STORMWATER MANAGEMENT
IN LEHIGH COUNTY

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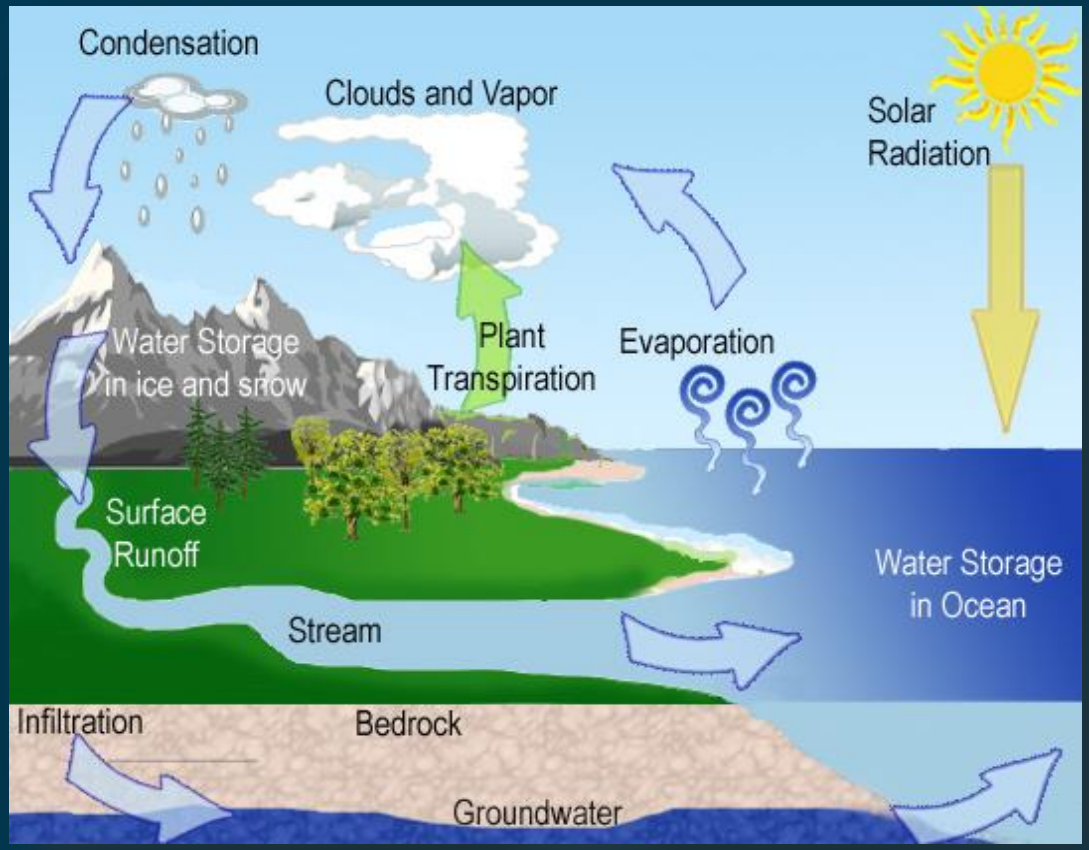
WHAT IS STORMWATER?

Water from rainfall and snowmelt that accumulates and travels across the land and through the ground.



What happens when you don't manage stormwater?

Water quality is a major environmental issue. Society has been quick to point fingers at industry, agriculture, forestry, and other large land-disturbing activities as the culprits of groundwater and surface water contamination.

The major source of groundwater and surface water contamination is non-point source (NPS) pollution. NPS pollution is a major water quality concern in Lehigh County, which is caused when runoff from rainfall and snowmelt move over and through the ground, picking up pollutants along the way, and depositing them into streams, lakes, rivers, wetlands, and underground aquifers.

With development, more water (volume) flows across the land instead of entering the ground, creating erosion.

Normally, the contribution of water pollutants from a homeowner's lawn is small. However, when several hundred small inputs are added together, the impact on water quality is significant.

The key to minimizing pollutants reaching our local water sources is reducing the levels of pollutants that enter the system at the starting point -

- our homes!

Home Owner Associations (HOAs) own vast amounts of stormwater management facilities and large areas of open space in Lehigh County, many with natural features such as streams, wetlands, woodlands, and floodplains.

HOA controlled communities are a very popular type of development within Lehigh County. Snow removal, road maintenance, trash pick-up, and stormwater management are primarily the main responsibilities for these organizations.

Proper stormwater management and regular maintenance of stormwater facilities/structures decrease the amount of pollutants that reach our local waterways.

WHY MANAGE STORMWATER?

You, as a homeowner, can reduce the impacts of stormwater runoff and NPS pollution through proper stormwater management and maintenance of …

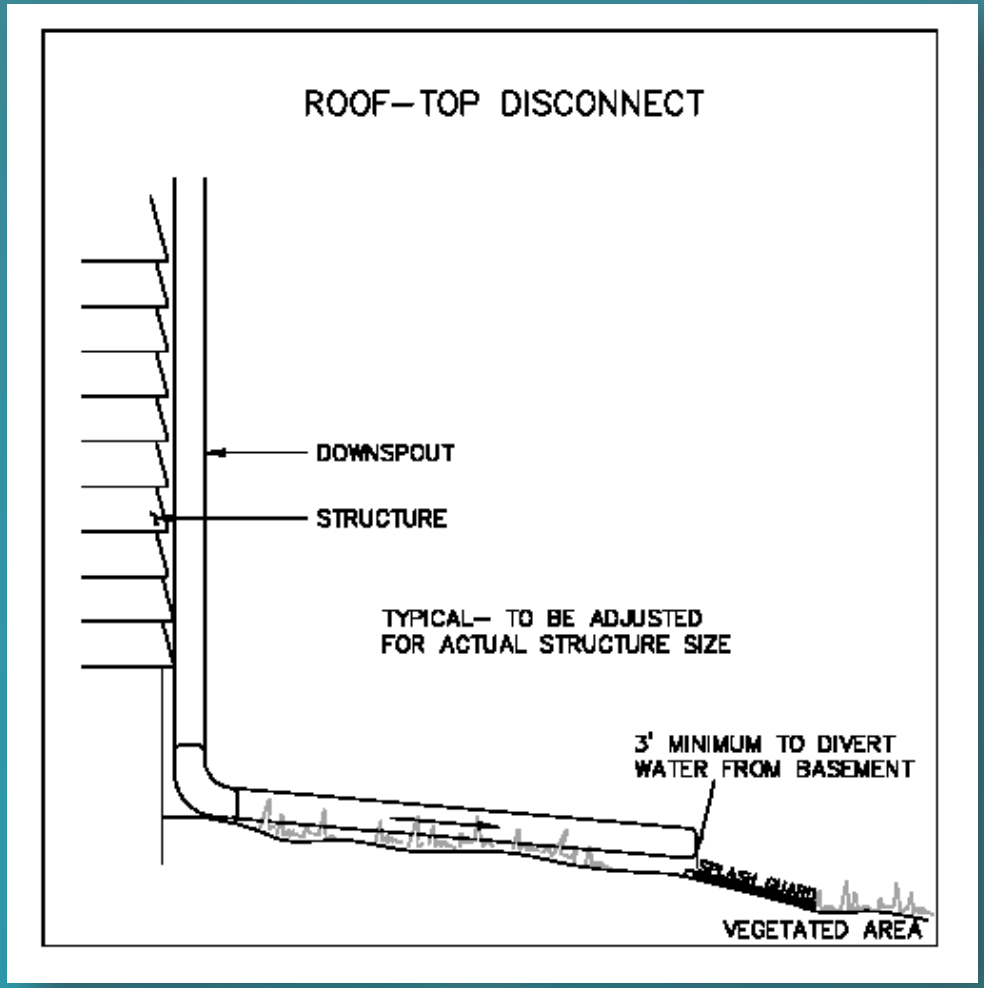
Stormwater Management Controls

The following slides illustrate recommended maintenance procedures for **STORMWATER MANAGEMENT.**

Residential subdivisions that were constructed after 2004 should have an approved Post Construction Stormwater Management (PCSM) Plan by the Pennsylvania Department Of Environmental Protection (PA DEP), County Conservation District, and/or Municipality.

Approved PCSM Plans include a detailed maintenance plan for each **STORMWATER MANAGEMENT FACILITY** that is constructed. Contact your County Conservation District and/or local Municipality for copies of these plans.

Roof Leader Disconnect



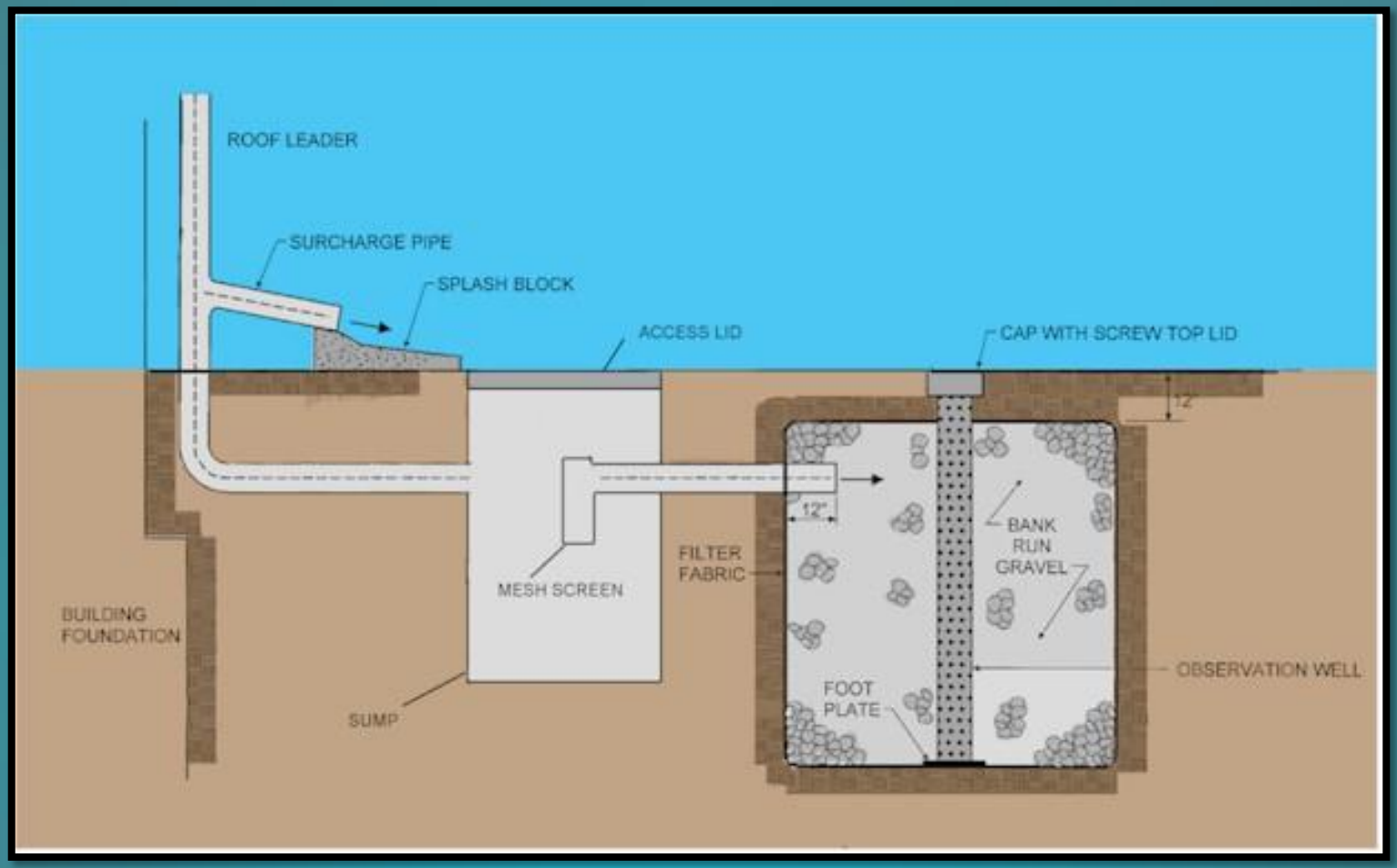
Roof Leader Disconnect

- The practice of roof leaders discharging to vegetated areas rather than being piped into the street gutter/stormsewer system
- Promotes infiltration of stormwater runoff (rainfall and snowmelt) from a roof into a well vegetated lawn or landscaped area
- Typically implemented on residential lots
- Should discharge to areas that naturally flow away from a building foundation

Roof Leader Disconnect Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Remove debris from roof gutters and leaders	Quarterly and weekly following fall foliage
Remove blockage from roof leader outfall	Prior to storm events
Repair erosion of the soil, restore vegetation at the outfall	Following major storm events

Dry Well/Seepage Pit



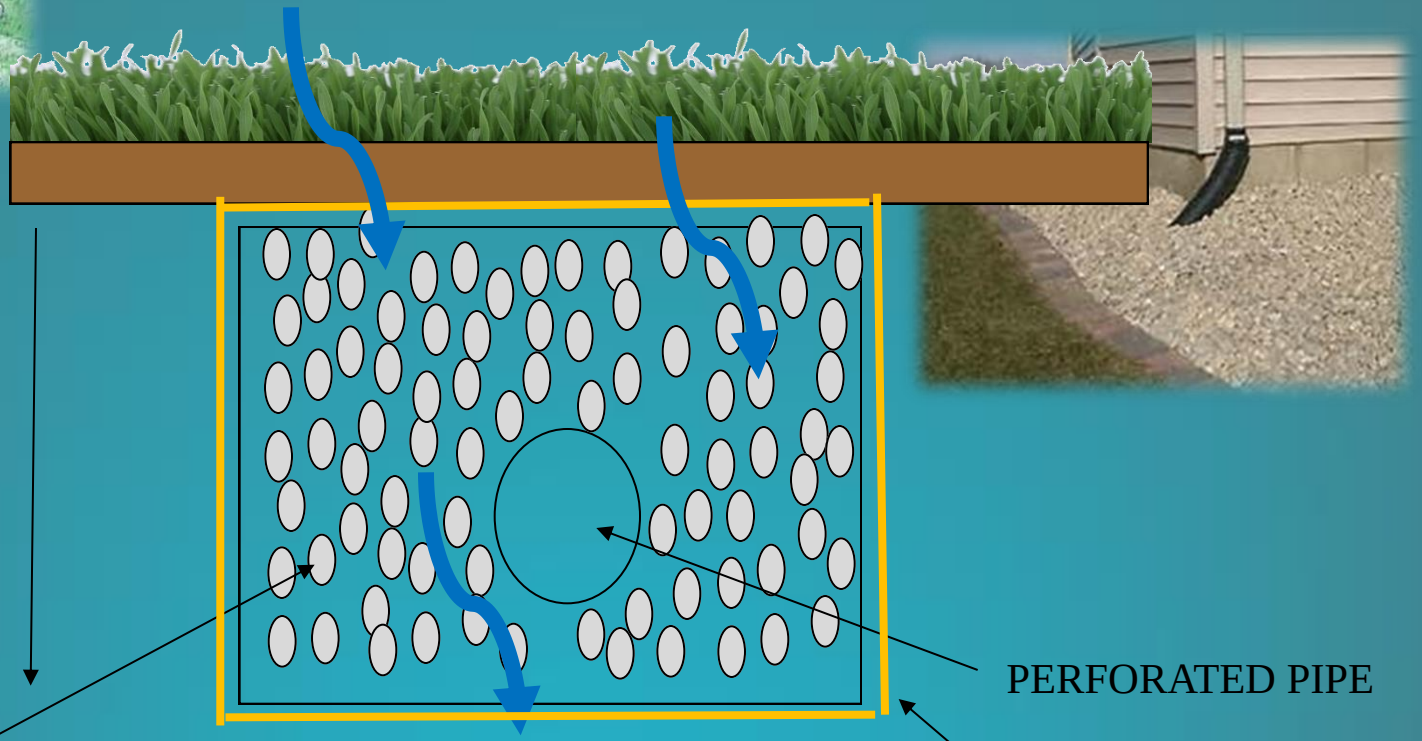
Dry Well/Seepage Pit

- A subsurface storage unit that temporarily stores and infiltrates stormwater from roof runoff
- Roof leaders are connected directly to the dry well. A dry well is typically filled with stone or consists of a buried pipe or prefabricated storage chamber
- Dry wells are located at least 10 feet away from a building foundation
- Designed with sumps for collecting debris
- Designed with overflows for larger storms

Dry Well/Seepage Pit Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Check dry well to make sure it drains within 72 hours	72 hours after the runoff event
Clean out gutters, make sure pipes are connected	Regularly
Replace filter screen	As needed
Clean out the sump (if one exists)	Yearly

Infiltration Trench



Infiltration Trench

- A linear subsurface stormwater facility consisting of a perforated pipe set inside a stone filled trench
- Typically 3’ - 8’ in width and 6’ in depth
- Located in areas with minimal space
- Typically receives stormwater runoff from roof leaders and catch basins/inlets
- Designed with an overflow system and cleanouts

Infiltration Trench Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Catch Basins/Inlets draining to basin should be inspected and cleaned	Twice a year and following runoff events
Vegetation should be maintained in good condition, bare spots should immediately be revegetated	As needed
Flush out/vacuum trench	As needed

Rain Garden - Residential

Rain Garden – Commercial Site

Rain Garden (Bioretention Basin)

- Small shallow surface depressions planted with native grasses, shrubs, and flowering plants
- Typically have an 18 inch planting soil/compost mix
- Provides for infiltration and water quality treatment for smaller runoff events
- Can easily fit into a landscape plan
- Designed with an overflow pipe/inlet or spillway for larger storms

Rain Garden Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Pruning and weeding	First Year
Cut down/back perennial plantings	End of growing season
Water plants	As needed and during droughts
Remove sediment buildup, repair erosion	Twice a year
Re-mulch rain garden bed	When erosion is evident and once every 2 to 3 years

Infiltration Basin

Infiltration Basin

- Designed to be shallow ponds that store and infiltrate stormwater runoff
- Can be planted with native grasses, meadow mixes, and trees or shrubs
- Removes pollutants in stormwater through vegetation and infiltration

Infiltration Basin Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Catch Basins/Inlets draining to basin should be inspected and cleaned	Twice a year and following runoff events
Basin vegetation should be maintained in good condition, bare spots should immediately be revegetated	As needed
Inspect the basin to make sure the stormwater infiltrates	72 hours following runoff events

Subsurface Infiltration Basin

Subsurface Infiltration Basin

- Temporarily stores and infiltrates stormwater runoff
- Typically filled with stone, plastic pipe, or other manufactured storage systems
- Stormwater runoff from nearby impervious areas (rooftops, parking lots, roads, driveways, etc.) drain to the basin by roof leaders, catch basins/inlets, and pipes
- Can be located under parking lots and athletic/recreational fields to optimize space

Subsurface Infiltration Basin Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Catch Basins/Inlets draining to basin should be inspected and cleaned	Twice a year and following runoff events
Basin vegetation should be maintained in good condition, bare spots should immediately be revegetated	As needed
Flush out/vacuum basin through its clean out pipes	As needed

Constructed Wetland

Constructed Wetland

- Shallow marsh systems planted with vegetation that thrives in water
- One of the best stormwater facilities for pollutant removal, wetlands also provide considerable aesthetic and wildlife benefits
- Should be located in an area with a high water table/adequate source of water to help promote a permanent pool of water
- Properly designed, installed, and established constructed wetlands require little maintenance

Constructed Wetland Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Manage vegetation, remove invasive species	During the first growing season every 2 to 3 weeks
Manage vegetation, remove invasive species	During the first 2 years 4 times per year and after major storms
Remove sediment and debris from outlet structures and forebays	Twice a year and after major storms

Wet Pond/Retention Basin

Wet Pond/Retention Basin

- Designed to store a substantial permanent pool of stormwater
- Typically include forebays at the entry point into the basin
- Planted with dense wetland vegetation
- Should be located in an area with a high water table/adequate source of water to help promote a permanent pool of water
- Properly designed, installed, and established wet ponds require little maintenance

Wet Pond/Retention Basin Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Manage vegetation	During the first growing season every 2 to 3 weeks
Manage vegetation	After established, 4 times per year and after major storms
Repair erosion, remove sediment and debris	4 times a year
Inspect the pond drain/outlet structure for blockage, remove debris	4 times a year
Watering, weeding, mulching, replanting	As needed during first 3 years
Once established, annual harvesting of vegetation	Summer

Dry Extended Detention Basin

Dry Extended Detention Basin

- Surface stormwater structures/ponds which provide for the temporary storage of stormwater runoff to help prevent downstream flooding impacts

- Historically, dry extended detention basins were the main stormwater control measures from the mid 1970s until approximately 2006

Dry Extended Detention Basin Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Inspect basin bottoms, trash racks, outlet structures, riprap or gabion structures, and inlets.	Quarterly and following every major storm event
Mowing and/or trimming of vegetation	As needed
Repair erosion, remove invasive species and unwanted plants	Annually

Vegetated Swale

Vegetated Swale

- Broad, shallow channels densely planted with a variety of native grasses, shrubs, and/or trees
- Check dams can be used to promote infiltration of stormwater
- Provide a high quality of pollutant removal through vegetation
- Designed to be integrated into the surrounding landscape while eliminating the need for gutters and stormwater pipes

Vegetated Swale Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Repair erosion, replant vegetation, remove sediment	Following runoff events including spring melt
Inspect for ponding water	Following runoff events
Remove debris from check dams, repair erosion	Following runoff events
Manage and mow vegetation	For turf grasses - regularly; for meadow grasses - twice a year

Infiltration Berm

Infiltration Berm

- Linear earthen berms that run parallel to existing contours/grade
- Collect and retain stormwater in shallow impoundments upslope of the berm
- Effective at infiltrating stormwater runoff from small drainage areas
- Typically not higher than 24 inches, berms can easily fit into a landscape plan

Infiltration Berm Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Inspect the berm to make sure stormwater infiltrates within 72 hours	72 hours following runoff events
Manage vegetation by mowing	For turf grasses - regularly; for meadow grasses - twice a year
Remove invasive plants, prune and re-mulch	As needed and annually
Repair erosion and low spots in berm	Monthly and after major storm events

Spray Irrigation

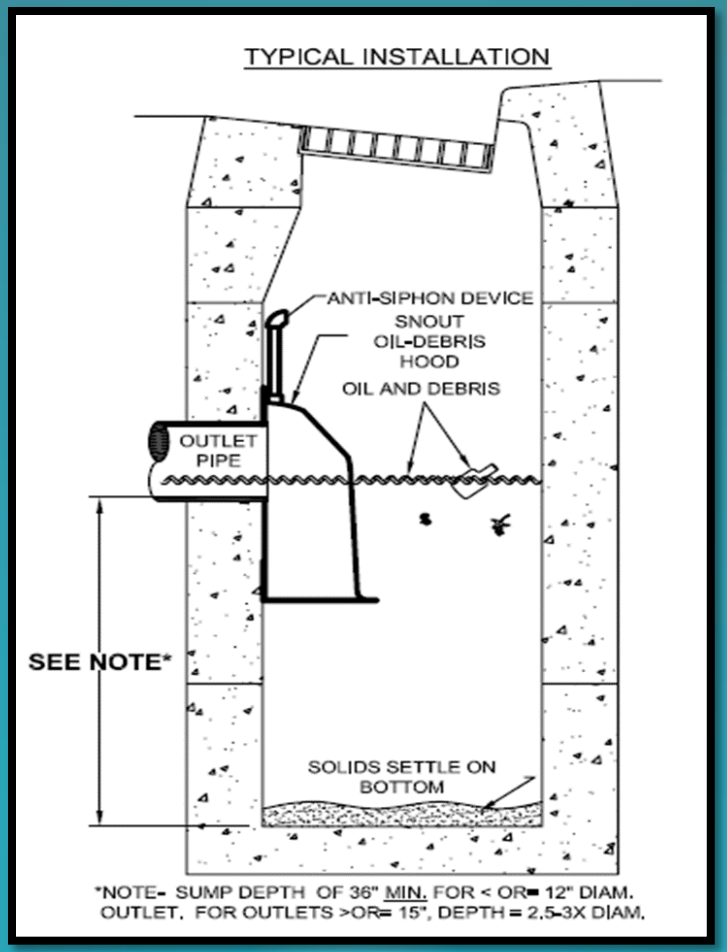
Spray Irrigation

- Designed to spray irrigate runoff collected in a stomwater pond
- Can be incorporated into landscaping
- Typically operates from March to November
- Stormwater is spray irrigated over a 6 day period
- Frequently used on commercial sites, campuses, industrial sites, and residential subdivisions with HOAs
- Since spray irrigation systems can be complicated, maintenance should be performed by an irrigation contractor

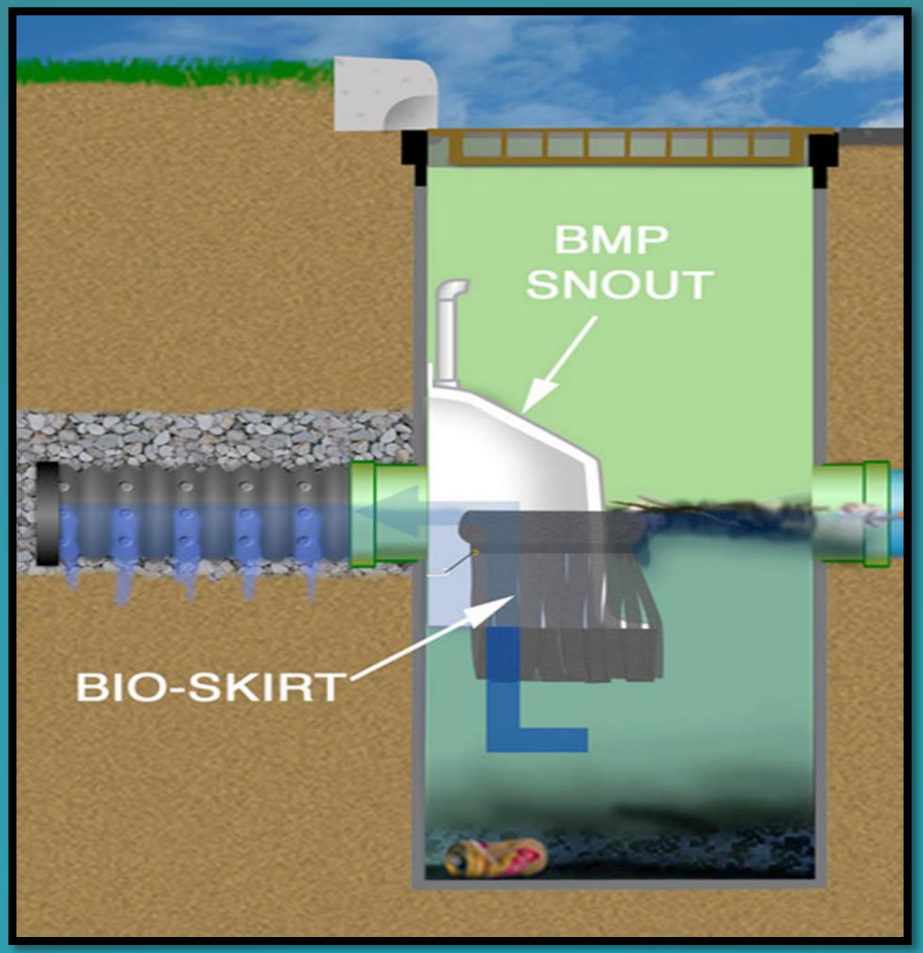
Spray Irrigation Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Remove vegetation from valve boxes and sprinklers	Monthly
Remove debris from intake pump screen	Monthly
Inspect all valves and sprinklers for proper operations	Monthly
Start up system	March
Winterize system	November

Water Quality Filters/Snouts®



Snout® with Bio-Skirt ™



Snout®

Water Quality Filters/Snouts®

- Structural/manufactured devices installed in catch basins/inlets to remove pollutants in stormwater runoff
- There are different variations of water quality filters. The most common filter is the Snout®
- Most filters will require a sump in the catch basin for sediment/particulates to collect in
- Maintenance is best done with a vacuum truck
- Always refer to the manufacturers maintenance recommendations

Snout® Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Vacuum out the structure and sump	Annually and immediately if a spill occurs
If Bio-Skirts™ are being used, they should be serviced or replaced when more than 2/3 of the boom is submerged	Monthly
Replace Bio-Skirts™	Annually

Landscape Restoration - Meadow

Temporary Construction Road

Road After Restoration

Landscape Restoration

- Landscape Restoration is a general term for sustainable landscape practices
- This can include the restoration of forest and/or meadow, and the conversion of lawn turf to meadow
- Native vegetation is used and typically requires little maintenance
- Effectively reduces stormwater runoff and removes pollutants in stormwater

Landscape Restoration Maintenance and Inspection Procedures - Meadows

Maintenance Activity	Inspection Frequency
Remove non-native weeds and debris	4 times annually during the first 4 years
Year 1 & 2 mow to height of 4-6 inches	Twice per year
Year 3 and beyond – mow close to ground, remove cut debris	Mid-Spring

Soil Amendments

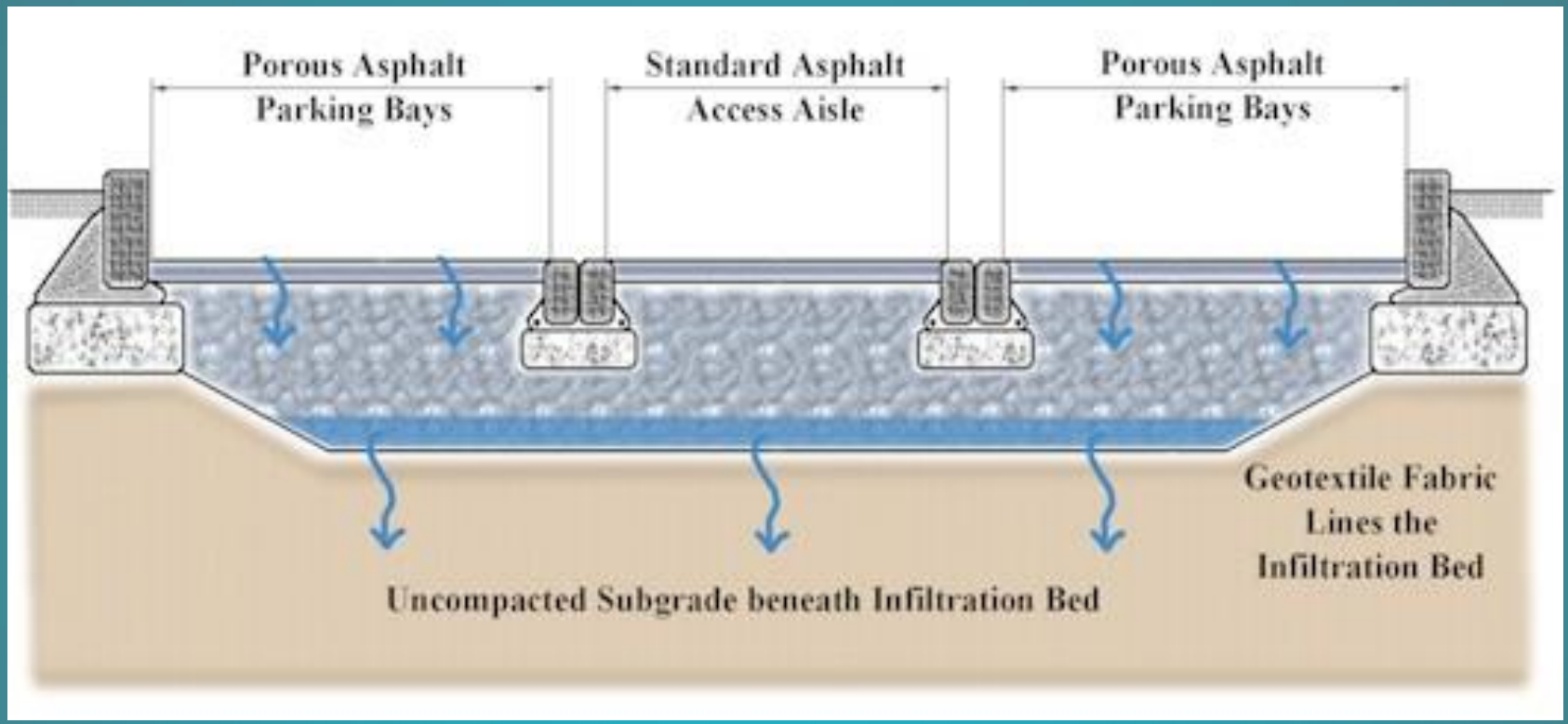
Soil Amendments

- The process of improving disturbed and/or compacted soils
- Methods include tilling and/or adding compost for the purpose of re-establishing the soil's infiltration capacity
- Tilling can be performed between the top 8 to 20 inches of soil
- 2 to 3 inches of compost can be spread and blended within the top 6 inches of soil

Soil Amendments Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Repeat soil restoration process - till or add compost to areas that have become compacted over time (i.e. athletic fields, open spaces)	As needed (when soil becomes compacted and/or no longer infiltrates)

Pervious Pavement & Pavers



Pervious Pavement

Pervious Pavement

- A permeable surface underlain by a stone bed
- May consist of porous asphalt, porous concrete, or porous pavers
- Can be used for parking lots, sidewalks, driveways, and courtyards
- Minimizes stormwater runoff
- Stores stormwater in the stone bed
- Allows for infiltration under the stone bed

Pervious Pavement Maintenance and Inspection Procedures

Maintenance Activity	Inspection Frequency
Vacuum pavement	2 to 3 times per year
Clean any soil deposited on pavement	Immediately
Clean inlets draining to the subsurface bed	2 times per year

Pervious Pavement – Special Occasions such as Winter Conditions

- Abrasives such as sand or cinders should not be applied on or adjacent to the pervious pavement
- Snow plowing is acceptable, provided it is performed carefully (i.e. by setting the blade slightly higher than usual, approximately an inch)
- Salt is acceptable for use as a deicer on the pervious sections of the pavement

Pervious Pavement - Repairs

- For damaged areas of less than 50 square feet, a repair could be patched by any means suitable with standard pavement, with the loss of porosity of that area being insignificant
- Areas greater than 50 square feet in need of repair, approval of patch type should be sought from either the engineer or owner
- **Under no circumstance should the pavement surface ever be seal coated**

For additional information,
please contact

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