

# **Inspection of Stormwater Management Facilities (Detention/Retention/Infiltration Basins and Catch Basins)**

August 31, 2022

**Presented to Hamilton Township**

Rutgers Cooperative Extension Water Resources Program  
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# Overview

- Tier A Permit Requirements
- Catch Basin Inspections
- What are Detention/Retention/Infiltration basins?
- Typical Basin Structure
- Detention/Retention/Infiltration Basin Inspection
- Maintenance/Repair
  - Routine
  - Non-routine

# **Tier A Municipal Separate Storm Sewer System Permit Requirements (January 1, 2022)**

"Catch Basin" means a cistern, vault, chamber or well that is typically built along a street and below an inlet grate as part of the storm sewer system that is designed to capture and retain sediment, debris, and pollutants so those particles do not pass on to the stormwater sewer system.

"Stormwater facility" means stormwater infrastructure including, but not limited to, catch basins, infiltration basins, detention basins, green infrastructure, filter strips, riparian buffers, infiltration trenches, sand filters, constructed wetlands, wet basins, bioretention systems, low flow bypasses, and stormwater conveyances.

"Storm drain inlet" means the point of entry into the storm drain system and is, where a catch basin is present, the uppermost portion (or cover) of a catch basin.

### **3. Inspection and Maintenance of Stormwater Facilities Owned or Operated by the Permittee**

- a. The permittee shall develop, update, and implement a program to ensure adequate long-term cleaning, operation, and maintenance of all municipally owned or operated stormwater facilities, which includes but is not limited to:
  - i. Storm Drain Inlet Inspection: The permittee shall inspect, at a minimum of once per year, all storm drain inlets that it owns or operates;
  - ii. Storm Drain Inlet Cleaning and Maintenance: The permittee shall develop, update, and implement a storm drain inlet cleaning and maintenance program. The program shall establish the conditions under which a storm drain inlet must be cleaned, and maintenance performed. Cleaning and maintenance shall be conducted, at a minimum, as frequently as necessary to ensure that sediment, trash, or other debris is removed as necessary to restrict it from entering the waters of the State; to eliminate recurring problems; and maintain proper function;

- iii. **Catch Basin Inspection:** The permittee shall inspect all catch basins that it owns or operates. At a minimum, permittees who own or operate less than 1,000 catch basins shall inspect them once per year. Permittees who own or operate 1,000 or more catch basins shall inspect a minimum of 20% of the total or 1,000 per year, whichever is greater, rotating the schedule in such a way that all catch basins are inspected at least once every five years on approximately the same frequency;
- iv. **Catch Basin Cleaning:** The permittee shall develop, update, and implement a catch basin cleaning and maintenance program. The program shall establish when a catch basin must be cleaned and maintained and include procedures for cleaning and maintenance. Cleaning and maintenance shall be implemented as frequently as necessary to ensure, at a minimum, that sediment, trash, or other debris is removed as necessary to control it from entering the waters of the State; to eliminate recurring problems; and maintain proper function.;

- v. MS4 Conveyance Inspection and Cleaning: The permittee shall develop, update, and implement a MS4 conveyance inspection, cleaning, and maintenance program. The program shall establish when the MS4 conveyance must be cleaned and maintained to ensure proper function and operation;
  
- vi. Stormwater Infrastructure Inspection (excluding i. – v. above): The permittee shall inspect all stormwater infrastructure that it owns or operates pursuant to approved maintenance plans. If there are no approved maintenance plans for certain stormwater infrastructure, the permittee shall inspect that infrastructure at least 4 times annually, and after each rainstorm exceeding 1 inch of total rainfall, unless the NJ Stormwater BMP Manual recommends a less frequent schedule;

- vii. Stormwater Infrastructure Maintenance (excluding i. – v. above): The permittee shall perform maintenance pursuant to approved maintenance plans, or more frequently as needed, to ensure the proper function and operation. See [www.njstormwater.org](http://www.njstormwater.org); for maintenance guidance;
  
- viii. The permittee shall maintain a log sufficient to demonstrate compliance with this section, including but not limited to the type of stormwater facility; location information of the facility with geographic coordinates; name of inspector; date of inspection; observations of the structural integrity; history of complaints; evidence of current or previous flooding; any preventative and corrective maintenance performed; and any additional information or findings. Example Maintenance Logs and Inspection Records forms are available at [www.njstormwater.org](http://www.njstormwater.org) under the maintenance guidance link;

- ix. If stormwater facilities are found not to be functioning properly, corrective maintenance and repairs shall be completed as soon as practicable, but no later than 90 days from discovery, unless another timeframe is authorized by the Department. The permittee shall prioritize these activities based upon environmental, health and safety concerns; and
- x. The permittee shall certify in the MSRP Annual Report whether or not municipally owned or operated stormwater facilities have been inspected, are properly maintained, and are properly functioning.
- xi. Existing Tier A permittees and new Tier A permittees shall implement this requirement upon EDPA.

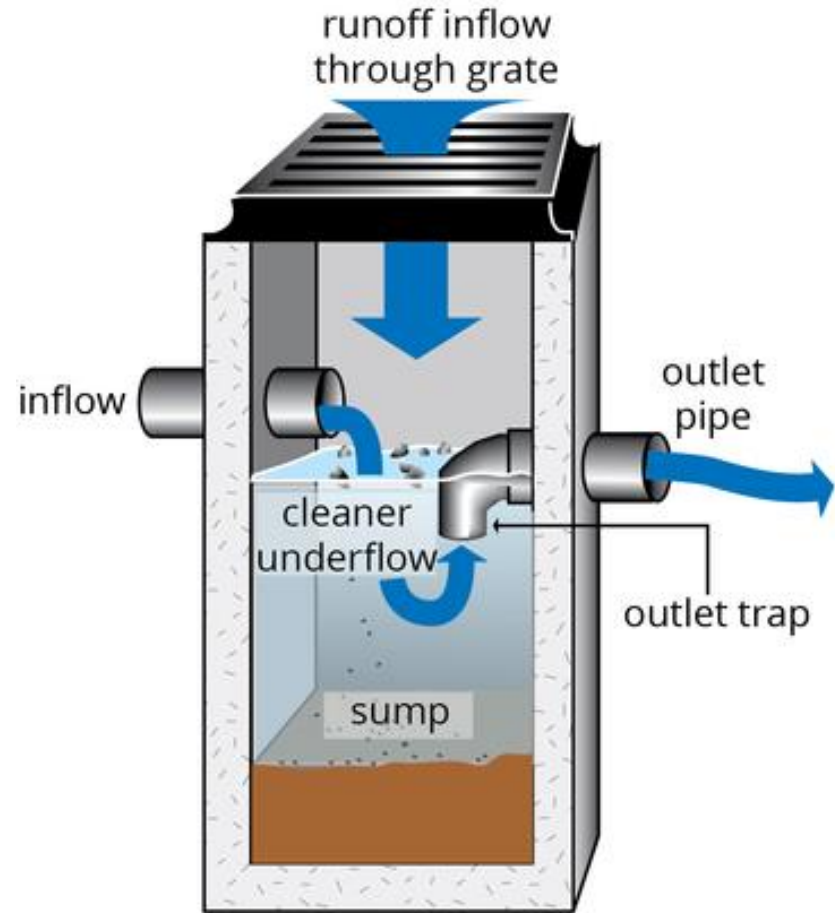


# What is the DPW's Responsibility?

- Stormwater infrastructure owned or operated by the Township
- Hamilton owns or operates about has about 7,265 catch basins which include:
  - CBs in right of way
  - CBs on municipal property
  - CBs in stormwater related easements
- Hamilton owns or operates about 41 stormwater basins (see 2019 Stormwater Basin Assessment Summary (Year 5A) )
- Inspections of this infrastructure must be done on a regular basis

# Catch Basin Inspections

- “Storm drain inlet”
  - Grate surface
  - Inspected annually
- “Catch basin”
  - The concrete vault below the street
  - Inspected once every five years



(portland.gov)

# Catch Basin Inspections

- What to look for?
  - Is the grate clear to allow flow into the catch basin? Does it need to be cleaned?
  - Does the catch basin need to be cleaned of excessive sediments?
  - Is the catch basin structurally stable or is it in need of repair?
- What to log?
  - Type of Inlet
  - Depth of catch basin
  - Size of inflow outflow pipes
  - Amount of sediment

# Data Collection

- Existing work order in Traisr can be used
- Trial run 2021, inspected 186 catch basins over two days w/ team of two
- Would need ~16 days to inspect 1/5 of catch basins each year
- Currently working with Traisr manager on better way to collect data more efficiently and in a more focused and mobile-friendly way

The form is divided into four main sections: Inspection Information, Cleaning Information, Maintenance Information, and a Comments section. Each section contains various input fields and checkboxes for data collection.

| Inspection Information |   |
|------------------------|---|
| Overall Condition      | Inspected by Rutgers?<br><input type="checkbox"/> Yes |

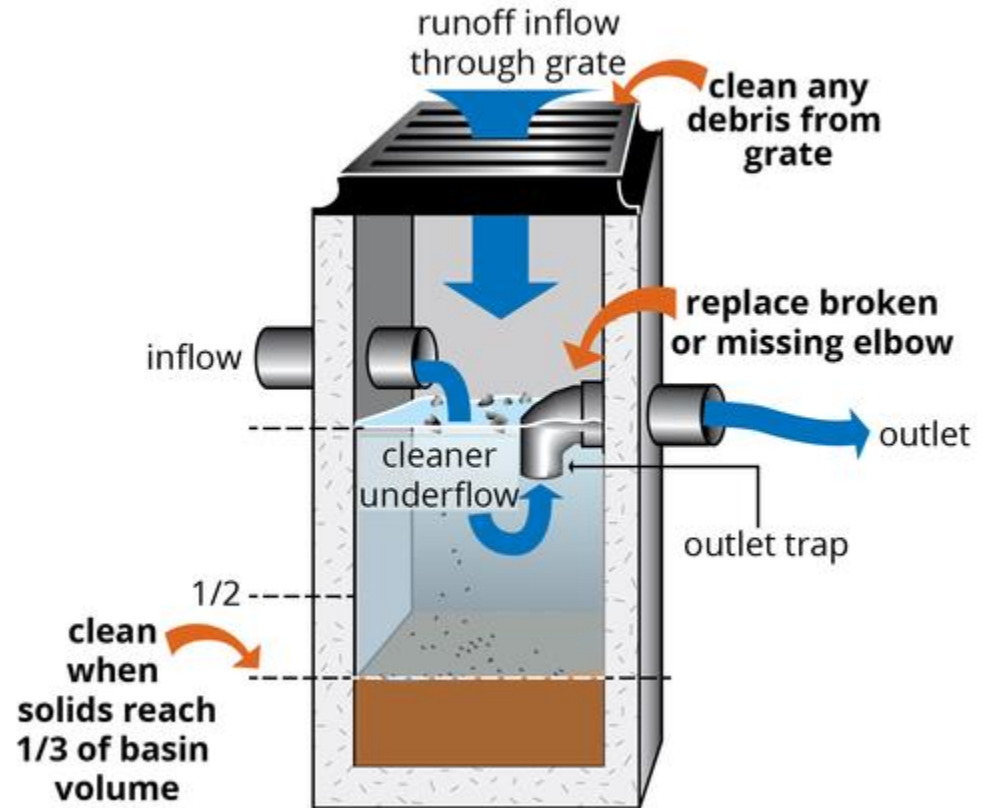
| Cleaning Information   |  |
|--|--|
| Address  | Snow Route<br><input type="checkbox"/> 3<br><input type="checkbox"/> 4<br><input type="checkbox"/> 5<br><input type="checkbox"/> 10<br><input type="checkbox"/> 11 |
| Grate Needs to be Cleaned<br><input type="checkbox"/> Yes<br><input type="checkbox"/> No | Box Needs to be Cleaned<br><input type="checkbox"/> Yes<br><input type="checkbox"/> No   |
| Used Vac?<br><input type="checkbox"/> Yes<br><input type="checkbox"/> No                 |  |

| Maintenance Information |              |
|-------------------------|--------------|
| Map Page                | Comments     |
| PA 1Call                | Repairs Done |

# Catch Basin Maintenance

- Clear vegetation or debris from basin surface
- Collect sediment from basin with vacuum truck
- Repair damaged structures



(portland.gov)

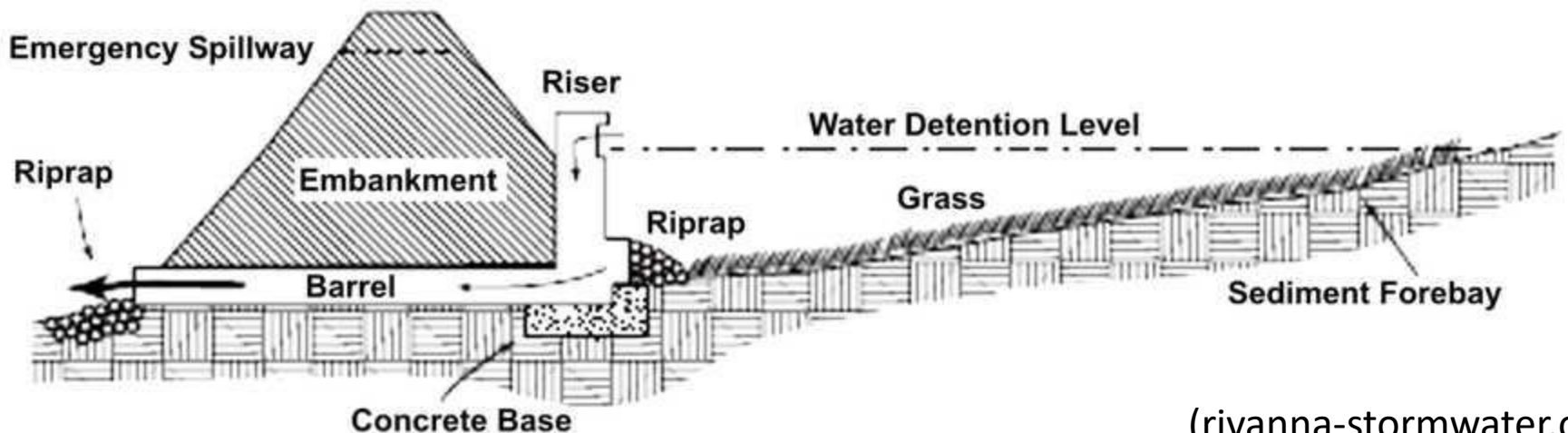
# Stormwater Basin Types

- Detention
  - Retains and slowly releases stormwater completely
- Retention
  - Permanently retains water to allow settling while still providing detention
- Infiltration
  - Outlet orifice is raised to allow portion of stormwater to infiltrate into the ground. Provides detention during larger storm events.

# What is a Detention Basin?

Detention basins are designed to detain stormwater runoff during a storm and slowly release the stormwater after the storm.

- Prevents downstream flooding
- Removes pollutants only through settling
- Typically goes dry 48-hours after storm
- Usually contains turf grass that is regularly mowed
- Often contain concrete low-flow channel
- Follow old regulation standard





# Typical Detention Basin





# Typical Detention Basin

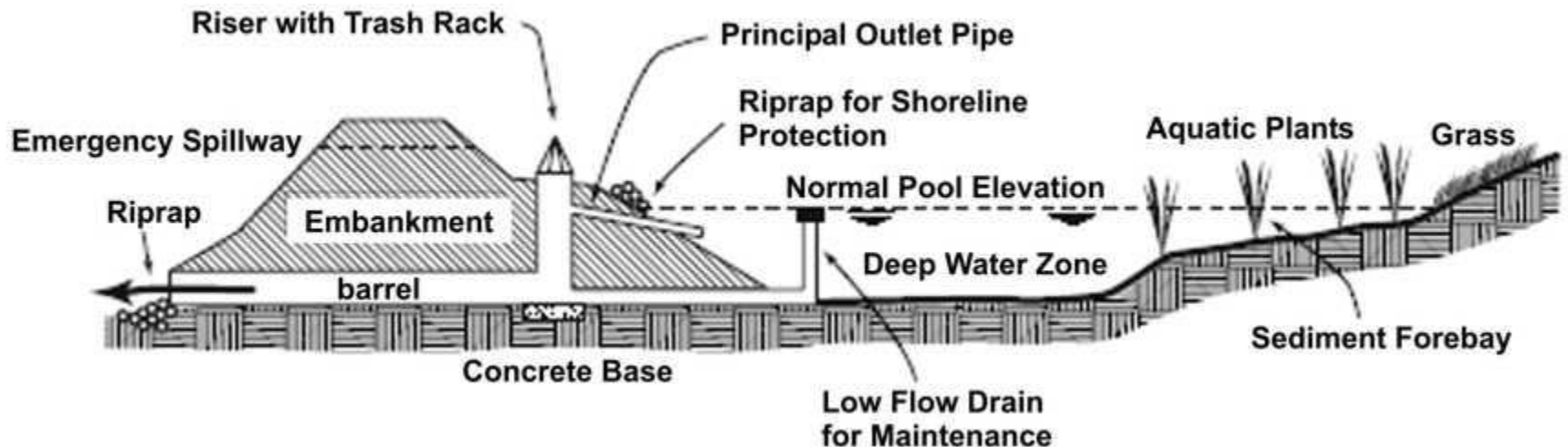


# What is a Retention Basin?

(a.k.a. stormwater ponds, wet retention ponds, wet ponds)

Retention basins maintains permanent pools and stores stormwater runoff on tope of existing standing water.

- Prevents downstream flooding
- Removes pollutants mainly through settling and algal uptake
- Always has a minimum of three feet of standing water
- Often attract lots of geese
- Can require dredging





# Typical Detention Basin



# Typical Retention Basin

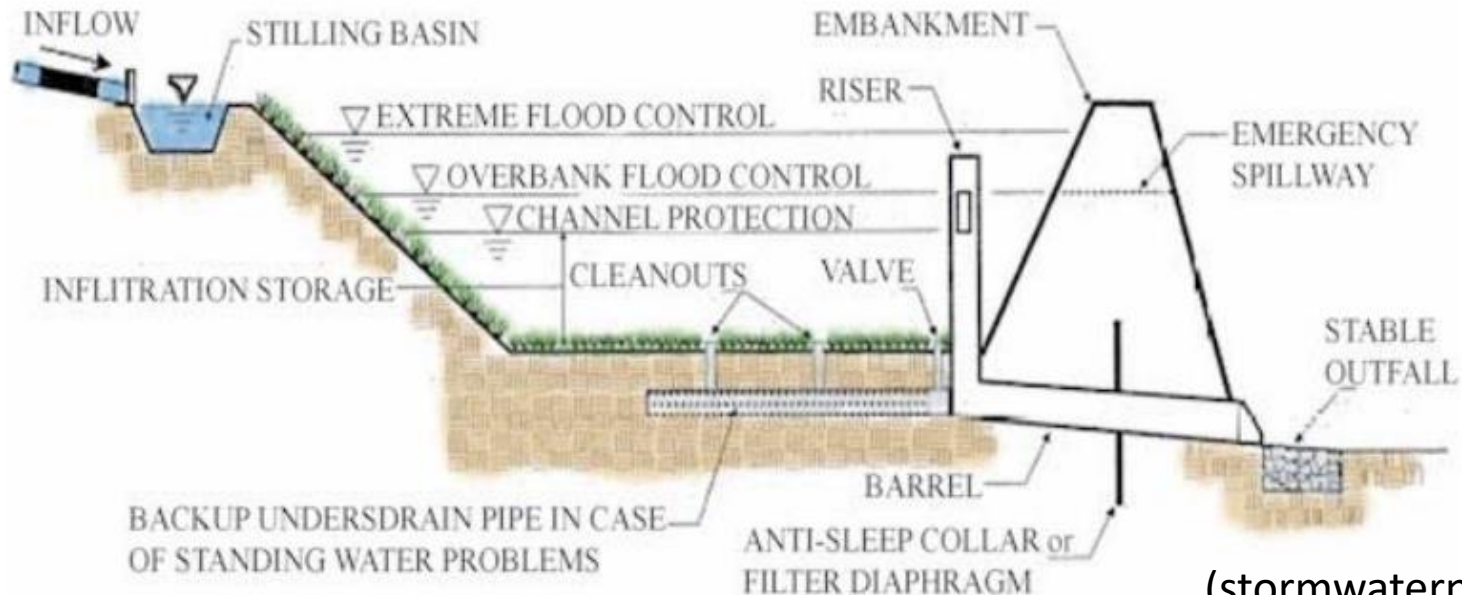




# What is an Infiltration Basin?

Infiltration basins have a raised outlet structure to allow infiltration with the intention of the system fully draining

- Prevents downstream flooding
- Removes pollutants through infiltration
- Typically dry 48 hours after storm
- Follow more modern regulation standards, but now largely replaced by bioretention systems (similar but with vegetation)



(stormwaterpa.org)

# Typical Infiltration Basin





# Detention/Infiltration Basin vs. Retention Basin

Does the basin hold a permanent pool of water?

NO – Detention/Infiltration

YES – Retention



USEPA



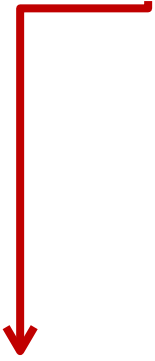
USEPA

# Detention Basin vs. Infiltration Basin

Is the basins primarily outlet at the bottom of the basin or does the basin have a low flow channel?

NO – Infiltration

YES – Detention

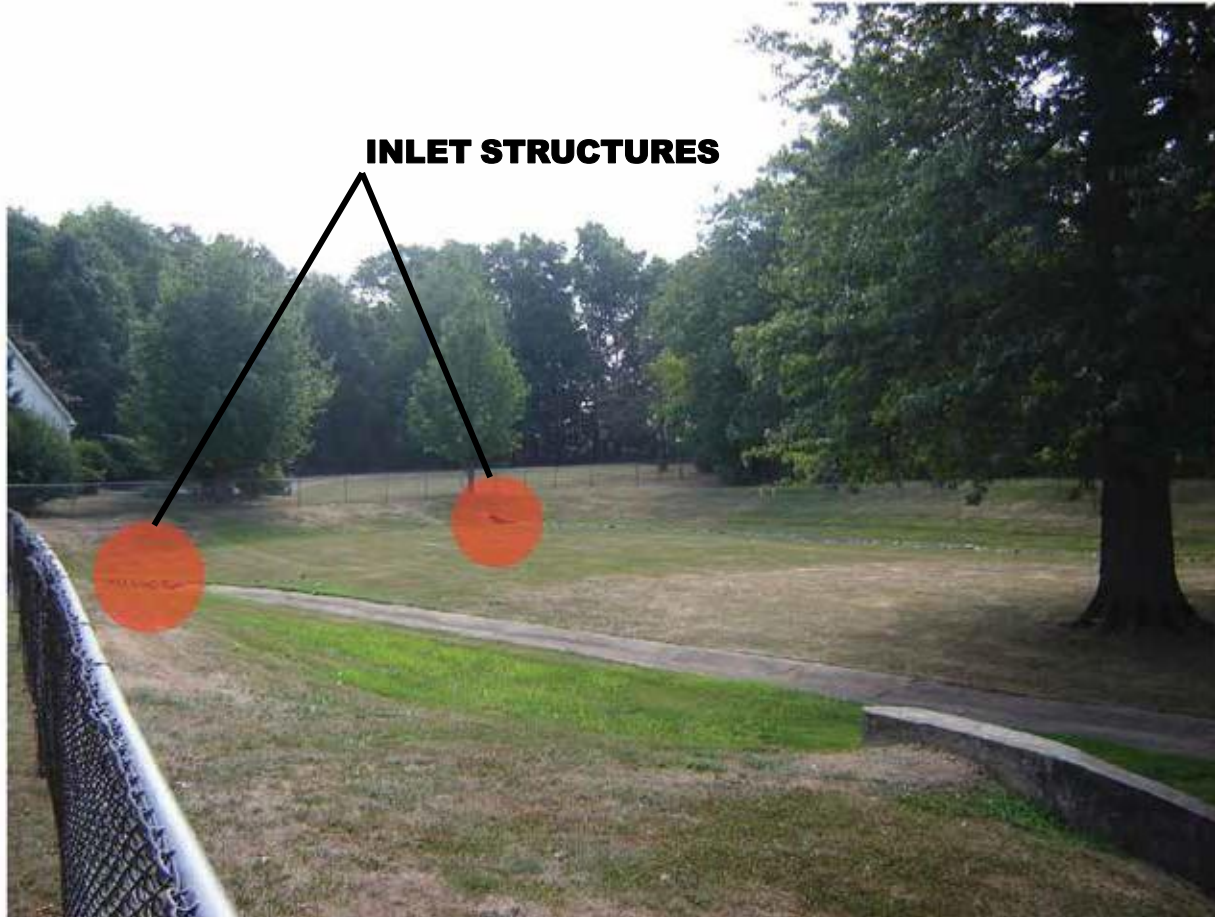




# Detention Basin Anatomy



# Detention Basin Anatomy



# Detention Basin Anatomy

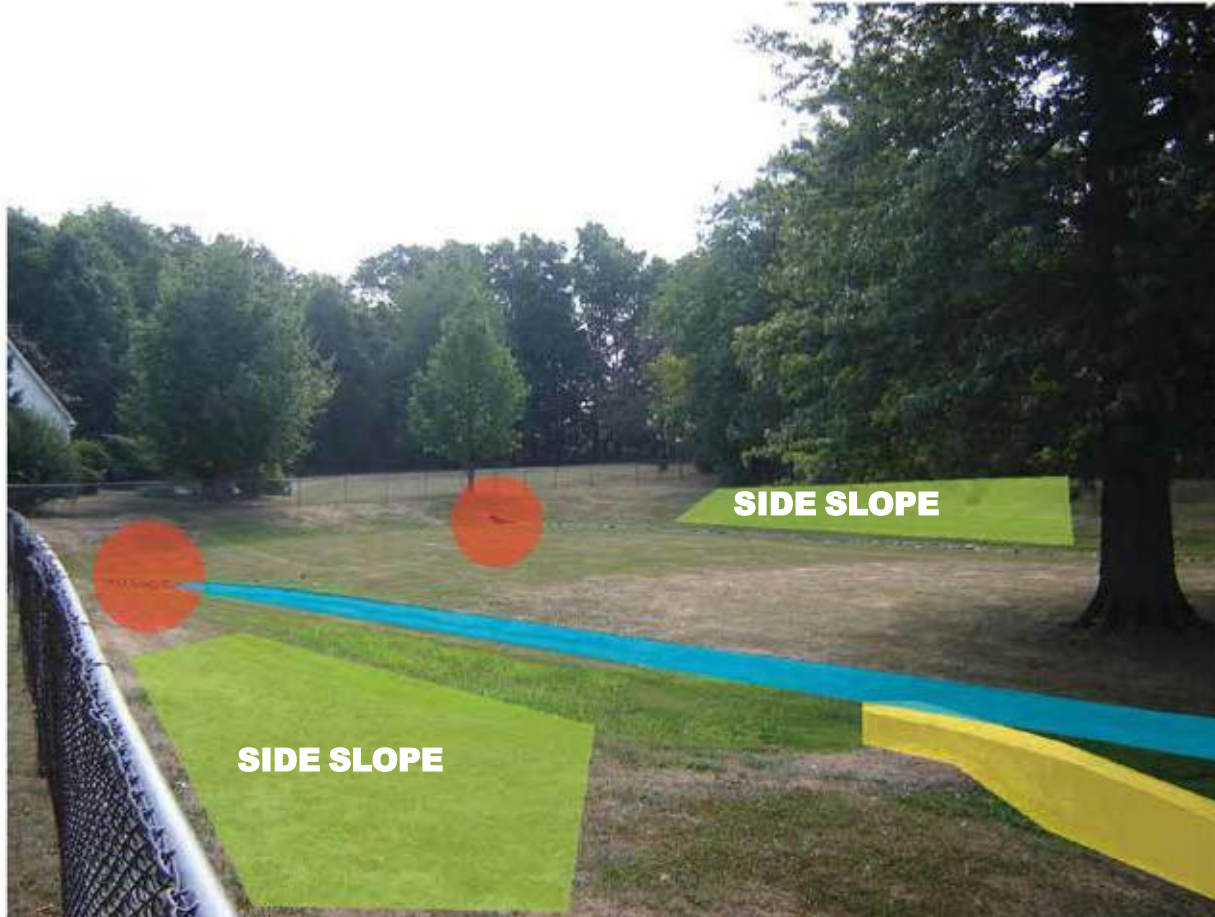




# Detention Basin Anatomy



# Detention Basin Anatomy

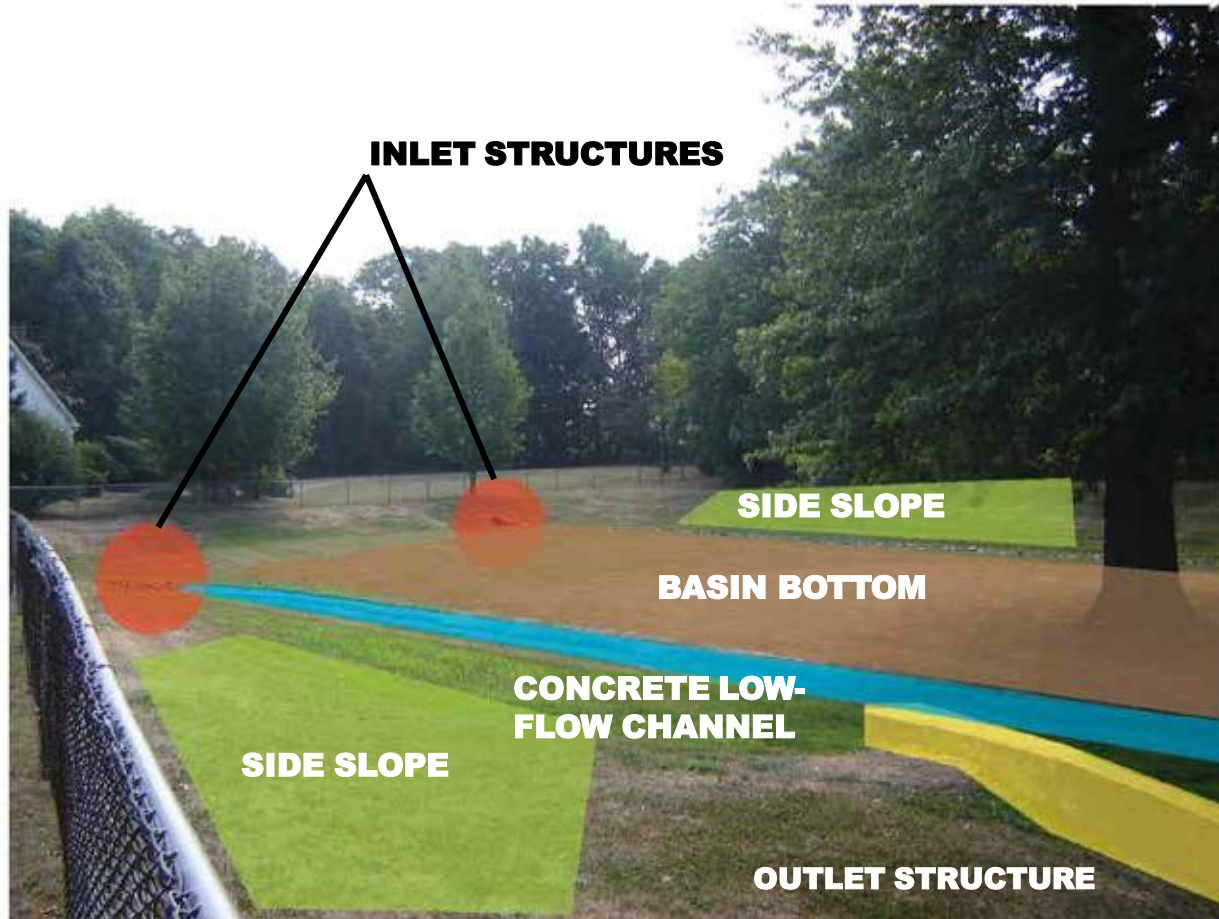


# Detention Basin Anatomy





# Detention Basin Anatomy



# Detention Basin Inspections

- Inspection Frequency
  - Pursuant to approved maintenance plans
  - OR, if there are no approved maintenance plans for certain stormwater infrastructure, the permittee shall inspect that infrastructure at least 4 times annually, and after each rainstorm exceeding 1 inch of total rainfall, unless the NJ Stormwater BMP Manual recommends a less frequent schedule



# Detention Basin Inspections

- Is there erosion of the side slopes or basin bottom?
- Is there sediment accumulation in the forebay or basin?
- Are the inlets and outlet devices free of debris and operational?
- Is the concrete low-flow channel clogged or broken?
- Is there standing water?
- Are there floatables accumulated in the basin?
- Is the grass healthy? Are there bare spots? Are there undesirable weeds or woody vegetation?
- Is there evidence of geese?

# Who does inspections?

MS4 Permit requires municipalities to ensure that all stormwater facilities (public and private) are being maintained and operating as designed.

- Municipality inspects public facilities
- Municipality require private facilities to be inspected by a stormwater professional
- Annual inspection reports are required

# Inspection Form (handout)



**Hamilton Township Stormwater Infrastructure  
Assessment Program  
Stormwater Basin Inspection Checklist**

|   |  |          |
|---|--|----------|
| <b>GENERAL INFORMATION</b>                                      |  | Site ID: |
| Name(s) person inspecting the basin:                            |  | Date:    |
| Location Address and Cross Streets:                             | Watershed:   |          |
| Name of Creek, Stream, or area into which the basin discharges: | Property Owner / Tax Parcel Block & Lot:   |          |
| Contact information:  |  |          |
| <b>STRUCTURAL COMPONENTS</b>                                    |  |          |
| Basin description, size and depth:                              | Is the basin accessible to maintain? Yes / No<br>Is it maintained: Mowed, clear of woody plants, inlet/outlet blockages? |          |
| Number of inlets:   | Outlet diameter:   |          |

| GENERAL OBSERVATIONS  | YES | NO | NOTES/REMARKS |
|---|-----|----|---------------|
| 1) Any reports on the basin not functioning?  |     |    |               |
| 2) Are there any unauthorized or malfunctioning structures in the basin?  |     |    |               |
| 3) Are there concrete low flow channels. Is the water entering the basin directly exiting the basin outlet without coming in contact with the basin bottom soil and vegetation? |     |    |               |
| 4) Is there standing water or evidence of standing water in the basin?  |     |    |               |
| <b>INLET/S</b>  |     |    |               |
| 1) Signs of breakage, damage, corrosion or rusting of inlet structure/pipe?   |     |    |               |
| 2) Debris or sediment accumulation in or around the inlet clogging the inlet opening/pipe?  |     |    |               |
| 3) Signs of erosion, scour or gullies; rock or vegetation above or around the inlet structure?  |     |    |               |
| 4) Tree roots, woody vegetation growing close to or through the inlet structure or a situation impacting the structure's integrity?   |     |    |               |
| 5) If the inlet has a pretreatment structure (trash rack, forebay) is it filled w/ debris or sediment?  |     |    |               |
| <b>BASIN</b>  |     |    |               |
| 1) Accumulation of debris or litter within basin?   |     |    |               |
| 2) Exposed dirt or earth visible, are there areas without vegetation or where turf is damaged?  |     |    |               |
| 3) Excess sediment accumulation in the basin?   |     |    |               |
| 4) Basin walls/embankment eroded, slumping, caved or being undermined?  |     |    |               |



**Hamilton Township Stormwater Infrastructure  
Assessment Program  
Stormwater Basin Inspection Checklist**

| OUTLET  | YES | NO | NOTES/REMARKS |
|---|-----|----|---------------|
| 1) Breakage, damage, corrosion or rusting to outlet pipe or conveyance?   |     |    |               |
| 2) Signs of erosion, scour or gullies; rock or vegetation above or around the outlet structure?                                 |     |    |               |
| 3) Debris or sediment accumulation in or around the outlet pipe (i.e. debris or sediment)?                                      |     |    |               |
| 4) Accumulation of debris or litter in or around outlet?  |     |    |               |
| 5) Tree roots or woody vegetation impacting the outlet or causing potential damage to the structure?                            |     |    |               |
| <b>SECONDARY/EMERGENCY OVERFLOW SPILLWAY</b>  |     |    |               |
| 1) Are pipes, conduits, or conveyances free of debris, clogs and in good condition? (i.e. no visible cracks, breakage slumping) |     |    |               |
| 2) Large tree or root growth close to pipes or conveyances with the potential to crack structure or impede flow?                |     |    |               |
| 3) Signs of erosion, scour or gullies; rock or vegetation above or around the spillway?   |     |    |               |
| <b>BASIN OUTFALL AREA</b>   |     |    |               |
| 1) Signs of stormwater exiting the basin in an uncontrolled manner over or through wall or berm?                                |     |    |               |
| 2) Signs of erosion, scour or gullies; rock or vegetation at or down slope of the outfall?                                      |     |    |               |
| <b>RECOMMENDATIONS FOR WATER QUALITY IMPROVEMENTS</b>   |     |    |               |
| 1) Reduce mowing  |     |    |               |
| 2) Plant buffers  |     |    |               |
| 3) Establish meadows  |     |    |               |
| 4) Retrofit with infiltration structures or other strategies  |     |    |               |
| 5) Other  |     |    |               |
| <b>SUMMARY AND NOTES: Identify unique characteristics and/or opportunities</b>  |     |    |               |
|   |     |    |               |

**GENERAL INFORMATION**

Site ID:

Name(s) person inspecting the basin:

Date:

Location Address and Cross Streets:

Watershed:

Name of Creek, Stream, or area into which the basin discharges:

Property Owner / Tax Parcel Block &amp; Lot:

Contact information:

**STRUCTURAL COMPONENTS**Basin description, size and depth:Is the basin accessible to maintain? Yes/No  
Is it maintained: Mowed, clear of woody plants, inlet/outlet blockages?

Number of inlets:

Outlet diameter:

| GENERAL OBSERVATIONS   | YES | NO | NOTES/REMARKS |
|--|-----|----|---------------|
| 1) Any reports on the basin not functioning?   |     |    |               |
| 2) Are there any unauthorized or malfunctioning structures in the basin?   |     |    |               |
| 3) Are there concrete low flow channels. Is the water entering the basin directly exiting the basin outlet without <u>coming in contact with the basin bottom soil and vegetation?</u> |     |    |               |
| 4) Is there standing water or evidence of standing water in the basin?   |     |    |               |

| INLET/S   | YES | NO | NOTES/REMARKS |
|---|-----|----|---------------|
| 1) Signs of breakage, damage, corrosion or rusting of inlet structure/pipe?   |     |    |               |
| 2) Debris or sediment accumulation in or around the inlet clogging the inlet opening/pipe?  |     |    |               |
| 3) Signs of erosion, scour or <u>gullies</u> ; rock or vegetation above or around the inlet structure?                              |     |    |               |
| 4) Tree roots, woody vegetation growing close to or through the inlet structure or a situation impacting the structure's integrity? |     |    |               |
| 5) If the inlet has a pretreatment structure (trash rack, forebay) is it filled w/ debris or sediment?                              |     |    |               |

| <b>BASIN</b>   | <b>YES</b> | <b>NO</b> | <b>NOTES/REMARKS</b> |
|--|------------|-----------|----------------------|
| 1) Accumulation of debris or litter within basin?  |            |           |                      |
| 2) Exposed dirt or earth visible, are there areas without vegetation or where turf is damaged? |            |           |                      |
| 3) Excess sediment accumulation in the basin?  |            |           |                      |
| 4) Basin walls/embankment eroded, slumping, caved or being undermined?                         |            |           |                      |

| <b>OUTLET</b>  | <b>YES</b> | <b>NO</b> | <b>NOTES/REMARKS</b> |
|--|------------|-----------|----------------------|
| 1) Breakage, damage, corrosion or rusting to outlet pipe or conveyance?                              |            |           |                      |
| 2) Signs of erosion, scour or gullies; rock or vegetation above or around the outlet structure?      |            |           |                      |
| 3) Debris or sediment accumulation in or around the outlet pipe ( <u>i.e.</u> debris or sediment)?   |            |           |                      |
| 4) Accumulation of debris or litter in or around outlet?   |            |           |                      |
| 5) Tree roots or woody vegetation impacting the outlet or causing potential damage to the structure? |            |           |                      |



| <b>SECONDARY/EMERGENCY<br/>OVERFLOW SPILLWAY</b>  | <b>YES</b> | <b>NO</b> | <b>NOTES/REMARKS</b> |
|---|------------|-----------|----------------------|
| 1) Are pipes, conduits, or conveyances free of debris, clogs and in good condition? ( <u>i.e.</u> no visible cracks, breakage slumping) |            |           |                      |
| 2) Large tree or root growth close to pipes or conveyances with the potential to crack structure or impede flow?                        |            |           |                      |
| 3) Signs of erosion, scour or gullies; rock or vegetation above or around the spillway?   |            |           |                      |

| <b>BASIN OUTFALL AREA</b>  | <b>YES</b> | <b>NO</b> | <b>NOTES/REMARKS</b> |
|--|------------|-----------|----------------------|
| 1) Signs of stormwater exiting the basin in an uncontrolled manner over or through wall or berm?   |            |           |                      |
| 2) Signs of erosion, scour or <u>gullies</u> ; rock or vegetation at or down slope of the outfall? |            |           |                      |

| <b>RECOMMENDATIONS FOR WATER QUALITY IMPROVEMENTS</b>  |  |
|--|--|
| 1) Reduce mowing<br>2) Plant buffers<br>3) Establish meadows<br>4) Retrofit with infiltration structures or other strategies<br>5) Other |  |
| <b>SUMMARY AND NOTES: Identify unique characteristics and/or opportunities</b>   |  |
|  |  |

- 1) Reduce mowing
- 2) Plant buffers
- 3) Establish meadows
- 4) Retrofit with infiltration structures or other strategies
- 5) Other

**SUMMARY AND NOTES: Identify unique characteristics and/or opportunities**

# Types of Maintenance

- Routine Maintenance
  - Vegetation management
  - Debris and litter removal
  - Mechanical components maintenance
- Non-Routine Maintenance
  - Stabilization and erosion control repairs
  - Sediment removal
  - Outlet repair or replacement

# Routine Maintenance



# Routine Maintenance Requirements

- **Vegetation management**
  - Mowing should be done where/when it is needed (traditionally, 10-14 times per year)
  - Effective groundcovers must be kept healthy to prevent erosion and damage to the system
- **Debris and litter removal**
  - Inlets and outlets should be regularly cleared of debris and litter to prevent obstructions and reduced efficiency of the system
- **Mechanical components maintenance**
  - All mechanical equipment, such as gates, valves, locks, or other components must be kept in working order should an emergency arise

# Routine Maintenance





# Routine Maintenance for Mechanical Components

- Regular inspections will reduce need for major replacements



# Reducing Routine Maintenance

- **Vegetation management**
  - Reduce need for mowing
  - Eliminate any use of commercial fertilizers and pesticides in stormwater management facilities
- **Debris and litter removal**
  - Install simple low-cost retrofits on catch basins near the discharge to the detention system
- **Mechanical components maintenance**
  - Regular inspections and immediate repairs will reduce need for major replacements



# Non-Routine Maintenance



# Non-Routine Maintenance

- **Stabilization and erosion control repairs**
  - If vegetation fails on embankments or in the basin, soil replacement, reseeding and stabilization should occur immediately
- **Sediment removal**
  - During the establishment of a new basin, the basin should be inspected for excessive sedimentation. After establishment, the basin should be inspected twice a year and excessive sediment accumulated in the basin should be removed.
- **Outlet repair or replacement**
  - Should the system stop functioning as designed the outlet structure may require repair or replacement

# Non-Routine Maintenance



# Reducing Costs for Non-Routine Maintenance

- **Stabilization and erosion control repairs**
  - Ensure basin designs do not incorporate steep embankments (greater than 3:1)
  - Maintain healthy groundcovers by not mowing basin areas to less than 4 inches in height
- **Sediment removal**
  - Install manufactured pre-treatment device prior to stormwater discharging to basins
  - Install a settling forebay near inlets where access can be provided and reached with available excavation equipment
- **Outlet repair or replacement**
  - Conduct regular inspections to ensure system is functioning properly and debris and litter are not clogging the outlet
  - Provide and maintain clear access to all structures of the system

# Expected Costs for Non-Routine Maintenance

- Sediment removal estimated to be needed:
  - Every 5-15 years for wet pond
  - Every 2-10 years for a dry pond
- Expected costs for sediment removal:
  - Mobilization \$2,500 - \$5,000 (dependent on size of project)
  - Dredging work \$10/cy - \$20/cy (dependent on depth of sediment)
  - Disposal off-site \$45/cy - \$75/cy (extremely variable and dependent on hauling distance, quality of material, and disposal requirements)
- Expected costs for pre-cast concrete replacement outlet structure:
  - \$5,000 - \$15,000 depending on size of structure, access, and complexity of the installation



# Stabilization and Erosion Control Repairs

- Ensure basin designs due not incorporate steep embankments (greater than 3:1)
- Maintain healthy groundcovers by not mowing basin areas to less than 4 inches in height





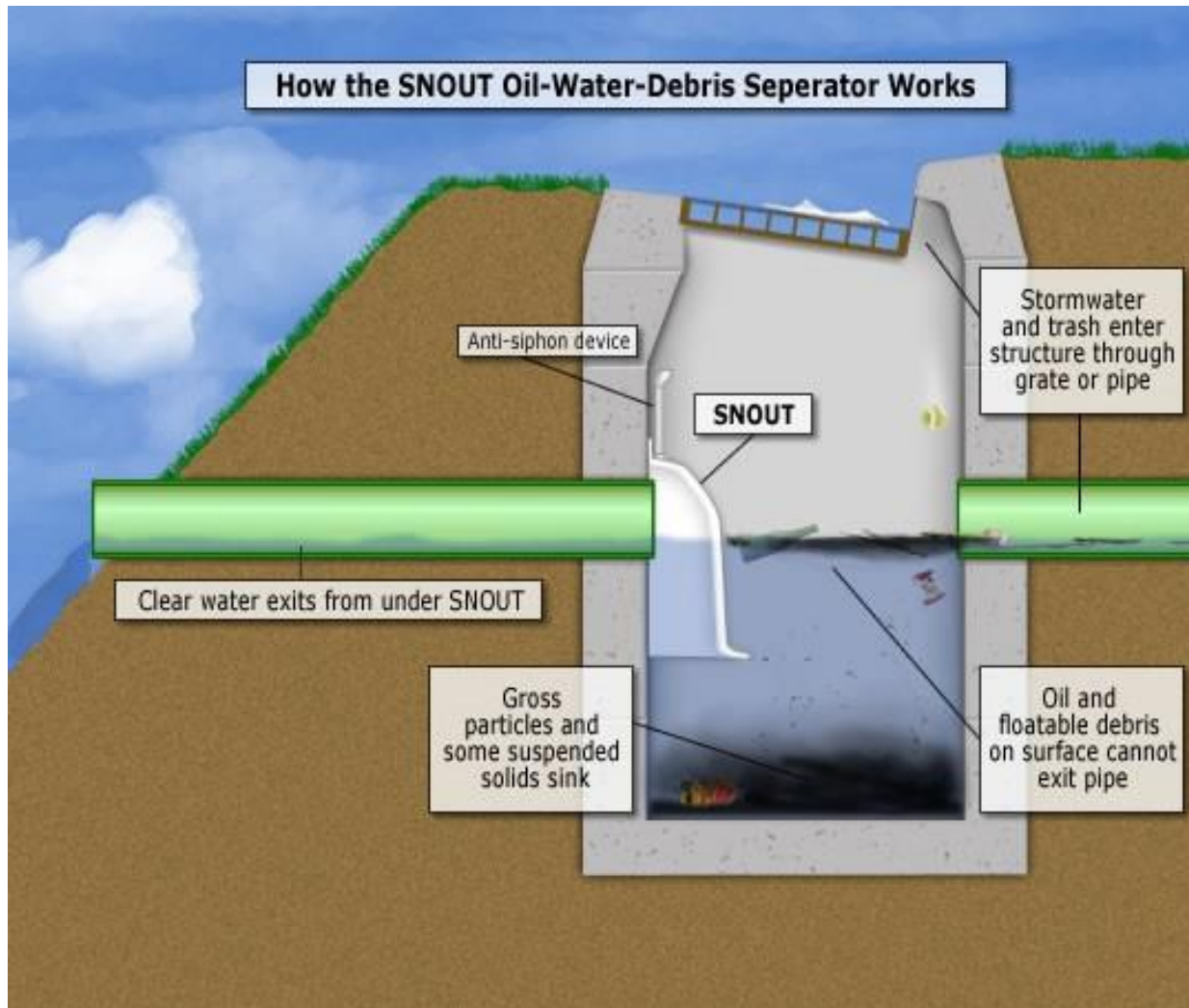
# Sediment Removal

## Manufactured Pre-Treatment Systems

- Intended to capture sediments, metals, hydrocarbons, floatables, and/or other pollutants in stormwater runoff before being conveyed to a storm sewer system, additional stormwater quality treatment facility, or waterbody.
- Adequate for small drainage areas that contain a predominance of impervious cover that is likely to contribute high hydrocarbon and sediment loadings, such as small parking lots and gas stations. For larger sites, multiple devices may be necessary.
- Devices are normally used for pre-treatment of runoff before discharging to other, more effective stormwater quality treatment facilities.

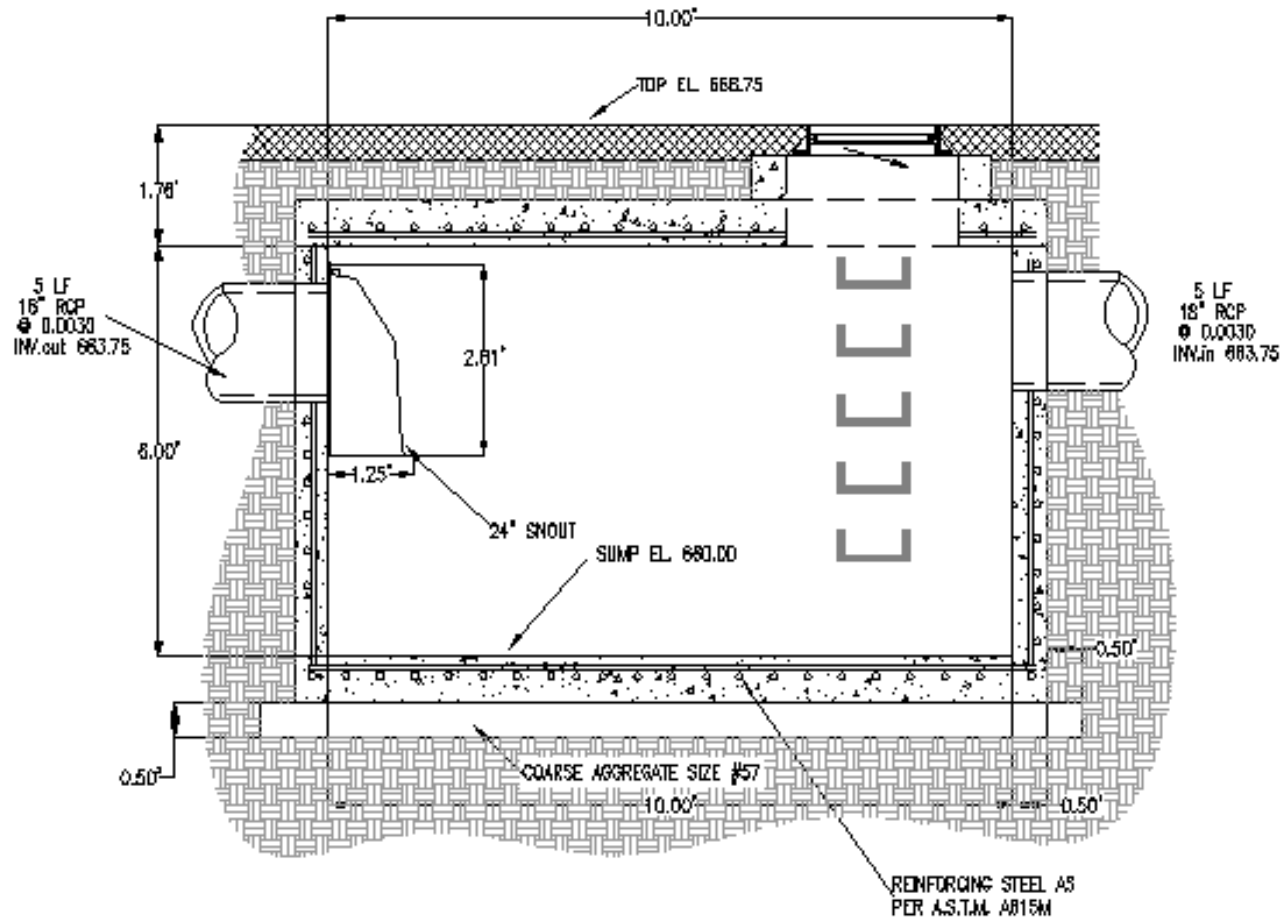
# Debris and Litter Removal

## Low Cost “Snout” Debris Separator



# Debris and Litter Removal

## Low Cost "Snout" Debris Separator

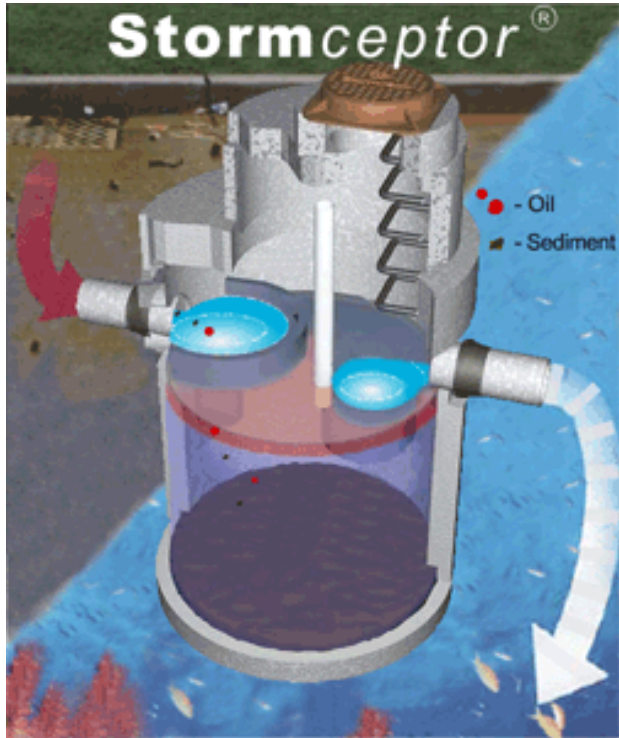


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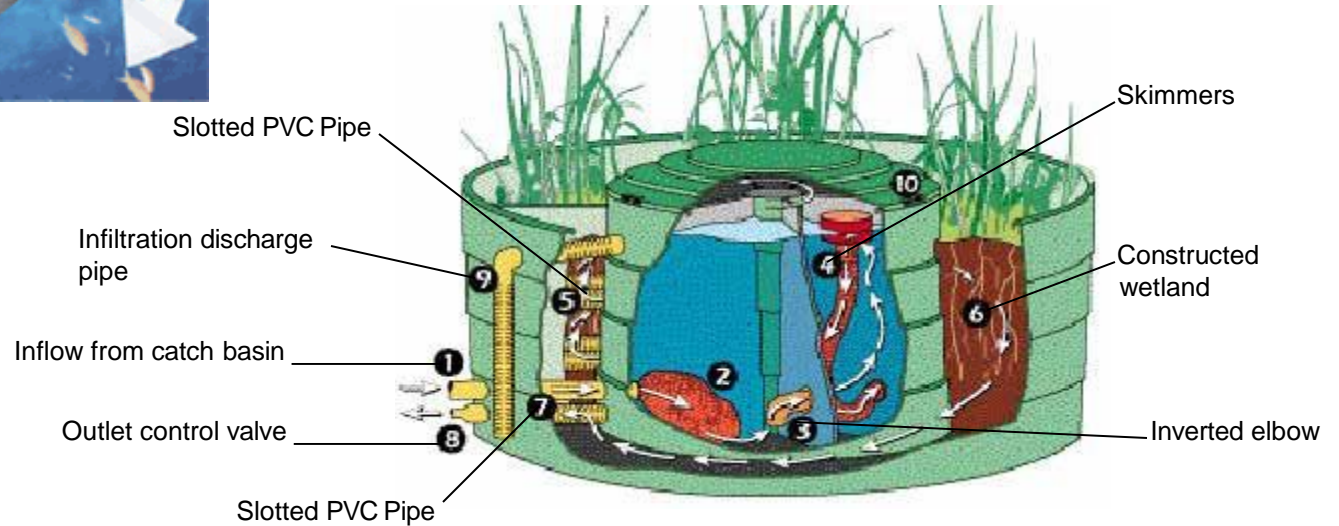
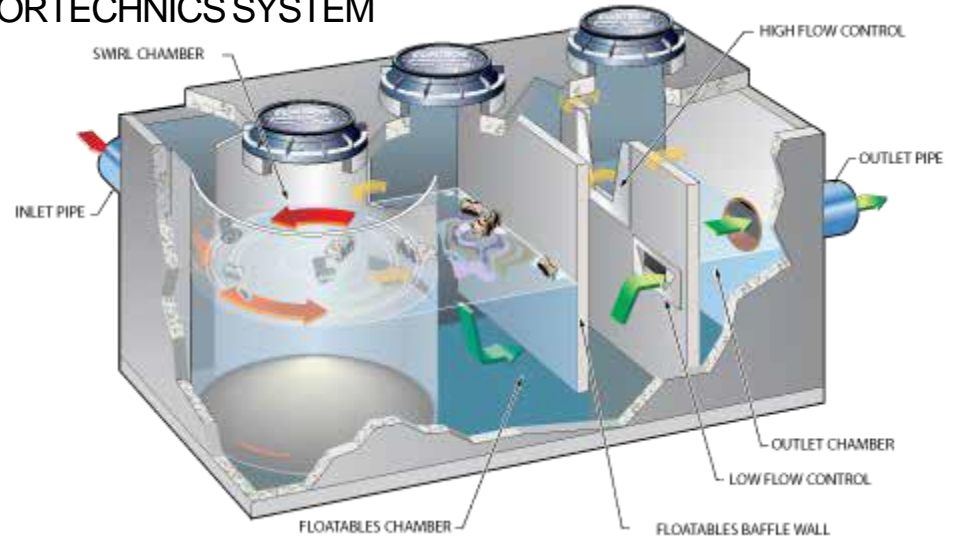
VAULT W/ SNOUT -ELEVATION

1" = 2'

# Manufactured Pre-Treatment Systems



VORTECHNICS SYSTEM





# Outlet Repair or Replacement

- Conduct regular inspections to ensure system is functioning properly and debris and litter are not clogging the outlet
- Provide and maintain clear access to all structures of the system





# Review

- Catch basin **inlet grates** should be inspected annually to ensure function.
- **Catch basins** themselves need to be inspected once every five years and maintained as needed. This data should be collected digitally and submitted to the Engineering Department.
- **Detention/Retention/Infiltration Basins** need to be inspected and certified to be working annually. Forms should be compiled and submitted to the Engineering Department.
- Other stormwater infrastructure also needs to be inspected and certified functioning as needed
  - Outfalls are currently being inspected by Rutgers WRP. These also need to be inspected every five years for structural integrity, erosion control, and illicit discharge connections.
  - Storm sewer piping should be regularly inspected (not specifically defined) and effort should be made to resolve any issues with the storm sewer system.

# ***QUESTIONS?***

## ***Rutgers Cooperative Extension Water Resources Program***

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