Pipe No. 1

Diameter (in):	4	6	8	10	12	15	18
Diameter (in):	21	24	27	30	36	42	Other
Material:	RCP	CMP	ACCMP	HCMP	HDPE	PVC	Other
Shape:	Circular	Elliptical	Other				

Post-Construction Stormwater Management Plan - Attachment A
Operation, Maintenance and Management Inspection Checklist
Catch Basin/Storm Manhole/Dry Well and Sedimentation Struture Inspection Form

Inlet Pipe No. 2

Diameter (in):	4	6	8	10	12	15	18
Diameter (in):	21	24	27	30	36	42	Other
Material:	RCP	CMP	ACCMP	HCMP	HDPE	PVC	Other
Shape:	Circular	Elliptical	Other				

Inlet Pipe No. 3

Diameter (in):	4	6	8	10	12	15	18
Diameter (in):	21	24	27	30	36	42	Other
Material:	RCP	CMP	ACCMP	HCMP	HDPE	PVC	
Shape:	Circular	Elliptical	Other				

Inlet Pipe No. 4

Diameter (in):	4	6	8	10	12	15	18
Diameter (in):	21	24	27	30	36	42	Other
Material:	RCP	CMP	ACCMP	HCMP	HDPE	PVC	
Shape:	Circular	Elliptical	Other				

Outlet Pipe

Diameter (in):	4	6	8	10	12	15	18
Diameter (in):	21	24	27	30	36	42	Other
Material:	RCP	CMP	ACCMP	HCMP	HDPE	PVC	
Shape:	Circular	Elliptical	Other				

Settlement	Yes	No	Soil Piping	Yes	No

Comments:

Post-Construction Stormwater Management Plan - Attachment B
Operation, Maintenance and Management Inspection Checklist
Hydrodynamic Separator Inspection Form

Date: _____

Time: _____

Weather Conditions: _____

Location (Street & No.): _____

GPS Waypoint No.: _____

Northing (WGS-84 Datum and Decimal Degree Format): N _____

Westing (WGS-84 Datum and Decimal Degree Format): W _____

Inspector: _____

Contractor (if Applicable): _____

Hydrodynamic Separator No: _____

Manufacturer: _____

Model No.: _____

Year Installed:

Inlet Frame and Cover Condition:	Excellent	Good	Fair	Poor	V. Poor
Middle Frame and Cover Condition:	Excellent	Good	Fair	Poor	V. Poor
Outlet Frame and Cover Condition:	Excellent	Good	Fair	Poor	V. Poor
Structure Condition	Excellent	Good	Fair	Poor	V. Poor
Field Measurements - Top of Frame Reference (in):	Inv. In	Bottom	Water	Sediment	Inv. Out
Field Measurements - Top of Frame Reference (ft) :	Inv. In	Bottom	Water	Sediment	Inv. Out

Water Surface to Sediment (in): _____

Water Surface to Sediment (ft): _____

Trash/Anthropogenic Debris Observed:	Yes	No

Estimated Trash/Anthropogenic Debris Thickness (in.): _____

Comments: _____

Oil/Hydrocarbon Layer Present:	Yes	No

Estimated Oil/Hydrocarbon Layer Thickness (in): _____

Comments: _____

Post-Construction Stormwater Management Plan - Attachment B
Operation, Maintenance and Management Inspection Checklist
Hydrodynamic Separator Inspection Form

Inlet Pipe No. 1

Diameter	12	15	18	21	24	27	30	36	Other
Material	RCP	CMP	ACCMP	HCMP	HDPE	PVC			
Shape	Circular	Elliptical	Square	Rect.	Other				

Inlet Pipe No. 2 (if Applicable)

Diameter	12	15	18	21	24	27	30	36	Other
Material	RCP	CMP	ACCMP	HCMP	HDPE	PVC			
Shape									
	Circular	Elliptical	Square	Rect.	Other				

Outlet Pipe

Diameter	12	15	18	21	24	27	30	36	Other
Material	RCP	CMP	ACCMP	HCMP	HDPE	PVC			
Shape									
	Circular	Elliptical	Square	Rect.	Other				

Outlet Pipe Outlet Protection

Riprap/Non-Woven Geotextile Stable	Yes	No	
			Comments:
Riprap Size and Thickness Adequate	Yes	No	
			Comments:
Articulated Concrete Block Stable	Yes	No	
			Comments:
Turf Reinforcement Mat Stable	Yes	No	
			Comments:
Erosion	Yes	No	
			Comments:
Sedimentation	Yes	No	
			Comments:
Trash/Debris	Yes	No	
			Comments:

Other Observations: _____

Post-Construction Stormwater Management Plan - Attachment C
Operation, Maintenance and Management Inspection Checklist
Subsurface Stormwater Detention and/or Infiltration Facility Inspection Form

Date: _____

Time _____

Weather Conditions: _____

Location (Street/Road & No.): _____

GPS Waypoint No.: _____

GPS Northing (WGS-84 Datum and Decimal Degree Format): N _____

GPS Westing (WGS-84 Datum and Decimal Degree Format): W _____

Inspoector: _____

Contractor (if Applicable): _____

Subsurface Stormwater Detention and/or Infiltration Facility

Manufacturer: **StormTech®**

Model No.:	SC-310	SC-740	DC-780	MC-3500	MC-4500	

"Isolator Row® Installed?	Yes	No	
			If "No" Do Not JetVac

Year Installed: _____

Manufacturer: **Contech® ChamberMaxx®**

"Containment Row™ Installed?	Yes	No	
Year Installed:			**If "No" Do Not JetVac**

Year Installed: _____

Manufacturer: **Cultec®**

	Contactor		Recharger®			
Model No.:	100HD		150XLHD	280HD	330XLHD	902HD

"Separator Row™ Installed?	Yes	No	
			If "No" Do Not JetVac

Year Installed: _____

Date	Inspector	Sediment Depth (in)	Accumulated Trash/Debris	Maintenance Performed

Post-Construction Stormwater Management Plan - Attachment C
Operation, Maintenance and Management Inspection Checklist
Subsurface Stormwater Detention and/or Infiltration Facility Inspection Form

Date	Inspector	Sediment Depth (in)	Accumulated Trash/Debris	Maintenance Performed

Post-ConstructionStormwater Management Plan - Attachment D
Operation, Maintenance and Management Inspection Checklist
Detention Basin/Pond Facility Inspection Form

Date:

Time:

Weather Conditions:

Location (Street & No.):

GPS Waypoint : No:

Northing (WGS-84 Datum and Decimal Degree Format): N

Westing (WGS-84 Datum and Decimal Degree Format): W

Inspector:

Contractor (if Applicable):

Maintenance Item	Yes	No	Comments
Basin Embankment			
Well Vegetated/Adequate Ground Cover			
Free of Woody Vegetation			
Seepage Observed			
Settlement Observed			
Animal Burrow(s) Observed			
Invasive Species Observed/Species			
Emergency Spillway			
Riprap/Non-Woven Geotextile Stable			
Turf Reinforcement Mat Stable			
Clear of Debris			
Well Vegetated/Adequate Ground Cover			
Evidence of Recent Flow			
Rill Erosion			
Basin/Pond Forebay			
Design Depth to Overflow (Feet)			
Sedimentation/Debris Depth (Feet)			
Structurally Sound			
Basin/Pond Interior			
Design Depth to Emergency Spillway (Feet)			
Sedimentation/Debris Depth (Feet)			
Anthropogenic Debris			
Well Vegetated/Adequate Ground Cover			
Free of Woody Vegetation			
Seepage Observed			
Settlement Observed			
Animal Burrow(s) Observed			
Invasive Species Observed/Species			

Stormwater Management Facility
Operation, Maintenance and Management Inspection Checklist
Detention Basin and Ponds

Maintenance Item	Yes	No	Comments
Outlet Control Structure			
Grate/Trash Rack Clear			
Grate/Trash Rack Securely Fastened			
Structurally Sound			
Concrete Cracks or Spalls			
Sump Sedimentation			
Sump Debris			
Concrete Maintenance Needed			
Outlet Pipe Annulus Sound			
Outlet Pipe Condition Sound			
Metal Outlet Pipe Corrosion			
Basin/Pond Outlet Structure Outlet Pipe Condition			
Embankment Settlement Over Pipe			
Soil Piping Evident			
Basin/Pond Outlet Structure Outlet Pipe Outlet Protection			
Riprap/Non-Woven Geotextile Stable			
Riprap size and Thickness Adequate			
Articulated Concrete Block Stable			
Turf Reinforcement Mat Stable			
Erosion			
Sedimentation			
Debris			
Chain Link Fence and Gate(s)			
Gate(s) Closed and Locked			
Fence Condition Stable			
Fence Posts Stable			
Fence Clear of Anthropogenic Debris			
Gate Posts Stable			
Gate Operation Smooth			
Evidence of Vandalism			

Other Observations:

Post-Construction Stormwater Management Plan - Attachment E
Operation, Maintenance and Management Inspection Checklist
Outfall Outlet Protection/Level Spreader Inspection Form

Date: _____

Time: _____

Weather Conditions: _____

Location (Street/Road & No.): _____

GPS Waypoint No.: _____

GPS Northing (WGS-84 Datum and Decimal Degree Format): N _____

GPS Westing (WGS-84 Datum and Decimal Degree Format): W _____

Inspector: _____

Contractor (If Applicable): _____

Outlet Pipe No. 1

Diameter (in):	12	18	21	24	27	30	36
Diameter (in):	42	48	54	60	66	72	Other
Material	RCP	CMP	ACCMP	HCMP	HDPE	PVC	Other
Shape	Circular	Elliptical	Other				

Outlet Pipe No. 2 (if Applicable)

Diameter (in):	12	18	21	24	27	30	36
Diameter (in):	42	48	54	60	66	72	Other
Material	RCP	CMP	ACCMP	HCMP	HDPE	PVC	Other
Shape	Circular	Elliptical	Other				

End Treatment

	Plain	FES	Endwall	Other			
FES Type	Reinforced Concrete	Galvanized Steeel	HDP	Other			
Endwall Type	Precast Concrete	CIP Concrete	Concrete Block	Cement Rubble	Dry Rubble	Segmental Block	Other

Post-Construction Stormwater Management Plan - Attachment E
Operation, Maintenance and Management Inspection Checklist
Outfall Outlet Protection/Level Spreader Inspection Form

Outfall Location

Landscape Setting

Upland	Inland Wetland	Intermittent Watercourse	Perennial Watercourse	Vernal Pool

If the outfall discharges to an Inland Wetland, Watercourse or Vernal Pool what is the approximate setback distance?

0 - 10'	10' - 25'	25' - 50'	50' - 75'	75' - 100'	>100'

Outfall Pipe Outlet Protection

Length (Feet)	0 - 10'	10' - 20'	20' - 30'	
Width (Feet)	0' - 5'	5 '- 10'	10' - 15'	15' - 20'

Riprap

Riprap Size	Modified		Intermediate		Standard	
Thickness (Feet)	0' - 0.5'	0.5' - 1.0'	1.0' - 1.5'	1.5' - 2.0'	2.0' - 2.5'	>2.5'
Filter Fabric	Woven		Non-Woven		Unknown	

Riprap Condition Assessment

Riprap Stable	Yes	No	
			Comments:
Riprap Size and Thickness Adequate	Yes	No	
			Comments:

Turf Reinforcement Mat (TRM) Condition Assessment

TRM Stable	Yes	No	
			Comments:
TRM Adequate	Yes	No	
			Comments:

Articulated Concrete Block (ABC) Condition Assessment

Riprap Stable	Yes	No	
			Comments:
Riprap Size and Thickness Adequate	Yes	No	
			Comments:

Other Observations or Comments:

Post-Construction Stormwater Management Plan - Attachment F
Operation, Maintenance and Management Inspection Checklist
Possible Illicit Discharge Assessment Inspection Form

Date: _____

Time: _____

Weather Conditions: _____

Location (Street/Road & No.): _____

_____

GPS Waypoint No. _____

GPS Northing (WGS-84 Datum and Decimal Degree Format) N _____

GPS Westing (WGS-84 Datum and Decimal Degree Format) W _____

Digital Photo No. or Range: First _____ Last _____

Inspector(s): _____

Reason for Visit:

☐	Complaint	☐	Dry Weather Screening
☐	Follow-Up	☐	Wet Weather Screening
☐	Illegal Connection	☐	Other

Surrounding Land Use:

☐	Industrial	☐	Insitutional
☐	Commercial	☐	Undeveloped
☐	Residential	☐	Other

Comment(s): _____

Receiving Structure:

☐	Pipe	☐	Storm Manhole
☐	Catch Basin	☐	Sediment Tank
☐	Yard Drain	☐	Other

Comment(s): _____

Discharge Origin:

☐	Sump Pump	☐	Cutoff Drain
☐	Foundation Drain	☐	Roof Gutter Downspout
☐	Yard Drain	☐	Other

Comment(s): _____

Discharge Nature:

☐	Groundwater	☐	Blackwater
☐	Graywater	☐	Other

Comment(s): _____

Discharge Flow:

☐	Trickle	☐	Continuous
☐	Intermediate	☐	Intermittent
☐	Significant	☐	Other

Comment(s): _____

Drains To:

☐	Intermittent Watercourse	☐	Pond
☐	Perennial Watercourse	☐	Lake
☐	Inland Wetland	☐	Other
☐	Potential Vernal Pool		

Comment(s): _____

Post-Construction Stormwater Management Plan - Attachment F
Operation, Maintenance and Management Inspection Checklist
Possible Illicit Discharge Assessment Inspection Form

Odor:

☐	None	☐	Rotten Eggs
☐	Chlorine	☐	Rancid (Sour Milk)
☐	Petroleum Product	☐	Musty
☐	Sewage	☐	Other
☐	Cooking Oil	☐	

Comment(s): _____

Color:

☐	None	☐	Black
☐	Orange-Brown	☐	Red
☐	Gray	☐	Other
☐	Green		

Comment(s): _____

Clarity:

☐	Clear	☐	Cloudy
☐	Opaque	☐	Other

Comment(s): _____

Solids/Floatables:

☐	None	☐	Oil Sheen
☐	Bubbles/Suds	☐	Iron Sheen
☐	Food Wastes	☐	Tissue
☐	Scum	☐	Other

Comment(s): _____

Vegetative Impact: ☐ Yes ☐ No

Overall Outfall Assessment as an Illicit Discharge:

☐	Unlikely	☐	Potential
☐	Suspect	☐	Obvious

Field Measurements:

☐	Temp,°F	☐	Temp,°C
☐	D.O.	☐	pH
☐	Conductivity	☐	Turbidity

Sample Collected for Lab.: ☐ Yes ☐ No

Recommended Actions: _____