

CITY OF MONESSEN
Stormwater Management and MS4 Program



Public Education and Outreach

October 2022

SUMMARY

STORMWATER MANAGEMENT PROGRAM

Stormwater management involves the control of water that runs off the surface of the land from rain or melting ice or snow. The volume, or amount of runoff and its rate of runoff, substantially increases as land development occurs. Construction of impervious surfaces, such as roofs and parking lots, and the installation of storm sewer pipes which efficiently collect and discharge runoff, prevent infiltration of rainfall into the soil.

Management of storm water is necessary to compensate for the possible impacts of development such as flooding, erosion and sedimentation problems, concentration of flow on adjacent properties, damages to roads, bridges and other infrastructure as well as non-point source pollution washed off from impervious surfaces.

MUNICIPAL SEPARATE STORM SEWER SYSTEMS OR MS4's

Stormwater runoff is commonly transported through Municipal Separate Storm Sewer Systems (MS4s), from which it is often discharged untreated into local waterways. These storm sewer systems are:

- Owned by a state, city, town or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes and ditches);
- Not a combined sewer (which carries stormwater and sewage); and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain a National Pollutant Discharge Elimination System (NPDES) permit and develop a stormwater management program.

What is included in an MS4 Program?

Listed below are the six minimum control measures that operators of regulated small MS4s must incorporate into stormwater management programs. These measures are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

- **Public Education and Outreach** – An informed and knowledgeable community is crucial to the success of a stormwater management program, since it helps to ensure greater support and program compliance as the public becomes aware of individual actions they can take to protect or improve the quality of area waters.
- **Public Participation/Involvement** – An active and involved community allows for broader public support, a broader base of expertise and a connection to other local environmental programs.
- **Illicit Discharge Detection and Elimination** – Illicit discharges are untreated discharges that could contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses and bacteria to receiving waterbodies. Operators of a regulated small MS4 are required to develop, implement and enforce an illicit discharge detection and elimination program.
- **Construction Site Runoff Control** – Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it can pick up pollutants like sediment, debris, and chemicals and transport these to a nearby storm sewer system or directly to a river, lake or stream.

SUMMARY

- **Post-Construction Runoff Control** – Increased impervious surfaces, like parking lots, driveways, and rooftops, interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process can include stream bank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property. Ordinances and other regulations are required to determine the appropriate best management practices and to ensure adequate long-term operation and maintenance of storm water controls.
- **Pollution Prevention/Good Housekeeping** – This measure involves recognizing the benefits of pollution prevention practices and includes the development and implementation of an operation and maintenance program. Reducing pollutant runoff from municipal operations into the storm sewer system can include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations. These controls could also include programs that promote recycling (to reduce litter), minimize pesticide use and ensure the proper disposal of animal waste.

How To Report An Illicit Discharge

An illicit discharge is defined as any discharge to the municipal separate storm sewer system (MS4) that is not composed entirely of storm water. These non-stormwater discharges occur due to illegal connections to the storm drain system from business or commercial establishments. As a result of these illicit connections, contaminated wastewater enters into storm drains or directly into streams before receiving treatment from a wastewater treatment plant. Illicit connections may be intentional or may be unknown to the business owner and often are due to the connection of floor drains to the storm sewer system. Additional sources of illicit discharges can be failing septic systems, illegal dumping practices, and the improper disposal of sewage from recreational practices such as boating or camping.

Illicit discharge detection and elimination programs are designed to prevent contamination of ground and surface water supplies by monitoring, inspection and removal of illegal non-stormwater discharges. Call City Hall at (724) 684-9400 to report an illicit discharge and complete the *Illicit Discharge Reporting Form*.

What Can You Do?

We need everyone to do their share in maintaining a safe and healthy environment. Anything that goes into the storm inlets flows directly into the streams untreated. The most important thing to consider is that what you dump into the storm inlet not only affects you, but it affects your neighbors and other communities that the streams flow through. Please be cautious and keep the following things in mind to prevent pollution.

- Dumping used motor oil or other toxic wastes down the storm inlets eventually finds its way into streams thus killing wildlife and polluting stream beds. Do not dump these hazardous wastes into the inlets. Instead they should be taken to recycling centers which dispose of the substances properly.
- Don't litter. Always dispose of trash and other debris in the proper receptacles.
- When using fertilizers and pesticides, follow the label for use and storage methods.
- Help prevent erosion by planting steep slopes and planting bare spots. Loose soil will erode the stream bank and harm fish and wildlife.

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COMMON ACRONYMS AND DEFINITIONS

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COMMON ACRONYMS

303(d) list	Clean Water Act Section 303(d) List of Water Quality Limited Segments
ACOE	Army Corps of Engineers
BMP	Best Management Practice
CBPRP	Chesapeake Bay Pollutant Reduction Plan
CCD	County Conservation District
CFR	Code of Federal Regulations
COMID	National Hydrography Dataset common identifier code for waterbodies
CWA	Federal Water Pollution Control Act (also known as the Clean Water Act)
ESA	Environmentally Sensitive Area
GI	Green Infrastructure
GIS	Geographic Information System
HHW	Household Hazardous Waste
HOA	Home Owners Association
IDD&E	Illicit Discharge Detection and Elimination
LA	Load Allocation
LID	Low Impact Development
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MOS	Margin of Safety
MS3	Municipal Separate Storm Sewershed
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PCM	Pollutant Control Measure
PCSM	Post Construction Stormwater Management
PennDOT	Pennsylvania Department of Transportation
PEOP	Public Education and Outreach Plan
PIPP	Public Involvement and Participation Plan
PRP	Pollutant Reduction Plan
QAPP	Quality Assurance Project Plan
QLP	Qualifying Local Program
SOP	Standard Operating Procedure

SSO	Sanitary Sewer Overflow
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
TAG	Target Audience Group
TMDL	Total Maximum Daily Load
UA	Urbanized Area
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Waste Load Allocation
WQ	Water Quality

IMPORTANT DEFINITIONS

Illicit Discharge Any discharge to an MS4 that is not composed entirely of stormwater, except authorized non-stormwater discharges. Examples of illicit discharges include dumping of motor vehicle fluids, grass clippings and landscape debris, animal wastes, industrial waste/discharges, restaurant wastes, or any other non-stormwater waste. Illicit discharges can be accidental or intentional.

Load Allocation The portion of a surface water’s loading capacity that is assigned or allocated to existing and future nonpoint sources and natural quality.

Municipal Separate Storm Sewer

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters; (ii) Designed or used for collecting or conveying stormwater; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Municipal Separate Storm Sewershed (MS3)

The land area draining to an individual MS4 outfall.

Municipal Separate Storm Sewer System (MS4)

All separate storm sewers that are defined as “large” or “medium” or “small” municipal separate storm sewer systems pursuant to 40 CFR §§ 122.26(b)(4), (b)(7), and (b)(16), respectively, or designated under 40 CFR § 122.26(a)(1)(v).

Outfall A point source as defined by 40 CFR § 122.2 at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters.

Point Source A discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, Concentrated Aquatic Animal Production Facility (CAAP), Concentrated Animal Feeding Operation (CAFO), landfill leachate collection system, or vessel or other floating craft from which pollutants are or may be discharged.

Small Municipal Separate Storm Sewer System (Small MS4)

An MS4 that is not a large or medium MS4 pursuant to 40 CFR §§ 122.26(b)(4) and 122.26(b)(7). The term small MS4 includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

Stormwater Management Program (SWMP)

The SWMP document is the foundational program management tool for MS4 Permit facilitation; capturing the developed process, procedure, and implementation strategies for described elements (including MCMs). The primary purpose of the document is to present an integrated approach for reducing the discharge of pollutants from the MS4 to the Maximum Extent Practicable (MEP), to protect and improve the quality of water bodies, and adhere to the appropriate water quality standards requirements in the CWA.

Surface Waters*

Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

Total Maximum Daily Load (TMDL)

The sum of individual waste load allocations for point sources, load allocations for nonpoint sources and natural quality and a margin of safety expressed in terms of mass per time, toxicity or other appropriate measures.

Waste Load Allocation (WLA)

The portion of a surface water's loading capacity that is allocated to existing and future point source discharges.

* This is PADEP's definition in the MS4 Permit. It is appropriate to consider the CWA definition for Waters of the United States (see below).

USEPA/ACOE CLEAN WATER RULE (PARTIAL)

Clean Water Rule: Definition of “Waters of the United States” 40 CFR 230.3

§230.3 Definitions.

* * * * *

(o) The term waters of the United States means:

(1) For purposes of the Clean Water Act, 33 U.S.C. 1251 et. seq. and its implementing regulations, subject to the exclusions in paragraph (o)(2) of this section, the term “waters of the United States” means:

(i) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(ii) All interstate waters, including interstate wetlands;

(iii) The territorial seas;

(iv) All impoundments of waters otherwise identified as waters of the United States under this section;

(v) All tributaries, as defined in paragraph (o)(3)(iii) of this section, of waters identified in paragraphs (o)(1)(i) through (iii) of this section;

(vi) All waters adjacent to a water identified in paragraphs (o)(1)(i) through (v) of this section, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters;

(vii) All waters in paragraphs (o)(1)(vii)(A) through (E) of this section where they are determined, on a case-specific basis, to have a significant nexus to a water identified in paragraphs (o)(1)(i) through (iii) of this section. The waters identified in each of paragraphs (o)(1)(vii)(A) through (E) of this section are similarly situated and shall be combined, for purposes of a significant nexus analysis, in the watershed that drains to the nearest water identified in paragraphs (o)(1)(i) through (iii) of this section. Waters identified in this paragraph shall not be combined with waters identified in paragraph (o)(1)(vi) of this section when performing a significant nexus analysis. If waters identified in this paragraph are also an adjacent water under paragraph (o)(1)(vi), they are an adjacent water and no case-specific significant nexus analysis is required.

(A) Prairie potholes. Prairie potholes are a complex of glacially formed wetlands, usually occurring in depressions that lack permanent natural outlets, located in the upper Midwest.

(B) Carolina bays and Delmarva bays. Carolina bays and Delmarva bays are ponded, depressional wetlands that occur along the Atlantic coastal plain.

(C) Pocosins. Pocosins are evergreen shrub and tree dominated wetlands found predominantly along the Central Atlantic coastal plain.

(D) Western vernal pools. Western vernal pools are seasonal wetlands located in parts of California and associated with topographic depression, soils with poor drainage, mild, wet winters and hot, dry summers.

(E) Texas coastal prairie wetlands. Texas coastal prairie wetlands are freshwater wetlands that occur as a mosaic of depressions, ridges, intermound flats, and mima mound wetlands located along the Texas Gulf Coast.

(viii) All waters located within the 100-year floodplain of a water identified in paragraphs (o)(1)(i) through (iii) of this section and all waters located within 4,000 feet of the high tide line or ordinary high water mark of a water identified in paragraphs (o)(1)(i) through (v) of this section where they are determined on a case-specific basis to have a significant nexus to a water identified in paragraphs (o)(1)(i) through (iii) of this section. For waters determined to have a significant nexus, the entire water is a water of the United States if a portion is located within the 100-year floodplain of a water identified in paragraphs (o)(1)(i) through (iii) of this section or within 4,000 feet of the high tide line or ordinary high water mark. Waters identified in this paragraph shall not be combined with waters identified in paragraph (o)(1)(vi) of this section when performing a significant nexus analysis. If waters identified in this paragraph are also an adjacent water under paragraph (o)(1)(vi), they are an adjacent water and no case-specific significant nexus analysis is required.

(2) The following are not “waters of the United States” even where they otherwise meet the terms of paragraphs (o)(1)(iv) through (viii) of this section.

(i) Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act are not waters of the United States.

(ii) Prior converted cropland. Notwithstanding the determination of an area’s status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

(iii) The following ditches:

(A) Ditches with ephemeral flow that are not a relocated tributary or excavated in a tributary.

(B) Ditches with intermittent flow that are not a relocated tributary, excavated in a tributary, or drain wetlands.

(C) Ditches that do not flow, either directly or through another water, into a water identified in paragraphs (o)(1)(i) through (iii) of this section.

(iv) The following features:

(A) Artificially irrigated areas that would revert to dry land should application of water to that area cease;

(B) Artificial, constructed lakes and ponds created in dry land such as farm and stock watering ponds, irrigation ponds, settling basins, fields flooded for rice growing, log cleaning ponds, or cooling ponds;

(C) Artificial reflecting pools or swimming pools created in dry land;

(D) Small ornamental waters created in dry land;

(E) Water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water;

(F) Erosional features, including gullies, rills, and other ephemeral features that do not meet the definition of tributary, non-wetland swales, and lawfully constructed grassed waterways; and

(G) Puddles.

(v) Groundwater, including groundwater drained through subsurface drainage systems.

(vi) Stormwater control features constructed to convey, treat, or store stormwater that are created in dry land.

(vii) Wastewater recycling structures constructed in dry land; detention and retention basins built for wastewater recycling; groundwater recharge basins; percolation ponds built for wastewater recycling; and water distributary structures built for wastewater recycling.

STORMWATER MANAGEMENT

What is Storm Water?

Storm water is water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers. These are the drains you see at street corners or at low points on the sides of streets. Collectively, the draining water is called storm water runoff.

Why is Storm Water “Good Rain Gone Wrong?”

Storm water becomes a problem when it picks up debris, chemicals, dirt, and other pollutants as it flows or when it causes flooding and erosion of stream banks. Storm water travels through a system of pipes and roadside ditches that make up storm sewer systems. It eventually flows directly to a lake, river, stream, wetland, or coastal water. All of the pollutants storm water carries along the way empty into our waters, too, because storm water does not get treated!

Pet wastes left on the ground get carried away by storm water, contributing harmful bacteria, parasites and viruses to our water.

Vehicles drip fluids (oil, grease, gasoline, antifreeze, brake fluids, etc.) onto paved areas where storm water runoff carries them through our storm drains and into our water.

Chemicals used to grow and maintain beautiful lawns and gardens, if not used properly, can run off into the storm drains when it rains or when we water our lawns and gardens.

Waste from chemicals and materials used in construction can wash into the storm sewer system when it rains. Soil that erodes from construction sites causes environmental degradation, including harming fish and shellfish populations that are important for recreation and our economy.

Where To Go To Continue the Information Flow

Your community is preventing storm water pollution through a storm water management program. This program addresses storm water pollution from construction, new development, illegal dumping to the storm sewer system, and pollution prevention and good housekeeping practices in municipal operations. It will also continue to educate the community and get everyone involved in making sure the only thing that storm water contributes to our water is . . . water! Contact your community's storm water management program coordinator or the Pennsylvania Department of Environmental Protection for more information about storm water management.

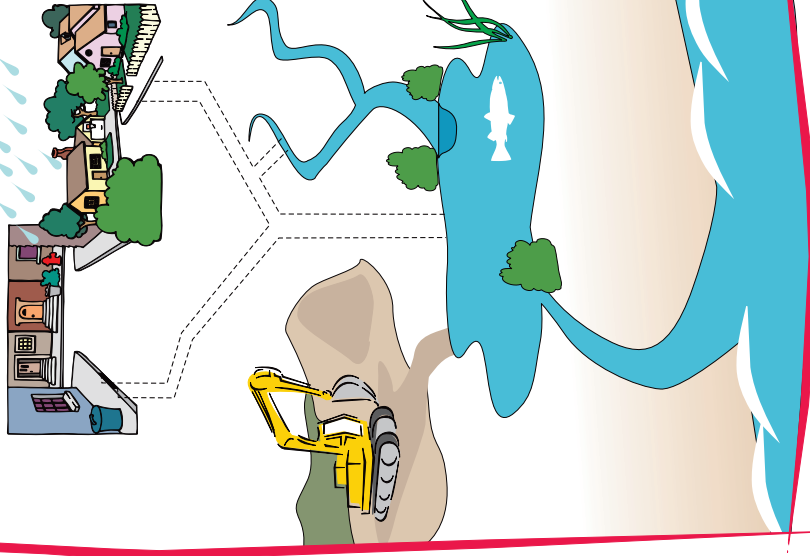


Pennsylvania Department of Environmental Protection

www.dep.state.pa.us

When It Rains, It Drains

Understanding Storm Water and How It Can Affect Your Money, Safety, Health, and the Environment



Answers to Test Your Storm Sewer System Savvy:

- Ditch** – Part of the storm sewer system. Most people think that the system is just a series of underground pipes. It can also include ditches used to convey storm water from the land to a receiving lake, river, or stream.
- Fire Hydrant** – Not part of the storm sewer system. Water sprayed from fire hydrants is not storm water; but is allowed by law to enter the storm sewer system.
- Curb with Storm Drain Inlet** – Part of the storm sewer system. Many people do not realize that this is an opening leading to the storm sewer system. Anything going into this inlet (e.g., trash, leaves, improperly disposed of hazardous materials) travel directly to a receiving lake, river, or stream without being treated first. Many communities stencil storm drains with “Do Not Dump” messages to let people know.
- Storm Sewer Outfall** – Part of the storm sewer system. An outfall is where storm water drains from the storm sewer system into a receiving lake, stream, or river. If there is a flow from an outfall when it isn't raining, there could be a problem with the system or someone has used a storm drain for illegally disposing of materials.
- Toilet** – Not part of the storm sewer system. Wastewater from sinks and toilets in houses and businesses travel through a sewer system constructed to carry sanitary wastes. In some instances, older communities may have a combined sewer system designed to carry both storm water and sanitary waste.
- Septic System** – Not part of the storm sewer system. Homeowners use septic tanks to manage sanitary wastes on-site. Improperly maintained septic systems can leak and contribute pollutants to the storm sewer system, as well as directly to lakes, rivers, and streams.
- Roads and Other Paved Areas** – Not part of the storm sewer system. Roads and other hardened surfaces such as parking lots and sidewalks can accumulate pollutants (e.g., oil, grease, dirt, leaves, pet wastes) that storm water eventually washes into the storm sewer system.
- Storm Drain Inlet** – Part of the storm sewer system. This is another example of what a storm drain may look like. Like the storm drain inlet shown in picture #3, anything that enters this drain will go directly to streams, rivers, and lakes without being treated first. It is important to recognize this as a storm drain to prevent it from being used as a trash can.

What Happens when It Rains?



Rain is an important part of nature's water cycle, but there are times it can do more damage than good. Problems related to storm water runoff can include:

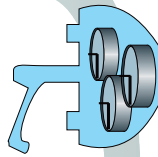
Flooding caused by too much storm water flowing over hardened surfaces such as roads and parking lots, instead of soaking into the ground.



Increases in spending on maintaining storm drains and the storm sewer system that become clogged with excessive amounts of dirt and debris.



Decreases in sportfish populations because storm water carries sediment and pollutants that degrade important fish habitat.



More expensive treatment technologies to remove harmful pollutants carried by storm water into our drinking water supplies.



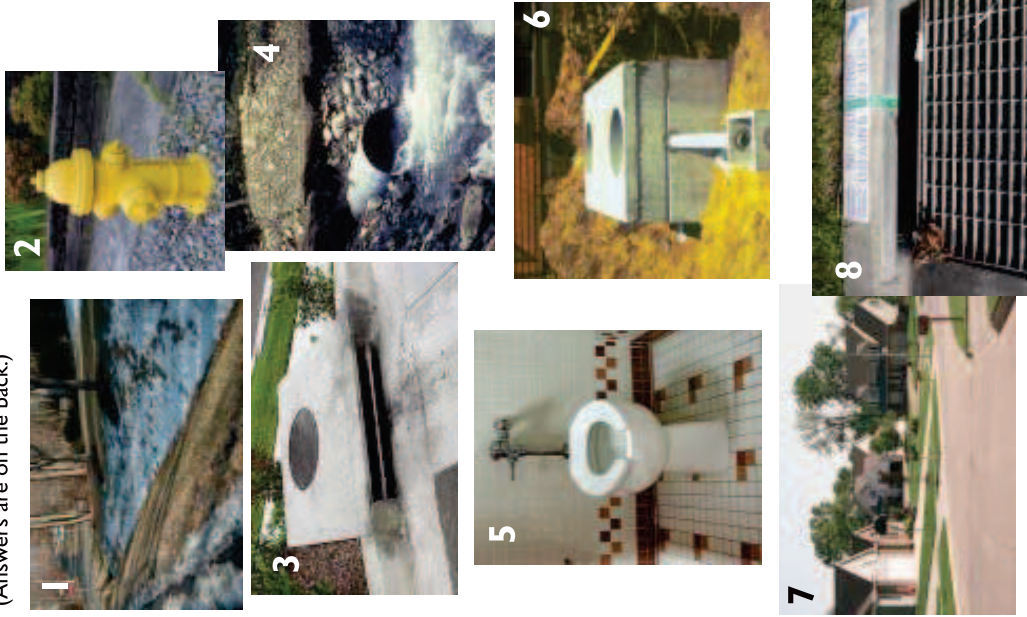
Closed beaches due to high levels of bacteria carried by storm water that make swimming unsafe.

We can help rain restore its good reputation while protecting our health and environment while saving money for ourselves and our community. Keep reading to find out how...

Test Your Storm Sewer System Savvy!



What does the storm sewer system look like in your community? See if you can identify which pictures are part of the storm sewer system. (Answers are on the back.)



Restoring Rain's Reputation: What Everyone Can Do To Help

Rain by nature is important for replenishing drinking water supplies, recreation, and healthy wildlife habitats. It only becomes a problem when pollutants from our activities like car maintenance, lawn care, and dog walking are left on the ground for rain to wash away. Here are some of the most important ways to prevent storm water pollution:

- Properly dispose of hazardous substances such as used oil, cleaning supplies and paint—never pour them down any part of the storm sewer system and report anyone who does.
- Use pesticides, fertilizers, and herbicides properly and efficiently to prevent excess runoff.
- Look for signs of soil and other pollutants, such as debris and chemicals, leaving construction sites in storm water runoff or tracked into roads by construction vehicles. Report poorly managed construction sites that could impact storm water runoff to your community. (See the back of this brochure for contact information.)
- Install innovative storm water practices on residential property, such as rain barrels or rain gardens, that capture storm water and keep it on site instead of letting it drain away into the storm sewer system.
- Report any discharges from storm water outfalls during times of dry weather—a sign that there could be a problem with the storm sewer system.
- Pick up after pets and dispose of their waste properly. No matter where pets make a mess—in a backyard or at the park—storm water runoff can carry pet waste from the land to the storm sewer system to a stream.
- Store materials that could pollute storm water indoors and use containers for outdoor storage that do not rust or leak to eliminate exposure of materials to storm water.



WATER RESOURCE CENTER

FACT SHEET

Southwestern Pennsylvania Commission

WATER RESOURCE CENTER

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INTRODUCTION TO STORMWATER MANAGEMENT

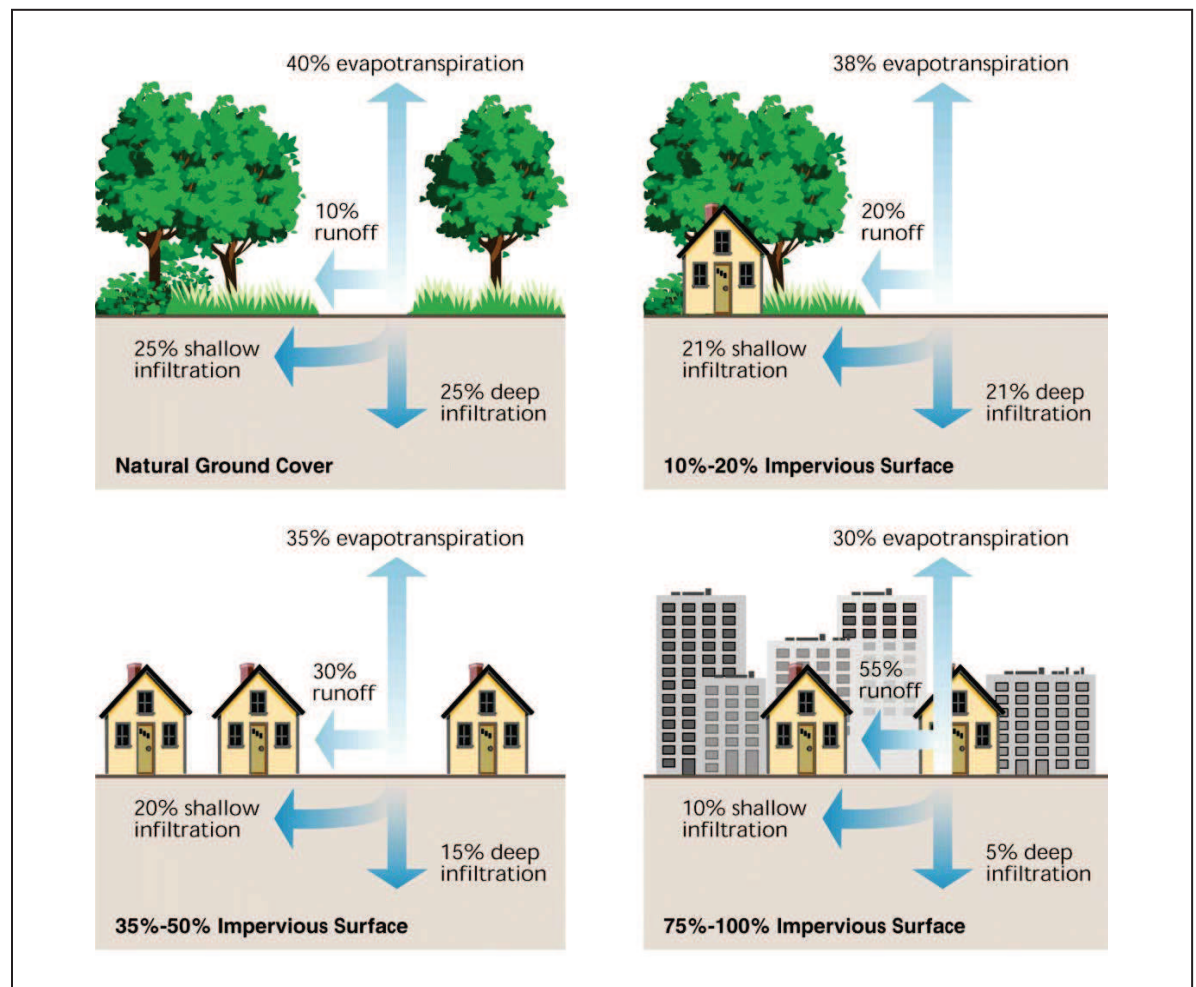
KEY CONCEPTS

STORMWATER occurs when it rains or when snow melts.

STORMWATER RUNOFF is a term used to describe rain and snow melt that is unable to infiltrate into the ground.

IMPERVIOUS SURFACES, such as roads, parking lots, roof tops, and compacted land, do not allow for any infiltration into the ground. The presence of impervious surfaces results in an increase in the amount of stormwater runoff.

NON-POINT SOURCE POLLUTION is pollution that comes from many sources. As stormwater makes its way across the surface and into our local waterways, it brings with it non-point source pollution. Causes of non-point source pollution include oils, fertilizer, pesticides, animal waste, trash, and organic matter.



As illustrated in the diagram above, the amount of stormwater runoff increases as the amount of impervious surfaces increases. Poorly managed stormwater runoff can cause a variety of problems such as environmental degradation and localized flooding.

Image: NRCS

(OVER)

IMPACTS OF STORMWATER

Stormwater runoff, when managed improperly, can impact land owners and the environment. Some examples of stormwater-related problems are listed below.



Poorly managed stormwater can lead to stream bank erosion. This can affect stream quality and habitat and cause property damage.

Photo: enviroloknw.com

Land Owner / Economic Consequences

- ◆ Localized flooding damages
- ◆ Land destabilization
- ◆ Loss of recreation and tourism income
- ◆ Transportation infrastructure and sewer system damage



Stormwater is usually not treated before entering our waterways. Therefore, pollutants that enter storm drains have direct environmental impacts on our waterbodies. Photo: Wilmingtonnc.gov

Did you know that...

- ◆ Stormwater is the primary cause of water pollution nationally.
- ◆ As little as 10% of impervious cover in a watershed can cause degraded stream conditions.
- ◆ Public and private drinking water sources can be affected by poorly managed stormwater.

Source: EPA

Environmental Consequences

- ◆ Erosion
- ◆ Polluted waterways through non-point sources such as oils, pesticides, trash, fertilizers, etc.
- ◆ Loss of aquatic habitat
- ◆ Lack of groundwater recharge
- ◆ Elevated concentrations of nutrients such as phosphorus

For More Information

To learn more about stormwater problems and solutions, visit the following websites:

- ◆ EPA.gov
- ◆ depweb.state.pa.us
- ◆ pacd.org
- ◆ bmpdatabase.org
- ◆ spcwater.org

STORMWATER SOLUTIONS: BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) refer to the suite of options available to avoid and/or minimize damages associated with stormwater. BMPs can include the installation of stormwater management controls as well as practices that prevent stormwater pollution. See below for some examples of effective BMPs for common land use types.

Residential BMPs

- ◆ Rain gardens
- ◆ Rain barrels
- ◆ Pervious walkways and patios
- ◆ Landscaping with native plants
- ◆ Minimization of pesticide and fertilizer use
- ◆ Proper disposal of hazardous chemicals, electronics, and pharmaceuticals

Commercial Development BMPs

- ◆ Vegetated swales
- ◆ Pervious pavement
- ◆ Preservation of existing undeveloped land
- ◆ Constructed wetlands
- ◆ Capture and reuse of stormwater for irrigation
- ◆ Detention basin
- ◆ Street sweeping
- ◆ Erosion and sediment control during construction



Rain gardens are relatively simple to construct and can be designed to fit a variety of land use types. In addition to managing stormwater, rain gardens improve aesthetics, support pollinators, and more.

Photo: afbeducation.org



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BEST MANAGEMENT PRACTICES STORMWATER MANAGEMENT

Best Management Practices (BMPs) are used in stormwater management to prevent and mitigate problems related to stormwater. BMPs include mechanisms that control the volume, rate, and quality of stormwater. BMPs also include practices that prevent the creation of stormwater runoff and stormwater pollution. BMPs used in stormwater management are classified as either non-structural or structural.

Non-Structural BMPs

Non-structural BMPs include design approaches and practices that are used for their ability to prevent the occurrence of stormwater runoff. A majority of non-structural BMPs must be incorporated during site development.

Principle Groups of Non-Structural BMPs

- ◆ Protect Sensitive & Special Value Features
- ◆ Cluster & Concentrate
- ◆ Minimize Disturbance & Maintenance
- ◆ Reduce Impervious Cover
- ◆ Disconnect / Distribute / Decentralize
- ◆ Source Control



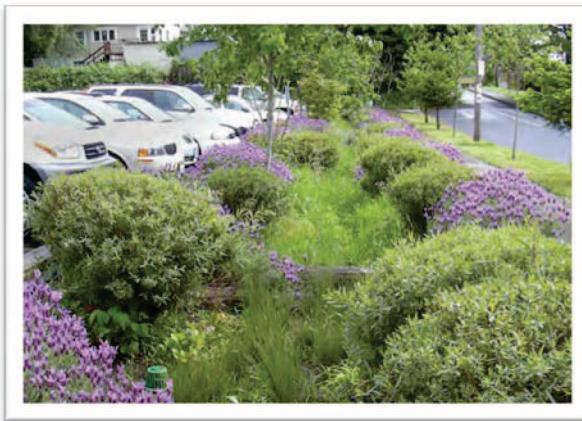
Preserving important natural features with special value for managing stormwater, such as floodplains and wetlands, is a key non-structural BMP for use when developing land. *Photo: naturalheritage.state.pa.us*

Structural BMPs

Structural BMPs are stormwater management techniques that have to be constructed and are typically used to mitigate the effects of stormwater runoff. Structural BMPs can be implemented during site development and in retrofit situations.

Principle Groups of Structural BMPs

- ◆ Volume / Peak Rate Reduction by Infiltration
- ◆ Volume / Peak Rate Reduction
- ◆ Runoff Quality / Peak Rate BMPs
- ◆ Restoration BMPs
- ◆ Other BMPs & Related Structural Measures



Vegetated swales are a structural BMP that manage stormwater volume and rate, while also improving water quality. *Photo: lowimpactdevelopment.org*



This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.



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GREEN STORMWATER INFRASTRUCTURE STORMWATER MANAGEMENT

Green Stormwater Infrastructure (GSI) refers to a suite of techniques that rely on natural processes associated with vegetation, soil and the hydrologic cycle, to manage stormwater quantity and quality. Utilizing GSI for stormwater management can provide a multitude of benefits beyond traditional approaches, which simply pipe the untreated water to the nearest body of water. Benefits of GSI include improved water quality and air quality, increased property values*, enhanced wildlife habitat, and much more.

Types of GSI

The suite of options to use for Green Stormwater Infrastructure is quite diverse. Varieties of GSI are chosen based on a number of considerations such as site conditions and performance goals. Examples of types of GSI are listed below:

- ◆ Rain Gardens
- ◆ Rain Barrels
- ◆ Stormwater Planters
- ◆ Pervious Pavement
- ◆ Green Roofs
- ◆ Trees
- ◆ Vegetated & Dry Swales
- ◆ Riparian Buffers
- ◆ Cisterns
- ◆ Downspout Disconnection
- ◆ Curb Bump-outs



Stormwater planters (left) manage flow from impervious surfaces, allowing stormwater to infiltrate into the ground instead of the sewer system. The vegetation also filters pollution and reduces temperature. Photo: Oregon Environmental Services

Benefits of GSI

Environmental

- ◆ Filters water & air pollution
- ◆ Mitigates flooding through reductions of peak flows
- ◆ Provides wildlife habitat
- ◆ Reduces soil erosion
- ◆ Protects drinking water supply through groundwater recharge

Social

- ◆ Reduces Heat Island Effect
- ◆ Provides Recreational Opportunities
- ◆ Improves neighborhood aesthetics
- ◆ Public education
- ◆ Reduces noise pollution

Economic

- ◆ Decreases pressure on existing stormwater or combined sewer system
- ◆ Increases property values*
- ◆ Creation of green jobs
- ◆ Reduces energy consumption costs



Rain Gardens (above) are one type of green stormwater infrastructure that work exceptionally well in residential settings. Rain gardens provide flood storage, filter pollutants, provide wildlife habitat, and beautify the neighborhood. Photo: afbeducation.org

For More Information

- SPCWater.org - dcnr.state.pa.us
- water.epa.gov - depweb.state.pa.us

*Source: EPA
(http://water.epa.gov/infrastructure/greeninfrastructure/gi_w hy.cfm)



What is Storm Water?

Storm water is water from precipitation that flows across the ground and pavement when it rains or when snow and ice melt. The water seeps into the ground or drains into what we call storm sewers. These are the drains you see at street corners or at low points on the sides of streets. Collectively, the draining water is called storm water runoff.

Good Rain Gone Wrong

Storm water becomes a problem when it picks up debris, chemicals, dirt, and other pollutants as it flows or when it causes flooding and erosion of stream banks. Storm water travels through a system of pipes and roadside ditches that make up storm sewer systems. It eventually flows directly to a lake, river, stream, wetland, or coastal water. All of the pollutants storm water carries along the way empty into our waters, too, because storm water does not get treated!



Pet wastes left on the ground get carried away by storm water, contributing harmful bacteria, parasites and viruses to our water.



Vehicles drip fluids (oil, grease, gasoline, antifreeze, brake fluids, etc.) onto paved areas where storm water runoff carries them through our storm drains and into our water.



Chemicals used to grow and maintain beautiful lawns and gardens, if not used properly, can run off into the storm drains when it rains or when we water our lawns and gardens.



Waste from chemicals and materials used in construction can wash into the storm sewer system when it rains. Soil that erodes from construction sites causes environmental degradation, including harming fish and shellfish populations that are important for recreation and our economy.

Where to Go to Continue the Information Flow

Your community is preventing storm water pollution through a storm water management program. This program addresses storm water pollution from construction, new development, illegal dumping to the storm sewer system, and pollution prevention and good housekeeping practices in municipal operations. It will also continue to educate the community and get everyone involved in making sure the only thing that storm water contributes to our water is . . .

water! Contact your community's storm water management program coordinator or the Pennsylvania Department of Environmental Protection for more information about storm water management.



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3850-BO-DEP5278 4/2020 G2421-APR20

Be Storm Water Smart

Understanding How Storm Water Affects Your Wallet, Safety, Health, and Environment in Pennsylvania



Answers to Test Your Storm Sewer System Savvy:

- 1. Ditch** – Part of the storm sewer system. Most people think that the system is just a series of underground pipes. It can also include ditches used to convey storm water from the land to a receiving lake, river, or stream.
- 2. Fine Hydrant** – Not part of the storm sewer system. Water sprayed on fires is not regulated as storm water, but water systems open hydrants to flush their water lines the chlorinated water should not be allowed to enter a stream.
- 3. Storm Drain Inlet** – Part of the storm sewer system. Anything that enters this drain will go directly to streams, rivers or lakes without being treated first. It is important to recognize this as a storm drain to prevent it from being used as a trash can.
- 4. Storm Sewer Outfall** – Part of the storm sewer system. An outfall is where storm water drains from the storm sewer system into a receiving lake, stream, or river. If there is a flow from an outfall when it isn't raining, there could be a problem with the system or someone has used a storm drain for illegally disposing of materials.
- 5. Toilet** – Not part of the storm sewer system. Wastewater from sinks and toilets in houses and businesses travels through a sewer system designed to carry wastewater.
- 6. Septic System** – Not part of the storm sewer system. Homeowners use septic tanks to manage sanitary wastes on-site. Improperly maintained septic systems can leak and contribute pollutants to the storm sewer system, as well as directly to lakes, rivers, and streams.
- 7. Roads and Other Paved Areas** – Source of much of the flow to storm sewer systems. Roads and other hardsurfaced surfaces such as parking lots and sidewalks can accumulate pollutants (e.g. oil, grease, dirt, leaves, trash, pet wastes) that storm water eventually washes into the storm sewer system.
- 8. Protected Storm Drain Inlet** – Where construction or other activities cause sediment or other pollutants to flow to an inlet, sandbags or filters can be used to mitigate.

What Happens When It Rains?

Rain is an important part of nature's water cycle, but there are times it can do more damage than good. Problems related to storm water runoff can include:



Flooding caused by too much storm water flowing over hardened surfaces such as roads and parking lots, instead of soaking into the ground.



Increases in spending on maintaining storm drains and the storm sewer system that become clogged with excessive amounts of dirt and debris.



Decreases in sportfish populations because storm water carries sediment and pollutants that degrade important fish habitat.



More expensive treatment technologies to remove harmful pollutants carried by storm water into our drinking water supplies.



Closed beaches due to high levels of bacteria carried by storm water that make swimming unsafe.

We can help rain restore its good reputation while protecting our health and environment while saving money for ourselves and our community. Keep reading to find out how...

Test Your Storm Sewer System Savvy!



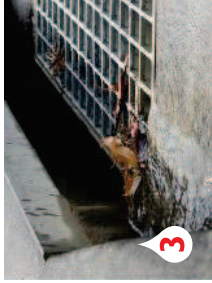
What does the storm sewer system look like in your community? See if you can identify which pictures are part of the storm sewer system (Answers are on the back.)



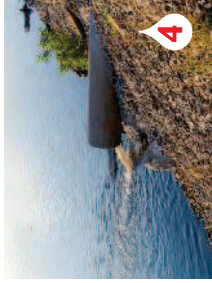
1



2



3



4



5



6



7



8

Restoring Rain's Reputation: What Everyone Can Do To Help

Rain by nature is important for replenishing drinking water supplies, recreation, and healthy wildlife habitats. It only becomes a problem when pollutants from our activities like car maintenance, lawn care, and dog walking are left on the ground for rain to wash away. Here are some of the most important ways to prevent storm water pollution:

- Properly dispose of hazardous substances such as used oil, cleaning supplies and paint—never pour them down any part of the storm sewer system and report anyone who does.
- Use pesticides, fertilizers, and herbicides properly and efficiently to prevent excess runoff.
- Look for signs of soil and other pollutants, such as debris and chemicals, leaving construction sites in storm water runoff or tracked into roads by construction vehicles. Report poorly managed construction sites that could impact storm water runoff to your community. (See the back of this brochure for contact information.)
- Install innovative storm water practices on residential property, such as rain barrels or rain gardens, that capture storm water and keep it on site instead of letting it drain away into the storm sewer system.
- Report any discharges from storm water outfalls during times of dry weather—a sign that there could be a problem with the storm sewer system.
- Pick up after pets and dispose of their waste properly. No matter where pets make a mess—in a backyard or at the park—storm water runoff can carry pet waste from the land to the storm sewer system to a stream.
- Store materials that could pollute storm water indoors and use containers for outdoor storage that do not rust or leak to eliminate exposure of materials to storm water.

STRUCTURAL BMP'S



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STRUCTURAL BMPs

STORMWATER MANAGEMENT

Structural Stormwater Best Management Practices (BMPs) are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.

Structural BMPs include systems that rely on the natural processes of soil and vegetation (e.g. vegetated swale) as well as systems that rely on manufactured components (e.g. water quality filters). Structural BMPs can be utilized to reduce volume and peak flows, and to improve water quality.

The Pennsylvania Best Management Practices Manual divides Structural BMPs into the following groups:

- Volume & Peak Rate Reduction by Infiltration BMPs
- Volume & Peak Rate Reduction BMPs
- Runoff Quality & Peak Rate Control BMPs
- Restoration BMPs
- Other BMPs & Related Structural Measures



Volume & Peak Rate Reduction by Infiltration BMPs

- ◆ Infiltration Basin
- ◆ Subsurface Infiltration Bed
- ◆ Infiltration Trench
- ◆ Rain Garden / Bioretention
- ◆ Dry well / Seepage Pit
- ◆ Constructed Filter
- ◆ Vegetated Swale
- ◆ Vegetated Filter Strip
- ◆ Infiltration Berm & Retentive Grading
- ◆ Pervious Pavement with Infiltration Bed

Volume & Peak Rate Reduction BMPs

- ◆ Vegetated Roof
- ◆ Runoff Capture & Reuse

Other BMPs & Related Structural Measures

- ◆ Level Spreader
- ◆ Special Detention Areas



Constructed wetlands (above) and vegetated swales (top right) remove pollutants, and reduce peak flow rates and runoff volume.

Restoration BMPs

- ◆ Riparian Buffer Restoration
- ◆ Landscape Restoration
- ◆ Soil Amendment & Restoration
- ◆ Floodplain Restoration

Runoff Quality & Peak Rate Control BMPs

- ◆ Constructed Wetland
- ◆ Wet Pond / Retention Basin
- ◆ Dry Extended Detention Basin
- ◆ Water Quality Filters & Hydrodynamic Devices



This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lowimpactdevelopment.org & ashmedia.org



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RAIN GARDENS

STRUCTURAL STORMWATER BMPs

Rain Gardens are excavated shallow depressions, planted with native vegetation that can withstand dry and wet periods. Stormwater is collected in the rain garden and is both infiltrated into the ground and evapotranspired by the vegetation. Rain gardens serve a variety of stormwater management functions, including improving water quality, recharging groundwater, and reducing volume and peak runoff rate.

Rain gardens are highly adaptable and relatively easy to construct. They can be incorporated into a variety of land use settings, including residential, commercial, ultra urban, industrial, highways/roads, parking lots, and various retrofit situations.

BMP Profile	
Name	Rain Garden
Type	Structural
Grouping	Volume and Peak Rate Reduction by Infiltration
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Groundwater Recharge ◆ Volume Reduction ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit ◆ Highway/Road



Rain gardens can be incorporated into most landscapes, including ultra urban retrofits (above left, Pittsburgh, PA) and residential areas (above right, Puyallup, WA). Rain gardens can serve a variety of stormwater management functions, including improving water quality, recharging groundwater, and reducing volume and peak runoff rate.

Key Considerations for Rain Gardens

- ◆ Soil may need to be amended with compost to improve water holding capability
- ◆ Gravel bed below the rain garden can increase storage capacity
- ◆ Native plants, trees, and shrubs should be used
- ◆ Maintenance plan is essential
- ◆ Landscape can be modified to direct stormwater flow to rain garden (example: curb cuts or downspout disconnection)
- ◆ Through reduced maintenance costs and stormwater conveyance costs, rain gardens can be more cost effective than traditional landscaping

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: cahnrs.wsu.edu



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CONSTRUCTED WETLANDS STRUCTURAL STORMWATER BMPs

Constructed Wetlands (CWs), also known as stormwater wetlands, are shallow aquatic systems planted with emergent vegetation. They are highly effective at removing pollutants from stormwater; they also mitigate peak flow rates and reduce runoff volume. Beyond stormwater management, CWs provide wildlife habitat and aesthetic value. Design and maintenance is critical for the ability of this BMP to function and be sustainable over time.

Detention Basins, a basic BMP that temporarily stores stormwater, are often retrofitted into CWs in order to maximize stormwater management function of the space and obtain the added benefits.



BMP Profile	
Name	Constructed Wetland
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Peak Rate Control ◆ Groundwater Recharge ◆ Flow Rate Reduction
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit



Constructed wetlands improve water quality, control peak flows, provide wildlife habitat, and much more. They can be used in a variety of land use situations, including retrofit (above right) and recreational spaces (above left).

Types of Constructed Wetlands

CWs can be designed as either online (hydrologically connected to existing waterway) or offline (not hydrologically connected to an existing waterway). They are often used in conjunction with other stormwater BMPs that mitigate flow and sediment. They are grouped into the following categories:

- ◆ Shallow Wetlands
- ◆ Extended Detention Shallow Wetlands
- ◆ Pocket Wetlands
- ◆ Pond/Wetland Systems

Water Quality Improvement

CWs improve water quality through a variety of mechanisms that include settling, filtration, biological decomposition, and more. They are effective at removing many common stormwater pollutants such as phosphorus, nitrogen, suspended solids, and petroleum products.

Pollutant removal capacity can be affected by seasonal variations. Performance is typically highest during the growing season and lowest during the winter months.



DESIGN AND MAINTENANCE CONSIDERATIONS

Proper design and maintenance are critical for the long-term viability of constructed wetlands. Key considerations are listed below.

<p>Hydrology Water conditions associated with CWs, including flow, depth, drainage area, etc.</p>	<ul style="list-style-type: none"> Flow contributions from rain, runoff, and groundwater are essential for long term performance Deeper areas should have a permanent water surface except during intense drought Drainage area should be 5 acres for pocket wetlands or 10 acres for other types of constructed wetlands A constant source of inflow can improve the health and functioning of constructed wetlands as well as reduce the drainage area requirements
<p>Underlying Soils Existing soils below CWs</p>	<ul style="list-style-type: none"> Underlying soils must be identified, tested, and amended if necessary Synthetic or highly-compacted soil liners may be needed to avoid excessive infiltration
<p>Planting Soil Soils used to plant vegetation</p>	<ul style="list-style-type: none"> Soils with very high organic content should be used due to their ability to serve as a sink for pollutants, retain high amounts of water, and support plant growth
<p>Vegetation Plants in CWs that provide many functions such as slowing water velocity & evapotranspiring water</p>	<ul style="list-style-type: none"> Vegetation serves many functions, including reduction of flow velocity, promoting settling of suspended solids, limiting erosion, promoting filter, and much more A diverse variety of tough, non-invasive perennial plants should be used Several zones of vegetation are necessary; see table 6.6.1-1* in PA Stormwater BMP Manual for details
<p>Configuration Design and placement considerations</p>	<ul style="list-style-type: none"> Ideal length to width ratio is at least 2:1 Construction should occur at least 10 feet from property lines and at least 50 feet from private wells Critical components include forebay/inflows, vegetation and open water zones, outlets, and safety benches; see Chapter 6.6.1* in PA Stormwater BMP Manual for more detail
<p>Buffer Undeveloped area around CWs</p>	<ul style="list-style-type: none"> Including a 25-foot buffer around the CW will improve habitat value, aesthetics, and wetland health Buffer should include trees, shrubs, and native ground covers; existing trees should be preserved
<p>Maintenance Access</p>	<ul style="list-style-type: none"> Stabilized and permanent maintenance access is needed at the forebay, outlet, and embankment
<p>Maintenance Vegetation and engineered systems need to be inspected and maintained to sustain CWs performance over time</p>	<ul style="list-style-type: none"> A maintenance plan is necessary Private facilities may require an easement, deed restriction, and/or legal measures to prevent neglect or removal Vegetation inspections should occur every 2 to 3 weeks during the first growing season Full inspections should occur 4x/year and after major storms during the first 2 years Vegetation and sediment problems should be promptly corrected Once established, inspections should occur semiannually and after major storms



A variety of tough, non-invasive plants should be used in the various vegetation zones. Joe Pye Weed (above) and Grass Leaf Arrowhead (below) are native plants that thrive in a variety of the vegetation zones required for optimal performance of constructed wetlands.



Constructed wetlands can be sited in a variety of conditions, including residential, commercial, industrial, and retrofit situations. The design and maintenance considerations should be followed in each of these applications.



This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

*Available for download at: <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>



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VEGETATED SWALE STRUCTURAL STORMWATER BMPS

Vegetated Swales are shallow channels, planted densely with vegetation, designed to reduce the rate of stormwater and encourage infiltration. Additional stormwater management benefits of vegetated swales include improved water quality and volume reduction.

Vegetated swales can be incorporated into a variety of landscapes, including residential, commercial, industrial, and highways/roads. In areas with steep slopes, check dams can increase the effectiveness of vegetated swales by further slowing the rate of stormwater and therefore increasing opportunities for infiltration.



Vegetated swales can be incorporated into a variety of landscapes, including retrofit situations. Above is an example of a parking lot that was retrofitted with a vegetated swale to perform on-site stormwater management and improve aesthetics.

BMP Profile	
Name	Vegetated Swale
Type	Structural
Grouping	Volume and Peak Rate Reduction by Infiltration
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Peak Rate Control ◆ Volume Reduction ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Highway/Road



In areas with steep slopes, check dams can be included in the design of a vegetated swale to increase stormwater management performance. The check dams attenuate the water, slowing the peak rate and allowing more time for infiltration.

Key Considerations for Vegetated Swales

- ◆ Better alternative to conventional conveyance systems due to ability to remove some pollutants and reduce speed of stormwater
- ◆ Utilize minimum of 24" of permeable soil beneath plants
- ◆ 12" – 24" of base rock layer should be placed below soil layer
- ◆ Plant with native vegetation that is tolerant of wet and dry conditions
- ◆ Maintenance plan is essential for long term success
- ◆ Can be designed to aesthetically enhance surroundings
- ◆ Should discharge to additional stormwater BMP or traditional stormwater infrastructure

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lacreekfreak.files.wordpress.com & oseh.umich.edu





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RUNOFF CAPTURE & REUSE STRUCTURAL STORMWATER BMPs

Runoff Capture and Reuse refers to the variety of techniques that are used to capture precipitation, store it for period of time, and reuse the water. Devices used to capture and store stormwater include rain barrels, cisterns, vertical storage mechanisms, and below-ground storage systems. These BMPs are most effective for use in controlling small, frequent storm events.

Stormwater management benefits of runoff capture and reuse devices include volume reduction, water quality improvements, peak rate control, and groundwater recharge. The ability of this BMP to perform each of these functions is dependent upon design and maintenance. This BMP can be applied in a variety of settings, including urban, residential, and commercial.

BMP Profile	
Name	Runoff Capture & Reuse
Type	Structural
Grouping	Volume and Peak Rate Reduction BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Volume Reduction ◆ Water Quality Improvements ◆ Peak Rate Control ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit



Some of the variations of runoff capture and reuse include underground storage (above left), rain barrels (above middle), and cisterns (above right). These systems are often implemented with other BMPs such as vegetated swales, rain gardens, and/or pervious pavement to maximize stormwater management performance.

Key Considerations for Runoff Capture Reuse

- ◆ Most effective for use in small, frequent storm events
- ◆ Systems must bypass for large storm events
- ◆ Water should not be reused for potable purposes
- ◆ Captured water can be reused for irrigation or greywater needs such as flushing toilets
- ◆ Systems must be winterized to avoid damage from freezing
- ◆ Devices should be protected from light in order to avoid algae growth

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo credits: ecoartsoffla.org, 3.bp.blogspot.com, and consultant.archicadd.com





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VEGETATED ROOFS STRUCTURAL STORMWATER BMPs

Vegetated Roofs are roofs that are covered with specialized media and planted with vegetation; this enables the roof to hydrologically perform in a manner similar to vegetated surfaces. The media holds water, which is eventually evapotranspired by the plants. They can be installed on flat and/or pitched roofs with a slope of $\leq 30\%$ in a variety of settings.

Vegetated roofs' primary function in stormwater management is volume reduction. Additional stormwater benefits include water quality improvements and some peak rate control. Environmental benefits beyond stormwater control include building temperature moderation and wildlife habitat.



The 1st green roof (above) in Westmoreland County is located at the County Conservation District's office. This installation was part of extensive sustainable stormwater retrofit solutions across the site. Photo: wcdpa.com

BMP Profile	
Name	Vegetated Roof
Type	Structural
Grouping	Volume and Peak Rate Reduction BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Volume Reduction ◆ Water Quality Improvements ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit



A green roof was installed on the Allegheny County Office Building (above) in 2010 as a demonstration project. There are four types of green roof technologies and extensive monitoring equipment in place. Photo: eislerlandscapes.com

Key Considerations for Vegetated Roofs

- ◆ Structural competency must be verified for both dead loads (when dry) and live loads (with rainfall retention)
- ◆ Require optimal waterproofing system to protect against biological and root damage
- ◆ Should not be fertilized or irrigated in order to achieve maximum benefits
- ◆ Performance is improved when coupled with ground infiltration measures
- ◆ Internal building drainage should be designed to manage large rainfall events without inundating the cover

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.





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Riparian Buffer Restoration STRUCTURAL STORMWATER BMPS

Riparian Buffer Restoration (RBR) is the restoration of the area surrounding streams, lakes, ponds, and wetlands. The restoration of these areas provides numerous stormwater management benefits, including water quality improvement, volume reduction, groundwater recharge, and peak rate control. Benefits beyond stormwater management are numerous, including providing wildlife habitat and providing aesthetic value.

RBR can be applied in a variety of settings, including forested landscapes, agricultural areas, suburban/developing sites, and urban areas. Design guidelines are available for these various landscapes in the PA Stormwater Best Management Practices Manual.

BMP Profile	
Name	Riparian Buffer Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Volume Reduction ◆ Groundwater Recharge ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit



Portions of Nine Mile Run (City of Pittsburgh) were restored in 2006. The photo to the left shows a portion of the restored riparian buffer area in 2014. Stormwater management functions of riparian buffer restoration projects become increasingly effective as the restoration vegetation grows.

Key Considerations for Riparian Buffer Restoration

- ◆ Land owner permission and support is critical
- ◆ Buffer width of 100' is preferred; 35' is considered the minimum width
- ◆ Forested buffers are the most effective for stormwater management and supporting wildlife
- ◆ Establish a plan for short term and long term maintenance and monitoring
- ◆ Use native trees, shrubs, and plants
- ◆ Buffers can be restored along perennial (flowing year-round), intermittent (seasonal / flows part of year), and ephemeral (flows after precipitation events) streams
- ◆ In addition to buffers around streams and rivers, riparian buffers around lakes, ponds, and wetlands are also very important. They can be restored with guidelines available in the PA Stormwater BMP Manual.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.





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Floodplain Restoration

STRUCTURAL STORMWATER BMPS

Floodplain Restoration aims to restore a floodplain to conditions present prior to development. It is a system-based BMP that strives to mimic undisturbed conditions between stream system elements: groundwater, stream surface flow, soils, and root systems of vegetation. This BMP has the ability to address problems on many scales, from the site level to the watershed level.

Stormwater management benefits of floodplain restoration include substantial water quality improvements, peak rate control, groundwater recharge, and volume reduction. Additional benefits of floodplain restoration include but are not limited to: increased aquatic and terrestrial habitats; increased wetland areas and native plants in floodplain; reduction of invasive plants; increased riparian areas; and, thermal cooling of stream baseflow.

BMP Profile	
Name	Floodplain Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Peak Rate Control ◆ Volume Reduction ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Highway/Road ◆ Ultra Urban



Floodplain restoration is very effective for stormwater management, provides habitat, and much more. Shown above is Saucon Creek pre-restoration (left) and post-restoration (right) at locations in close proximity.

Key Considerations for Floodplain Restoration

- ◆ Effectively reduces flooding damage
- ◆ Greatly reduces or stops streambank and channel erosion
- ◆ Easily integrated into site planning process
- ◆ Maintenance and monitoring plans are important
- ◆ Must follow local, state, and federal floodplain requirements
- ◆ Floodplain restoration can be used as a BMP on-site or downstream from a development site
- ◆ Existing watershed conservation plans and inventories can help guide the selection of restoration areas
- ◆ Potential for incorporation of greenways and/or trails with floodplain restoration project

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: landstudies.com





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Dry Extended Detention Basin STRUCTURAL STORMWATER BMPS

Dry Extended Detention Basins (DEDBs) are detention basins which are designed to provide temporary stormwater storage and water quality benefits. The temporary storage of stormwater prevents downstream flooding. Water quality benefits are achieved through sediment settling out of the stormwater while held in the DEDB. DEDBs are often used in conjunction with other BMPs to maximize stormwater management benefits on site.

The DEDB is a design enhancement from the Dry Detention Basin, which has been popular since the 1970s. The extended detention of stormwater maximizes water quality benefits.

BMP Profile	
Name	Dry Extended Detention Basin
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Water Quality ◆ Volume Reduction
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit ◆ Highway/Road



The primary stormwater management benefit of dry extended detention basins (left and right) is peak rate control. Water quality benefits can also be achieved when water is held for an extended period.



Fun Fact: Detention basins and retention basins are often confused. A detention basin is designed to temporarily hold water, thus *detaining* it for a specific design period. A retention basin is designed as to hold water until it eventually evaporates or infiltrates into the ground, thus *retaining* the water.

Key Considerations for Dry Extended Detention Basins

- ◆ Require periodic sediment removal
- ◆ Primary function is peak rate control, although some water quality and volume reduction benefits can be achieved
- ◆ Minimum DEDB width is 10 feet
- ◆ Minimum length-to-width ratio is 2:1
- ◆ Forebays are required and should be vegetated
- ◆ Diverse native plants, trees, and shrubs should be used for basin bottom
- ◆ Outlet should be designed to detain stormwater for extended periods

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo Credits: unce.unr.edu & stormwaterpa.org





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Landscape Restoration STRUCTURAL STORMWATER BMPS

Landscape Restoration describes the use of sustainable landscaping practices in areas beyond riparian buffers and other specially protected areas. Landscape restoration includes the conversion of turf to meadow; the restoration of meadow areas; and, the reforestation of forested areas. Landscape restoration is exceptionally effective at improving water quality. Other stormwater management functions of landscape restoration can include groundwater recharge, volume reduction, and peak rate control. Landscape restoration can be used in a variety of land use settings, including residential, commercial, industrial, highway areas, and more.

BMP Profile	
Name	Landscape Restoration
Type	Structural
Grouping	Restoration BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Volume Reduction ◆ Groundwater Recharge ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Highway/Road ◆ Ultra Urban



Converting turf grass into meadow is one type of landscape restoration. Landscape restoration is a stormwater management BMP that greatly increases water quality and can also provide peak rate control, volume reduction, and recharge groundwater. *Photos: 2.bp.blogspot.com & countrylawn.webs.com*

Key Considerations for Landscape Restoration

- ◆ Use native plants for restoration areas and landscaped areas
- ◆ Minimize or eliminate use of pesticides and fertilizers
- ◆ During development process, avoid soil compaction, establish erosion controls, and minimize disturbance
- ◆ Restored meadows and forests require minimal maintenance in comparison to formal landscape
- ◆ Stormwater management benefits increase as native plants and trees become more established
- ◆ Soil, geology, terrain, history of site, existing native and non-native vegetation, and sensitive habitats should be carefully considered during planning and planting
- ◆ Planting should not be done during drought

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.





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Wet Pond / Retention Basin

STRUCTURAL STORMWATER BMPs

Wet Ponds (WPs), also called Retention Basins, are stormwater basins that include a permanent pool of water as well as additional capacity for temporary storage of stormwater. They are effective at controlling peak stormwater rates and also provide water quality benefits. Beyond stormwater management, WPs can also provide aesthetic and wildlife benefits. WPs can be used in a variety of land use settings, including residential, commercial, ultra urban, industrial, retrofit, and highways/roads.

WPs can be designed as either online (hydrologically connected to existing waterway) or offline (not hydrologically connected to an existing waterway). They are often used in conjunction with other stormwater BMPs that mitigate sediment accumulation. Existing dry detention basins can be retrofitted into a WP in order to achieve additional benefits.

BMP Profile	
Name	Wet Pond / Retention Basin
Type	Structural
Grouping	Runoff Quality and Peak Rate BMP
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Water Quality ◆ Volume Reduction ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Ultra Urban ◆ Industrial ◆ Retrofit ◆ Highway/Road

Existing dry detention basins can be retrofitted into a WP in order to achieve additional benefits.



Wet ponds are relatively easy to construct and maintain. Their stormwater management functions include peak rate control and water quality improvement. *Photo: rwmwd.org*



Including a 25-foot vegetated buffer around the wet pond (above) can greatly enhance pond health, mediate water temperature, provide habitat, and aesthetics. *Photo: utahkoi.com*

Key Considerations for Wet Ponds

- ◆ Require sufficient source of inflow to maintain permanent pool and biological health
- ◆ Need high groundwater table
- ◆ Should include a forebay for sediment collection and removal
- ◆ Typically cover 1% - 3% of the total drainage area
- ◆ Vegetation is a key element of the functioning and health of a WP
- ◆ Should be surrounded by dense emergent wetland vegetation
- ◆ Can discharge warm water; must be used with caution near temperature-sensitive waterbodies
- ◆ Minimum length to width ratio 2:1

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.



NON-STRUCTURAL BMP'S



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NON-STRUCTURAL BMPs

STORMWATER MANAGEMENT

Non-Structural Stormwater Best Management Practices (BMPs) focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

Non-structural BMPs refer to the suite of options available to avoid and/or minimize damages associated with stormwater volumes and runoff from development. The most effective way to manage stormwater begins with the prevention of problems. It is much more efficient and cost-effective than attempting to correct problems after development has occurred. Utilizing non-structural BMPs is the most important step in managing runoff.

The Pennsylvania Best Management Practices Manual divides Non-Structural BMPs into the following groups:

- ◆ Protect Sensitive and Special Value Resources
- ◆ Cluster and Concentrate
- ◆ Minimize Disturbance and Minimize Maintenance
- ◆ Reduce Impervious Cover
- ◆ Disconnect / Distribute / Decentralize
- ◆ Source Control



Protect Sensitive and Special Value Resources

- ◆ Protect Sensitive / Special Value Features
- ◆ Protect / Conserve / Enhance Riparian Areas
- ◆ Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design



Protection of sensitive areas, such as this riparian area and steep slopes (top right) and forested wetland (bottom right) are examples of non-structural BMPs. Photos : summitpost.org & Erin Kepple

Cluster and Concentrate

- ◆ Cluster Uses at Each Site; Build on Smallest Area Possible
- ◆ Concentrate Uses Area-wide through Smart Growth Practices

Reduce Impervious Cover

- ◆ Reduce Street Imperviousness
- ◆ Reduce Parking Imperviousness

Disconnect / Distribute / Decentralize

- ◆ Rooftop Disconnection
- ◆ Disconnection from Storm Sewers

Minimize Disturbance and Minimize Maintenance

- ◆ Minimize Total Disturbed Area
- ◆ Minimize Soil Compaction in Disturbed Areas
- ◆ Re-Vegetate and Re-Forest Disturbed Areas Using Native Species

Source Control

- ◆ Streetsweeping



Benefits of Non-Structural BMPs

There are environmental, economic, and social benefits associated with incorporating non-structural BMPs into site planning and development. These benefits may include but are not limited to:

Environmental

- ◆ Maintains a more natural and functional landscape
- ◆ Promotes harmony between development and existing natural systems
- ◆ Mitigates flooding through reductions of peak flows
- ◆ Retains wildlife habitat and supports biodiversity
- ◆ Reduces soil erosion
- ◆ Protects drinking water supply through groundwater recharge
- ◆ Encourages decentralized treatment, infiltration, and evaporation of precipitation, helping to prevent negative consequences associated with stormwater
- ◆ Protects water quality and aquatic habitat
- ◆ Protects and improves air quality

Economic

- ◆ Reduction in stormwater infrastructure costs
- ◆ Disconnection of impervious surfaces to infiltration areas decreases pressure on existing stormwater or combined sewer system
- ◆ May help to increase community marketability and property values
- ◆ Reduces development cost
- ◆ Rooftop disconnection and use of rain barrels can save money for landscape irrigation

Social

- ◆ Preserves open space
- ◆ Reduces heat island effect
- ◆ Provides recreational opportunities
- ◆ Improves neighborhood aesthetics
- ◆ Reduces noise pollution



Protecting, conserving, and enhancing riparian areas is an important non-structural BMP. Riparian areas are very effective at protecting and improving water quality. This non-structural BMP has many additional stormwater management benefits, including but not limited to: volume reduction, groundwater recharge, and peak rate control.

For More Information

To learn more about non-structural BMPs, stormwater management, and more, visit the following websites:

- ◆ <http://water.epa.gov/infrastructure/greure/index.cfm>
- ◆ http://spcwater.org/ed_bmp_specnonstruct.shtml
- ◆ <http://www.stormwaterpa.org/non-structural-bmps.html>
- ◆ <http://www.bmpdatabase.org/>
- ◆ <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.



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CLUSTER USES AT EACH SITE NON-STRUCTURAL STORMWATER BMPs

Cluster Uses at Each Site; Build on Smallest Area Possible (CUES/BSAP) is a design and development strategy which reduces site disturbance through clustering proposed uses together, building vertically, and moving uses closer together. CUES/BSAP is highly effective at preventing the generation of and managing stormwater. Stormwater management benefits of CUES/BSAP include water quality protection and improvement, runoff volume reduction, groundwater recharge, and peak rate control. Benefits beyond stormwater management include the preservation of open space, wildlife habitat, improved aesthetics, increased recreation opportunities, air quality, temperature moderation, and more.

BMP Profile	
Name	Cluster Uses at Each Site; Build on Smallest Area Possible
Type	Non-Structural
Grouping	Cluster and Concentrate
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Volume Reduction ◆ Groundwater Recharge ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Retrofit ◆ Industrial ◆ Ultra Urban



Clustering uses and building on the smallest area possible (above right) generates significantly less stormwater quantity and quality challenges than conventional development (above left).

Key Considerations of Cluster Uses at Each Site; Build on Smallest Area Possible

- ◆ Links with other non-structural BMPs such as reducing imperviousness associated with parking and streets, utilizing natural flow pathways, and preserving sensitive and special value features
- ◆ Maximizes sense of place design qualities for residents
- ◆ Zoning and municipal ordinances may affect the ability to cluster
- ◆ Can reduce development costs
- ◆ Maintenance costs of undisturbed open space are typically lower
- ◆ Can reduce infrastructure maintenance costs associated with street sweeping, sewer, water, etc.

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: lakecountyil.gov





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MINIMIZE DISTURBED AREA NON-STRUCTURAL STORMWATER BMPs

Minimize Disturbed Area – Grading (MDA-G)

is a non-structural best management practice (BMP) that focuses on minimizing grading and site disturbance while maximizing soil restoration and the conservation of existing site vegetation. MDA-G includes practices such as modifying the alignment of roads and disturbance areas to minimize necessary grading. MDA-G can be applied to any site development; however, it is most effective when coupled with other non-structural BMPs such as the protection of sensitive (e.g., steep slopes) and special value features (e.g., riparian areas and wetlands). Stormwater management benefits of MDA-G include runoff volume reduction, groundwater recharge, peak rate control, and the protection and improvement of water quality.

BMP Profile	
Name	Minimize Disturbed Area - Grading
Type	Non-Structural
Grouping	Minimize Disturbance and Minimize Grading
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Volume Reduction ◆ Water Quality ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Ultra Urban ◆ Highway/Road



Areas that are disturbed during grading (above) are prone to soil erosion and compaction.



Protection of special value resources, such as woodlands (above), can help to prevent the generation of stormwater-related problems.

Key Considerations of Minimize Disturbed Area - Grading

- ◆ Minimize construction-traffic locations
- ◆ Minimize stockpiling and storage areas during construction
- ◆ Restore soil permeability (ability of soil to infiltrate water) through soil restoration efforts
- ◆ Does not generate additional maintenance needs
- ◆ Municipal zoning and ordinances can be used to encourage non-structural BMPs in site planning and development, including MDA-G
- ◆ Areas that have been compacted during development become semi-impervious, therefore, it is critical that disturbed soils are restored

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: raydartist.files.wordpress.com & o.static.wix.com





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MINIMIZE IMPERVIOUS AREA NON-STRUCTURAL STORMWATER BMPs

Reducing Street Imperviousness (RSI) and **Reducing Parking Imperviousness (RPI)** are two non-structural best management practices (BMPs) that can be highly effective for stormwater management when incorporated into site design and development. RSI includes minimizing street widths and lengths; RPI includes reducing the impervious area associated with parking through practices such as designating overflow parking on an area that is pervious. Specific stormwater management functions of reducing impervious cover include runoff volume reduction, peak rate control, groundwater recharge, and improved water quality.

The PA Stormwater BMP Manual groups RSI and RPI into the overall category of *Reduce Impervious Cover*.

BMP Profile	
Name	Reduce Street Imperviousness and Reduce Parking Imperviousness
Type	Non-Structural
Grouping	Reduce Impervious Cover
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Groundwater Recharge ◆ Volume Reduction ◆ Water Quality
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial



Reducing the impervious area associated with streets and parking can be done through a variety of innovative ways such as installing curb bump-outs (left) or using permeable pavers for parking areas.

Key Considerations for Reducing Street and Parking Imperviousness

- ◆ RSI can be achieved through alternative street layouts, on-street parking restrictions, minimizing radii of cul-de-sacs, and using permeable pavers
- ◆ Consult local fire code standards, construction codes, and ADA requirements
- ◆ Preventative stormwater management
- ◆ RPI can be achieved through narrowing traffic lanes, using slanted parking stalls, and utilizing pervious materials in the primary and/or overflow parking areas
- ◆ Reduction in paved area can significantly reduce costs
- ◆ RSI and RPI are components of Low Impact Development

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: phillywatersheds.org





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PROTECT RIPARIAN AREAS NON-STRUCTURAL STORMWATER BMPs

Protect / Conserve / Enhance Riparian Areas (PCERA) is a non-structural best management practice (BMP) that preserves and enhances vegetated areas that are adjacent to streams and rivers. While this BMP focuses on stream and river riparian areas, it should be noted that riparian buffers around other waterbodies such as lakes, ponds, and wetlands are also very valuable. Riparian areas perform important stormwater and ecosystem functions. Stormwater management functions of riparian areas include water quality protection and improvement, runoff volume reduction, groundwater recharge, stream bank and channel stabilization, and some peak runoff rate control. Ecosystem functions include providing a food supply, habitat, and thermal protection for fish and other wildlife.

BMP Profile	
Name	Protect / Conserve / Enhance Riparian Areas
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Water Quality ◆ Volume Reduction ◆ Groundwater Recharge ◆ Peak Rate Control
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Highway/Road



Preserving and enhancing riparian areas is one of the most effective ways to manage stormwater and protect Pennsylvania's waterways.

Key Considerations of Protect / Conserve / Enhance Riparian Areas

- ◆ Maximize buffer widths to maximize stormwater and ecosystem benefits
- ◆ In Pennsylvania, riparian areas are forested under undisturbed conditions
- ◆ Forested buffers are the most effective for stormwater management and wildlife habitat
- ◆ When enhancing a riparian area that has been degraded by past practices, native trees, shrubs and plants should be used
- ◆ Municipal zoning and ordinances can be used to establish riparian buffer requirements

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photo: forcechange.com.c.presscdn.com





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PROTECT SPECIAL VALUE FEATURES NON-STRUCTURAL STORMWATER BMPS

Protect Sensitive and Special Value Features (PSSVF)

is a non-structural best management practice (BMP) that protects areas with stormwater impact sensitivities as well as areas that hold important stormwater functional values. Areas with stormwater impact sensitivities include but are not limited to: steep slopes, historical and natural resources, and adjoining properties. Areas with special stormwater functional values include but are not limited to: floodplains, riparian areas, wetlands, woodlands, and natural flow pathways. Stormwater management functions of PSSVF include runoff volume reduction, groundwater recharge, peak runoff rate control, and protection and improvement of water quality.

Benefits beyond stormwater management can include protection of open space and wildlife habitat, as well as the potential to increase property values and improve aesthetics.

BMP Profile	
Name	Protect Sensitive and Special Value Features
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Volume Reduction ◆ Water Quality ◆ Groundwater Recharge
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Highway/Road ◆ Ultra Urban



Protecting areas with special stormwater functional values, such as wetlands (above left), woodlands (above right), and riparian areas is a highly effective tool for stormwater management.

Key Considerations of Protecting Sensitive and Special Value Features

- ◆ Disturbing areas with important stormwater functional values, such as floodplains, may double or triple the amount of site runoff
- ◆ Sensitive and special value features should be identified and mapped to guide the site design process
- ◆ Clustering (building on the smallest area possible) is an effective way to achieve the stormwater benefits associated with PSSVF, as well as reduce construction costs associated with land clearing, grading, sidewalks, utility infrastructure, etc.



This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: egtischler.files.wordpress.com & sourcewaterpa.org



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PROTECT NATURAL FLOW PATHWAYS

NON-STRUCTURAL STORMWATER BMPS

Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design is a non-structural best management practice (BMP) that can minimize stormwater impacts associated with site development. Protecting natural drainage features such as swales, depressions, and ephemeral streams during site development can provide a variety of stormwater management functions, including reducing peak runoff, improving water quality, and reducing runoff volume. Benefits beyond stormwater management can include protection of open space and wildlife habitat, as well as the potential to increase property values and improve aesthetics.

Utilizing natural flow pathways for stormwater management can greatly reduce the need for engineered stormwater systems. Natural flow pathways typically require little maintenance as long as they are incorporated properly into a site design (e.g., protected from erosive stormwater flows).



Preserving and utilizing natural features such as depressions (left) and ephemeral streams (right) during site development can minimize stormwater impacts associated with site development.



BMP Profile	
Name	Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design
Type	Non-Structural
Grouping	Protect Sensitive and Special Value Resources
Stormwater Management Benefits	<ul style="list-style-type: none"> ◆ Peak Rate Control ◆ Volume Reduction ◆ Water Quality
Potential Applications	<ul style="list-style-type: none"> ◆ Residential ◆ Commercial ◆ Industrial ◆ Retrofit ◆ Highway/Road

Key Considerations for Protecting/Utilizing Natural Flow Pathways

- ◆ Natural drainage features should guide site design
- ◆ Planting native vegetation buffers around natural drainage features can enhance their stormwater management performance
- ◆ Natural flow pathways should be protected from disturbance (such as clearing or filling) during construction
- ◆ Performance of natural drainage features may be enhanced through a variety of ways, such as planting a native vegetation buffer to slow flow, improve water quality, and increase evapotranspiration; installing check dams to slow flow; and/or creating berms around the features to increase storage capacity

This information was adapted from the Pennsylvania Stormwater Best Practices Manual. Check out SPC's other fact sheets to learn more about specific BMPs, flooding, and more.

Photos: townhall.townofchapelhill.org & sciencenordic.com



MS4 PROGRAM

MS4 PROGRAM OVERVIEW



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MS4: PROGRAM OVERVIEW*

STORMWATER MANAGEMENT

What is the MS4 Program?

Certain stormwater regulations associated with the Federal Clean Water Act are administered under the Municipal Separate Storm Sewer System (MS4) Program. In Pennsylvania, the MS4 program is managed by the Pennsylvania Department of Protection.



What is an MS4?

The Environmental Protection Agency defines an MS4 as “a conveyance or system of conveyances that is:

- ◆ Not part of a Publicly Owned Treatment Works (sewage treatment plant);
 - ◆ Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
 - ◆ Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.); and
- Not a combined sewer.”

Who is an MS4?

MS4 regulations were rolled out in two phases:

- ◆ Phase I, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage for their stormwater discharges.
- ◆ Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as some small MS4s outside the urbanized areas, to obtain NPDES permit coverage for their stormwater discharges.

What is required under the MS4 Program?

Operators of a small MS4 must obtain a NPDES permit and develop and implement a Stormwater Management Plan (SWMP) according to the details of their specific permit. Mandatory elements of the SWMP include six (6) Minimum Control Measures (MCMs). Each MCM has a number of associated Best Management Practices (BMPs) that explain in more detail how the MCM can be carried out.

The MCMs are:

1. Public Education and Outreach on Stormwater Impacts
2. Public Involvement / Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management in New and Re-Development Activities
6. Pollution Prevention / Good Housekeeping for Municipal Operations

MS4s in the SPC Region

As of December 2014, there were 207 municipalities within the 10-county SPC Region that hold an MS4 permit.





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PUBLIC EDUCATION & OUTREACH

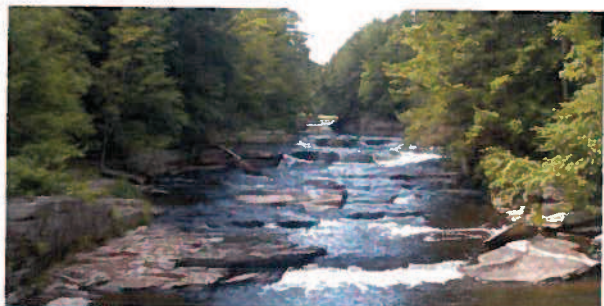
Small MS4 Program: Minimum Control Measure #1

Public Education and Outreach is one of the six (6) Minimum Control Measures (MCMs) required of small MS4s under the MS4 program*. The goal of the Public Education and Outreach MCM is to build greater support for the stormwater management program (SWMP), increase compliance, and ultimately increase environmental awareness amongst members of the community.

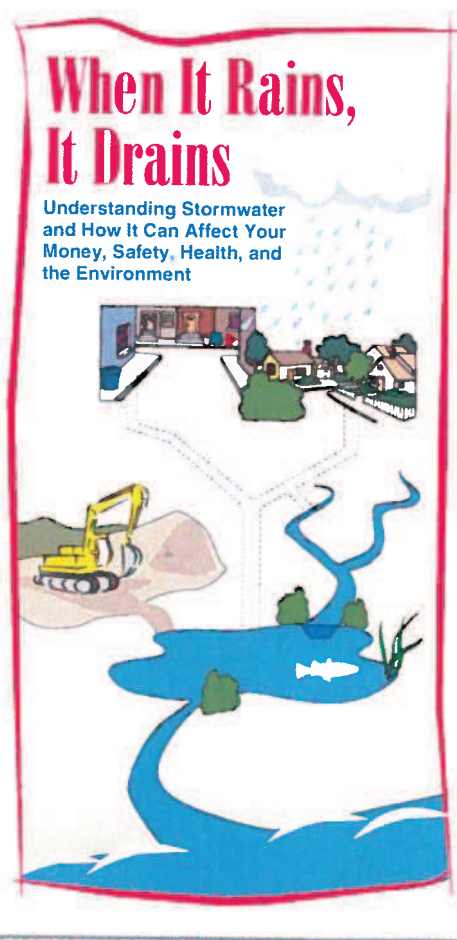
Federal EPA Regulations specifically require the following under this MCM: "Implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff."

There are four (4) Best Management Practices (BMPs) required under this MCM. Keep reading to learn more about their requirements, resources to help meet these requirements, and more.

BMP #1 - Develop, implement, and maintain a Public Education and Outreach program. The plan should include goals, strategies, a timeline, and provisions for reviewing and updating annually. This plan can be relatively simple and is an easy way to ensure that you are meeting all the requirements of the Public Education and Outreach MCM. EPA's "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns" (EPA 841-B-03-002, December 2003) is an exceptionally helpful resource for meeting this BMP requirement.



One of the goals of the Public Education and Outreach MCM is to protect our waterways by increasing environmental awareness amongst the community. Photo: planning.co.wayne.pa.us



Many sources, such as the EPA and PA DEP have a variety of materials and templates available on their websites for use in MCM #1. This pamphlet is available under "MS4 Resources" at www.portal.state.pa.us.

(OVER)



BMP #2 – Develop and maintain lists of target audience groups that are present within the areas served by your small Ms4. Target audiences typically include residents, businesses, developers, schools, and municipal employees. Remember to modify this list based on the characteristics of your municipality. For example, be sure to include agricultural entities if these exist within your municipality.

BMP #3 – Annually publish at least one issue of a newsletter, a pamphlet, a flyer, or a website that includes general stormwater educational information, a general description of your SWMP, and/or information about your stormwater management activities. One of the following must be done: 1) Publish and distribute in printed form a newsletter, pamphlet, or flyer containing information consistent with this BMP; or 2) Publish educational and informational items including links to DEP's and EPA's stormwater websites on your municipal website.

BMP #4 – Distribute educational materials and/or information to the target audiences (identified in BMP #2) using a variety of distribution methods, including but not limited to: displays, posters, signs, pamphlets, booklets, brochures, radio, local cable TV, newspaper articles, posters, bill stuffers, presentations, conferences, meetings, fact sheets, giveaways, or storm drain stenciling. All permittees shall utilize at least two (2) of these methods to conduct outreach a year.



Many people don't realize that stormwater isn't treated before it ends up in our local waterways. Storm drain stenciling (above) is a great way to raise awareness that storm drains are connected to waterways. It is also one of the ways to meet BMP #4 required under the Public Education and Outreach MCM. Photo: gannett-cdn.com

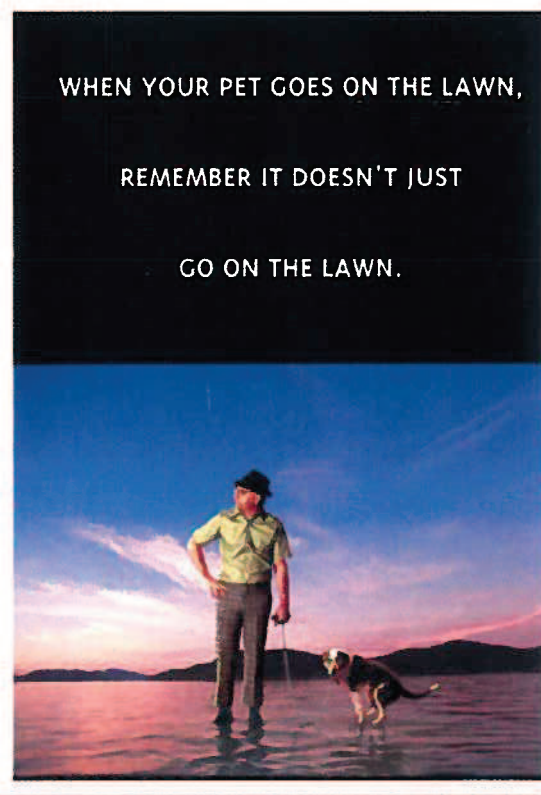


Developers are often on the list of target audience groups that is required under BMP #2. Educating developers and their contractors on the importance of and regulatory requirements associated with stormwater management can have a big impact.

Photo: bluewaterbaltimore.org

Outreach efforts, such as the poster to the right, can help your target audiences understand their role in stormwater management, pollution prevention, and keeping our waterways clean. These efforts can help you meet requirements under BMP #4.

Photo: upperdublin.net



For more information, please visit:

- ◆ www.spcwater.org
- ◆ http://www.portal.state.pa.us/portal/server.pt/community/municipal_stormwater/21380/ms4_resources/1489647
- ◆ <http://cfpub.epa.gov/npstbx/index.html>
- ◆ <http://water.epa.gov/polwaste/npdes/stormwater/Municipal-Separate-Storm-Sewer-System-MS4-Main-Page.cfmPAG>

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PUBLIC PARTICIPATION / INVOLVEMENT

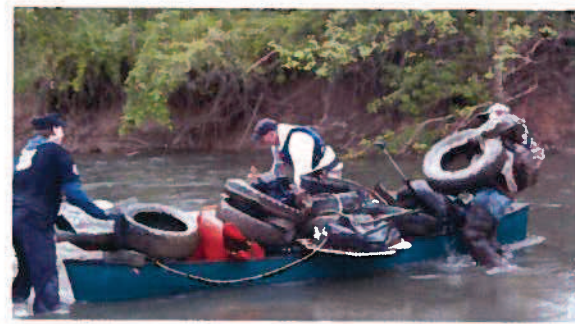
Small MS4 Program: Minimum Control Measure #2

Public Participation/Involvement is one of the six (6) Minimum Control Measures (MCMs) required under the MS4 program*. The goal of the Public Participation/Involvement MCM is to facilitate successful implementation of your Stormwater Management Program (SWMP) through a number of means, including: garnering broad public support; utilizing expertise and local knowledge; shortening implementation schedules; and building partnerships with other community and government programs.

There are three (3) Best Management Practices (BMPs) required under this MCM.

BMP #1 – Develop, implement, and maintain a Public Involvement and Participation Program (PIPP) which describes various types of possible participation activities and describes methods of encouraging the public’s involvement and soliciting of public’s input. The PIPP should be developed the first year of permit coverage and re-evaluated annually. PIPP should include, but not be limited to: 1) opportunities for the public to participate in your SWMP; 2) regular communication methods to organizations such as watershed groups, environmental advisory committees, etc.; and 3) making MS4 reports available to the public.

BMP #2 – Prior to the adoption of any ordinance required by the permit, provide adequate public notice and opportunities for public review, input, and feedback. Public comments that are received should be documented and responded to.



Getting the public involved through river and stream cleanups (above and below) is a great way to achieve multiple water quality goals, including: educating and engaging the public, removing trash from local waterways, and meeting some requirements of the Public Participation/Involvement MCM.

Photos: popcitymedia.com & wwwa.org



BMP #3 – Regularly solicit public involvement and participation from the target audience groups. This should include an effort to solicit public reporting of suspected illicit discharges. Assist the public in their efforts to help implement your SWMP. Conduct public meetings to discuss the ongoing implementation of your SWMP.

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ILLICIT DISCHARGE DETECTION AND ELIMINATION

Small MS4 Program: Minimum Control Measure #3

Illicit Discharge Detection and Elimination is one of the six (6) Minimum Control Measures (MCMs) required under the small MS4 program*. The goal of the Illicit Discharge Detection and Elimination (IDD&E) is to reduce pollution to our waterways through the removal of non-stormwater contributions to the storm sewer system. Common sources of illicit discharges include sanitary wastewater, improper disposal of auto and household toxins, and car wash wastewaters.

There are six (6) Best Management Practices (BMPs) required under this MCM.

BMP #1 – Develop and implement a written program for the detection, elimination, and prevention of illicit discharges into your regulated small MS4. Your program should include dry weather field screening of outfalls for non-stormwater flows, and sampling of dry weather discharges for selected chemical and biological parameters. Test results should be used as indicators of possible discharge sources. The program must include the following:

- ◆ Procedures for identifying priority areas
- ◆ Procedures for screening outfalls in priority areas during varying seasonal and meteorological conditions
- ◆ Procedures for identifying the source of an illicit discharge when a contaminated flow is detected
- ◆ Procedures of eliminating an illicit discharge
- ◆ Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems
- ◆ Mechanisms for gaining access to private property to inspect outfalls
- ◆ Procedures for evaluation, program documentation, and assessment

Why are illicit (illegal) discharges important?

Illicit discharges make their way to our waterways untreated. Illicit discharges such as paint or oil dumped into storm drains, septic effluent, car wash wastewater, and wastewater piping connected illegally can cause serious pollution issues. These illicit discharges can carry a variety of pollutants, such as:

- ◆ Heavy metals
- ◆ Bacteria
- ◆ Viruses
- ◆ Nutrients
- ◆ Oil and grease
- ◆ Solvents
- ◆ Toxins



MCM #3 under the MS4 program requires regular screening of stormwater outfalls to detect any illicit discharges. Photo: water.epa.gov

(OVER)

BMP #2 – Develop and maintain a map of your regulated small MS4. The map must also show the location of all outfalls and the locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls. Surface waters that should be included are creeks, streams, ponds, lakes, basins, swales, and channels that receive stormwater discharges. Outfalls should have unique names to assist in record-keeping.

BMP #3 – In conjunction with the map created under BMP #2, new permittees should map the entire storm sewer collection system including roads, inlets, piping, swales, catch basins, channels, basin, and any other features of the permittees storm sewer system including municipal boundaries and watershed boundaries. New permittees should develop this map by the completion of the fourth year of the permit. Renewal permittees should update and maintain the map annually.

BMP #4 – Following the IDD&E program created under BMP #1, the permittee shall conduct outfall field screening, identify the source of any illicit discharges, and remove or correct any illicit discharges using the procedures outlined under BMP #1.

BMP #5 – Enact a stormwater ordinance to implement and enforce a stormwater management program that includes the prohibition of non-stormwater discharged to the regulated MS4. Ordinances associated with an Act 167 Stormwater Management Plan that was approved by PA DEP in 2005 or later meet the requirements of BMP #5. You can also meet the ordinance requirement by utilizing PA DEP's model MS4 Stormwater Management Ordinance or by developing an ordinance that meets all applicable requirements outlined in the MS4 Stormwater Management Ordinance Checklist.

BMP #6 – Provide educational outreach to public employees, business owners and employees, property owners, the general public, and elected officials about the program to detect and eliminate illicit discharges. Educational outreach should be conducted to the target audiences by the methods outlined in MCM #1, Public Education/Outreach. Programs should be developed to encourage and facilitate public reporting of illicit discharges, illegal dumping, or outfall pollution.



Some common sources of illicit discharges include fryer oil from restaurants (above), carwash wastewater (below), and septic tank effluent. Photos: clemson.edu & keepitcleanpartnership.org



Unusual colors, odors, or flow volumes may be indicators of illicit discharges. Photos: facilities.vt.edu & pwcgov.org



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This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).



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CONSTRUCTION SITE RUNOFF CONTROL

Small MS4 Program: Minimum Control Measure #4

Construction Site Runoff Control is one of the 6 minimum control measures (MCMs) required under the small MS4 program*. The goal of the Construction Site Runoff Control MCM is to protect our waterways from stormwater-related pollution that can result from construction activities. Four (4) best management practices (BMPs) are required under this MCM.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or DEP must issue a permit for earth disturbance activities greater than or equal to 1 acre. If the permittee chooses to rely on DEP's statewide program for issuing NPDES permits for stormwater discharges associated with construction activities, they satisfy all requirements under this MCM. It is a good practice for the permittee to have a written agreement, such as a Memorandum of Understanding (MOU), with their County Conservation District which clearly defines roles in the permitting, inspection, and enforcement of land development activities.

BMP #1 - Develop your program consisting of all procedures necessary to comply with the requirements of this MCM. The program must include:

- Construction stormwater permitting
Construction inspection
Enforcement of installation and maintenance of E&S controls

The program should be developed within the first year of permit coverage and reviewed/updated annually. A simple tracking system for active construction sites, inspections, enforcement actions, and other activities related to this MCM can simplify the reporting process while ensuring that all applicable activities are being managed.

Pollutants Commonly Associated with Construction Sites

- Sediment
Trash
Sanitary Waste
Phosphorus
Nitrogen
Pesticides
Oil and Grease
Concrete Truck Washout
Construction Chemicals



Sediment is the primary pollutant of concern associated with construction site stormwater runoff. Sediment-polluted stormwater can cause physical, chemical, and biological damage to waterways. Proper installation and maintenance of erosion and sediment control best management practices is essential to protect our waterways.

Photos: catawbariverkeeper.org

(OVER)

BMP #2 – Enact, implement, and enforce an ordinance to require the implementation of erosion and sediment control BMPs, as well as sanctions to ensure compliance. Permittees should adopt the ordinance within the first year of permit coverage.

BMP #3 – Develop and implement requirements for construction site operators to control waste at the construction site that may cause adverse impacts to water quality.

Sediment is the primary pollutant of concern for MCM #4; however, other pollutants associated with construction are also important and should be addressed under this BMP. Pollutants may include but are not limited to: discarded building materials, washout from concrete trucks, chemicals, litter, and sanitary waste. Permittees should establish requirements within the first year. The goal of these requirements should be communicated to construction site operators during pre-construction meetings. Permittees must keep detailed records of site inspections, findings, and any resulting actions.

BMP #4 – Develop and implement procedures for the receipt and consideration of public inquiries, concerns, and information submitted by the public regarding local construction activities. The permittee should demonstrate acknowledgement and consideration of the information submitted. Permittees should establish and implement a tracking system to keep a record of any submitted public information as well as responses, actions, and results. This BMP should be implemented during each year of permit coverage. This BMP closely aligns with and supports requirements associated with MCM #2, Public Involvement and Participation.

Sediment Pollution in Our Waterways

Sediment pollution is, by volume, the greatest contributor to pollution in Pennsylvania waterways. Nationally, it is the second leading cause of pollution in impaired waterways (second only to bacteria). Sediment can cause physical, biological, and chemical harm to streams, lakes, wetlands, and rivers. According to the EPA, sediment runoff from construction sites can be 1,000 to 2,000 times greater than that of forested land, and 10 to 20 times greater than that of agricultural land. The installation and maintenance of construction site erosion and sediment controls is critical for the protection of our waterways.



Polluted runoff from construction sites eventually makes its way to our waterways untreated (left). Sediment is the most common pollutant associated with construction sites. Impacts of uncontrolled sediment runoff include but are not limited to: ecosystem damage, storm system infrastructure damage, and increased costs of producing drinking water.

Photo: blog.epa.gov

Elements of An Effective Stormwater Site Plan

A stormwater site plan is one of many essential elements necessary to minimize stormwater pollution from construction sites. Ten (10) key elements of an effective stormwater site plan include:

1. Minimize clearing and grading
2. Protect waterways
3. Phase construction to limit soil exposure
4. Immediately stabilize exposed soils
5. Protect steep slopes and cuts
6. Install perimeter controls to filter sediments
7. Employ advanced sediment settling controls
8. Certify and train contractors on stormwater site plan implementation
9. Control waste at the construction site
10. Inspect and maintain BMPs

Source: [http://water.epa.gov/polwaste/npdcs/swbmp/Construction Phase Plan Review.cfm](http://water.epa.gov/polwaste/npdcs/swbmp/Construction%20Phase%20Plan%20Review.cfm)

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POST-CONSTRUCTION RUNOFF CONTROL

Small MS4 Program: Minimum Control Measure #5

Post-Construction Runoff Control is one of the six (6) Minimum Control Measures (MCM) required under the Small MS4 program*. The goal of the Post-Construction Runoff Control MCM is to avoid increased stormwater runoff problems and increased non-point source pollution that often accompanies the development of land and associated increase in impervious surfaces. Six (6) best management practices (BMPs) are required under this MCM.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or the Pennsylvania Department of Environmental Protection (DEP) must issue a permit for earth disturbance activities greater than or equal to 1 acre. If the permittee chooses to rely on DEP's statewide program for issuing NPDES permits for stormwater discharges associated with construction activities, they satisfy all requirements under BMPs 1-3 of this MCM. It is a good practice for permittees to have a written agreement, such as a Memorandum of Understanding (MOU), with their County Conservation District which clearly defines roles in the permitting, inspection, and enforcement of land development activities.

BMP #1 – Develop a written procedure that describes how the permittee will address all required components of this plan. Guidance can be found in the Pennsylvania Stormwater Best Management Practices Manual, which can be accessed at www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305. The plan should be developed within the first year of permit coverage and be annually reviewed and updated where necessary. Minimum requirements of the plan include:

- ◆ Minimum requirements for use of structural and/or non-structural BMPs in plans for development and redevelopment
- ◆ Criteria for selecting and standards for sizing stormwater BMPs
- ◆ Implementation of an inspection program to ensure that BMPs are properly installed

BMP #2 – Require the implementation of a combination of structural and/or non-structural BMPs that are appropriate to the local community, that minimize water quality impacts, and that are designed to maintain pre-development runoff conditions. The ordinance requirements under BMP #4 of this MCM (see next page) will satisfy this requirement. All qualifying development or redevelopment projects should be reviewed to ensure that their post-construction stormwater management plans and selected BMPs conform to the applicable requirements. A tracking system should be used to record qualifying projects and their BMPs.



Preserving and restoring riparian buffers (right) are best management practices that can effectively manage stormwater in post-construction situations.

BMP #3 – Ensure that controls are installed that will prevent or minimize water quality impacts. Qualifying development or redevelopment projects should be inspected during construction to ensure proper installation of the approved post-construction stormwater management (PCSM) BMPs. A tracking system should be used to track inspections and results. Permittees that do not rely on Chapter 102 as a QLP to fulfill these requirements must summarize construction inspections and results in periodic reports.

BMP #4 – The permittee should enact, implement, and enforce an ordinance or other regulatory mechanism to address post-construction stormwater runoff from new development and redevelopment projects, as well as sanctions and penalties associated with non-compliance, to the extent allowable under state law. An ordinance must be adopted within the first year.

BMP #5 – Develop and implement measures to encourage and expand the use of Low Impact Development (LID) in new and redevelopment. Measures also should be included to encourage retrofitting LID into existing development. DEP's Pennsylvania Stormwater Best Management Practices Manual provides guidance on implementing LID practices. An inventory of development and redevelopment projects that discharge stormwater to your regulated MS4 must be kept. In this inventory, note which projects that have been authorized for construction since 3/10/2003 that incorporated LID practices (and specifics on what LID practices were used). Additionally, ordinances should be enacted that are consistent with LID practices. Sections of existing ordinances that conflict with LID practices should be repealed.

BMP #6 – Ensure adequate operation and maintenance of all post-construction stormwater management BMPs installed at all qualifying development or redevelopment projects (including those owned or operated by the permittee). Within the first year of permit coverage, permittees should develop and implement a written inspection program to ensure that BMPs are properly operated and maintained. This program should be reviewed annually and updated accordingly. An inventory of PCSM BMPs should be developed and updated regularly. The inventory should include all PCSM BMPs installed since 3/10/2003 that discharge to your regulated MS4. Information required in inventory includes but is not limited to: owner, location, type of BMP, installation date, required maintenance, inspection activities, and an assessment by the permittee to determine if proper inspection and maintenance of BMP has been taking place.



Bioswales (above) are a structural BMP that can help mitigate the effects of stormwater once a site has been developed.

What is a Post Construction Stormwater BMP (PCSM BMP)?

PCSM BMPs are practices that are put in place to prevent and mitigate stormwater runoff after the site is developed. PCSM BMPs include non-structural and structural BMPs. Non-structural BMPs include practices that aim to avoid and/or minimize damages associated with stormwater volumes and runoff from development. Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater.

Examples of Non-Structural BMPs

- ◆ Minimize Impervious Area
- ◆ Protect Special Value Features (e.g., Floodplains, Wetlands, Riparian areas, etc.)
- ◆ Re-vegetate Disturbed Areas with Native Vegetation

Examples of Structural BMPs

- ◆ Rain Gardens
- ◆ Constructed Wetlands
- ◆ Riparian Buffer Restoration

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POLLUTION PREVENTION / GOOD HOUSEKEEPING

Small MS4 Program: Minimum Control Measure #6

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Pollution Prevention/Good Housekeeping is one of the six (6) Minimum Control Measures (MCMs) required under the small MS4 program*. The goal of the Pollution Prevention/Good Housekeeping MCM is to help ensure a reduction in the amount and type of pollution that is generated from municipally-owned and maintained facilities (e.g., streets, parking lots, and vehicle maintenance areas) and eventually discharged into local waterways. An additional goal of MCM #6 is to reduce the amount of pollution that is discharged to waterways from poor maintenance of storm sewer systems.

There are three (3) best management practices (BMPs) required under this MCM.

BMP #1 – Identify and document all facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the small regulated MS4. This includes activities conducted by contractors for the permittee.

Municipal Activities may include the following:

- ◆ Street sweeping
- ◆ Snow removal/deicing
- ◆ Inlet/outlet cleaning
- ◆ Lawn/grounds care
- ◆ Storm system maintenance, inspection and repair
- ◆ Park and open space maintenance
- ◆ Municipal building maintenance
- ◆ New construction and land disturbances
- ◆ Right of Way maintenance
- ◆ Vehicle maintenance, operation, fueling and washing
- ◆ Material transfer operations, including leaf/yard debris pickup and disposal procedures

Municipal Facilities may include the following:

- ◆ Streets, roads, highways and parking lots
- ◆ Maintenance and storage yards
- ◆ Waste transfer stations
- ◆ Parks
- ◆ Fleet or maintenance shops
- ◆ Wastewater treatment plants
- ◆ Stormwater conveyances (open and closed)
- ◆ Riparian buffers
- ◆ Stormwater storage or treatment units (e.g., basins, constructed wetlands, etc.)

Potential Pollutants Associated with Municipal Facilities and Municipal Activities

Pollutants from municipal facilities and activities can eventually make their way to our local waterways through the stormwater conveyance and collection system. These pollutants can cause physical, chemical, and biological harm to our lakes, streams, rivers, and wetlands. Pollutants associated with municipal facilities and activities may include but are not limited to:

- ◆ Sediment
- ◆ Nutrients
- ◆ Trash
- ◆ Metals
- ◆ Bacteria
- ◆ Oil
- ◆ Toxic Materials
- ◆ Organic Materials
- ◆ Pesticides
- ◆ Grease

(OVER)

BMP #2 – Develop, implement, and maintain a written operation and maintenance (O&M) program for all municipal operations and facilities that could contribute to the discharge of pollutants from the regulated small MS4s, as identified under BMP #1. This program should address municipally-owned stormwater collection or conveyance systems, but could include other areas (as identified in BMP #1). The O&M plan should stress pollution prevention and good housekeeping measures, contain site-specific information, and address the following areas:

- ◆ Management practices, policies, and procedures to reduce or prevent the discharge of pollutants to your small regulated MS4. Consider eliminating maintenance-area floor drains.
- ◆ Maintenance activities, schedules, and inspection procedures to reduce the potential for pollutants to reach your small regulated MS4.
- ◆ Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, and salt/sand (anti-skid) storage locations and snow disposal areas.
- ◆ Procedures for the proper disposal of waste removed from your regulated smalls MS4s and your municipal operations, including dredge spoil, accumulated sediments, trash, household hazardous waste, used motor oil, and other debris.

BMP #3 – Develop and implement an employee training program that addresses appropriate topics to further the goal of preventing or reducing the discharge of pollutants from municipal operations to your regulated small MS4s. The program may be developed and implemented using any guidance and training materials that are available from federal, state, or local agencies, or other organizations. Any municipal employee or contractor shall receive training; this may include:

- ◆ Public Works Staff
- ◆ Building/Zoning/Code Enforcement Staff
- ◆ Engineering Staff (On-Site and Contracted)
- ◆ Administrative Staff
- ◆ Elected Officials
- ◆ Police and Fire Responders
- ◆ Volunteers
- ◆ Contracted Personnel

Training should cover all relevant parts of the stormwater management program that could affect municipal operations, such as illicit discharge detection and elimination, construction sites, and ordinance requirements.



Many municipal facilities and activities have the potential to negatively impact water quality. Some examples include improper storage of chemicals (above); allowing vehicle washing effluent to enter storm sewer system (below); improper disposal of hazardous waste; and, improper disposal of debris collected during street sweeping.

Photos: waterresources.saccounty.net & arlnow.com



Application and storage protocols for commonly-used materials such as road salt (above), herbicides (below), pesticides and fertilizers can help protect water quality while also reducing costs. Photos: 27east.com & npic.orst.edu



*Please note that this information is not intended to replace regulatory requirements. Actual individual and/or general permits issued by PADEP should be followed to ensure that MS4 regulatory requirements are met. This information was adapted from Appendix A of PADEP's Stormwater Management Program & EPA's Stormwater Fact Sheet Series).

QUICK RESOURCE GUIDE TO THE MS4 PROGRAM

Quick Resource Guide to the MS4 Program



**WATER RESOURCE
CENTER**



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DEPARTMENT OF ENVIRONMENTAL
PROTECTION

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This guide is provided exclusively for general educational and informational purposes. This guide does not in any way replace or supersede any municipal, county, state, or federal requirements or regulations related to stormwater management. This guide is not intended to be a substitute for professional design and implementation services. The management of stormwater is a complex and site specific issue and that the general information contained in this guide may not be sufficient to assess any and all particular site conditions. Any stormwater management practice should be installed with the consultation of an experienced professional who can address specific site conditions.

Cover photo credits: Etna Borough, Southwestern Pennsylvania Commission, and the Westmoreland Conservation District

How to Use This Guide

This guide was written for municipalities that own and operate **Municipal Separate Storm Sewer Systems (MS4s)**. Stormwater regulations associated with the Federal Clean Water Act (CWA) are administered under the MS4 Program by the Environmental Protection Agency (EPA). In Pennsylvania, the MS4 program is managed by the Pennsylvania Department of Protection (PADEP). The PADEP General Permit PAG-13 provides a streamlined process to meet the state and federal stormwater requirements. Operators of a regulated MS4 must obtain a National Pollutant Discharge Elimination System (NPDES) permit and develop and implement a stormwater management plan (SWMP) according to the details of their specific permit. Mandatory elements of the SWMP include six (6) Minimum Control Measures (MCMs); each MCM has a number of associated BMPs.

In this guide, we begin with the history and background of MS4s and regulations. Then we provide an overview of the six (6) **Minimum Control Measures (MCMs)** of the **NPDES MS4 permit** and their associated **Best Management Practices (BMPs)**. Examples provided of BMPs are not meant to be the only available solution – there are many other BMPs, and we have listed a few examples from our region within the MCM section and in the Resources section.

This booklet will provide an overview on the following topics:

1. Keys to developing your SWMP
2. Record keeping strategies for each MCM
3. What to expect during an inspection
4. Resource directory of essential contacts

History and Background



Figure 1: A polluted waterway (Source: wwf.panda.org)

Why Do We Regulate Stormwater?

The MS4 program requires the MS4 owner/operator to implement a series of programs to reduce the discharge of pollutants from the storm sewer system to the maximum extent practicable in a manner that protects water quality. The Pennsylvania Code Chapter 93 sets the water quality standards for surface waters of the Commonwealth and these standards seek to protect the waters for aquatic life, water supply, recreation and fish consumption, and areas that need special protection. The MS4 program focuses on managing discharges into the waters of the Commonwealth by educating and implementing proper control measures and best management practices (BMPs).

Total maximum daily loads (TMDLs) are in place to reduce pollutants in impaired waterways so that they meet water quality standards. TMDLs focus on identifying sources of impairment and implementing corrective work based on the best available data and information. Additional monitoring and data collection will occur to track progress and better characterize pollutant sources, loadings and the effectiveness of control measures and BMPs.

What is an MS4?

MS4s are conveyances or systems of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains that are owned or operated by a public entity, are designed or used for collecting or conveying stormwater, and are not a combined sewer or part of a publicly-owned treatment works.

A municipality is bound by US Environmental Protection Agency (EPA) regulations for an MS4 when all or a portion of a municipality lies within an urbanized area (UA), as determined by the US Census Bureau (see glossary).

See the DEP's municipal stormwater NPDES permits page at <http://www.dep.pa.gov/Pages/default.aspx#NPDES> for more information.

Stormwater Management Program

Each MS4 permittee must create a **Stormwater Management Program (SWMP)** to minimize the impacts from runoff. A SWMP must be completed to comply with the NPDES MS4 General Permit. The SWMP requires municipalities to focus on six Minimum Control Measures (MCMs). In the permit application, the permittee indicates whether the BMPs and Measurable Goals under each of the six MCMs follow Appendix A in the permit, or whether alternative BMPs and Measurable Goals for any of the MCMs are provided. The permittee is required to satisfy all requirements of the Stormwater Management Program as a condition of the permit during the term of your permit.

To the right is an outline of a typical SWMP, which will give you an idea of what should be included in this plan. All plans should be reviewed/updated annually.

An introduction may be written to tie the document together that provides background information, the goal of the plan, and how they plan to assess the progress/value of plan implementation.

The introduction could include, but is not limited to: land area total, population, number of acres of urbanized area for the permit, a breakdown of the residential, industrial, commercial and undeveloped land, where the stormwater discharges go, impaired waterways, any TMDL pollutants, and/or how to assess the effectiveness of the SWMP.

Each surface water in the state has designated use(s) to be protected. Each designated use has water quality standards and criteria assigned to protect the designated use(s). Water quality standards for all Pennsylvania surface waters can be found in Pa Code: Chapter 93 - Water Quality Standards and Chapter 16 - Water Quality Toxics Management Strategy.

Surface waters that do not meet water quality standards for the designated uses are commonly called “impaired” and are placed on the federal Clean Water Act (CWA) Section 303(d) List. Once on the 303 (d) List, a TMDL will be developed to address the pollutant(s) of concern.

Identifying impairments allows you to focus your program efforts on improving water quality prior to a TMDL being issued. Water quality impairments and/or TMDLs within the MS4 permittee boundaries need to be incorporated into the plan and MS4 program.

It is anticipated that the new PAG13 will be released March 2018, so check the DEP Program Updates section often for any changes or additional guidance.

Sample SWMP Outline

- ◆ Introduction
- ◆ MCM 1: Public Education and Outreach
 - BMPs 1-4
 - Measurable Goals
- ◆ MCM 2: Public Involvement and Participation
 - BMPs 1-3
 - Measurable Goals
- ◆ MCM 3: Illicit Discharges Controls
 - BMPs 1-6
 - Measurable Goals
- ◆ MCM 4: Construction Site Runoff Control
 - BMPs 1-4
 - Measurable Goals
- ◆ MCM 5: Post-Construction Stormwater Management
 - BMPs 1-6
 - Measurable Goals
- ◆ MCM 6: Pollution Prevention and Good Housekeeping
 - BMPs 1-3
 - Measurable Goals
- ◆ Outfall Inventory Checklist
- ◆ TMDL Plan (if applicable)

Refer to Sample Appendix A in your individual permit for more information regarding the Stormwater Management Program.

One common issue found in audits is that the SWMP does not identify pollutants of concern, “impairments” or address TMDLs.

For more information about the 303(d) List and TMDLs:

303(d) List

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/WaterQuality/Pages/Integrated-Water-Quality-Report-2014.aspx#.V0btMXLD9aQ>

TMDLs

<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/default.aspx>

Minimum Control Measures (MCMs)

As part of the terms of your permit, you must include the six MCMs in your SWMP in order to meet the conditions of your NPDES permit.

MCM 1: Public Education and Outreach
Distributing educational materials and performing outreach to inform the public about the impacts polluted stormwater runoff discharges can have on water quality.
MCM 2: Public Participation/Involvement
Providing opportunities for the public to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging representatives on a stormwater management panel.
MCM 3: Illicit Discharge Detection and Elimination
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
MCM 4: Construction Site Runoff Control
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).
MCM 5: Post-Construction Runoff Control
Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
MCM 6: Pollution Prevention/Good Housekeeping
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

Implementation Options

There are a number of implementation options for regulated MS4 operators. These include sharing responsibility for program development with a nearby regulated MS4 operator; taking advantage of existing local or state programs; or participating in the implementation of an existing MS4's stormwater program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

Program Evaluation and Assessment

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the "maximum extent practicable" and to determine if the BMPs are satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program's measurable goals.

Documentation

Documentation is the required evidence to ensure the MS4 permittee is implementing the SWMP. Failure to properly provide documentation will result in violations and other potential enforcement actions. Although documentation can be time consuming, it will help the permittee in assessing the effectiveness of the SWMP, MCMs, and BMPs. Documentation helps relay information to the regulating community and to the public.

Minimum Control Measure #1: Public Education & Outreach on Stormwater Impacts

The goal of the Public Education and Outreach MCM is to educate the public about stormwater activities. It aims to build greater support for the stormwater management program (SWMP), increase compliance, and promote environmental awareness in local communities.

BMP #1 – Develop, implement, and maintain a **Public Education & Outreach Program (PEOP)**. A written plan must be developed for each program. The plan should include goals, strategies, a timeline, and provisions for reviewing and updating annually. See EPA’s “Getting in Step, A Guide for Conducting Watershed Outreach Campaigns”

<https://cfpub.epa.gov/npstbx/files/getnstepguide.pdf>.

BMP #2 – Develop and maintain lists in a document or a spreadsheet of target audience groups that are served by your stormwater system. Target audiences typically include residents, businesses, developers, schools, and municipal employees.

BMP #3 – Annually publish at least one issue of a newsletter, a pamphlet, a flyer, or a website that includes general stormwater educational information, a general description of your SWMP, and/or information about your stormwater management activities either in printed form or on your municipal website.

BMP #4 – Distribute educational materials and/or information to the target audiences identified in BMP #2 using your choice of at least two distribution methods.

Example options include, but are not limited to:

- Classroom integration of stormwater education
- Displays, posters, signs, fact sheets
- Pamphlets, booklets, brochures
- Radio, local cable TV, newspaper articles
- Presentations, conferences, meetings
- Promotions/Giveaways

Helpful Tips

- ◆ Documentation of your public education and outreach actions are important throughout the MCM process and proper records will need to be kept. Keep track of the dates that you publicize a document and when you update them as well.
- ◆ Have a stormwater link on your website for the public to access your information and provide links for more resources.
- ◆ A newsletter should contain information that is exclusively MS4 and stormwater-focused.
- ◆ Be sure to give good rationale as to why you selected your target group and why you chose to educate them on a particular topic.



Figure 2: The water cycle created by Westmoreland Conservation District to educate the public

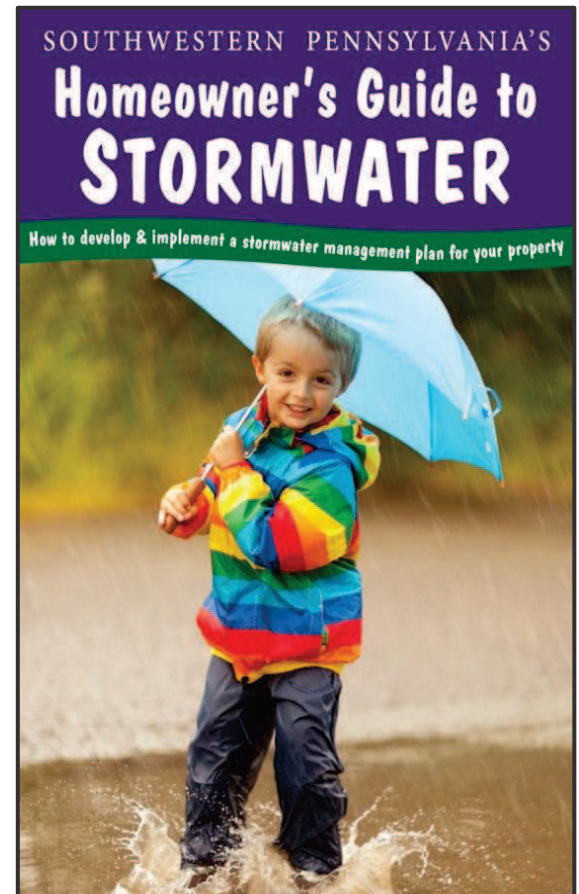


Figure 3: The “Southwestern Pennsylvania's Homeowner's Guide to Stormwater” educates homeowners about stormwater issues

Minimum Control Measure #2: Public Participation/Involvement



Figure 4: The public participating in a rain barrel workshop in Westmoreland County

The goal of the Public Participation/Involvement is to involve the public in stormwater activities. It should facilitate the successful implementation of your Stormwater Management Program (SWMP) through garnering public support; utilizing expertise and local knowledge; shortening implementation schedules; and, building partnerships with other community and government programs. It goes hand-in-hand with MCM 1.

BMP #1 – Develop, implement, and maintain a written **Public Involvement and Participation Program (PIPP)**. A written plan must be developed for each program. It can be combined with the Public Education and Outreach Program (PEOP) discussed under MCM 1 BMP #1.

The PIPP should describe various types of participation activities, methods of encouraging involvement and getting input from the public. It should include:

- Opportunities for public participation in decision-making processes associated with the development, implementation and update of programs and activities associated with the permit.
- How you communicate with and update groups in or near your MS4, such as watershed associations, environmental organizations and others.
- Your method of making your MS4 reports available to the

public on your website, at municipal offices, or by mail upon request.

BMP #2 – Provide adequate public notice and opportunities for the public to review a stormwater ordinance and provide their input and feedback prior to adopting any sort of ordinance. You should advertise any proposed MS4 stormwater ordinance, accept public comments, and document how you received and responded to them.

BMP #3 – Regularly solicit public involvement and participation from target audience groups. One public meeting per year is required, either as a stand-alone MS4 meeting or as part of another public meeting. At these meetings, you should summarize the ongoing implementation of your SWMP, including activities and accomplishments, and allow time and opportunities for public feedback and input.

Active Outreach	Passive Outreach
Active outreach engages the public in learning and is therefore a more effective tool in educating the public. It may be difficult to prove the effectiveness of passive distribution methods.	
Examples	Examples
<ul style="list-style-type: none"> • Community clean-ups • Tours • Workshops • Storm drain stenciling • Interactive public meetings 	<ul style="list-style-type: none"> • Publication of fact sheets, pamphlets, newsletters, etc. • Social media websites • Educational signage
Pros	Pros
<ul style="list-style-type: none"> • Creates interactive dialogue • Increases critical thinking of participants • Provides an engaged process and requires a conscious effort to make sense of the information 	<ul style="list-style-type: none"> • There is a lot of information and requires a smaller effort to organize it • Very organized and controlled distribution to the public
Cons	Cons
<ul style="list-style-type: none"> • Time and effort to organize • It can take some time to catch on as an activity 	<ul style="list-style-type: none"> • No opportunity to clarify the information immediately • No direct engagement with the public

Helpful Tips

- Documentation is a critical component of the entire MS4 program, including MCM #2 – Public Participation and Involvement. You must be sure to document public involvement, which might include various activities from presentations at municipal meetings to stream clean-ups.
- Keep sign in sheet information from public meetings to show who and how many were in attendance.
- Show your connections and relationships with watershed and other environmental groups in your documentation.
- Properly identify which meetings the public should attend to learn more about MS4 practices and stormwater management.
- There are plenty of issues to discuss, including the stormwater management budget; what is and is not working in your municipality; the topic of a stormwater authority; or even a stormwater fee. Be sure that the public knows which meetings to attend for this information.

Minimum Control Measure #3: Illicit Discharge Detection & Elimination

The goal of the Illicit Discharge Detection & Elimination (IDD&E) MCM is to locate and stop illicit discharges into your MS4.

DEP recommends that you utilize the 2004 IDD&E Guidance Manual that is referenced in the MS4 NPDES permit to develop or improve your IDD&E Program. Common sources of illicit discharges include sanitary wastewater, improper disposal of auto and household toxins, and car wash wastewaters.

Why are illicit (illegal) discharges important?

Illicit discharges make their way to our waterways untreated. Illicit discharges such as paint or oil dumped into storm drains, septic effluent, car wash wastewater, and illegally connected wastewater piping into sewers can cause serious pollution issues. These illicit discharges can carry a variety of pollutants, such as heavy metals, bacteria, viruses, nutrients, oil and grease, and solvents. Illicit discharges are dangerous to public and environmental health, it's unsightly, may affect drinking water, and will diminish recreational value.

Dry weather flows need to be sampled to determine if discharge is illicit. Dry weather flow outfalls need to be screen annually.

BMP #1 – Develop and implement a written IDD&E program for the detection, elimination, and prevention of illicit discharges into your MS4. The program must include dry weather field screening of outfalls for non-stormwater flows, and sampling of dry weather discharges or selected chemical and biological parameters. Test results are to be used as indicators of possible discharge sources.

BMP #2 – Map streams and outfalls. This map can be combined with BMP #3. The map must show the location of all outfalls and the locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls. Surface waters that should be included are creeks, streams, ponds, lakes, basins, swales, and channels that receive stormwater discharges. Maps should be developed within the first year of permit coverage and updated/maintained from thereafter.

BMP #3 – The storm sewer collection system including pipes, municipal watershed boundaries and roads (including streets, catch basins, curbs, basins and artificial channels) must be mapped. This map can be created in conjunction with BMP #2.



Figure 5: Illicit discharge (Source: EPA IDDE Manual: https://www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf)

What should be included in your IDD&E Program

- ◆ Identify priority areas with a high likelihood of discharge or dumping. Consider looking at old infrastructure, dumping history, sewage conversion or failing septic systems – put this info on a map.
- ◆ Screen outfalls – check for dry weather flows and sample them for pollutants or pathogens. Two people should do this together for safety reasons.
- ◆ Identify pollution sources. Did you find an illicit discharge? Where is it coming from? Investigate using standard written procedures. Photographic documentation is useful.
- ◆ Eliminate illicit discharge when a contaminated flow is detected. Have a process in place to follow – start by knocking on doors and escalate as necessary.
- ◆ Sewage discharge potential – is your MS4 a retrofit built separately?
- ◆ Access to private property – your ordinance should address this as it is a big issue for MS4s and should provide adequate authority. Include access as a discussion topic in public education and involvement activities (MCMs 1 and 2). Provide instructions to staff to avoid liability and ensure safety.
- ◆ Documentation and evaluation – record who went where, what they found, and what was done (what was the follow-up? was it effective?).
- ◆ Develop and maintain a reporting system for the public to report illicit discharges. Make sure the reporting system is user-friendly so that anyone can understand how to submit the complaint. Also, keep records on what actions were taken and how.



Figure 6: From left to right: A stenciled storm drain in Pittsburgh; Staining which shows some sort of illicit discharge poured down a drain; A "no dumping" stormwater identification marker in Etna; An outfall to a stream (Sources: SPC and Westmoreland Conservation District)

BMP #4 – Outfall screenings must be done in your MS4. “Screening” means that you physically check your outfalls and report the results as outlined in your SWMP. Documentation is key – write down who went, what they found, include their inspection checklist and any photos taken. New permittees need to screen each outfall twice (screen 40% of outfalls each year of the permit term). During subsequent permit terms, outfalls are to be screened once per permit term (screen 20% of outfalls each year).

BMP #5 – Enact a stormwater management ordinance to implement and enforce a SWMP. Two model ordinances are included in the DEP permit application. Sections that should be included are prohibitions, right of entry, and enforcement. The ordinance must meet the requirements listed in the MS4 Stormwater Management Ordinance Checklist.

Ordinance-related BMPs of MCMs 3, 4 and 5 can be combined into a single stormwater management ordinance.

Ordinances associated with an Act 167 Stormwater Management Plan that was approved by DEP in 2005 or later meet the requirements of BMP #5. You can also meet the ordinance requirement by utilizing DEP’s model MS4 Stormwater Management Ordinance or by developing an ordinance that meets all applicable requirements outlined in the MS4 Stormwater Management Ordinance Checklist.

BMP #6 – Provide educational outreach on IDD&E to your target audience. Programs should be developed to encourage and facilitate public reporting of illicit discharges, illegal dumping, or outfall pollution.

Helpful Tips

- ◆ Stay current on IDD&E ordinances. Be sure that they are up to date and check to see if you have multiple ordinances that may make regulating this issue burdensome.
- ◆ When screening 20% of your outfalls each year, make sure that you’re screening different outfalls each year. Don’t screen the same ones year after year.
- ◆ Be sure to be informed on what a proper outfall is. Mapping your outfalls, as well as outfalls maintained by PennDOT, will be helpful in the process.
- ◆ DEP has an MS4 IDD&E Checklist that can be useful for completion of MCM3:
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUK.

Minimum Control Measure #4: Construction Site Runoff Control

Sediment is the primary pollutant of concern associated with construction site stormwater runoff. Sediment-polluted stormwater can cause physical, chemical, and biological damage to waterways. The goal of the Construction Site Runoff Control MCM is to protect our waterways from stormwater-related pollution that can result from construction activities.

In your Notice of Intent (NOI) submission (permit application) to DEP for your MS4 NPDES permit, the MS4 permittee decides whether it will be relying on DEP's Qualifying Local Program (QLP) or developing a program in-house. Relying on the QLP means that all BMPs under MCM 4 and BMPs #1 - 3 of MCM 5 are automatically satisfied. County Conservation Districts (CCD) play a major role in implementing the Chapter 102 program. MS4s are encouraged to enter into a Memorandum of Understanding (MOU) with their CCD to oversee stormwater program requirements for construction. Municipalities should have a copy of the MOU to review during an inspection and it is recommended that municipalities develop a written plan for the responsibilities beyond the QLP.

If you will not be relying on DEP's statewide QLP, you must satisfy one of the following statements:

- Enact, implement, and enforce an ordinance from an Act 167 Plan approved by DEP in 2005 or later
- Enact the MS4 Stormwater Management Ordinance
- Enact an ordinance that satisfies all applicable requirements in a completed and signed MS4 Stormwater Management Ordinance Checklist



Figure 7: Filter sock used to provide erosion and sediment control (Source: Westmoreland Conservation District)

BMP #1 – Develop a written construction site stormwater runoff control program. The purpose is to establish clear roles and responsibilities for this MCM, outlining the procedures necessary for compliance. The program must include construction stormwater permitting, construction inspection, and enforcement of installation and maintenance of erosion and sediment (E&S) controls.

The program should be developed within the first year of permit coverage and reviewed/updated annually. A simple tracking system for active construction sites, inspections, enforcement actions, and other activities related to this MCM can simplify the reporting process while ensuring that all applicable activities are being managed.

BMP #2 – Write, adopt and enforce an ordinance that requires the implementation of erosion and sediment (E&S) control BMPs, as well as sanctions to ensure compliance. Permittees should adopt the ordinance within the first year of permit coverage.

BMP #3 – Develop and implement requirements for site operators to control waste at the construction site that may cause adverse impacts to water quality. Sediment is the primary pollutant of concern for MCM 4; however, other pollutants associated with construction are also important and should be addressed. Permittees should establish requirements within the first year. Requirements should be reviewed annually and updated if necessary.

BMP #4 – Develop and implement procedures for the receipt and consideration of public inquiries, concerns, and information submitted by the public regarding local construction activities. The permittee should demonstrate acknowledgement and consideration of the information submitted. Permittees should establish and implement a tracking system to keep a record of any submitted public information as well as response, actions, and results. If you have TMDL responsibilities, you may choose to regulate disturbances less than one acre and take credit for BMPs serving this purpose. This should be included in your ordinance.



Figure 8: A damaged silt fence which is supposed to provide erosion and sediment control where soil is being disturbed by construction (Source: Allegheny County Conservation District)

Minimum Control Measure #5: Post-Construction Stormwater Management

The goal of the Post-Construction Stormwater Management MCM is to avoid increased stormwater runoff problems and increased non-point source pollution that often accompanies the development of land and the associated increase in impervious surfaces.

Under Chapter 102, Erosion and Sediment (E&S) Control, County Conservation Districts and/or DEP must issue a permit for earth disturbance activities one acre or greater. If the MS4 permittee elects to use their participation in the Chapter 102 program as a Qualifying Local Program (QLP) under their MS4 permit requirements, then MCM 5 BMPs 1 -3 are automatically accounted for.

Once again, municipalities should have a copy of the MOU to review during an inspection and it is recommended that municipalities develop a written plan for the responsibilities beyond the QLP for MCM5 as well. There should be coordination with the QLP to have copies of your inspection records for documentation.

BMP #1 – Develop a post-construction stormwater management procedure. This written procedure describes how the permittee will address all required components of the plan. Guidance can be found in the Pennsylvania Stormwater Best Management Practices Manual (source can be found in Appendix 3).

Minimum requirements of the plan should include:

- Minimum requirements for use of structural and/or non-structural BMPs in plans for development and redevelopment
- Criteria for selecting and standards for sizing stormwater BMPs
- Implementation of an inspection program to ensure that BMPs are properly installed

BMP #2 – Require the implementation of a combination of structural and/or non-structural BMPs that are appropriate to the local community; minimize water quality impacts; and, are designed to maintain pre-development runoff conditions.



Figure 9: A rain garden in a parking lot to capture stormwater from an impervious parking lot (Source: Westmoreland Conservation District)

BMP #3 – Ensure that controls are installed that will prevent or minimize water quality impacts. Qualifying development or redevelopment projects should be inspected during construction to ensure proper installation of the approved post-construction stormwater management (PCSM) BMPs. Permittees that do not rely on Chapter 102 as a QLP to fulfill these requirements must summarize construction inspections and results in periodic reports.

All MS4 permittees are responsible for implementing BMPs 4, 5 and 6.

BMP #4 – Enact, implement, and enforce a post-construction stormwater runoff ordinance or other regulatory mechanism to address new development and redevelopment projects, as well as sanctions and penalties associated with non-compliance. PCSM controls apply to disturbances one acre or greater, but can also apply to those less than one acre.

BMP #5 – Develop and implement measures to encourage and expand the use of Low Impact Development (LID) in new and redevelopment. DEP’s Pennsylvania Stormwater Best Management Practices (BMP) Manual provides guidance on implementing LID practices, including, but not limited to:

- Protect sensitive and special-value features by avoiding floodplains, woods and wetlands
- Cluster and concentrate
- Minimize disturbance
- Reduce impervious cover
- Disconnect, distribute, decentralize
- Source control, such as street-sweeping

An inventory of development and redevelopment projects that discharge stormwater to your regulated MS4 must be kept. In this inventory, note which projects that have been authorized for construction since 3/10/2003 that incorporated LID practices (and specifics on what LID practices were used). Additionally, ordinances should be enacted that are consistent with LID practices.



Figure 10: Infiltration swale at Westmoreland County Community College (Source: Westmoreland Conservation District)

Information required in this inventory includes but is not limited to:

- Owner
- Location
- Type of BMP
- Installation date
- Required maintenance inspection activities and maintenance
- An annual assessment by you that the BMP operation and maintenance is adequate

BMP #6 – Ensure adequate operation and maintenance of all post-construction stormwater management BMPs installed at all qualifying development or redevelopment projects (including those owned or operated by the permittee). Within the first year of permit coverage, permittees should develop and implement a written inspection program to ensure that BMPs are properly operated and maintained. An inventory of BMPs should be developed and updated regularly. The inventory should include all BMPs installed since 3/10/2003 that discharge to your regulated MS4.

Helpful Tips

- ◆ A single system to record and track the inventory implementation specified in BMPs 3, 5 and 6 of this MCM will be helpful for your MS4 documentation.
- ◆ For MCM5, make sure your SWMP identifies the mechanism that will be used to address post-construction runoff (i.e., ordinance); why that mechanism was chosen; and describe the plan to develop that mechanism.
- ◆ The Pennsylvania Stormwater Best Management Practices Manual can be found here: <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>

Minimum Control Measure #6: Pollution Prevention/Good Housekeeping

The goal of the Pollution Prevention/Good Housekeeping MCM is to help ensure a reduction in the amount and type of pollution that is generated from municipally-owned and maintained facilities (e.g., streets, parking lots, and vehicle maintenance areas) and eventually discharged into local waterways. An additional goal of MCM 6 is to reduce the amount of pollution that is discharged to waterways from environmentally damaging land development, flood management practices, and/or poor maintenance of storm sewer systems.

BMP #1 – Identify and document all facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the small regulated MS4. This includes activities conducted by contractors for the permittee. The examples below are not limited to these facilities.

Municipal Facility Examples	Municipal Activity Examples
<ul style="list-style-type: none"> • Streets, roads, highways, and parking lots • Maintenance and storage yards • Waste transfer stations • Parks • Fleet or maintenance shops • Wastewater treatment plants • Stormwater conveyances (open and closed) • Riparian buffers • Stormwater storage or treatment units (e.g., basins, constructed wetlands, etc.) 	<ul style="list-style-type: none"> • Street sweeping • Snow removal/deicing • Inlet/outlet cleaning • Lawn/grounds care • Storm system maintenance, inspection, and repair • Park and open space maintenance • Municipal building maintenance • New construction and land disturbances • Right of Way maintenance • Vehicle maintenance, operation, fueling, and washing • Material transfer operations, including leaf/yard debris pickup and disposal procedures



Figure 11: Municipal facilities and activities (Source: SPC and regional partners)

BMP #2 – Develop, implement, and maintain a written operation and maintenance (O&M) program for all municipal operations and facilities that could contribute to the discharge of pollutants from the regulated small MS4s, as identified under BMP #1. A written plan must be developed within your O&M program. The O&M plan should stress pollution prevention and good housekeeping measures, contain site-specific information, and address the following areas:

- Management practices, policies, and procedures to reduce or prevent the discharge of pollutants to your small regulated MS4. Consider eliminating maintenance-area floor drains.
- Maintenance activities, schedules, and inspection procedures to reduce the potential for pollutants to reach your small regulated MS4.
- Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, salt/sand (anti-skid) storage locations, and snow disposal areas.
- Procedures for the proper disposal of waste removed from your regulated MS4s and your municipal operations, including dredge spoil, accumulated sediments, trash, household hazardous waste, used motor oil, and other debris.

BMP #3 – Develop and implement an employee training program that addresses appropriate topics to further the goal of preventing or reducing the discharge of pollutants from municipal operations to your regulated small MS4s. The program may be developed and implemented using any guidance and training materials that are available from federal, state, or local agencies, or other organizations. Any municipal employee or contractor must receive training, including, but not limited to:

- Public works staff
- Building/zoning/code enforcement staff
- Engineering staff (on-site and contracted)
- Administrative staff
- Elected officials
- Police and fire responders
- Volunteers
- Contracted personnel

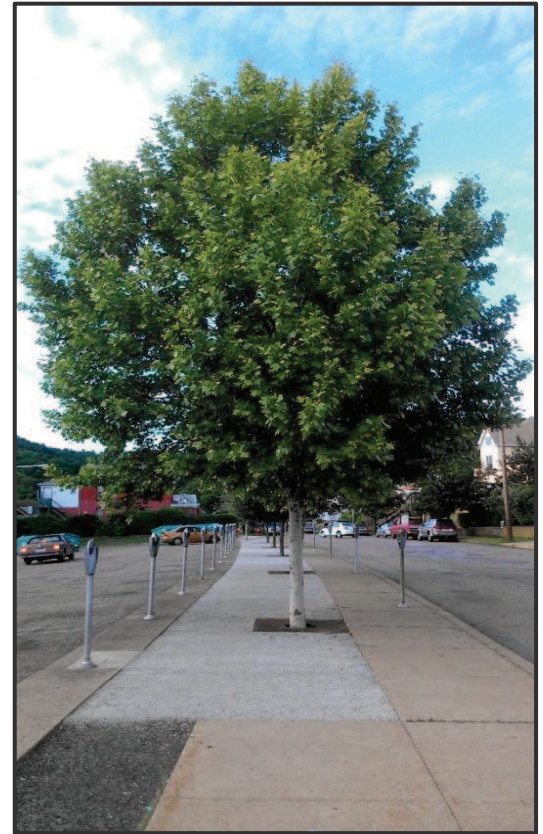


Figure 12: Vandergrift streetscape with mature tree and porous concrete to reduce impervious surfaces (Source: Westmoreland Conservation District)

Training should cover all relevant parts of the permittees' overall stormwater management program that could affect municipal operations, such as illicit discharge detection and elimination, construction sites, and ordinance requirements.

Helpful Tips

- ◆ Even if you contract out your catch basin cleanings, be sure to have records regarding the cleanings.
- ◆ Remember that your municipal garage isn't the only housekeeping you need to do. Good housekeeping applies to your entire permit area/municipality.
- ◆ Be specific regarding the training your employees are receiving. Document the date and topic of the training.
- ◆ Organization is key. Keeping good records and using a tracking software will help with implementation as well as a DEP or EPA audit. Even with a tracking software in place, paper copies/binders still need to be kept.

Record-Keeping & Reporting Strategies

Record-keeping is a very important aspect of your MS4 permit compliance activities. This is how you will demonstrate to inspectors that you have satisfied the requirements of your permit. There are many resources on the internet and companies that offer tracking, reporting and record-keeping services. This may be the right choice for you, depending on budget constraints and technology preferences. It is also fairly simple to keep your efforts organized and documented by using inexpensive three-ring binders. These binders should be updated, organized, and easily accessible to staff responsible for MS4 compliance.

You should consider networking with other regulated MS4s to compare notes about what types of forms they use for inspections; the templates they use for reports and notices; and, how they interact with their various municipal departments (e.g., public works for fleet maintenance and engineering for building permits) to ensure compliance with the terms of their permit. Regulatory agencies, including DEP and EPA, often have templates and resources available to assist with compliance.

Avoid language that presents uncertainty in your annual reports and documentation, such as “maybe,” “should,” “could,” or “can.” Be specific on the “what,” “when,” “where,” and “how.”

Documentation Needed by MCM

<p>MCMs 1 & 2</p>	<ul style="list-style-type: none"> ✓ Two written plans are required under these MCMs – the PEO and the PIPP. These two plans can be combined into one document if you wish. Be prepared to show these plans to the inspector, along with your target audience list. ✓ Keep copies or photographic evidence of your stormwater education materials. Also, document how you distributed them to the public and your target audience via at least two methods in past year. ✓ Keep documentation that you held at least one meeting in the last year by making a copy of the sign-in sheet or the meeting minutes. The date and time of the meeting and which staff members were present should also be included. ✓ Detail the rationale behind your PEO and PIPP. For example, explain why a certain flyer was selected, the logic behind the timeline for distribution or why you chose your target audience. These descriptions are vital to the documentation and audit processes. ✓ If you adopted a stormwater ordinance, show that you provided adequate public notice by copying the newspaper article or keeping a transcript of your PSA. You should document who received comments and how they were responded to. 				
<p>MCM 3</p>	<ul style="list-style-type: none"> ✓ Provide a copy of your written IDD&E Program Plan, which includes: <ul style="list-style-type: none"> ✓ Records of outfall screening and inspections ✓ Results, documentation on identified IDD&E and resolutions ✓ Maps of all outfalls, receiving waters and stormwater collection system ✓ Outfall sampling records ✓ Ordinance prohibiting illicit discharges ✓ Tracking system for outfall screening (Excel spreadsheet, for example) ✓ Be sure the IDD&E Program Plan describes the processes for screening, tracing, resolution and enforcement. ✓ Mapping your MS4 is critical. The map should include your entire stormwater collection system, including all outfalls. Drainage areas feeding each outfall should also be delineated. The map of your MS4 should be completed by the 4th year of permit coverage. If you are operating under a renewed permit, your mapping should already be complete. 				
<p>MCM 4</p>	<p style="text-align: center;">Are you are relying on Pennsylvania’s QLP for stormwater associated with construction activity under Chapter 102?</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Yes</th> <th style="width: 50%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ✓ Be prepared to describe your local approval process of construction-related projects. Explain step-by-step who does what, when it is done, and how your municipality ensures building permits are not issued until Chapter 102 requirements have been satisfied. DEP strongly encourages that you have a Memorandum of Understanding (MOU) in place with your County Conservation District to formalize your roles in this process. ✓ It is still your responsibility to outline the processes in the MOU and explain the roles and responsibilities within that process. </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> ✓ You must show your written program for stormwater associated with construction activities, an ordinance requiring implementation of erosion and sediment control BMPs, and written procedures for managing inquiries of local construction activity. </td> </tr> </tbody> </table>	Yes	No	<ul style="list-style-type: none"> ✓ Be prepared to describe your local approval process of construction-related projects. Explain step-by-step who does what, when it is done, and how your municipality ensures building permits are not issued until Chapter 102 requirements have been satisfied. DEP strongly encourages that you have a Memorandum of Understanding (MOU) in place with your County Conservation District to formalize your roles in this process. ✓ It is still your responsibility to outline the processes in the MOU and explain the roles and responsibilities within that process. 	<ul style="list-style-type: none"> ✓ You must show your written program for stormwater associated with construction activities, an ordinance requiring implementation of erosion and sediment control BMPs, and written procedures for managing inquiries of local construction activity.
Yes	No				
<ul style="list-style-type: none"> ✓ Be prepared to describe your local approval process of construction-related projects. Explain step-by-step who does what, when it is done, and how your municipality ensures building permits are not issued until Chapter 102 requirements have been satisfied. DEP strongly encourages that you have a Memorandum of Understanding (MOU) in place with your County Conservation District to formalize your roles in this process. ✓ It is still your responsibility to outline the processes in the MOU and explain the roles and responsibilities within that process. 	<ul style="list-style-type: none"> ✓ You must show your written program for stormwater associated with construction activities, an ordinance requiring implementation of erosion and sediment control BMPs, and written procedures for managing inquiries of local construction activity. 				

Are you relying on Pennsylvania's QLP for stormwater associated with construction activity under Chapter 102?	
Yes	No
<p>✓ You are covered, however, the process should be described with roles and responsibilities if an MOU is not in place.</p>	<p>✓ Be prepared to show written Post-Construction Stormwater Management (PCSM) plan, tracking system with post-construction BMPs, and results of post-construction BMP inspections.</p>
MCM 5	<p>✓ In either case, you will need to show the inspector your ordinance for inspecting BMPs and your inspection program that ensures BMPs are properly operated and maintained. Implementation – you will need to maintain an inventory of BMPs, including their location. For private property, you should have maintenance agreements. An MOU with the CCD to help implement MCM 5 is a useful option for many MS4s.</p> <p>✓ Demonstrate to DEP that you understand the SW Management ordinance and are enforcing it. Must provide authority to control, regulate construction activity and inspect BMPs and legal authority to access private land (DEP model ordinance).</p> <p>✓ DEP may request a field visit to verify construction and operation of BMPs, especially when reported in periodic reports, especially if TMDLs are in place. Discuss ongoing O&M needs for BMPs. Design plans or as-built plans should be available.</p>
MCM 6	<p>✓ DEP will ask to see an inventory of municipal facilities and land uses that contribute stormwater to MS4, including all facilities owned and operated by the permittee (e.g., street sweeping, fleet care, storage yards, composting sites, streets, lots). The O&M plan will need to be shown to the inspector, as well as the written employee training program (includes contractors and consultants) and a list of trainings with frequency and participants.</p> <p>✓ DEP will also want to see the activities associated with the listed facilities. These activities can often have greater pollution potential than the facilities. Keep track of these activities and document the actions.</p>

Office and Field Inspections

Your MS4 NPDES permit is an authorization to discharge stormwater under specific rules that you must follow. If DEP inspects your MS4, their objective will be make sure you understand what is required and they will expect you have documentation on hand demonstrating compliance for each of the MCMs.

It is important that your records are easily found and well organized for the office portion of the inspection. Documentation of the activities outlined in your SWMP is an important part of demonstrating compliance. If you are routinely inspecting and reporting, this should not become an overwhelming task.

The inspector will need a full day and a space to work in. Consider who from your staff will need to be there and when they will need to be available. The following forms available from DEP (<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-11575>) will provide information on what you can expect during your inspection. Keep in mind that the inspector may ask questions or request documentation not listed here.

Helpful Tips

- 💧 You can organize your filing system any way you choose, but it must be well-organized and easily accessible. You might consider organizing it by MCMs of the permit in a three-ring binder. This keeps the information organized and attainable for you and your inspector.
- 💧 Summary spreadsheets in Excel can be a great organization tool for when inspections are done, your outfall information and when public workshops were held. Consider keeping an Excel file for each MCM with the necessary information.
- 💧 Printed maps are the most helpful as they will be needed for the field inspection. Consider this when preparing for your audit and have plenty of maps prepared.

Inspectors may request additional information, including but not limited to:

Individual tracking sheets should include but are not limited to:	Summary Spreadsheets that may be helpful to develop may include but are not limited to:
<ul style="list-style-type: none"> • Illicit Discharge Complaint Forms • Outfall Screening Forms • PCSM Complaint Forms and PCSM Inspection Forms • Active Construction Complaint Forms and Active Construction Inspection Forms • Snow Removal/De-icing/Anti-icing Logs • Catch Basin Cleaning Logs • Street Sweeping Logs • Housekeeping Inspection Forms • Training Sign-in Sheets • Public Meeting Sign-in Sheets • Public Comments and Municipal Response • Education & Outreach Documents • Etc. 	<ul style="list-style-type: none"> • Illicit Discharge Tracking • Illicit Discharge Complaints • Illicit Discharge Enforcement • PCSM BMPs • PCSM Inspections • PCSM Enforcements • PCSM Complaints • Active Construction Sites • Active Construction Inspections • Active Construction Enforcements • Employee Trainings • Public Meetings • Municipally-Owned Facilities/Activities/Land Uses • Etc.

Records must be retained for 3 years and at least 1 year after permit termination. A copy of the NOI (the permit application), the MS4 NPDES permit and any other authorization or approval must be kept for at least 1 year after permit termination.

Items that will need to be available for review during the office inspection:

- A copy of all past Annual Reports
- A copy of the original and renewal NOI
- A copy of the original and renewal permits
- The Public Education and Outreach Program (PEOP) (written plan)
- The Public Involvement and Participation Program (PIPP) (written plan)
- The Illicit Discharge Detection and Elimination (IDD&E) Program (written plan)
- The inventory of municipal facilities and activities that are owned or operated by the permittee and have the potential for generating stormwater runoff to the regulated small MS4
- The written Operation & Maintenance Plan for municipal facilities and activities
- The written employee training program
- A map of all outfalls, receiving waters, stormwater collection systems, swales, basins, etc.
- Ordinance prohibiting non-stormwater discharges
- The stormwater management ordinance
- The inventory of all Post-Construction BMPs installed since March 10, 2003 that discharge directly or indirectly to your regulated small MS4
- The Memorandum of Understanding between the permittee and the County Conservation District

Field Inspections

During the field inspection, BMPs may be inspected to verify their functionality. Previous and active construction sites may also be inspected. Physical operations may be inspected, such as outfalls and maintenance facilities. Stormwater facilities that have been constructed from 2003 on, such as ponds, must be maintained and functioning as originally designed. Common issues to look for may include:

- Erosion may be occurring; remove as needed
- Check DEP and/or the United States Army Corps of Engineers (USACE) about removal of wetland vegetation if not part of original design
- Overflow structures need to function as designed
- Clear trash and debris
- Remove sediment buildup; maintain as designed

Overview of Stormwater Best Management Practices (BMPs)

BMPs are important, because they can provide some actions that municipalities can take to fulfill some of the required permit obligations. Structural and non-structural BMPs help manage stormwater in our municipalities.

Structural BMPs are engineered systems that are designed to mitigate the impacts of stormwater. Structural BMPs are effective tools for stormwater management in both development and retrofit situations.

Non-Structural BMPs focus on the prevention of stormwater generation, therefore effectively reducing runoff volume, and decreasing development costs while increasing property value and marketability.

The Pennsylvania Department of Environmental Protection's Stormwater Best Management Practices (BMP) Manual will help guide you as you look into BMPs that might work well for your municipality. Refer to this manual for a comprehensive look at stormwater BMPs.



Figure 13: Local examples of Structural BMPs. Derry Borough parking with porous pavers (top left), a rain garden at Green Forge (top right), a residential rain garden (bottom left), and an adjustment to a parking lot in Greensburg. (Source: Westmoreland Conservation District)

This document can be found here:

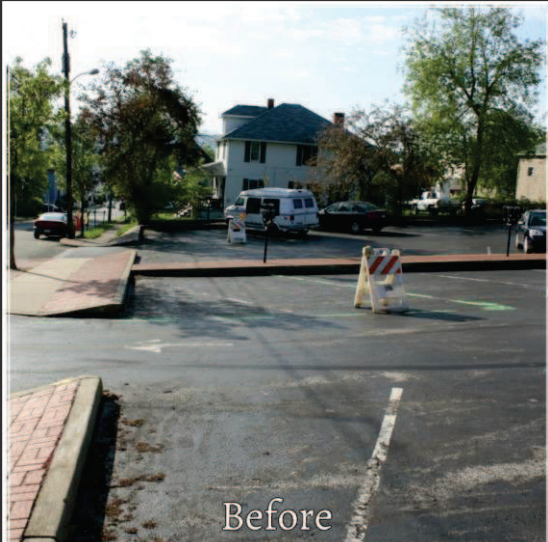



<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>.

The purpose of the Pennsylvania Stormwater Best Management Practices (BMP) Manual is to provide guidance, options and tools that can be used to protect water quality, enhance water availability and reduce flooding potential through effective stormwater management. This manual presents design standards and planning concepts for use by local authorities, planners, land developers, engineers, contractors, and others involved with planning, designing, reviewing, approving, and constructing land development projects.

The manual describes a stormwater management approach to the land development process that strives to:

- Prevent or minimize stormwater problems through comprehensive planning and development techniques
- Mitigate any remaining potential problems by employing structural and non-structural BMPs

Structural BMPs provide benefits for **water quality, groundwater-recharge, volume reduction and peak rate control**, but they also provide other benefits beyond stormwater management that are illustrated below.

Structural BMPs	Additional Benefits
<p>Floodplain Restoration aims to restore a floodplain to conditions present prior to development. It is a system-based BMP that strives to mimic undisturbed conditions between stream system elements: groundwater, stream surface flow, soils, and root systems of vegetation.</p>	<ul style="list-style-type: none"> ◆ Increased aquatic and terrestrial habitats ◆ Increased wetland areas and native plants in floodplain ◆ Reduction of invasive plants ◆ Thermal cooling of stream baseflow
<p>Rain Gardens are excavated shallow depressions, planted with native vegetation that can withstand dry and wet periods. Stormwater is collected in the rain garden and is both infiltrated into the ground and evapotranspired by the vegetation.</p>	<ul style="list-style-type: none"> ◆ Enhances aesthetic appeal of homes, neighborhoods and commercial or industrial sites ◆ Provides a wildlife habitat
<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><i>Before</i> <i>After</i></p> <div style="text-align: right; padding-right: 50px;"> <p>Rain garden in Mt. Pleasant. Photos: Westmoreland Conservation District</p> </div>	
<p>Riparian Buffer Restoration (RBR) is the restoration of the area surrounding streams, lakes, ponds, and wetlands.</p>	<ul style="list-style-type: none"> ◆ Provides a wildlife habitat ◆ Provides aesthetic value
<p>Vegetated Swales are shallow channels, planted densely with vegetation, designed to reduce the rate of stormwater and encourage infiltration.</p>	<ul style="list-style-type: none"> ◆ Enhances aesthetic appeal of streets, neighborhoods and commercial or industrial sites
<div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: center;"><i>Before</i> <i>After</i></p> <div style="text-align: right; padding-right: 50px;"> <p>Infiltration/Vegetated swale at Westmoreland County Community College. Photos: Westmoreland Conservation District</p> </div>	
<p>Wet Ponds (WPs), also called Retention Basins, are stormwater basins that include a permanent pool of water as well as additional capacity for temporary storage of stormwater. They are effective at controlling peak stormwater rates and also provide water quality benefits.</p>	<ul style="list-style-type: none"> ◆ Provides a wildlife habitat ◆ Provides aesthetic value

Non-Structural BMPs	Additional Benefits
<p>Cluster Uses at Each Site/Build on Smallest Area Possible (CUES/BSAP) is a design and development strategy which reduces site disturbance through clustering proposed uses together, building vertically, and moving uses closer together.</p>	<ul style="list-style-type: none"> ◆ Preservation of open space ◆ Improved aesthetics ◆ Increased recreation opportunities ◆ Improved air quality ◆ Temperature moderation
<p>Minimize Disturbed Area – Grading (MDA-G) focuses on minimizing grading and site disturbance while maximizing soil restoration and the conservation of existing site vegetation. MDA-G includes practices such as modifying the alignment of roads and disturbance areas to minimize necessary grading.</p>	<ul style="list-style-type: none"> ◆ Maximized soil restoration ◆ Preservation of open space ◆ Protection of open space and wildlife habitat
<p>Protect/Conserve/Enhance Riparian Areas (PCERA) preserves and enhances vegetated areas that are adjacent to streams and rivers.</p>	<ul style="list-style-type: none"> ◆ Provides a food supply, habitat, and thermal protection for fish and other wildlife
<p>Protect/Utilize Natural Flow Pathways in Overall Stormwater Planning and Design minimizes stormwater impacts associated with site development. Protecting natural drainage features such as swales, depressions, and ephemeral streams during site development can provide a variety of stormwater management functions.</p>	<ul style="list-style-type: none"> ◆ Protection of open space and wildlife habitat ◆ Potential to increase property values ◆ Provides aesthetic value
<p>Reducing Street Imperviousness (RSI) and Reducing Parking Imperviousness (RPI): RSI includes minimizing street widths and lengths; RPI includes reducing the impervious area associated with parking through practices such as designating overflow parking on an area that is pervious.</p>	<ul style="list-style-type: none"> ◆ Increased neighborhood livability, traffic conditions, and pedestrian safety



New parking at Valley High School with permeable pavers.
Photos: Westmoreland Conservation District

(Disclaimer: The BMP examples and references included are not intended to be comprehensive. This list of BMPs is not all-inclusive, nor does it preclude MS4 permittees from using other technically sound practices.)

Appendix 1: Glossary of Terms and Acronyms

BMP - A BMP is a term used to describe “Best Management Practices” for reducing quantity and improving quality of stormwater, either through physical structures and practices or through planning and outreach (non-structural). BMPs are typically divided into two categories: structural or non-structural. They describe control measures taken to control stormwater changes caused by changes to land use (development or re-development). Generally, BMPs focus on water quality problems caused by increased impervious surfaces from land development.

Combined Sewer Overflow (CSO) - Discharge from a combined sewer system that is caused by snowmelt or stormwater runoff.

DEP – Pennsylvania Department of Environmental Protection.

EPA – United States Environmental Protection Agency.

Green Infrastructure (GI) - Reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.

Illicit (illegal) discharge - All discharges other than authorized discharges listed in your permit.

Minimum Control Measure (MCM) - MS4 permits call for the development and implementation of a stormwater management program that addresses six “minimum control measures” (MCMs). Implementing these minimum control measures means identifying **Best Management Practices (BMPs)** and measurable goals the MS4 permittee can implement to satisfy the CMC. MS4 permittees must satisfy the six MCMs in their permit. These are six elements that your **Stormwater Management Plan (SWMP)** must address.

MS4 - MS4 stands for **Municipal Separate Storm Sewer System**. It is any conveyance or system of conveyances (including streets, ditches, and pipes) that is: owned by a municipality; designed or used for collecting or conveying stormwater; not a combined sewer (i.e., not intended for both sewage and stormwater); AND not part of a Publicly Owned Treatment Works (POTW). It is a separate stormwater collection system owned and operated by a municipality. (When a municipality only has one system for sewage and stormwater, it is called a combined sewer system.)

NPDES Permit - A **National Pollutant Discharge Elimination System (NPDES) permit** is a permit authorized by the Clean Water Act, a federal law. In Pennsylvania, it is administered by the state’s Department of Environmental Protection (DEP). It is required for any point source discharge to waters of the Commonwealth, including stormwater. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States, including stormwater.

Stormwater - Water on the surface of the ground resulting from rain or melting snow (precipitation). It is also called “runoff”

Urbanized Area (UA) – Land area comprising one or more places (central places) and the adjacent densely-settled surrounding area (urban fringe) that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile, as defined by the United States Bureau of the Census, and as determined by the latest available decennial census. The UA outlines the extent of automatically regulated areas.

Appendix 2: Directory of Public and Non-Profit Partners

State, regional, and local partners are essential to the MS4 process. If you have questions, for example, regarding your permit or regarding MS4 BMPs, find the appropriate contact in the list below.

Southwestern Pennsylvania Commission Water Resource Center	
Two Chatham Center, Suite 400 112 Washington Place Pittsburgh, PA 15210 412-391-5590 www.spcwater.org	
Counties: Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington and Westmoreland	
Pennsylvania Department of Environmental Protection offices	
DEP Southwest Region 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4000 Counties: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland	DEP Northwest Region 230 Chestnut St. Meadville, PA 16335-3481 814-332-6984 Counties: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren
Local US Environmental Protection Agency office	
EPA Region 3 1650 Arch Street Philadelphia, PA 19103-2029 215-814-5122 States: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia	
County Conservation Districts	
Allegheny County Conservation District River Walk Corporate Centre 33 Terminal Way, Suite 325B Pittsburgh, PA 15219 412-241-7645 www.accdpa.org	Armstrong Conservation District Armsdale Administration Building 124 Armsdale Road, Suite B-2 Kittanning, PA 16201-3738 724-548-3425 www.armstrongcd.org
Beaver County Conservation District 156 Cowpath Road Aliquippa, PA 15001 724-378-1701 www.beavercountyconservationdistrict.org	Butler County Conservation District 122 McCune Drive Butler, PA 16001 724-284-5270 www.bccdonline.org
Fayette County Conservation District 10 Nickman Plaza Lemont Furnace, PA 15456 724-438-4497 www.fayettecd.org	Greene County Conservation District Ben Franklin Building, Suite 204 22 West High Street, Waynesburg, PA 15370 724-852-5278 www.co.greene.pa.us/secured/gc2/depts/gccd/GCCD-index.htm
Indiana County Conservation District 625 Kolter Drive, Suite 8 Indiana, PA 15701-3571 724-471-4751 www.iccdpa.org	Lawrence County Conservation District Lawrence County Government Center 430 Court Street New Castle, PA 16101 724-652-4512 www.lawrencecd.org
Washington County Conservation District 2800 North Main Street, Suite 105 Washington, PA 15301 724-705-7098 www.pawccd.org/index.html	Westmoreland Conservation District J. Roy Houston Conservation Center 218 Donohoe Road Greensburg, PA 15601 724-837-5271 www.wcdpa.com

In addition to the organizations listed above, nonprofits such as watershed groups can also work cooperatively to help with various tasks such as MCM2 and general baseline water quality sampling.

Appendix 3: Sample Checklists (Visit PA DEP MS4 Resources for access to sample checklists)

3800-FM-BCW0521 12/2015
MS4 Outfall Field Screening Report



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

MS4 OUTFALL FIELD SCREENING REPORT

BACKGROUND INFORMATION

Permittee Name:	NPDES Permit No.: PA
Date of Inspection:	Outfall ID No.:
Land Uses in Outfall Drainage Area (Select All): <input type="checkbox"/> Industrial <input type="checkbox"/> Urban Residential <input type="checkbox"/> Commercial <input type="checkbox"/> Suburban Residential <input type="checkbox"/> Open Space <input type="checkbox"/> Other:	Latitude: _____° _____' _____"
	Longitude: _____° _____' _____"
	Dry Weather Inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No
	Date of Previous Precipitation:
	Amount of Previous Precipitation: _____ in
Inspector Name(s):	Were Photographs Taken? <input type="checkbox"/> Yes <input type="checkbox"/> No
	Are Photographs Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No

OUTFALL DESCRIPTION

TYPE	MATERIAL	SHAPE	DIMENSIONS	SUBMERGED
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> CMP <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Steel <input type="checkbox"/> Other	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other <input type="checkbox"/> Other	Diameter: _____ in	<input type="checkbox"/> In Water <input type="checkbox"/> With Sediment
<input type="checkbox"/> Open Channel	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Other	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> Other	Depth: _____ in Top Width: _____ in Bottom Width: _____	

Dry Weather Flow Present at Outfall During Inspection? Yes No *(If No, skip to Certification Section)*

Description of Flow Rate: Trickle Moderate Significant N/A

DRY WEATHER FLOW EVALUATION

Does the dry weather flow contain color? Yes No If Yes, provide a description below.

Does the dry weather flow contain an odor? Yes No If Yes, provide a description below.

Is there an observed change in the receiving waters as a result of the discharge? Yes No
If Yes, provide a description below.

Does the dry weather flow contain floating solids, scum, sheen or substances that result in deposits? Yes No
If Yes, provide a description below.

Were sample(s) collected of the dry weather flow? Yes No (If Yes, No. Samples: _____)

FIELD / LABORATORY ANALYSIS

PARAMETER	RESULTS	UNITS	PARAMETER	RESULTS	UNITS
Flow Rate		GPM	Fecal Coliform		No./100 mL
pH		S.U.	COD		mg/L
Total Residual Chlorine (TRC)		mg/L	BOD5		mg/L
Conductivity		µmhos/cm	TSS		mg/L
Ammonia-Nitrogen		mg/L	TDS		mg/L
Other: _____			Oil and Grease		mg/L
Other: _____			Other: _____		

Indicate the parameters above that were analyzed by a DEP-certified laboratory:

ILLICIT DISCHARGES

Is the dry weather flow an illicit discharge? Yes No
If Yes, describe efforts made to determine the source(s) of the illicit discharge.

Describe corrective actions taken by the permittee in response to the finding of an illicit discharge.

Inspector Comments:

Inspector Comments:

RESPONSIBLE OFFICIAL CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowledge of violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Responsible Official Name

Signature

Telephone No.

Date

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) ILLICIT DISCHARGE DETECTION & ELIMINATION (IDD&E) CHECKLIST

This checklist may be used by MS4 permittees to ensure complete implementation of MCM #3 of MS4 NPDES permits.

Requirement	Check if Completed
BMP #1: Develop and maintain a written IDD&E program to detect, eliminate and prevent illicit discharges. The program must be developed within one year of permit coverage for new permittees and updated and evaluated annually for renewal permittees. The program must include:	<input type="checkbox"/>
a. Dry weather field screening of outfalls for non-stormwater flows.	<input type="checkbox"/>
b. Sampling of dry weather discharges for selected chemical and biological parameters.	<input type="checkbox"/>
c. Procedures for identifying priority areas. These are areas with a higher likelihood of illicit discharges, illicit connections or illegal dumping. Priority areas may include areas with older infrastructure, a concentration of high-risk activities, or past history of water pollution problems.	<input type="checkbox"/>
d. Procedures for screening outfalls in priority areas during varying seasonal and meteorological conditions.	<input type="checkbox"/>
e. Procedures for identifying the source of an illicit discharge when a contaminated flow is detected at a regulated small MS4 outfall.	<input type="checkbox"/>
f. Procedures for eliminating an illicit discharge.	<input type="checkbox"/>
g. Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems (e.g., on-lot septic systems, sanitary piping) with storm drain systems.	<input type="checkbox"/>
h. Mechanisms for gaining access to private property to inspect outfalls (e.g., land easements, consent agreements, search warrants).	<input type="checkbox"/>
i. Procedures for program documentation, evaluation and assessment.	<input type="checkbox"/>
j. Recordkeeping – records must be kept of all outfall inspections, flows observed, results of field screening and testing, and other follow-up investigation and corrective action work performed under this program.	<input type="checkbox"/>
BMPs #2 & #3: Develop and maintain map(s) of your regulated small MS4. The map(s) must be developed by the fourth year of permit coverage for new permittees and be updated as necessary. The map(s) must depict the following:	<input type="checkbox"/>
a. Locations of all outfalls directly or indirectly discharging stormwater from your MS4.	<input type="checkbox"/>
b. Locations and names of all surface waters of the Commonwealth that receive discharges from those outfalls.	<input type="checkbox"/>
c. The entire storm sewer collection system, including roads, inlets, piping, swales, catch basins, channels, basins, etc.	<input type="checkbox"/>
d. Municipal and/or watershed boundaries.	<input type="checkbox"/>
BMP #4: Conduct outfall field screening, identify the source of any illicit discharges, and remove or correct any illicit discharges using procedures developed under BMP #1. Specific requirements include the following:	<input type="checkbox"/>
a. New permittees – screen all identified MS4 outfalls at least twice during dry weather during the permit term; screen at least forty percent of the total number of outfalls per year.	<input type="checkbox"/>
b. Renewal permittees – screen all identified MS4 outfalls at least once during each permit coverage term; for areas where past problems have been reported or known sources of dry weather flows occur on a continual basis, outfalls must be screened annually.	<input type="checkbox"/>

MS4 IDD&E Checklist

Requirement	Check if Completed
c. If screening reveals dry weather flow, the discharge from the outfall and the area around the outfall must be inspected visually for color, turbidity, sheen, floating or submerged solids; for adverse effects on plants or animals in proximity to the outfall; and for odor. If the outfall produces any odor, or if the visual inspection shows any indication that the discharge may contain pollutants, then samples of the discharge must be collected for field and/or lab testing of selected chemical and biological parameters as part of a process to determine if the dry weather flow is illicit.	<input type="checkbox"/>
d. Prioritize outfall screenings according to the perceived chance of illicit discharges within the outfall's contributing drainage area.	<input type="checkbox"/>
e. Inspections must be recorded on the Outfall Reconnaissance Inventory/Sample Collection field sheet.	<input type="checkbox"/>
f. Adequate written documentation must be maintained to justify a determination that an outfall flow is not illicit. If an outfall flow is illicit, the actions taken to identify and eliminate the illicit flow must be documented.	<input type="checkbox"/>
g. The results of outfall inspections and actions taken to remove or correct illicit discharges must be summarized in periodic reports.	<input type="checkbox"/>
BMP #5: Enact a stormwater management ordinance to implement and enforce a stormwater management program that includes prohibition of non-stormwater discharges to the regulated small MS4.	<input type="checkbox"/>
a. New permittees – within the first year of coverage under the permit, new permittees must enact and implement an ordinance from an Act 167 Plan approved by the Department in 2005 or later, the MS4 Stormwater Management Ordinance, or an ordinance that satisfies all applicable requirements in a completed and signed MS4 Stormwater Management Ordinance Checklist.	<input type="checkbox"/>
b. New permittees – submit a letter signed by a municipal official, municipal engineer, or the municipal solicitor as an attachment to your first year report certifying the enactment of an ordinance that meets all applicable requirements of this permit.	<input type="checkbox"/>
c. Renewal permittees – continue to maintain, update, implement, and enforce a Stormwater Management Ordinance that satisfies all applicable requirements.	<input type="checkbox"/>
BMP #6: Provide educational outreach to public employees, business owners and employees, property owners, the general public and elected officials (i.e., target audiences) about the program to detect and eliminate illicit discharges.	<input type="checkbox"/>
a. During each year of permit coverage, appropriate educational information concerning illicit discharges shall be distributed to the target audiences using methods outlined under MCM #1 of the MS4 NPDES permit.	<input type="checkbox"/>
b. Establish and promote a stormwater pollution reporting mechanism (e.g., a complaint line with message recording) by the end of the first year of permit coverage for the public to use to notify you of illicit discharges, illegal dumping or outfall pollution.	<input type="checkbox"/>
c. Respond to all complaints in a timely and appropriate manner. Document all responses, include the action taken, the time required to take the action, whether the complaint was resolved successfully.	<input type="checkbox"/>



MS4 COMPLIANCE INSPECTION REPORT

OFFICE INSPECTION				
Most Recent Annual/Progress Report Due Date:				
Date Most Recent Annual/Progress Report Submitted:				
List all deficiencies identified in the most recent Annual/Progress Report Review:				
Describe the permittee's progress with addressing deficiencies, if applicable:				
Verify the presence of the following documentation; check "Yes" if available, "No" if not available, and "NA" if not applicable.				
MCM	Item	Yes	No	NA
1	Public Education and Outreach Program (PEOP) (written plan)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Lists of target audience groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Published stormwater educational materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Two methods of distributing educational materials in past year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Public Involvement and Participation Program (PIPP) (written plan)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Public notice prior to adoption of any ordinance (municipal) or SOP (non-municipal)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	At least one public meeting in past year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Illicit Discharge Detection and Elimination (IDD&E) Program (written plan)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Outfall inspection and illicit discharge tracking system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Complaint tracking system for illicit discharges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Map of all outfalls, receiving waters, stormwater collection system, swales, basins, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Stormwater sampling and monitoring records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Ordinance (municipal) or SOP (non-municipal) prohibiting non-stormwater discharges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	If not relying on PA's program, a written stormwater associated with construction activities program (written plan)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	If not relying on PA's program, an ordinance (municipal) or SOP (non-municipal) requiring implementation of erosion and sediment control BMPs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	If not relying on PA's program, written procedures for managing public inquiries of local construction activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	If not relying on PA's program, a written post-construction stormwater management plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	If not relying on PA's program, a tracking system containing post-construction BMPs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	If not relying on PA's program, inspection results of post-construction BMPs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	An ordinance (municipal) or SOP (non-municipal) to enforce post-construction BMPs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	An inspection program ensuring stormwater BMPs are properly operated and maintained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Inventory of municipal facilities and land uses that contribute to stormwater runoff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Written Operation & Maintenance Plan for municipal facilities addressing housekeeping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Written employee training program	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Date:
 Yellow – Permittee

Permit No.:
 Pink – Inspector



MS4 COMPLIANCE INSPECTION REPORT

FIELD INSPECTION – BMPs	
BMP Description: Locational Description: Comments/Deficiencies:	<input type="checkbox"/> Structural BMP <input type="checkbox"/> Non-Structural BMP BMP Reported In: <input type="checkbox"/> Annual/Progress Report <input type="checkbox"/> Other (_____) Property: <input type="checkbox"/> Public <input type="checkbox"/> Private Is BMP Implemented or Being Implemented? <input type="checkbox"/> Yes <input type="checkbox"/> No Who Is Responsible for O&M (Structural BMPs Only)? <input type="checkbox"/> Municipality <input type="checkbox"/> Other (Name: _____) Date Installed (Structural BMPs Only): Is BMP Located in Urbanized Area? <input type="checkbox"/> Yes <input type="checkbox"/> No
BMP Description: Locational Description: Comments/Deficiencies:	<input type="checkbox"/> Structural BMP <input type="checkbox"/> Non-Structural BMP BMP Reported In: <input type="checkbox"/> Annual/Progress Report <input type="checkbox"/> Other (_____) Property: <input type="checkbox"/> Public <input type="checkbox"/> Private Is BMP Implemented or Being Implemented? <input type="checkbox"/> Yes <input type="checkbox"/> No Who Is Responsible for O&M (Structural BMPs Only)? <input type="checkbox"/> Municipality <input type="checkbox"/> Other (Name: _____) Date Installed (Structural BMPs Only): Is BMP Located in Urbanized Area? <input type="checkbox"/> Yes <input type="checkbox"/> No
BMP Description: Locational Description: Comments/Deficiencies:	<input type="checkbox"/> Structural BMP <input type="checkbox"/> Non-Structural BMP BMP Reported In: <input type="checkbox"/> Annual/Progress Report <input type="checkbox"/> Other (_____) Property: <input type="checkbox"/> Public <input type="checkbox"/> Private Is BMP Implemented or Being Implemented? <input type="checkbox"/> Yes <input type="checkbox"/> No Who Is Responsible for O&M (Structural BMPs Only)? <input type="checkbox"/> Municipality <input type="checkbox"/> Other (Name: _____) Date Installed (Structural BMPs Only): Is BMP Located in Urbanized Area? <input type="checkbox"/> Yes <input type="checkbox"/> No
BMP Description: Locational Description: Comments/Deficiencies:	<input type="checkbox"/> Structural BMP <input type="checkbox"/> Non-Structural BMP BMP Reported In: <input type="checkbox"/> Annual/Progress Report <input type="checkbox"/> Other (_____) Property: <input type="checkbox"/> Public <input type="checkbox"/> Private Is BMP Implemented or Being Implemented? <input type="checkbox"/> Yes <input type="checkbox"/> No Who Is Responsible for O&M (Structural BMPs Only)? <input type="checkbox"/> Municipality <input type="checkbox"/> Other (Name: _____) Date Installed (Structural BMPs Only): Is BMP Located in Urbanized Area? <input type="checkbox"/> Yes <input type="checkbox"/> No

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 Pink – Inspector

Appendix 4: Document Sources and Additional Resources

SPC Water Resource Center

www.spcwater.org

DEP MS4 Resources

http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfjG_krKUK

DEP's Appendix A: Stormwater Management Program. April 2012.

http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-95044/08_3800-PM-BPNPSM0100h-AppendixA.pdf

Pennsylvania Stormwater Best Management Practices Manual. December 2006.

<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>

EPA MS4 Resources

<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu>

StormwaterPA

<http://www.stormwaterpa.org/>

PA DCNR Parks BMPs

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_006535.pdf

3 Rivers Wet Weather

3 Rivers Wet Weather is a nonprofit environmental organization created in 1998 to support 82 Allegheny County municipalities and the City of Pittsburgh in addressing the region's wet weather overflow problem.

<http://www.3riverswetweather.org/>

DEP Individual Permit – MS4 Stormwater Operation and Maintenance (O&M) Ordinance Checklist and MS4 Stormwater Management Ordinance Checklist

http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-94978/11_3800-PM-BPNPSM0200k%20Ordinance%20Checklist.pdf

NPDES Sample Inspection Reports

<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-1575>

MCM1: Public Education and Outreach on Stormwater Impacts

- ◆ EPA Public Education and Outreach on Stormwater Impacts Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu>
- ◆ Westmoreland Conservation District Homeowner's Guide to Stormwater
<http://wcdpa.com/wp-content/uploads/Homeowners-Stormwater-Guide.pdf>
- ◆ EPA "Getting in Step, A Guide for Conducting Watershed Outreach Campaigns"
<https://cfpub.epa.gov/npstbx/files/getnstepguide.pdf>

MCM2: Public Involvement/Participation

- ◆ DEP Public Education Plan Template
<http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfnYfkrKUK>
- ◆ EPA Public Involvement/Participation Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#inv>

MCM3: Illicit Discharge Detection and Elimination (IDD&E)

- ◆ DEP MS4 IDD&E Checklist
Checklist may be used by MS4s to ensure complete implementation of MCM #3 of MS4 NPDES permits.
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUK
- ◆ DEP MS4 Outfall Field Screening Report
<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-12798>
- ◆ EPA Illicit Discharge Detection and Elimination Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#ill>
- ◆ Illicit Discharge Detection and Elimination Guidance Manual
<http://nepis.epa.gov/Exe/ZyNET.exe/20017KFK.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2000+Thru+2005&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C00thru05%5CTxt%5C00000010%5C20017KFK.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL>

MCM4: Construction Site Stormwater Runoff Control

- ◆ DEP Erosion and Sediment Pollution Control Program Manual (PDF)
<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88925/363-2134-008.pdf>
- ◆ Construction Site Complaint Form
This form may be used by MS4s for logging and tracking complaints about construction stormwater issues.
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUK
- ◆ EPA Construction Site Stormwater Runoff Control Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr>
- ◆ Westmoreland Conservation District Typical Best Management Practices for Construction Sites
<http://wcdpa.com/wp-content/uploads/WCD-BMP-Booklet-2016-web.pdf>

MCM5: Post-Construction Stormwater Management

- ◆ DEP Pennsylvania Stormwater Best Management Practices Manual
<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>
- ◆ EPA Post-Construction Stormwater Management in New Development and Redevelopment Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#post>
- ◆ Westmoreland Conservation District Typical Best Management Practices for Construction Sites
<http://wcdpa.com/wp-content/uploads/WCD-BMP-Booklet-2016-web.pdf>

MCM6: Pollution Prevention/Good Housekeeping for Municipal Operations

- ◆ Sample Municipal Facilities Operation and Maintenance Program Plan
Optional MS4 MCM #6 model "Inventory" and "O&M Plan"
http://www.dep.pa.gov/Business/Water/PointNonPointMgmt/StormwaterMgmt/Stormwater/Pages/MS4-Resources.aspx#.VxfJG_krKUK
- ◆ EPA Pollution Prevention/Good Housekeeping for Municipal Operators Resources
<https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#poll>

**Links are active as of June 2016. Please contact the Water Resource Center with any information on broken links.
An electronic version of this guide can also be found on the SPC Water Resource Center Website (www.spcwater.org).

The Southwestern Pennsylvania Commission (SPC) hereby gives public notice that it is the policy of the Commission to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI and other related statutes require that no person in the United States of America shall, on the grounds of race, color, sex, national origin, age, or disability, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which SPC receives federal financial assistance. Any person who believes they have been aggrieved by an unlawful discriminatory practice by SPC under Title VI has a right to file a formal complaint with the Commission. Any such complaint must be in writing and filed with SPC's Title VI Coordinator within one hundred eighty (180) days following the date of the alleged discriminatory occurrence. For more information, or to obtain a Title VI Discrimination Complaint Form, please see our website at: www.spcregion.org or call 412-391- 5590.



Funding for the development of this booklet was provided by the Southwestern Pennsylvania Commission Water Resource Center and the Pennsylvania Department of Environmental Protection's Environmental Education Grants Program

Southwestern Pennsylvania Commission Water Resource Center

In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region. WRC's Mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments.

**For an electronic version of this guide, visit:
www.spcwater.org**

HOMEOWNER'S GUIDE TO STORMWATER

SOUTHWESTERN PENNSYLVANIA'S
**Homeowner's Guide to
 STORMWATER**

How to develop & implement a stormwater management plan for your property



This guide has been funded by the League of Women Voters of Pennsylvania
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 administered by the U.S. Environmental Protection Agency

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 The Homeowner's Guide to Stormwater produced by the Little Conestoga Partnership
 and its funder the National Fish and Wildlife Foundation

Partners for the Southwestern Pennsylvania Guide



County of Allegheny



City of Pittsburgh



County of Westmoreland

PENNSTATE



Cooperative Extension
 College of Agricultural Sciences



Produced by:



**Penn's Corner Conservancy
 and Charitable Trust, Inc.**

Penn's Corner Conservancy and Charitable Trust, Inc.
 c/o Allegheny County Conservation District
 Riverwalk Corporate Centre
 33 Terminal Way, Suite 325 B
 Pittsburgh, PA 15219



Residential rain garden in Mount Pleasant, PA

Penn's Corner Conservancy Charitable Trust, Inc.

Our vision: Complete restoration and ongoing conservation of our natural resources, in harmony with strong, productive communities.
Our mission: To enhance the area's natural resources and build strong communities by fostering regional partnerships, securing resources, and delivering needed services and programs.
Our focus: Entire southwestern Pennsylvania region.

Contact your local County Conservation District for more information about stormwater

- Allegheny(412) 241-7645 www.accdpa.org
- Armstrong(724) 548-3425 www.armstrongcd.org
- Beaver(724) 378-1701 beavercountyconservationdistrict.org
- Builer(724) 284-5270 www.bccdonline.org
- Fayette(724) 438-4497 www.fayetteccd.org
- Greene.....(724) 852-5278 www.co.greene.pa.us
- Indiana.....(724) 471-4751 www.iccdpa.org
- Washington.....(724) 705-7098 pawccd.org
- Westmoreland(724) 837-5271 www.wcdpa.com

Photo Credits

- Kathryn Hamilton, RIA: inside front cover; page 2, stormdrain; page 3, driveway; pavers; page 5, surface ponding; stream erosion; downspouts; page 7, rain garden; page 16, maps; page 17, pavers; page 18, swale in rain; coneflower and bee
- Stephen Simpson, page 2, stormwater on road
- Margaret Kyler, page 6, rain gauge
- Matt Kofroth, LCCD, page 18, girl and rain barrel
- Matt Royer, Penn State, page 8, planting
- Dick Brown, page 8, vegetated swale
- Fritz Schroeder, Live Green, page 17, rain barrel
- Kristen Kyler, Penn State, page 19 measuring water
- Mark Jackson, page 2, forest; page 7, riparian buffer; page 8 meadow; page 23, houses

Graphics

- Matt Zambelli, page 4, property boundaries; buildings on property; page 5, natural features on property; page 21, BMP graphics; map of potential best management practices on property. Best Management Practices Treatment Potential for one inch rainfall.

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Purpose of this Guide

Are you concerned about water quality? Is flooding a problem in your neighborhood? Are you planning a home improvement project? If the answer is yes to any of these questions, then you need to know more about managing stormwater.* This guide will help you better understand:

- what stormwater is, why stormwater runoff can be a problem, and what you can do about it;
- how much stormwater runoff is generated by impervious areas on your property;
- how stormwater flows across and leaves your property; and
- how you can reduce the amount of stormwater runoff leaving your property.

This guide will help you create your own stormwater management plan and select simple stormwater solutions to be implemented on your property.

** Check with your local municipality to find out more about what permits may be required for any building projects.*

Acknowledgments

The Penn's Corner Conservancy Charitable Trust, Inc., extends its appreciation to the Little Conestoga Partnership and its funder, the National Fish and Wildlife Foundation, for allowing us to adapt their publication, The Homeowner's Guide to Stormwater, for our residents in southwestern Pennsylvania. Members of the Little Conestoga Partnership include: Alliance for the Chesapeake Bay, Brandywine Conservancy, Chesapeake Bay Foundation, Habitat MT, Lancaster County Clean Water Consortium, Lancaster County Conservancy, Lancaster County Conservation District, Lancaster County Planning Commission, Little Conestoga Watershed Alliance, PA Department of Environmental Protection, PA Department of Conservation and Natural Resources, PA Landscape & Nursery Association, and Penn State University.

Section 1: Introduction

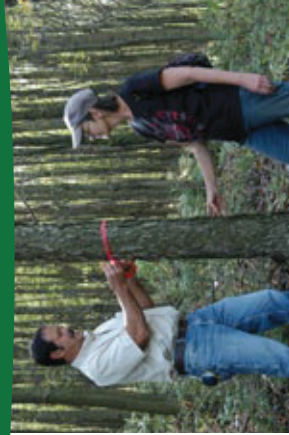
What is Stormwater Runoff?

Stormwater runoff is precipitation (rain or snowmelt) that flows across the land. Stormwater may infiltrate into soil, discharge directly into streams, water bodies, or stormdrains, or evaporate back into the atmosphere.

In the natural environment, most precipitation is absorbed by trees and plants or permeates into the ground, which results in stable stream flows and good water quality.

Things are different in the built environment. Rain that falls on a roof, driveway, patio, or lawn runs off the surface more rapidly, picking up pollutants as it goes. This stormwater runoff flows into streams or storm drains that empty into waterways like the Allegheny, Monongahela and Ohio rivers.

Healthy forest



What Can I Do to Help?

As a homeowner, you can help avoid the problems associated with stormwater runoff by:

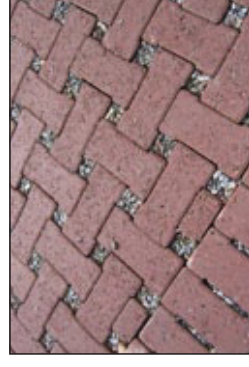
- reducing impervious areas (hard surfaces like roofs, paved areas) so that rain soaks into the ground
- planting native trees and plants which help infiltrate stormwater and increase evaporation and transpiration
- managing stormwater on-site with rain gardens, rain barrels, and similar practices
- following the lawn care practices described in this guide

By doing many small things on your property, you can have a big impact on improving stormwater management and water quality in our region.

Impervious surface



Permeable pavers

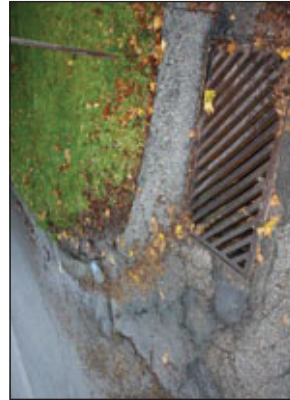


Why Can Stormwater Runoff Be a Problem?

Poorly managed stormwater runoff can cause many problems. These include:

- **Flooding.** As stormwater runs off roofs, driveways, and lawns, large volumes quickly reach streams, causing them to rise and flood. When more impervious surfaces exist, flooding occurs rapidly and can be severe, resulting in damage to property and harm to people.
- **Pollution.** Stormwater running over roofs, driveways, roads, and lawns will pick up pollutants such as oil, fertilizers, pesticides, dirt/sediment, trash, and animal waste. These pollutants “hitch a ride” with the stormwater and flow untreated into local streams, polluting our waters.
- **Stream Bank Erosion.** When stormwater flows into streams at unnaturally high volumes and speeds, the power of these flows can cause severe stream bank erosion. Eroding banks can eat away at streamside property, create dangerous situations, and damage natural habitat for fish and other aquatic life. This erosion is another source of sediment pollution in streams.
- **Threats to Human Health.** Stormwater runoff can carry many pollutants, such as toxic metals, organic compounds, bacteria, and viruses. Polluted stormwater, especially coming from combined sewer overflows, can contaminate drinking water supplies and hamper recreational opportunities as well as threaten fish and other aquatic life.

Storm drain



Polluted urban flooding

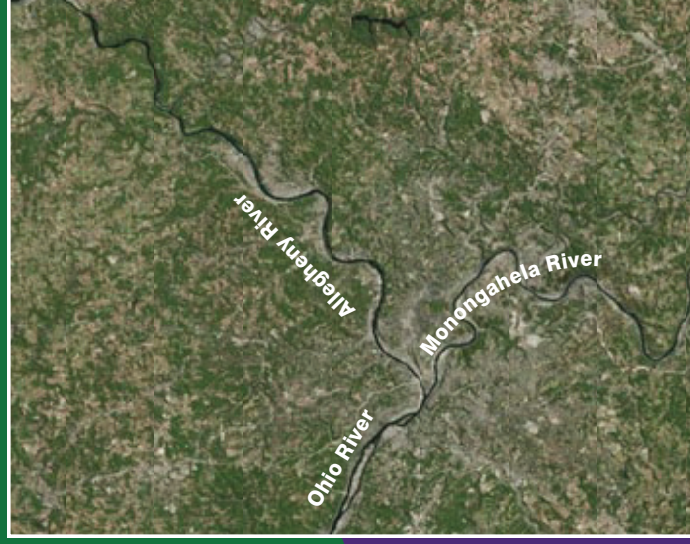


Photo by ESRP

In Pennsylvania, the drainage area of the Allegheny, Monongahela, and Ohio rivers covers more than a third of the state and is home to more than three million people. (www.orsanco.org)

Managing stormwater on your property will not only help protect local streams, but will also help clean up downstream waterways like these rivers.

Section 2: Assessing Stormwater on Your Property

In order to better manage stormwater on your property you should first understand how stormwater affects it. Follow these simple steps to figure out where stormwater is generated, how it flows, and approximately how much stormwater comes from your property. You may draw your map on paper using Appendix A, or use the additional instructions in Appendix B to create an aerial photo map.

1. Walk your property and map your boundaries and basic features.

Step 1: Draw your property boundaries.

Draw the boundaries of your lot. If you are not sure of your boundaries, you may be able to look this up on your property tax assessment, deed to your house, or at your county's tax office.



Typical property boundary mapped via www.stormwaterguide.org

Step 2: Draw buildings and other features of your property.

Draw and label the buildings and other features of your property. These include:

- **Impervious areas.** These are hard surfaces on your property that prevent stormwater from soaking into the ground. They include rooftops, driveways, parking areas, walkways, decks, patios, or other hard surfaces.
- **Lawn and landscaped areas.** These include any areas with grass or landscaping that you regularly maintain.
- **Natural vegetation.** These are areas of woods, meadow, or other naturally vegetated areas that are allowed to grow on your property.
- **Water features.** These could be streams, wetlands, ponds, or swimming pools.



Impervious surfaces mapped via www.stormwaterguide.org

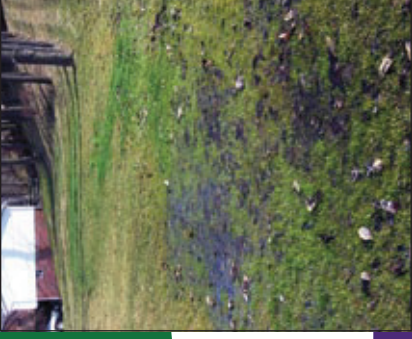
You can determine the approximate size of each area by using a tape measure and calculating the square footage of each. Depending on the overall size of your property, you may want to calculate these areas in square feet or convert to acres (1 acre = 43,560 square feet). If your property has no natural vegetation, such as woods or meadows, or water features on it, you can simply subtract the impervious areas from your total lot size to get your total lawn and landscaped area.

2. Assess and map your stormwater flow.

The next step is to show how and where runoff flows on your property and identify any problems it may be causing. Common stormwater problems may include large puddles ("ponding"), damp basements, soil erosion, and collapsing stream banks. The ideal time to assess stormwater flow is during or immediately after a rain storm. Look for and map the following:

- **Roof downspouts.** Indicate the location of roof downspouts and the direction stormwater flows from the downspouts.

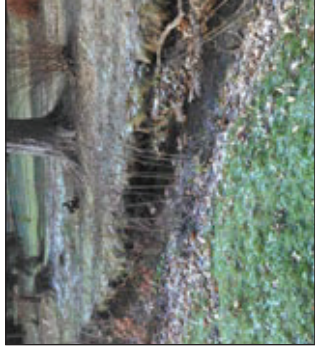
Surface ponding



- **Stormwater flow paths.** Using arrows, show the direction of stormwater flow off impervious surfaces. If you have any areas where stormwater collects, such as drainage swales or ditches, show this and label them as such.

- **Areas of ponding.** Indicate locations of standing water or ponding on the map.

- **Gullies or ditches from soil erosion.** Indicate any areas of soil erosion which have resulted in gullies or ditches. This may appear within existing drainage swales or channels and would be good to note on your assessment.



Stream erosion

- **Slope of the land.** Water always flows downhill.

Which areas of your property are high and which are low? What is above or below your home?

If you have multiple downspouts, drainage channels, ponding areas, etc., organize your map and assessment plan by numbering them.



Natural features mapped via www.stormwaterguide.org



Downspouts for roof runoff

Section 3: Developing Your Stormwater Management Plan

Now that you know what areas of your property generate stormwater when it rains, how the runoff flows, and what areas generate the most amount of runoff, you can start thinking about adding stormwater management practices to your property.

1. Types of stormwater best management practices.

Many management practices exist for handling stormwater runoff. This guide suggests six of the simpler, easier to implement practices. Each practice is introduced briefly in this section so you can consider which ones are right for you. (related cost value scale: \$ \$\$ \$\$\$ \$\$\$\$)

RAIN GARDEN A depressed landscape bed that uses mulch, soil mix, and deep-rooted native plants to capture, absorb, and infiltrate stormwater.		
Benefits	<ul style="list-style-type: none"> Manages stormwater and filters pollutants Provides wildlife habitat Minimal maintenance Adds beauty 	<p>Cost</p> <ul style="list-style-type: none"> \$ - \$\$\$ Varies depending on size and depth
Negatives	<ul style="list-style-type: none"> Plants can take 2-3 years to establish More maintenance required in first few years 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Construct downslope of runoff to be captured Locate at least 10 feet from buildings & utilities Soils may require underdrain
Maintenance	<ul style="list-style-type: none"> Low once plants are established Weeding and watering in first two years Some thinning in later years 	<p>Aesthetic Appeal</p> <ul style="list-style-type: none"> Ranges from medium to high Can customize based on plant selection
RIPARIAN BUFFER Planting native trees or shrubs along streams to restore the streamside area to forested conditions. These "riparian buffers" filter runoff and have numerous water quality benefits.		
Benefits	<ul style="list-style-type: none"> Increases infiltration and groundwater recharge Improves water quality Controls erosion & sedimentation Provides wildlife habitat 	<p>Cost</p> <ul style="list-style-type: none"> \$ Supplement existing native vegetation
Negatives	<ul style="list-style-type: none"> Not as effective on steep slopes Flooding may damage planting 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Plant in spring or fall Contact your municipality or conservation district for possible permit information
Maintenance	<ul style="list-style-type: none"> Low, once native plants are established Weeding and watering in first two years Some plant thinning in later years Regularly remove debris 	<p>Aesthetic Appeal</p> <ul style="list-style-type: none"> Ranges from medium to high Higher aesthetic appeal than conventional stormwater conveyances

3. Estimate how much stormwater is generated on your property.

The amount of stormwater runoff generated from your property depends on how long and how hard it rains, the slope of your property, the type and quality of the soils, the amount of impervious surface on your property, and other factors. Nevertheless, there is a simple calculation you can use to estimate how much stormwater runoff your property generates during a typical rainstorm.

The majority of annual rainfall in southwestern Pennsylvania comes in the form of small storms of one inch or less. These small storms carry most of the pollutants that impact water quality, and thus the stormwater generated by your property for the one inch storm is a good measure of typical stormwater runoff. Use the following chart to determine how much stormwater is generated by the impervious area on your property:

Square Feet of Impervious Area	Gallons of Runoff to be Managed
500 or less	less than 312
501 - 1,000	312 - 624
1,001 - 2,000	624 - 1,246
2,001 - 3,000	1,246 - 1,869
3,001 - 4,000	1,869 - 2,492
4,001 - 5,000	2,492 - 3,115
5,001 - 10,000	3,115 - 6,231
10,001 - 20,000	6,231 - 12,462
20,001 - 43,000	12,462 - 26,793

The above numbers were calculated using the following formula:

$$(\text{Total square feet of impervious area}) \times 0.0833 \times 7.48 = \text{_____ gallons of runoff}$$

Use this formula if you want a more accurate calculation of the runoff generated from your impervious area.

0.0833 is to convert feet to inches • 7.48 = number of gallons per cubic foot



Rain gauge

Appendix A: Stormwater Management Plan Template

You may use this template to create your stormwater management plan.

1. Map

Use the grid paper provided to hand draw your stormwater management plan map. (See sample map on page 16.) Or, follow the tutorial provided in Appendix B to create a computer generated aerial map. If you hand draw your map, it is suggested you use one ink color to draw existing conditions and a different color to draw your proposed stormwater management practices.

2. Plan Details

Fill in the template to create the details of your plan. For both existing conditions and proposed stormwater management practices, be sure to label all features on your map with numbers that correspond to the plan template.

Stormwater Management Plan

Property Owner's Name: _____

Property Address: _____

Municipality: _____ County: _____

Watershed: _____ (example: Youghiogheny River)

Name of stream into which stormwater flows: _____ (example: Sewickley Creek)

EXISTING CONDITIONS

IMPERVIOUS AREAS		
Buildings	Description (house, shed, etc.)	Square Feet
Driveways and Walkways		
Other Hard Surfaces		
Total Impervious Area:		

TREE PLANTING	
<p>Planting native trees and shrubs to restore a portion of your property to forested conditions.</p> <p>Benefits</p> <ul style="list-style-type: none"> Increases infiltration and evapotranspiration of stormwater Filters pollutants Requires minimal maintenance Provides wildlife habitat Large numbers of native trees maximizes benefits <p>Maintenance</p> <ul style="list-style-type: none"> Maintain tree tube/stakes or cages, remove after 5 years Mow between trees at least twice a year during first 4 to 5 years 	<p>Negatives</p> <ul style="list-style-type: none"> Takes many years before trees grow to provide maximum benefit Regular maintenance is required where invasive plant species exist Must guard against deer browsing and rodent damage <p>Aesthetic Appeal</p> <ul style="list-style-type: none"> High aesthetic appeal, as trees add interest, structure, color, and wildlife to property
<p>Cost</p> <p>\$-\$-\$</p> <ul style="list-style-type: none"> Varies, depending on species, size, and type of tree planted 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Plant in spring or fall Watering may be necessary after planting during dry weather (25 gallons/week)



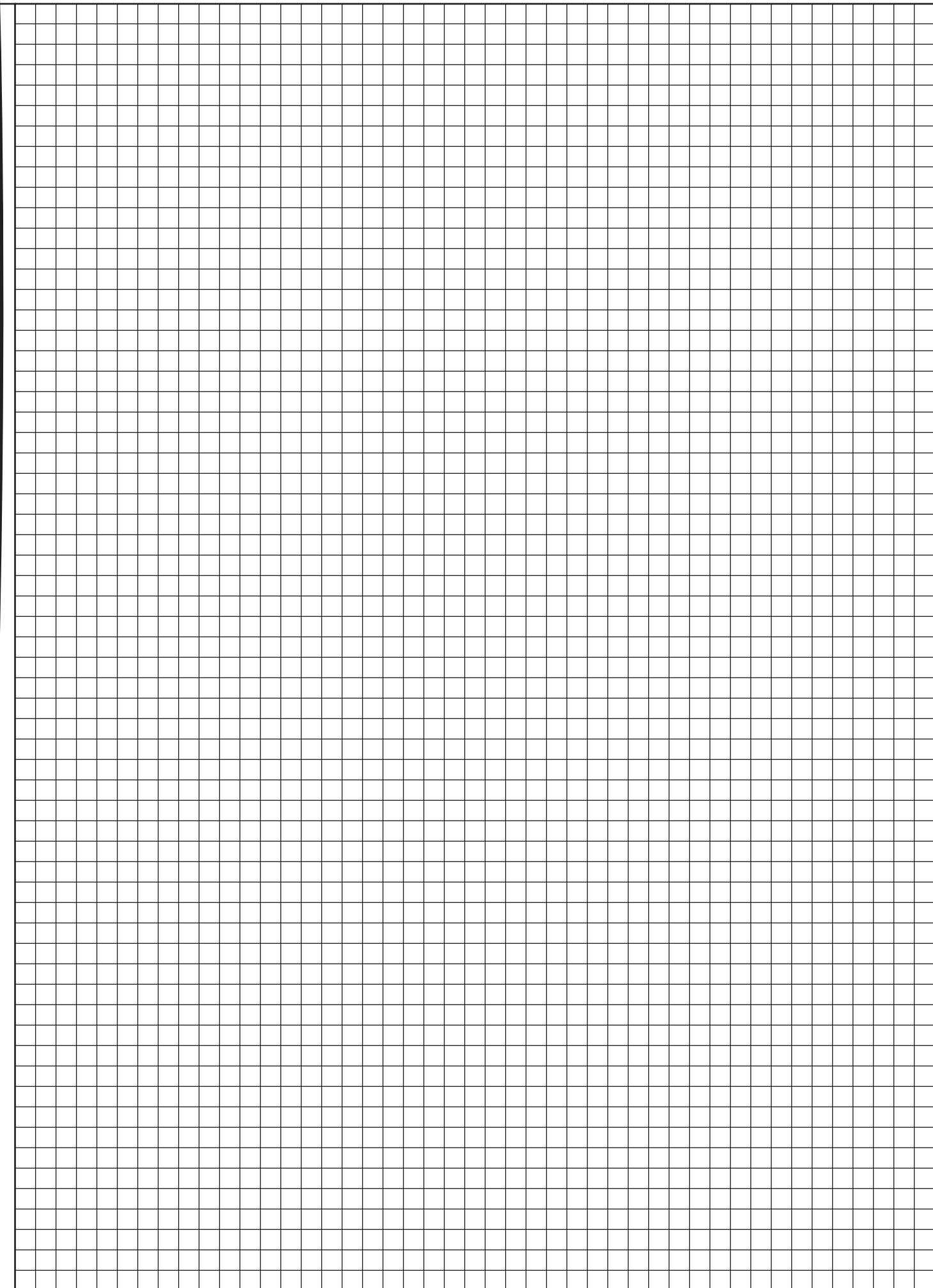
"Trees can lower energy costs, remove pollution from the air, increase property values, capture stormwater and provide wildlife habitat."

(Pittsburgh Office of Sustainability)

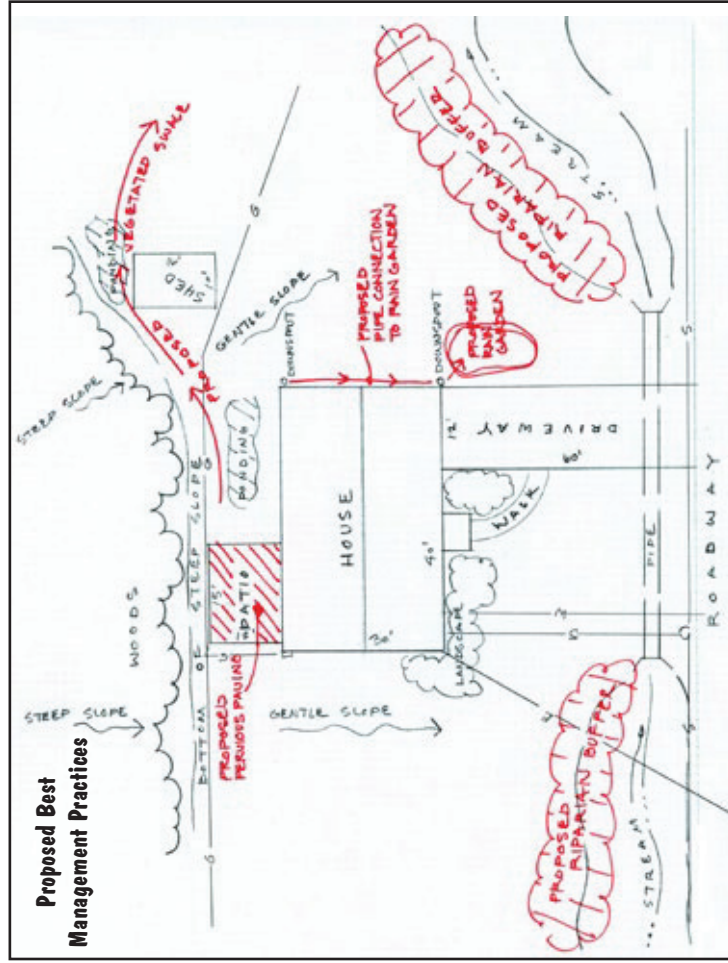
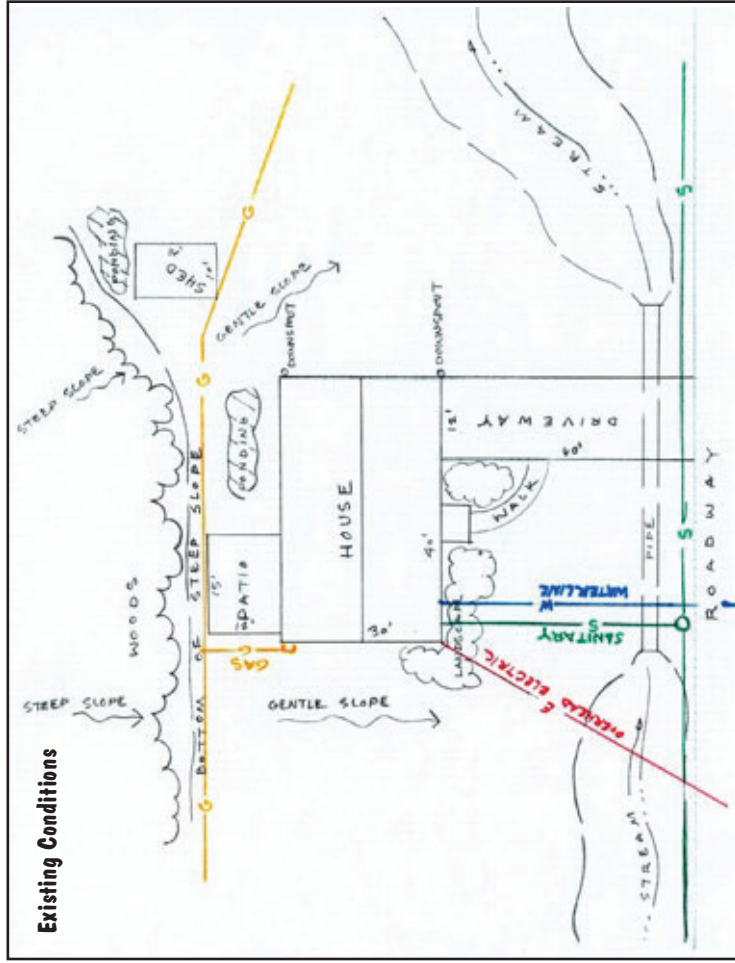
VEGETATED SWALE OR NATIVE MEADOW	
<p>An area planted with native grasses and wildflowers and maintained as a natural area. "No mow" areas can also develop into meadow areas.</p> <p>Benefits</p> <ul style="list-style-type: none"> Increases infiltration and evapotranspiration of stormwater Filters pollutants Requires little maintenance Provides wildlife habitat <p>Maintenance</p> <ul style="list-style-type: none"> Mow twice a year for first two years, then annually Control invasive plant species 	<p>Negatives</p> <ul style="list-style-type: none"> Site preparation (including turf grass removal) is required before planting Meadows may conflict with local weed ordinances <p>Aesthetic appeal</p> <ul style="list-style-type: none"> High aesthetic appeal, as tall grasses and wildflowers add interest, structure, color, and wildlife to property
<p>Cost</p> <p>\$</p> <ul style="list-style-type: none"> Native seed mixes vary depending on type of species and amount of variety desired 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Plant in spring Monitor and control invasive species



Stormwater Management Plan Map



SAMPLES - MAPS & PLANNING



<p>PERVIOUS PAVING</p> <p>Pervious concrete or asphalt can be poured in place for use in driveways, parking areas, or walkways. Impervious building materials, such as stone, concrete, or brick, can be laid with space in between to allow for pervious areas (gravel, sand, or vegetation).</p>	
<p>Benefits</p> <ul style="list-style-type: none"> Increases infiltration and groundwater recharge Reduces volume and rate of runoff 	<p>Negatives</p> <ul style="list-style-type: none"> More labor intensive to install than other practices Extra maintenance needed
<p>Maintenance</p> <ul style="list-style-type: none"> Moderate to high maintenance Grass between pavers may have to be mowed Inspect for signs of clogging Pressure wash and replace pea stone as needed Snow plow using higher blade 	<p>Aesthetic appeal</p> <ul style="list-style-type: none"> Ranges from low to medium Artistic designs with layout can increase aesthetic appeal Creeping plants can be used as infill
<p>Cost</p> <p>\$\$\$</p> <ul style="list-style-type: none"> Can save by installing permeable pavers May need to excavate and install stone base 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Need to install permeable stone base layer 10"-12" thick May require underdrain Pavement subgrade should slope away from building foundation

<p>RAIN BARREL/CISTERN</p> <p>A barrel that captures rainwater from a roof and stores it for later use, such as watering plants or gardens. A cistern is a larger container that does the same thing.</p>	
<p>Benefits</p> <ul style="list-style-type: none"> Conserves water Captures and reuses stormwater 	<p>Negatives</p> <ul style="list-style-type: none"> Minimal volume captured Poor construction or maintenance can result in mosquitoes Freezing/splitting if not put away in the winter
<p>Maintenance</p> <ul style="list-style-type: none"> Clean screen/filter regularly Clean gutters twice annually Monitor during severe storms to avoid overflow Empty before winter months 	<p>Aesthetic appeal</p> <ul style="list-style-type: none"> Ranges from low to medium depending on type of barrel used
<p>Cost</p> <p>\$</p> <ul style="list-style-type: none"> Minimal cost as DIY project Can save dollars because of reduced potable water usage 	<p>Implementation Considerations</p> <ul style="list-style-type: none"> Place on level surface Full rain barrel weighs 400 lbs Can be used in series for more storage capacity Water should be used between rain events

3. Choose where to locate the stormwater best management practices on your property.

Now that you know about your property and the type of practices you would like to install, it's time to choose the right locations for the practices. Some considerations in your planning are:

- **Ponding Water.** Many stormwater practices encourage water to infiltrate into the soil (such as rain gardens and pervious paving). Where water ponds on your property, water is unable to infiltrate and it may be inappropriate to use these practices. (*Note- if you have an on-lot sanitary septic disposal system and an area is permanently wet near this system, the septic system may be failing. The disposal system should be evaluated and fixed before any other practices are installed.*)
- **Depth to bedrock.** You do not want to construct infiltration practices where rock layers are visible or are close to the surface.
- **Proximity to foundations.** You should also avoid constructing infiltration practices within 10 feet of building foundations.
- **Location of underground utilities.** Do not construct infiltration practices near septic systems or drinking water wells. Also avoid any underground utilities such as electric, cable, water, sewer, and gas lines (make sure to use the PA ONE-CALL system to locate underground utilities and contact your municipality).



Infiltration test

- **Slope.** Depending on the practice, a steeper slope may prohibit siting, or it may be something that needs to be taken into account during the design stage. Consult the chart on the next page for guidance.
- **Soil percolation.** Since rain gardens and pervious paving are designed to infiltrate stormwater into the ground, the soil in the location of the rain garden or pervious paving must be able to drain. When considering these practices, you should conduct a simple percolation test where you would like to locate them:
 - Dig a 1 foot deep hole and fill with water.
 - Allow the water to moisten soil and drain completely. If water is still in the hole after 24 hours, choose a different location.
 - Fill the hole with water a second time and place a ruler in the hole. Note the water level and time.
 - After 15 minutes, re-measure the water level. Multiply the change in water level by 4 to get the number of inches of infiltration per hour.
 - A perforated underdrain may be necessary to drain excess water from a rain garden or permeable pavement if the infiltration rate is less than 1/2 inch per hour.



2. Factors to consider when choosing stormwater best management practices for your property.

Here are some considerations that might help you decide which practices you would like to install on your property.

- If you would like to enhance your landscaping with flowers and other attractive plants consider a rain garden or a native meadow/swale.
- If you want to reduce the amount of time it takes to mow the lawn, a rain garden or native meadow/swale would help accomplish this goal.

If you would like to see more butterflies, a rain garden or native meadow/swale can provide excellent butterfly habitat.

- If you have outdoor water needs (water for a garden, to water your lawn, or to wash your car) consider a rain barrel.
- If you don't have much yard to work with, a rain barrel takes up minimal space.
- If your driveway needs to be repaved, consider using pervious paving instead of traditional pavement.
- If you would like to give your patio a new look, consider pervious paving.



Rain barrel use

- If you would like to restore forested conditions on a portion of your property, consider tree planting.
- If a stream is running through your property installing a forested riparian buffer would be beneficial.
- If you want to cut down on air conditioning costs during the summer, consider planting some trees on your property.

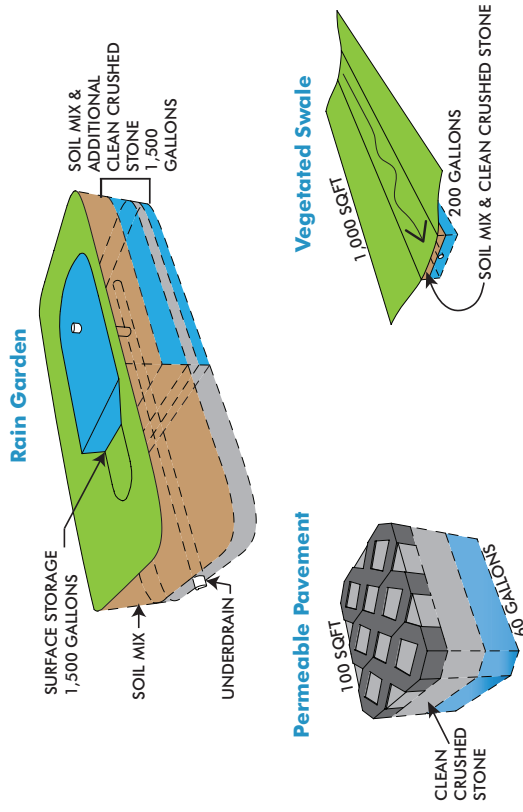


Native Purple Coneflower

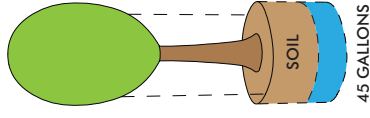


Tree planting

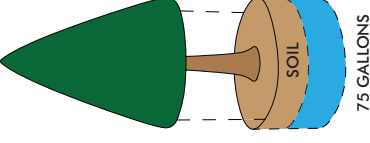
Best Management Practices: Stormwater Captured During a 1" Rainfall



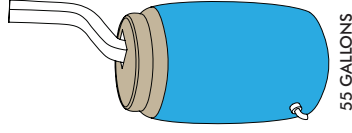
2" Caliper Deciduous Tree



6' Tall Evergreen Tree



Rain Barrel
100 sq ft of Roof



4. List and map your chosen stormwater best management practices.

Now that you've chosen stormwater management practices for your property, list them on the stormwater management plan template provided in Appendix A. Draw them on your property map. Again, you can either hand draw them on the graph paper provided in Appendix A, or continue to follow the Computer Mapping Tutorial in Appendix B to map your chosen stormwater practices on your computer generated property map.



Map of potential best management practices via www.stormwaterguide.org

Use this summary chart to help you select one or more stormwater practices that are right for your property.

	Rain Garden	Riparian Buffer	Tree Planting	Native Swale/Meadow	Pervious Paving	Rain Barrel/Cistern
Space Required	Minimum Size: 50 – 200 ft ² 5 – 10 ft wide 10 – 20 ft long 6 – 12 inches ponding depth	The wider the better for water quality benefits based on lot size and configuration	Consider space needed for canopy spread	Not a factor	As needed to accommodate walkway, patio, or driveway	Not a factor
Slopes	Locate down slope of building foundations and drainage	Not usually a limitation, but a design consideration	Not usually a limitation, but a design consideration	5% or less along length of swale	2% or less	Barrel must be on level surface
Depth to Water Table	1 – 4 ft clearance	Not a factor if correct species are planted	1 – 4 ft clearance	1 – 4 ft clearance	1 – 4 ft clearance	Not a factor
Depth to Bedrock	1 – 4 ft clearance	1 – 4 ft clearance	1 – 4 ft clearance	Not a factor	1 – 4 ft clearance	Not a factor
Building Foundations	Minimum 10 ft down slope from building foundations	Usually not a factor	Usually not a factor	Usually not a factor	Usually not a factor	Usually not a factor
Maintenance All practices should be inspected seasonally and after major storm events.	Low to Moderate: Weeding and watering in first 2 years. Some thinning in later years. Replace mulch.	Low to Moderate: Maintain tree tubes or cages. Mow between trees for first 4-5 years. Control invasives. Water as needed.	Low to Moderate: Maintain tree tubes or cages. Mow between trees for first 4-5 years. Control invasives. Water as needed.	Low to Moderate: Mow twice annually for first two years. Control invasive plants	Moderate to High: Trim vegetation. Inspect for signs of clogging and vacuum 2 times per year. Replace stone fill as needed.	Low: Clean screen/filter regularly. Clean gutters twice annually. Monitor for overflows. Empty and store before winter months.
Treatment Potential	1500 gallons treatment capacity per 200 ft ² *	200 gallons captured and treated per 1000 ft ²	45 gallons of water captured and treated per 2 inch caliper deciduous tree. 75 gallons of water captured and treated per 6 ft evergreen tree	200 gallons captured and treated per 1000 ft ²	30 gallons water captured and treated for a 1/2 inch rain fall per 100 ft ²	A 55 gallon drum will be filled from a one inch storm on a 100 ft ² roof

*the subsurface storage of a rain garden should be equal to the surface ponding volume.

Chart adapted from the New Hampshire Homeowner's Guide to Stormwater Management Do-It-Yourself Stormwater Solutions. NH Department of Environmental Services (March 2011, revised February 2012).

Please remember that by law and for safety you must call PA One Call before digging underground so you know where your underground utilities are located (ie electrical, sanitary sewer, water, etc.).

Section 4: Implementing Your Stormwater Management Plan

Congratulations! Your stormwater management plan is complete! You have taken an important step in managing stormwater on your property to help clean your local stream and river. Now you are ready to start implementing your plan. If you are a do-it-yourselfer, there are several online resources that provide detailed design and implementation guidance for the six practices discussed in this guide. Note: Please refer to the disclaimer at the end of this guide.

In the meantime, here are some other online guides you can reference:

RAIN GARDENS

Rain Gardens: A How-To Manual for Homeowners (University of Wisconsin Extension)
<http://learningstore.uwex.edu/assets/pdfs/GWQ037.pdf>

Rain Gardens in Connecticut: A Design Guide for Homeowners (UConn Cooperative Extension System) http://nemo.uconn.edu/publications/rain_garden_broch.pdf

Primer - Bioretention in Clay Soils <http://wcdpa.com/tech-services/stormwater-management/stormwater-primer-entry-page/>

Three Rivers Rain Garden Alliance
<http://www.raingardenalliance.org>

RIPARIAN BUFFERS

Riparian Forest Buffer Guidance (PA Department of Environmental Protection)
<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-82308/394-5600-001.pdf>

TREE PLANTING

Planting and After Care of Community Trees (Penn State Extension)

<http://pubs.cas.psu.edu/freepubs/pdfs/uh143.pdf>

PATrees.org: The Free Resource Guide

<http://www.patrees.org>

NATIVE MEADOWS

Meadows and Prairies: Wildlife-Friendly Alternatives to Lawn (Penn State Extension)

<http://pubs.cas.psu.edu/FreePubs/pdfs/uh117.pdf>

PERVIOUS PAVING

New Hampshire Homeowner's Guide to Stormwater Management Do-It-Yourself Stormwater Solutions: Pervious Walkways & Patios (NH Dept. of Environmental Sciences)

<http://des.nh.gov/organization/divisions/water/stormwater/documents/perv-walkw-patios-fs.pdf>

Westmoreland Conservation District Fact Sheets

<http://www.wcdpa.com>

RAIN BARRELS AND CISTERNS

Build Your Own Rain Barrel (Chesapeake Bay Foundation) <http://www.cbf.org/Document.Doc?id=30>

Rainwater Harvesting: Guidance for Homeowners (North Carolina Cooperative Extension)

<http://www.ces.ncsu.edu/depts/agecon/WECO/documents/WaterHarvestHome2008.pdf>

STORMWATER MANAGEMENT

3 Rivers Wet Weather

<http://www.3riverswetweather.org>

StormwaterPA

<http://stormwaterpa.org/>

Pennsylvania Stormwater Best Management Practices Manual

<http://wcdpa.com/publications/technical-reference-manuals/pa-stormwater-bmp-guide-2006-cover-id/>

WATERSHEDS

EPA Surf Your Watershed

<http://cfpub.epa.gov/index.cfm>

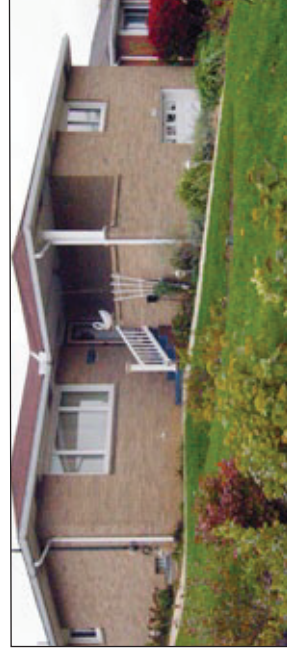
If installing these stormwater practices is not something you want to tackle, you can take your plan to a landscape professional with experience in designing and implementing these types of stormwater practices. You may want to do some of the work yourself and enlist the help of a professional to do the other part. The choice is up to you.

Please note that this guide focuses on six practices that are fairly simple to plan and construct. There are many other, more complex stormwater best management practices that may be applicable to your property and that you may want to consider. These include bioswales, underground cisterns, drywells, infiltration trenches, and many more. If you are interested in seeing if any of these types of practices are a good fit for your property, you should consult an experienced professional to plan, design, and implement them.

Section 5: Healthy Lawn Care Practices

The practices described in this guide are alternatives to maintaining a lawn and go a long way to protecting our streams. Yet lawns remain a significant component of the residential landscape and are important to homeowners for many uses. A special EPA Expert Panel looking at the issue

of lawns and water quality concluded that maintaining a dense, vegetative cover of turf grass reduces runoff, prevents erosion, and retains nutrients in the turf grass.



EPA'S TIPS FOR GROWING AND MAINTAINING A HEALTHY LAWN:
Consult with your local Penn State extension office or lawn care professional for technical assistance to develop an effective nutrient management plan for your lawn based on a soil test analysis.

The precise lawn care prescription should be based on site-specific recommendations that take into account soil properties, the type of grass species, the age of the lawn, and other factors. Look

for professionals who are Pennsylvania Certified Horticulturists or Landscape Industry Certified.

Per the recommendations of your local extension educator or your lawn care professional, follow one of four fertilizer application strategies: (1) choose not to fertilize; (2) fertilize with organic materials; (3) reduce rate and monitor; or (4) apply less than a pound of nitrogen per 1,000 square feet per each individual application.

First, elect not to fertilize at all. Some lawns, due to their age or natural soil fertility may be able to maintain a healthy, dense cover without additional fertilization. (However, if your lawn is thin, is weed infested, or has bare spots, you should consider fertilizing to restore a thick turf grass cover, using one of the other three strategies.)

Second, apply organic fertilizer such as compost, composted manure, or Milorganite™

Third, take a “reduced rate and monitor” approach. For this approach, follow the nitrogen application rates on the fertilizer bag label and reduce them by one-third to a half, and monitor the results. If lawn quality starts to fall below acceptable levels, re-apply at the reduced rates.

Fourth, fertilize at the Penn State Extension recommended rate (3.0 to 3.5 pounds of nitrogen per 1,000 square feet of lawn per season), but split into 3 or 4 small doses during the growing season (for example, early spring, late spring, late summer and mid-fall). This will get you to an accepted application rate of less than a pound of nitrogen per 1,000 square feet for each individual application.

Most bagged fertilizers in Pennsylvania have already removed phosphorus from their products, except for “starter fertilizers” used to establish grass seed in new lawns. If your soil tests show a phosphorus deficiency, ask your lawn care professional for recommendations on how to provide the phosphorus your lawn needs.

Use a mulching mower to retain clippings and mulched leaves on the lawn and keep them out of streets and storm drains.

Lawn clippings are high in nutrients and should be treated as if they are a fertilizer. Nitrogen fertilization can be reduced without decreasing turf grass quality when clippings are left to decompose and return to the lawn.

Do not apply fertilizers before spring green up or after the grass becomes dormant.

The risk of pollution by leaching or surface runoff is greatest during the seasons of the year when grass is dormant. Avoid applying fertilizer in the late fall or winter. In spring, wait until the grass begins to green.

Maximize use of slow release nitrogen fertilizer.

Less nutrient loss occurs when slow release fertilizer products are used during the growing season, compared to water soluble formulations. Slow release fertilizer is typically shown on fertilizer products as water insoluble nitrogen (WIN), and can range from 20 to 50% of the total nitrogen product. You can shop for the fertilizer product with the greatest percentage of WIN. Avoid using in late fall as they may release nitrogen when the grass is dormant or frozen.

Apply lime.

Lime will improve vegetation health and soil porosity. Many southwestern PA soils are clay-based and have a low pH - an indication of an acid soil. Lime applied according to Penn State Extension recommendations will ensure good turf grass growth and stormwater retention.

Immediately sweep off any fertilizer that lands on a paved surface.

Rotary spreaders are the most common method to apply fertilizers and can broadcast fertilizer granules near the edge of a lawn, street, or driveway, where they can be subsequently washed off in a rain storm. Sweep up wayward granules before they have a chance to get into gutters and storm sewers. If you use a rotary spreader, purchase one with a deflector shield to prevent spraying fertilizer on the street, driveway, or sidewalks.

Do not apply fertilizer within 15 to 20 feet of a stream, pond, or other water body and consider managing this zone as a perennial planting, native meadow, native grass buffer, or forest buffer.

The risk of runoff is greatest from lawn areas adjacent to water features such as streams, shorelines, sinkholes and drainage ditches. Consider establishing a riparian buffer of shrubs, trees, or perennials along streams and other water courses.

Set mower height at 3 inches or taller.

Maintaining taller grass produces a deeper and more extensive root system, increasing nutrient uptake, and reducing runoff. The deeper roots also capture moisture during times of drought, suppress weeds, and increase turf density.

A well maintained lawn, with a dense healthy cover of turf grass significantly slows and absorbs stormwater runoff. However, you should consider installing stormwater best management practices where runoff is causing problems. Rain gardens, trees, and vegetated swales help lawns infiltrate excess stormwater.

Disclaimer

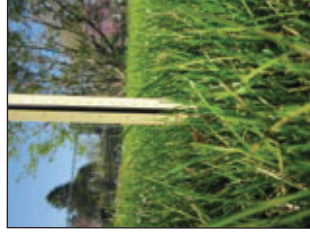
The practices described in this guide are provided exclusively for general educational and informational purposes. This guide is intended to help property owners evaluate and assess current runoff pathways on their properties and identify practices to better manage stormwater. This guide outlines several practices to choose from that are fairly simple to plan and construct.

All efforts have been made to ensure the material in this guide is accurate and up to date. However, Penn's Corner Conservancy and Charitable Trust and its partner organizations cannot be held responsible for any circumstances resulting from its use, unavailability, or possible inaccuracy.

This guide is not intended to be a substitute for professional design and implementation services. This guide provides you with general information on an “as is” basis. You acknowledge that you assume the entire risk of loss in using this guide and the information provided herein, including without limitation any loss incurred by any end user. You further acknowledge that the management of stormwater is a complex and site specific issue and that the general information contained in this guide may not be sufficient to assess any and all particular site conditions. Any stormwater management practice should be installed with the consultation of an experienced professional who can address specific site conditions.

The Penn's Corner Conservancy and Charitable Trust and its partner organizations make no representations and specifically disclaim all liabilities and warranties, express, implied, or statutory, regarding the accuracy, timeliness, or completeness for any particular purpose of any material contained in this guide.

The information presented in this guide does not in any way replace any municipal, county, state, or federal requirements or regulations related to stormwater management. You should check with all appropriate regulatory authorities before relying upon this guide to plan or implement any and all stormwater management practices on your property.



WHAT YOU CAN DO TO HELP



- Clean up after your pet every single time, on walks and in the yard.
- Dispose of the waste properly in the toilet, or bagged in the trash. **Never** place it in a storm drain!
- Town parks, trails and recreation areas offer complimentary waste bags and disposal receptacles for your convenience. Don't just leave bags on the ground.
- Carry extra bags when walking your dog and share them with other pet owners who are without.
- Keep extra bags in your car so you are prepared when you travel with your dog.
- Tell friends and neighbors about the harmful effects of animal waste on the environment. Encourage them to clean up after their pets also.

Interesting Fact!

Every dog produces about 3/4 lbs. of solid waste per day... and about 7.8 billion fecal coliform bacteria!

Pet Waste and Water Quality



You and your pet both love the outdoors, but did you know that failing to pick up your dog's waste can hurt the environment? Pet waste is full of bacteria, viruses and parasites. When pet waste is left on the lawn or the side of the street, all of the bacteria, viruses and parasites in that pet waste are picked up by rain water and washed down the storm drain into the nearest creek, river or pond. This is harmful for water quality and human health.

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Dog feces have a higher phosphorous concentration than found in cow and swine manure. Phosphorus is a nutrient that negatively impacts water quality and plant species. Nitrogen, found in dog urine, also causes contaminated runoff and leads to serious water quality issues.

Pet waste left on the ground eventually contaminates the watershed. Waste components like fecal bacteria and nutrients are washed into storm drains, streams, and other receiving waters by irrigation, rain, melting snow, and flooding. They can also simply leach through the soil and into the groundwater.

You Can Make A Difference!

Dog waste is cited as the 3rd or 4th largest contributor of bacterial pollution in urban watersheds.

The average dog produces approximately 3/4 pounds of poop every day. 1,000 dogs will produce 750 pounds of excrement a week. Do your part- pick up after your dog. It's the neighborly thing to do!

When pet waste is disposed of improperly, not only water quality suffers – your health may be at risk, too. Pets, children who play outside, and adults who garden are most at risk for infection from some of the bacteria and parasites found in pet waste. Flies may also spread diseases from animal waste.



Diseases or parasites that can be transmitted from pet waste to humans include:

- ◆ **Campylobacteriosis** – A bacterial infection carried by dogs and cats that frequently causes diarrhea in humans.
- ◆ **Cryptosporidium** – A protozoan parasite carried by dogs, cats, mice, calves and many other mammals. Common symptoms include diarrhea, stomach cramps, nausea and dehydration. May be fatal to people with depressed immune systems.
- ◆ **Toxocariasis** – Roundworms usually transmitted from dogs to humans, often without noticeable symptoms, but may cause vision loss, a rash, fever, or cough.
- ◆ **Toxoplasmosis** – A protozoan parasite carried by cats that can cause birth defects such as mental retardation and blindness if a woman becomes infected during pregnancy; also a problem for people with depressed immune systems. Symptoms include headache, muscle aches, lymph node enlargement.



Scooping your dog's waste isn't just a courtesy for those walking behind you; it also keeps our water resources safe.

Clean water resources are essential for drinking, navigation, and recreational activities such as swimming and boating.

We all need to work together to keep our lakes and streams healthy.

Please remember to clean up after your pet.

Pet waste pollutes local water resources and can be a significant public health risk!



Scoop the Poop!

Dog owners can make a positive change in our community by keeping local water resources clean!



Why all the fuss? Because pet waste pollutes local water resources and can be a significant public health risk!

When rain or snowmelt flows over land surfaces, it carries pet waste to storm drains and eventually flows into nearby lakes, streams, and wetlands. The polluted runoff contains harmful bacteria and nutrients such as phosphorus and nitrogen and can make lakes and streams unsafe for drinking and swimming. Microorganisms found in the dog waste can cause human diseases and health problems from roundworms, Giardia and Salmonella, viruses, and parasites. Nitrogen and phosphorus from the waste will also promote the growth of unwanted algae and rooted aquatic plants in lakes and streams.



Stepping in dog waste can be a nasty experience.

Even worse is the knowledge that dog waste may be polluting our drinking water, local swimming areas, and favorite lake fishing spots. Listed below are a few tips on how dog owners can protect local water resources.

Dog owners are encouraged to clean up after their pets in order to protect our local community and its water resources.

- Always bring a plastic bag with you when you walk your dog.
- Use the bag like a glove, pick up the pet waste, turn the bag inside out, and seal it.
- Place the bag in the trash, or flush the un-bagged waste down the toilet. Homeowners with large yards can also bury the dog waste in a hole at least 5 inches deep and away from vegetable gardens and waterways.

Never place the dog waste (bagged or un-bagged) in the storm drain!

Storm drains lead directly to streams, rivers, lakes and wetlands. And remember — dog waste is only one of many pollutants that impact local waterways. Community members are also encouraged to reduce runoff containing lawn fertilizers, motor oil, driveway sand and salt, and yard waste such as grass clippings and leaves.



One day's waste from a large dog can contain 7.8 billion fecal Coliform bacteria.

Pet waste pollutes our rivers, lakes, and streams. If you think picking up dog waste is unpleasant, try swimming in it!

What is a Watershed?

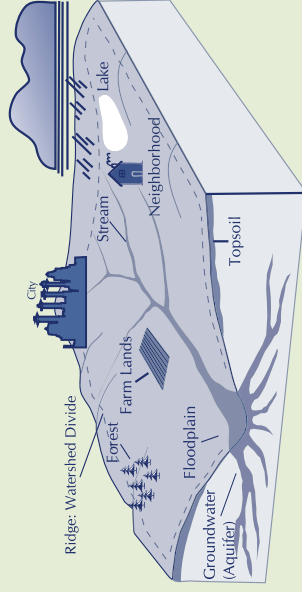
A watershed is an area of land that drains to a common point, such as a nearby creek, stream, river or lake. Every small watershed drains to a larger watershed that eventually flows to the ocean.

Watersheds support a wide variety of plants and wildlife and provide many outdoor recreation opportunities. By protecting the health of our watersheds we can preserve and enhance the quality of life for Kansas City area residents.

What is Stormwater Runoff?

Stormwater is water from rain or melting snow. It flows from rooftops, over paved streets, sidewalks and parking lots, across bare soil, and through lawns and storm drains. As it flows, runoff collects and transports soil, pet waste, salt, pesticides, fertilizer, oil and grease, litter and other pollutants. This water drains directly into nearby creeks, streams and rivers, without receiving treatment at sewage plants.

Polluted stormwater contaminates streams, rivers and lakes. It can kill or damage plants, fish and wildlife, while degrading the quality of our water.



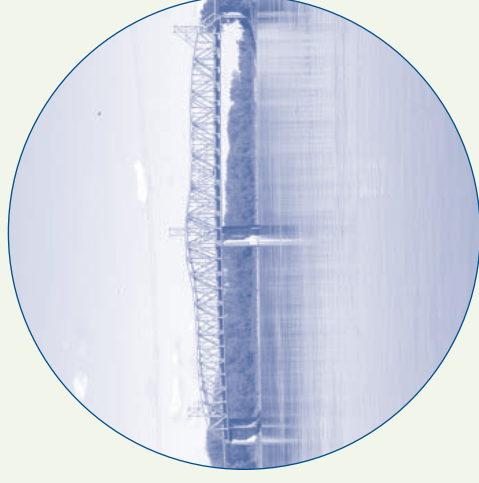
A typical watershed system

Wash your car the right way



Spring Watershed Tip

The car is clean
but what about
the water?



**Clean Water.
Healthy Life.**

Clean Water. Healthy Life.

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The Facts About Car Washing

For many, car washing is a springtime ritual. Often, citizens don't know that by washing all that winter grime off their vehicles they might actually be causing harm to our local waterways.

Water entering storm drains, unlike water that enters sanitary sewers, does not undergo treatment before it is discharged into our waterways. When cars are washed on streets and driveways, that dirty water eventually winds up in rivers, streams, creeks, and lakes.

Washing one car may not seem to be a problem, but collectively car washing activity adds up to big problems for our local lakes, creeks and streams. Pollution associated with car washing degrades water quality while also finding its way into sediments, impacting aquatic habitats.



**Clean Water.
Healthy Life.**

What's the Problem?

Washing your car is only a problem if you don't know where or how to do it correctly. The average homeowner uses 116 gallons of water to wash a car! Most commercial car washes use 60 percent less water for the entire process than a homeowner uses just to rinse the car.

Among the many impacts of motor vehicles on our environment, car washing has been noted by water quality experts as a serious contributor to water pollution.

Water that runs off a car when it is washed in a driveway, street, or parking lot can contain substances that pollute the environment. Dirty water containing soap, detergents, residue from exhaust fumes, gasoline, heavy metals from rust, and motor oils can wash off cars and flow directly to storm drains and into the nearest creek or stream where it can harm water quality and wildlife.

The phosphates from soap can cause excess algae to grow. Excessive algae smell bad, look bad, and harm water quality. As algae decay, the process uses up oxygen in the water that fish need.

Car wash fundraisers can be a significant source of this kind of pollution. These events are usually held in heavily paved areas where there is little runoff control or grass to filter out harmful substances before they reach our waterways.

What Can You Do?

The best way to minimize the effect washing your car has on the environment is to use a commercial car wash. Most locations reuse wash water several times before sending it to a treatment plant.

However, if you choose to wash your car at home or on the street, these are some things that you can do to minimize the water quality impact:

- Use biodegradable, phosphate-free, water-based cleaners only.
- Minimize water usage. Use a spray gun with flow restriction to minimize water volume and runoff.
- Wash on an area that absorbs water, such as gravel, or grass. This can filter water before it enters groundwater, storm drains, or creeks. Avoid washing cars on concrete or asphalt pavement unless it drains into a vegetated area.
- Only let wash water soak into the ground as long as you are using biodegradable, phosphate-free cleaners.
- When planning a car wash fundraiser, try developing a partnership with a commercial car wash facility, or use a safe location.
- Always empty wash buckets into sinks or toilets.

Green Lawns, Clean Water

Simple lawn care tips to keep your yard healthy and prevent polluted runoff.



FROM YOUR YARD TO THE RIVER

Your lawn can either be a source of water pollution or a buffer to protect against it.

DID YOU KNOW that poor lawn care practices create pollution in our waterways? Grass clippings, leaves, fertilizer and other pollutants can wash into the streets, through the stormdrains and into nearby water bodies.

MOW HIGH — 3 INCHES OR HIGHER

Don't cut your grass too short. Setting your lawn mower at a height of three inches or greater will produce denser, healthier grass that is more resistant to weeds, drought and erosion. It will also help trap pollutants that would otherwise blow into stormdrains.

CUT ONE-THIRD (OR LESS) AT A TIME

At any given time, don't cut more than one-third of the length of the grass blade. Doing so will stress your lawn and make it difficult to re-grow. It will also leave unsightly piles of grass clippings that can blow into stormdrains and pollute nearby waterbodies.

KEEP YOUR MOWER BLADES SHARP

Dull lawn mower blades can damage grass tips and give lawns a yellowish or whitish appearance. Keep your mower blades sharp to keep your lawn healthy and help your mower run more efficiently. Most hardware stores can sharpen mower blades for a small fee.

WATER WISELY

Early morning watering is best, so the grass can retain the moisture better. Lawns generally require one inch of water per week, so use a rain gauge to determine how much (if any) extra water your lawn needs between rainfalls. Also, avoid sprinkling hard surfaces.

MULCH OR COMPOST YOUR YARD WASTE

Mulch your grass clippings and leave them on your lawn; it's the same as applying a round of fertilizer. You can also mulch leaves and leave them on your lawn as long as it doesn't cover up more than 50 percent of the grass. You can put excess mulch in a compost bin.

FERTILIZE SMART

If you choose to use fertilizer, do it in the fall when it's most effective. Apply the amount directed, and use only zero-phosphorus fertilizers. Sweep up any excess that falls on hard surfaces. Also, consider aerating your yard in the fall; it will strengthen your lawn naturally.



STORMDRAINS AND WATER POLLUTION

The stormdrains in your street connect directly to the Monongahela River and other waterbodies. Grass clippings, leaves and other yard trimmings pollute water with phosphorus, nitrogen and other excess nutrients.

BEAUTIFY YOUR YARD AND STOP POLLUTED RUNOFF

- Pick up your pet's waste to prevent lawn burns and keep bacteria out of stormdrains
- Replace your turfgrass with native perennial plants
- Install a raingarden to capture and absorb stormwater runoff
- Wash your vehicles at a commercial car wash — not in your driveway
- Install a rainbarrel to capture stormwater for irrigation
- Point your downspouts away from hard surfaces

MS4 and Grass Clippings

With the rains that occurred over the past several years, many of us have had to mow our lawns more often. These heavy rains can also contribute to grass clippings ending up in storm water runoff. Grass clippings that are blown into the street eventually enter the street storm drain.

When lawn clippings, fertilizers, soil, leaves, or animal wastes, are picked up by storm water runoff, they are carried directly to our local streams and lakes. All of these materials including grass clippings contain phosphorus. According to the U.S. EPA, phosphorus is one of the most troublesome pollutants in storm water runoff and it is considered the primary cause of water quality problems in our river and streams.

Grass clippings contribute nutrients such as nitrogen and phosphorous, which cause unwanted and uncontrolled growth of algae and aquatic weeds in the waterways. Increased algae growth is observed as green algae blooms or "scums" on the river and streams. Too much algae is harmful to our natural water system. It blocks sunlight and prevents other plants from growing. When it dies and decays, it also takes much needed oxygen away from fish. Limiting phosphorus reduces algae blooms. According to the Northeast Wisconsin Stormwater Coalition, one bushel of fresh grass clippings can contain 0.1 pounds of phosphorus is enough to produce 30 to 50 pounds of algae.

When mowing your yard, make certain that you do not blow grass clippings into the street. The City of Monessen has an MS4 Permit with the DEP which regulates stormwater and pollution which may enter the streams from the storm system. The City was required to adopt an MS4 Ordinance adhering to these regulations. Lawn clippings blown into the street and not cleaned up by the homeowner may enter the storm system and is a violation of the MS4 Ordinance. When mowing, make the first few passes with the lawnmower blowing the grass clippings into the lawn not the street. If there are grass clippings on the street or sidewalk, use a broom or leaf blower to blow them back into the lawn. Do not use a hose to wash them into the street or storm drains. Keeping your leaves and lawn clippings out of the streets and gutters will have significant benefits for your river or stream. You can reduce the amount of phosphorus entering the river or stream and keep one of our most precious renewable resources clean for the next generation.

BENEFITS OF RAIN BARRELS

Environmental Benefits:

- ◆ Reduces roof runoff
- ◆ Conserves water use
- ◆ Reduces pollutants from entering streams
- ◆ Clean water for gardens, lawns, washing cars, etc.!

Maintenance:

- ◆ Keep openings covered with a fine-mesh screen to prevent mosquito breeding; You can also use “dunks,” a non-toxic bacteria to kill larvae.
- ◆ Empty barrel frequently to keep stored water from developing odors. Baking soda (not vinegar) can also help.
- ◆ Check barrel and connections frequently to remove debris.
- ◆ Drain barrel and connections and place in storage during winter to avoid freezing damage.

Application:

- ◆ Residence
- ◆ Business
- ◆ School
- ◆ Anywhere there is a rain leader from a roof!

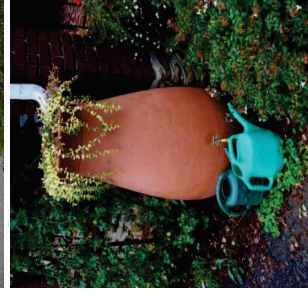
Take Note:

Water from barrel should NEVER be used for drinking, cooking, or bathing!

RAIN BARRELS: STORMWATER SOLUTIONS FOR ANY LOCATION



URBAN: Rain barrels can be installed in any small area; some models even include planter boxes or flat backs for conserving space.



RESIDENTIAL/ BUSINESS: Barrels come in all designs to best fit space, amount of rainwater, and aesthetics.

Stormwater Best Management Practices



Nonpoint Source Pollution
Reduction Strategy:

RAIN BARRELS



City of Monessen

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Phone: 724-684-9000

www.cityofmonessen.com

ABOUT THIS BROCHURE

This brochure was developed to educate the residents of Monessen about stormwater management; nonpoint source pollution and its impacts; and, strategies for reducing water pollution that can be implemented at home, at work, or in the community.

What is nonpoint source pollution (NPS)? NPS pollution occurs when precipitation flows over lawns, parking lots, farm fields, city streets and forests picking up pollutants and carrying them into our streams, rivers and oceans.

Activities such as littering, oil leaks, lawn over-fertilization, and improper disposal of chemicals contribute to the contamination of our local waters. If left unchecked, these activities eventually increase the level of pollution content in our streams & waterways.

What can we each do? Strategies for managing stormwater and reducing nonpoint source pollution can be accomplished in many ways. Some of those ways are demonstrated on this trail and include Installation of Pervious Surfaces, Water Quality Units, Rain Gardens or Bioretention Areas, and Subsurface Infiltration Systems.

RAIN BARRELS

What are Rain Barrels?

A **rain barrel** is a rainwater collection system that stores rooftop runoff that can be used for irrigating gardens and lawns, while conserving water!

Can I use a Rain Barrel?

Cisterns, Rain Barrels, Vertical Storage, and similar devices have been used for centuries to capture stormwater from the roofs of buildings. Capture and reuse encompasses a wide variety of water storage techniques designed to “capture” precipitation, hold it for a period of time, and reuse the water. Storage/reuse techniques range from small, residential systems such as **rain barrels** that are maintained by the homeowner to supplement garden needs, to large, “vertical storage” units that can provide firefighting needs. Storage/reuse techniques can be useful in urban areas where there is little physical space to manage stormwater.



WATER RESOURCE MANAGEMENT



WATER RESOURCE CENTER

FACT SHEET

Southwestern Pennsylvania Commission

WATER RESOURCE CENTER

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WATER RESOURCE CENTER

Water resource management is a large and growing field with continuous emerging concerns. In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region, with an initial focus on Stormwater Management Planning.

The SPC region covers a 10-county area with a total of 7,112 square miles. The 10 counties are Allegheny, Armstrong, Beaver, Butler, Indiana, Fayette, Greene, Lawrence, Washington, and Westmoreland and contain a total of 548 municipalities.

Mission

The WRC's mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments. Specifically, the WRC will have four major tasks to undertake for its members:

- ◆ Provide needed technical assistance
- ◆ Provide educational resources
- ◆ Serve as a regional information clearinghouse
- ◆ Provide a forum for regional coordination of water issues

The primary Clients for the WRC are: Member Governments (Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington and Westmoreland Counties and the City of Pittsburgh); Local Governments (municipalities, municipal authorities and school districts); Related Agencies (Federal Agencies, State Agencies and Conservation Districts); and, Related Organizations (including but not limited to regional nonprofits that share a related mission).



The photo above shows the improper installation of stormwater management controls for new construction. Act 167 Stormwater Management Plans, and associated ordinances require proper management of stormwater runoff from new development and redevelopment projects.

Leading causes of stream impairments in the SPC Region:

- ◆ Acid Mine Drainage, 34.5%
- ◆ Other/Unknown, 18.6%
- ◆ Agriculture, 15.5%
- ◆ Runoff, 13.8%
- ◆ Bank Mod/Channelization, 4.5%
- ◆ Habitat Mod/Land Dev., 4.3%
- ◆ Other Categories, <1%, 2.3%
- ◆ Mining, 1.6%
- ◆ Combined Sewer Overflows, 1.4%
- ◆ Construction, 1.4%
- ◆ On-Site Wastewater, 1.3%
- ◆ Erosion from Derelict Land, 1.0%

Source: PADEP Integrated List Non-Attaining, GIS Data July 2013



CONSIDER THE SOURCE
A POCKET GUIDE TO PROTECTING YOUR
DRINKING WATER

Consider the Source: A Pocket Guide to Protecting Your Drinking Water

Drinking Water Pocket Guide #3



United States
Environmental Protection
Agency

Cover Photo: The Kakagon Sloughs is located in northern Wisconsin, on the Bad River Chippewa Indian reservation. The Tribe depends on its waters for wild rice harvesting, fishing, and hunting. The integrity of this wetland is also important to drinking water sources in Lake Superior's Chequamegon Bay region. — USEPA Region 5, Great Lakes National Program Office.

Office of Ground Water and
Drinking Water (4606-M)
EPA 816-K-02-002
www.epa.gov/safewater
June 2002

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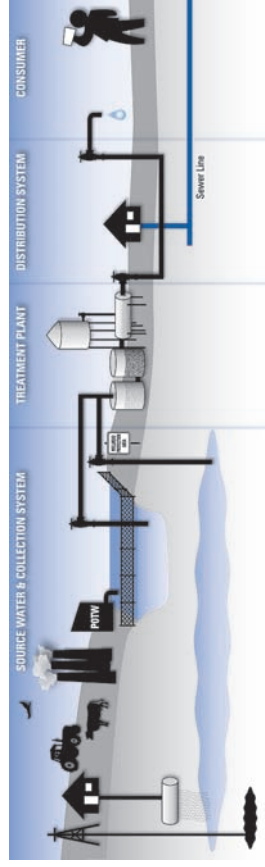
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I. Introduction

Virtually every stream, lake, river and aquifer in this country is used as a drinking water source. Protecting these source waters from contaminants is a major national priority in protecting public health through ensuring a clean, safe drinking water supply. Reducing the threat of waterborne illnesses helps save hundreds of millions of dollars annually by eliminating costly health care expenses, lost wages, work absences, decreased job productivity, and additional treatment costs incurred by Public Water Systems (PWSs) required to meet federal drinking water quality standards. The Source Water Protection Program, authorized by the 1996 Amendments to the Safe Drinking Water Act (SDWA), outlines a comprehensive plan to achieve maximum public health protection. According to the plan, it is essential that every community take these six steps:

- **DELINEATE** your drinking water source protection area
- **INVENTORY** known and potential sources of contamination within these areas
- **DETERMINE THE SUSCEPTIBILITY** of your water supply system to these contaminants
- **NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWS.
- **IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate threats
- **DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies



II. Ensuring Safe Drinking Water Through the Multiple-Barrier Approach

Whether your tap water comes from surface or ground water, all drinking water sources are vulnerable to a variety of contaminants from a variety of activities. The origin of contaminants might be in your neighborhood or many miles away. When rain falls or snow melts, it picks up and carries away pollutants, depositing them into lakes, rivers, wetlands, coastal and even underground sources of drinking water. Because we know these activities have the potential to

contaminate the source of our drinking water, we have created four major barriers to protect our source water from contamination. Preventing pollution is critical to protecting drinking water from contamination and reducing the need for costly treatment. Community involvement and individual action are key to providing a safe supply of drinking water.

Risk Prevention Barrier

The best way to protect drinking water is to keep contaminants from entering source water. Multiple federal, state, and local laws and programs and individual action help communities identify the sources of drinking water and potential threats. This work enables communities to take appropriate steps to protect the watershed.

Risk Management Barrier

The public water system is the first line of defense to reduce or eliminate contaminants in source water. The Safe Drinking Water Act, which regulates these systems, develops standards and guidance to help them reach the goal of providing safe and reliable drinking water. They must collect and treat water, hire trained and qualified operators and have an emergency response plan in case of natural disaster or terrorist attack.

Risk Monitoring and Compliance Barrier

Dealing effectively with risks to drinking water requires constant evaluation of the water quality. Water is monitored at the source; at the treatment plant, after it has been treated and disinfected; at the distribution system, which delivers water through pumps and pipes to your home; and in some cases, at the consumer's tap. If systems have difficulty meeting regulations and providing safe, reliable drinking water, assistance can be provided to help them. If all this fails, enforcement action can be taken against the system.

Individual Action Barrier

Constant vigilance to protect water before it becomes your drinking water is essential and involves all of us. An informed, involved and supportive public is the foundation of drinking water protection. What we do in the watershed can directly impact the quality of water that arrives at the treatment plant. The more you know about drinking water, the better equipped you are to help protect it. See what you can do in the next section, titled, "What You Can Do to Protect Your Drinking Water."

III. SDWA and the Source Water Assessment and Protection Program

Originally created in 1970, EPA's primary mission was to address the potential risks to public health posed by a variety of sources polluting our air and water, and initial program efforts within the agency focused on individual threats from unique, discreet sources. Since then an understanding of the complexity of contaminants and activities posing threats has increased dramatically, and has resulted in the need for a combined and coordinated interdisciplinary approach in order to address the problem in a cross-media fashion. Consequently, lessons learned over the last two decades have enabled a more comprehensive understanding of the concept of cumulative risk (e.g., net impact from many



media such as air, water, and land uses) and we have modified preventive programs to meet those changing needs.

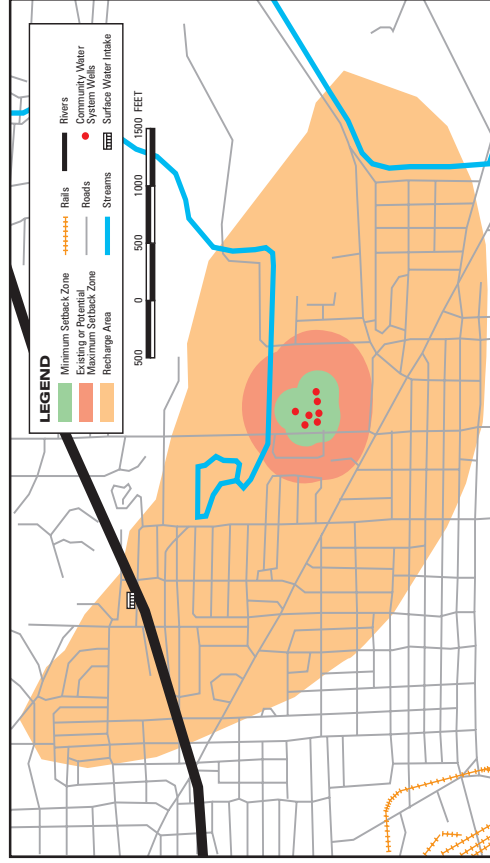
The 1996 amendments to the Safe Drinking Water Act (SDWA 1996) established EPA's Source Water Assessment and Protection Programs. They are the Agency's newest programs targeted at providing clean safe drinking water, but they build on programs developed to carry out EPA's original mission. Congress recognized the need for a more comprehensive and integrated approach to the problem of cumulative risk reduction, and SDWA 1996 mandated specific program elements to address the areas of risk identification (delineation and source inventories), risk ranking and screening (susceptibility analyses), risk management measures (prevention programs), and preparation for unexpected drinking water supply replacement emergencies (contingency planning).

The SDWA Amendments of 1996 outline six steps for prevention programs to protect and benefit public drinking water systems. Together, they form the basis of comprehensive drinking water source protection.

- **STEP 1 – DELINEATE** the Source Water Protection Area (SWPA).

PURPOSE: Delineating the SWPA shows the area to be protected and prescribes the boundaries of the area from which drinking water supplies are drawn.

This step also designates the area within which contaminant source inventories are conducted, identifying substances or activities that may pose potential risks to the drinking water supplies within that area. Delineations may be performed using a variety of accepted methods (e.g., calculated fixed radius; computer modeling, etc.), and are most protective when they include all sources of water and potential contaminants and activities affecting them within the prescribed area.



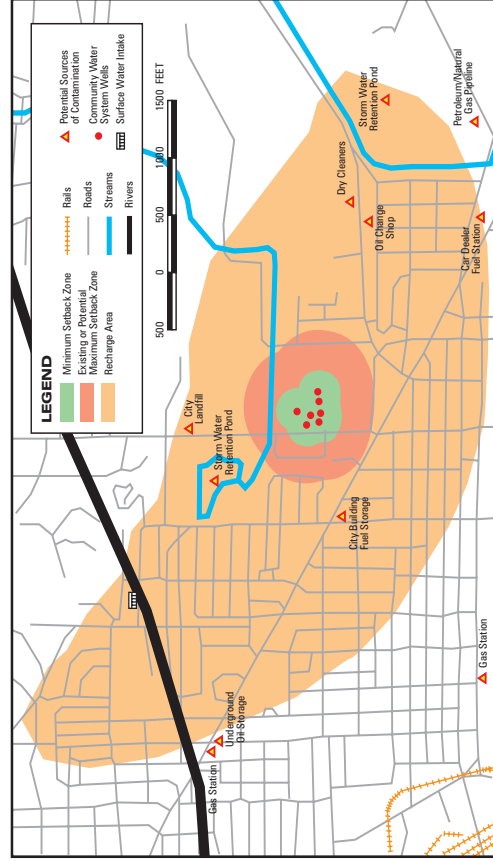
This map shows the delineation of a Source Water Protection Area.

- **STEP 2 – INVENTORY** known and potential sources of contamination.
PURPOSE: The source inventory lists all documented and potential contaminant sources or activities of concern that may be potential threats to drinking water supplies.

The source inventory indicates the level of concern assigned to each potential risk by ranking, rating, or prioritizing management measures to reduce or eliminate them.

A contaminant source list may look like this:

Potential Contaminant/Activity	Threat or Risk	Level of Concern
Agricultural Crop Spraying	Excess amounts of material or improper application methods	Low to moderate, depending on proximity to source waters
Industrial Waste Disposal Wells (e.g., Class V Wells)	Introduction of chemicals directly into or above USDWs	Moderate to high, depending on surrounding hydrogeology
Storm water runoff; car washes; service stations	Introduction of contaminants into ground or surface water	Low to moderate, depending on type of surrounding facilities (e.g., parking lots) and proximity to source waters.



This map inventories known and potential sources of contamination.

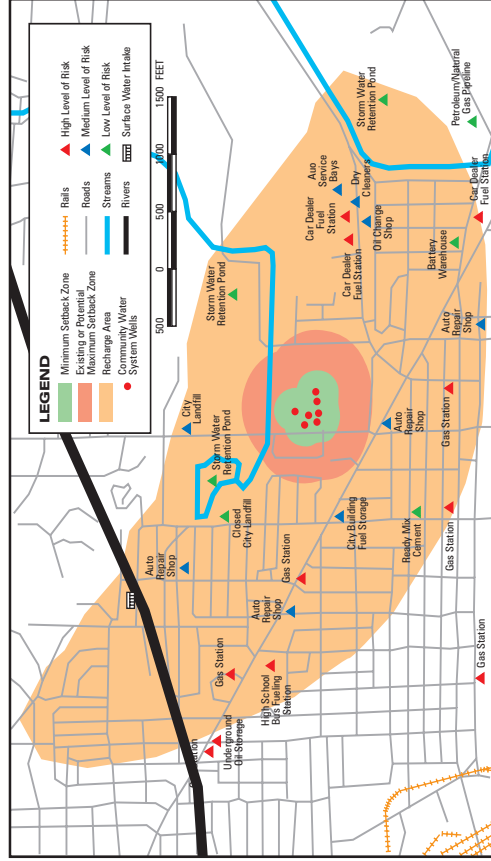
- **STEP 3 – DETERMINE THE SUSCEPTIBILITY** of the PWS to contaminant sources or activities within the SWPA.

PURPOSE: Determining susceptibility of the PWS to inventoried threats relates the nature and severity of the threat to the likelihood of source waters serving that system being contaminated.

Mitigating factors taken into account when determining susceptibility include potency or toxicity of the contaminant, volume of discharge or release, distance from wells or intakes, and the likelihood of entry of the contaminant into the source waters.

A susceptibility determination for an individual PWS may look like this:

Contaminant/ Activity	Level of Concern	Risk Reducing Factors	Susceptibility Rating
Leaking Underground Storage Tanks	High	Remove or Repair Tanks	High
Concentrated Animal Feeding Operations	Moderate	New/Upgraded Facility and Equipment	Low
Road Salt Storage Shed	Moderate	Diked facility with berms	Moderate



This map rates the susceptibility of a PWS to inventoried threats.

- **STEP 4 – NOTIFY AND INVOLVE THE PUBLIC** about threats identified in the contaminant source inventory and what they mean to their PWSs.

PURPOSE: To ensure that the public has information necessary to control and modify their own actions to prevent contamination and to participate effectively in community activities to protect drinking water.

- Use plain English in reports
- Provide maps of the SWPA
- List, show or indicate potential sources/threats to the PWS identified within the SWPA
- List, rank, or otherwise prioritize importance of threats identified to the individual PWS and explains what it means to your water supply
- Reports are unique to each individual PWS
- Public meetings are effective methods of involving the community.

- **STEP 5 – IMPLEMENT MANAGEMENT MEASURES** to prevent, reduce, or eliminate risks to your drinking water supply.

PURPOSE: Using the information gathered from the assessments allows specific management measures to be formulated and put in place. By examining the results of the contaminant source inventory and the susceptibility determination for each PWS, these measures can be tailored to address each threat or array of risks specific to each PWS.

A successful drinking water contamination prevention plan is tailored to the unique concerns and circumstances of the local community. Effective involvement is a critical component to a successful public health plan.

- Every PWS's source water is unique.
- Management measures need to tailor local actions to address threats to your water supplies.



- Early involvement in the source water protection process and consensus on need for action is essential — you can help!
- Many players make for broad application and coverage of management strategies that bring the best individual programs into play.
- Some key players and tools are:
 - local business communities
 - media
 - parent-teacher associations
 - citizen activists
 - state, county, and local governments
 - sanitary surveys
 - zoning regulations
 - voluntary best management practices (BMPs)

- **STEP 6 – DEVELOP CONTINGENCY PLANNING STRATEGIES** to deal with water supply contamination or service interruption emergencies.

PURPOSE: In the event of short- or long-term water drinking water supply disruption as a result of natural causes (e.g., biological contamination or floods) or intentional destruction (e.g., vandalism or terrorism), water supply replacement strategies that coordinate all available efforts to restore service to single or multiple PWSs are an indispensable part of any drinking water protection program.

- Outline emergency plans for short or long-term drinking water supply replacement
- Direct plan towards water supply interruption due to contamination or physical damage to supply system
- Coordinate the efforts of water supply managers with those of civil defense, local emergency response, hazmat/spill cleanup, and local area disaster response networks

IV. Tools, Resources, and Actions Useful In Protecting Your Drinking Water Supplies

The Safe Drinking Water Act provides for a number of resources to help local communities protect their drinking water:

- **Source Water Assessments** — States are required to complete source water assessments for every public water supply in the U.S. Congress provided for funds under Section 1453 through the Drinking Water State Revolving Fund (DWSRF) for support.
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(g) from the DWSRF up to 10 percent of a state's allotment for the DWSRF to administer or provide technical assistance. States must match, dollar-for-dollar, the 10 percent set aside (see Section VIII).
- **Drinking Water State Revolving Fund Set Asides** — States may set aside funds under 1452(k) from the DWSRF up to 15 percent of the state's capitalization grant for more than one of several source water protection activities (i.e., land acquisition/easements, voluntary protection and petition activities, source water assessments and well head protection).

- **Wellhead Protection** — Each state must establish a program under Section 1428 to protect the land areas around water supply wells from contaminants that may enter the ground water and adversely affect human health.
- **Source Water Petition Program** — A state may establish a source water protection partnership petition program under 1454 of the Act designed to assist in the local development of a voluntary, incentive-based partnership between water supplies and community members. States can use DWSRF funds for loans to water supplies to implement local programs.
- **Water Conservation Planning Guidelines** — EPA issued guidelines under Section 1455 for water conservation plans for public water systems. States may require systems to submit water conservation plans as a condition of receiving a DWSRF loan.
- **Sole Source Aquifer Protection** — Entities may petition EPA for protection of an aquifer that is the sole or principal source of drinking water for 50 percent or greater of the local population served (see “Petition’s Guidance for Sole Source Aquifers”, EPA 44016-87-003 Feb. 1987).
- **State Underground Injection Control Programs** — EPA must review applications under Section 1422 of the Act for state or tribal primacy (primary enforcement responsibility). Approved programs will be adopted by the state or tribe, which will promulgate rules to ensure non-endangerment of drinking water sources.

- **Oil and Gas Programs** — Section 1425 of the Act allows EPA approval of existing state oil and gas programs if the state can show that the program is effective in preventing endangerment of drinking water supplies.
- **More Information** — “State Source Water Assessment and Protection Program Guidance” (EPA 816-R-97-009 Aug. 1997) on www.epa.gov/safewater/Pubs/index.html discusses these and other statutes and provisions pertaining to Source Water Assessment and Protection.

V. Additional Resources Available Under the Clean Water Act

The Clean Water Act was established by Congress in 1972 and is the primary federal law that protects our nation's waters, including lakes, rivers, aquifers and coastal areas. The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: eliminate the discharge of pollutants into the nation's waters, and achieve water quality levels that are fishable and swimmable.

- **Federal Assistance to States** — Under Section 106 of the Act, EPA may provide money to states (including territories, the District of Columbia, tribes) and interstate agencies to establish and implement ongoing water pollution control programs, including ground water programs.
- **Water Quality Standards** — Under Section 303(C)(1) define water quality goals for a water body by designating the use of the water, setting criteria to protect those uses, and setting anti-degradation provisions for the water body. States must update their water quality standards every three years.

New and revised water quality standards "shall be submitted" to EPA for review. Under Section 303(c)(2) of the Act, water quality standards "shall consist of" designated uses and water

quality criteria. In setting water quality standards, states shall consider the use and value of public water supplies.

- **Point Source Effluent Limits, or Total Maximum Daily Loads (TMDLs)** — Under Section 303(d), States “shall identify those waters for which” the point source effluent limits [see §§301 (b)(1)(A)-(B)] are not stringent enough to implement a water quality standard, and establish a ranking of such waters taking into account the severity of pollution and the uses made of such waters.

Section 303(d)(1) provides for the establishment of TMDLs for pollutants that EPA has listed under §304(a)(2) as “suitable for such calculation.” States shall set the TMDLs “at a level necessary to implement the applicable water quality standards with seasonal variation and a margin of safety taken into account.”

Section 303(d)(2) requires States to submit to EPA for approval “from time to time” their list of impaired and threatened waters and the TMDLs they have established for those waters.

- **The National Water Quality Inventory Report to Congress** — Under 305(b) States must report to EPA on the quality of their waters.

- **Publishing of TMDLs** — 304(a)(2) of the Act requires EPA to publish information on, “and the identification of, pollutants suitable for maximum daily load measurement correlated with the achievement of water quality objectives.”
- **NPS Program** — States must 1) conduct statewide assessments of their waters under Section 319 to identify those that were either impaired or threatened because of NPSs; 2) develop NPS management programs to address the impaired or threatened waters.
Under 212, 319, and 320, funding is provided through the Clean Water State Revolving Fund (CWSRF) — funding is provided for non point source, point source and estuary source water protection projects, depending on priorities determined by each State.
- **Dredge and Fill** — Section 404 regulates the discharge of dredged or fill material into waters of the U.S.
- **NPDES Program** — The National Pollutant Discharge Elimination System Program — regulates point source discharges to surface waters under Section 402 of the Act.

VI. Financing for Source Water Assessment and Protection Programs

There are two major avenues of funding for the drinking water source water assessment and protection programs. They are the Drinking Water State Revolving Fund (DWSRF) and the Clean Water Act State Revolving Fund (CWSRF).

<i>Section</i>	<i>Description</i>
SDWA 1452	The 1996 Amendments to the Safe Drinking Water Act authorized the DWSRF to assist public water suppliers to finance the cost of infrastructure needed to achieve or maintain compliance with SDWA requirements and to protect public health. In addition, states may use a portion of their capitalization grants to fund various state and local water systems management programs and projects including SWP activities. States may elect to use up to 31 percent of the funds available to them under Section 1452 for eligible "set-aside" activities. The DWSRF program has made available billions of dollars in assistance since 1997 to finance infrastructure improvements for drinking water utilities. States have also reserved \$575 million from the

\$3.6 billion in federal grants they have received to fund other programs and activities that support their drinking water programs through these “set-asides;”

CWA 106; 319

Subchapter VI of the CWSRF provides a powerful partnership between EP A and the states, providing states with the flexibility to fund projects that will address the highest priority water quality needs (see Sections 601-607). CW A funds may be used to fund certain source water protection activities, and cost savings can be realized through combining SWP and CWA efforts. CWSRF loans can be used for watershed protection; funds allocated under Section 106 of the Act may be set aside for state ground water programs, and Section 319 funds, which are aimed at non-point source pollution prevention, may also be used for source water protection. Nationally, the CWSRF program has more than \$37 billion in assets and has provided \$34 billion in assistance since 1988. The CWSRF program currently funds nearly \$4 billion annually in water-quality related projects, including more than \$1 billion to fund projects addressing non-point sources of pollution that can often negatively impact sources of drinking water.

In addition to federal resources, these tools bolster protection at the local level.

- **Education:** Consumer awareness and citizen advocacy highlight the problem
- Voluntary **Best Management Practices (BMPs):** Once individuals understand they may be part of the problem, they also understand they can be part of the solution
- **Sanitary Setbacks** are prescribed by local health codes for the placement of individual private waste disposal systems (septic tanks) and community waste-treatment systems
- **Zoning** has proven to be a very powerful tool in preventing siting of potential contaminant threats or activities adjacent to public drinking water supply source waters

VII. The Underground Injection Control (UIC) Program and SWAP

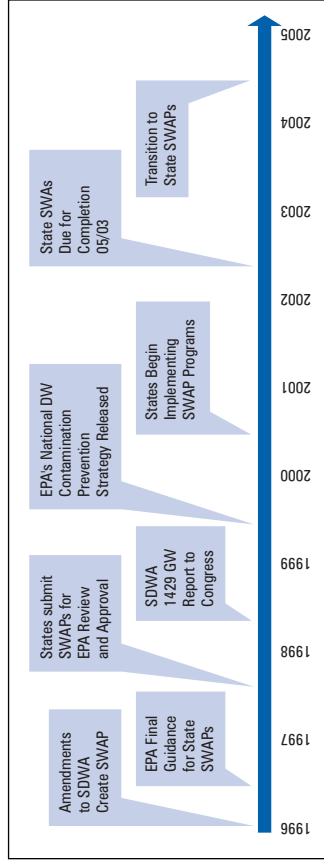
The UIC program is a crucial component of the source water assessment and protection program, because it identifies, permits, and regulates the design, siting, operation, and maintenance of injection wells that are designed to dispose of waste underground. It is the major federal and state program to control some 800,000 wells with the potential to contaminate drinking water sources if not properly managed. The program identifies, as such, these wells are considered potential contaminant sources in any source water assessment and protection program contaminant source inventory. For example, all new motor vehicle waste disposal wells (e.g., service station bay floor drains) and all new large-capacity cesspools (e.g., serving multiple dwellings or single units serving more than 20 persons per day) were banned as of April 2000. The Safe Drinking Water Act requires EPA to provide safeguards so that injection wells or other similar conveyance systems do not endanger current and future underground sources of drinking water (USDWs).

Through the UIC program, EPA has developed minimum federal standards to regulate wells that range from deep, technically-sophisticated and highly-monitored wells, to shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. These require-

ments also cover wells that discharge a variety of hazardous and nonhazardous fluids above, into, or below aquifers. A comprehensive description of the five different classes of UIC wells may be found in "Protecting Drinking Water Through Underground Injection Control," EPA 816-K-02-001.

EPA's main concern relative to the source water assessment and protection program is the large inventory of Class V UIC wells — typically shallow on-site drainage systems such as septic systems, cesspools, and storm water drainage wells. They are a concern because their simple construction provides little or no treatment of the injected fluids. There are more than 500,000 Class V wells in operation. Some examples are agricultural drainage wells, aquifer recharge and aquifer storage and recovery wells, industrial waste disposal wells, large capacity cesspools, large capacity septic systems, motor vehicle waste disposal wells, and storm water drainage wells. There are many other subcategories of Class V wells.

VIII. SWAP Milestones



The focus of many of EPA's efforts in the 1990s shifted from a cleanup and remediation-oriented approach to one of prevention. In the next few years, citizens, local, state, tribal, and federal officials will work together to collect information and take action to protect our precious drinking water sources. Because of the changing nature of potential threats and local needs, communities will need to periodically revise their strategies.

IX. Best Management Practices (BMPs) Available for SWPAs

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Septic Systems	<p>Improper siting, maintenance and use may contaminate both surface and ground water by percolation or runoff.</p> <p>Bacteria, protozoa, and viruses present in sanitary wastewater can cause gastrointestinal illness, cholera, hepatitis A and typhoid if consumed.</p>	<ul style="list-style-type: none"> • Establish proper siting criteria • Specify appropriate design and construction criteria • Establish operation and maintenance protocols ("Septic System Ground Water Protection" EPA, July 1986 GPO 1991-517-003-28046) • Analyze assimilative capacity of soils and receiving water to

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Lawn and Garden Fertilizer	<p>Field leaching or runoff into surface and ground water.</p> <p>Nitrogen leaching into drinking water supplies at levels above MCLs may cause “blue baby syndrome” in infants under 6 months — life-threatening without immediate medical</p>	<p>determine appropriate density of septic system units.</p> <ul style="list-style-type: none"> • Consider connecting to a public water system • Eliminate excess uses • Ensure proper application • Select appropriate fertilizer • Avoid application near wells used for drinking water, agricultural drainage wells; surface waters

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	<p>attention. Symptoms are shortness of breath and blue skin color.</p> <p>Phosphorus may affect taste and odor of drinking water and may require treatment.</p>	<ul style="list-style-type: none"> Plant native plants and grasses requiring less fertilizer and water
Pet Waste	<p>Watershed runoff or direct contact can introduce wastes into drinking water supplies. <i>Cryptosporidium</i>, <i>Giardia lamblia</i>, <i>Salmonella</i>, and <i>E. coli</i> pose the greatest threats</p>	<ul style="list-style-type: none"> Pick up after pets

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
<p>Pesticide Application (Large Scale)</p>	<p>Runoff to surface waters due to rainfall or irrigation return flow. Soil injection threatens ground water sources.</p> <p>Possible health from exposure to large amounts of pesticides in drinking water over a long period of time include: effects include cancer, liver and kidney damage, reproductive difficulties, and nervous system effects.</p>	<ul style="list-style-type: none"> • Pesticide alternatives through Integrated Pest Management • Mix, load, and apply consistent with label directions • Reduce techniques such as soil incorporation, pre- and post-plant emergence applications, spot treatments; split applications • Proper storage and disposal

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Turfgrass/ Agricultural Fertilizer Application	Field leaching or runoff into surface and ground water. Nitrogen leaching into drinking water supplies at levels above MCLs may cause “blue baby syndrome” in infants under 6 months — life-threatening without immediate medical	<ul style="list-style-type: none"> • Avoid application around wells used for drinking water, agricultural drainage wells, and surface water • Utilize application rates and fertilizer types consistent with actual plant needs. • Time applications with periods of maximum crop uptake • Impede runoff by using tillage buffer strips, or filter strips

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	<p>attention. Symptoms are shortness of breath and blue skin color.</p> <p>Phosphorus may affect taste and odor of drinking water and may require treatment.</p>	<ul style="list-style-type: none"> • Store and dispose fertilizers properly • Avoid application near wells used for drinking water
Livestock and Poultry Waste	<p>High Nitrogen and pathogens (<i>Cryptosporidium</i>; <i>Giardia lamblia</i>, <i>Salmonella</i>, and <i>E. coli</i>) can enter both ground and surface water sources used for drinking water via runoff or percolation.</p>	<ul style="list-style-type: none"> • Prevent animal waste contact with water • Ensure proper land application of manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
		<ul style="list-style-type: none">• Avoid application near drinking water wells and surface waters• Use pasture management techniques such as fencing and planting legumes• Avoid siting animal waste lagoons near drinking water wells or flood plains• Use low-permeability lagoon liners• Aerobically compost horse manure

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Sanitary and Combined Sewer Overflows (SSOs/CSOs)	<p>SSOs discharge untreated sewage through broken pipes, equipment failures and overloads</p> <p>CSOs discharge untreated sewage and storm water when system capacity is exceeded</p> <p>Contaminants are bacteria, molds, fungi, protozoa and helminths</p>	<ul style="list-style-type: none"> • Divert wildlife from sensitive areas by fencing, mowing, landscaping, tree pruning, and drainage devices • Non-structural prevention methods such as visual inspections, monitoring and maintenance programs, employee training and public education • Consider structural prevention methods such as upgrading of collection

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
	Chief threats are gastroenteritis, cholera, dysentery and infectious hepatitis	systems, wet-weather storage facilities, and new sewer collection systems
Injection Wells (UIC Program), Classes I-IV	Misuse or discharge of hazardous chemicals into Class V Wells	See companion Pocket Guide for descriptions of well classes and regulations that apply to each
Injection Wells (UIC Program), Class V	Injection of nonhazardous fluids into or above USDWs	(Available BMPs for selected representative examples below) See vehicle washing, small quantity chemical use, and underground storage tanks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
<p>Storm Water Runoff</p> <ul style="list-style-type: none"> - Rain or snow runoff carrying sediments and contaminants into surface or ground waters - Pathways include excess volume runoff from settling ponds, municipal storm drains, parking lots, truck stops, gas stations, airports (fuel and 	<p>Possible contaminants include gasoline, oil, automotive fluids, sediment, pesticides, nutrients, animal wastes, and hazardous wastes. Nationally, 77 of 127 priority pollutants have been detected in urban runoff.</p> <p>Potential health effects from these contaminants include gastrointestinal illness, reproductive and developmental effects and increased cancer risk.</p>	<p>Basic pollution prevention practices such as erosion control and sedimentation control measures; land use controls; grassed swales; buffer strips; filter strips; storm water capture and retention ponds, and constructed wetlands.</p>

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
deicing fluids) and road chemical storage	– Sediment and contaminants carried to surface and ground waters via infiltration through soil of drainage to subsurface wells or septic systems.	

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
<p>Vehicle Washing</p> <ul style="list-style-type: none"> Nationally, States estimate that there are in excess of 7,200 facilities of this type currently in operation. 	<p>Contaminants include used oil, degreasers, antifreeze and synthetic oils.</p> <p>Patrons may use solvents or degreasers at unmanned washing facilities, thereby contributing to contamination of rinse waters entering Class V wells.</p> <p>Potential health effects from these contaminants include kidney damage; circulatory problems, increased cancer risk; delays in physical or mental development.</p>	<ul style="list-style-type: none"> Use alternative cleansing agents such as phosphate-free, biodegradable detergents. Discourage use of solvent and emulsifier-based agents Install water-recycling systems Train employees on spill control and response to problems Control and manage spills

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
<p>Small Quantity Chemical Use</p> <p>Chemicals of concern may reach ground and surface waters through improper disposal practices via discharge to sewers, septic systems, dry wells, or through improper handling, hauling and disposal.</p>	<p>Includes chemicals used in cleaning, degreasing, polishing, paint preparation, rust removal, photo processing, medical practices.</p>	<ul style="list-style-type: none"> • Avoid excess use of chemicals • Follow label directions on proper use, storage and disposal • Train employees on spill control and response protocols • Refer to manufacturer's Material Safety Data Sheets for specific hazard descriptions

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
<p>Underground Storage Tanks (USTs)</p> <p>National inventory shows approximately 714,000 USTs on 269,000 sites.</p>	<p>Releases of petroleum fuel substances through corrosion of parts, improper installation, failure of piping systems, sloppy fuel deliveries, and improper operation and maintenance</p>	<ul style="list-style-type: none"> • Ensure compliance with federal UST requirements (see: www.epa.gov/oilspill) • Consider local registration programs for exempt tanks • Consider local land-use controls such as zoning, use restrictions, permits and setbacks

Category, Activity, or Threat	Impacts, Implications, or Risk	Possible BMPs Available
Above Ground Storage Tanks (ASTs)	Release of petroleum fuel substances mainly through leaks or spills may enter drinking water supplies via soil accumulation or runoff in storm waters to surface	<ul style="list-style-type: none">• Follow federal AST requirements (see: www.epa.gov/oilspill)• Periodic cleanup of containment areas• Consider local registration programs for exempt tanks• Consider local land-use controls such as zoning, use restrictions, permits and setbacks

X. Glossary

Aquifer – A natural underground layer, often of sand or gravel, that contains water.

Assessment – An analysis of the susceptibility of drinking water sources to contamination, communicated effectively to the public.

Ground Water – The water that systems pump and treat from aquifers.

Potential Contaminant Source – Specific point or nonpoint sources from which contamination of drinking water may originate; activities that may result in drinking water contamination.

Public Water System (PWS) – Any water system which provides water to at least 25 people for at least 60 days annually. There are more than 170,000 PWSs providing water from wells, rivers and other sources to about 250 million Americans. The others drink water from private wells. There are differing standards for PWSs of different sizes and types.

Risk Ranking – Rating or prioritizing levels of concern of potential contaminant sources based on susceptibility of public water systems.

Sole Source Aquifer – A drinking water supply in an area with few or no alternative sources to the ground water resource, and where if contamination occurred, using an alternative source

would be extremely expensive. If such an aquifer supplies a public water system on which at least 50 percent of the population depends, it may be designated as a sole source aquifer.

Source Water Protection Area – The area delineated by the state for a public water system, or including numerous PWSs, whether the source is ground water, surface water, or both. Delineating the source water protection area is part of the state source water assessment plan approved by EPA under section 1453 of the Safe Drinking Water Act.

Surface Water – The water that systems pump and treat from sources open to the atmosphere, such as rivers, lakes, and reservoirs.

Susceptibility – The level of risk of drinking water contamination, based on the nature and severity of contaminants, and the likelihood of the contaminants getting into a drinking water source.

Underground Injection Control Program – A program to prevent injection activities from endangering underground sources of drinking water.

Wellhead Protection Area – The surface and subsurface area surrounding a well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or field.

XI. Contacts

The following list includes regional office contacts for Source Water Assessment and Protection and Underground Injection Control. For state contacts, regional and local contacts at other federal agencies, and other partners, see www.epa.gov/safewater/protect/contacts.html. The Safe Drinking Water Hotline (bottom of page) also maintains the list of these contacts.

EPA Region 1 – Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut	(617) 918-1578
EPA Region 2 – New York, New Jersey, Puerto Rico and the U.S. Virgin Islands	(212) 637-3822
EPA Region 3 – Pennsylvania Delaware, Maryland, Virginia, West Virginia, and Washington, DC	(215) 814-5779
EPA Region 4 – Kentucky, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, and Florida	(404) 562-9459
EPA Region 5 – Minnesota, Wisconsin, Illinois, Michigan, Indiana, and Ohio	(312) 886-9262

EPA Region 6 – New Mexico, Texas, Oklahoma, Arkansas, and Louisiana	(214) 665-7129
EPA Region 7 – Nebraska, Kansas, Iowa, and Missouri	(913) 551-7423
EPA Region 8 – Montana, North Dakota, Wyoming, South Dakota, Utah and Colorado	(303) 312-6753
EPA Region 9 – California, Nevada, Arizona, Hawaii, Guam, and American Samoa	(415) 744-1829
EPA Region 10 – Washington, Oregon, Idaho, and Alaska	(206) 553-1563
Headquarters – Office of Ground Water and Drinking Water	(202) 564-3867

For More Information

**EPA Office of Ground Water
and Drinking Water**

www.epa.gov/safewater

Safe Drinking Water Hotline 1 (800) 426-4791

WINTER MAINTENANCE BMP'S

Quick Resource Guide for Winter Maintenance BMPs



**WATER RESOURCE
CENTER**



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

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This guide was published in **May 2016**, exclusively for general educational and informational purposes. This guide does not in any way replace or supersede any municipal, county, state, or federal requirements or regulations related to stormwater management. This guide is not intended to be a substitute for professional design and implementation services. The management of stormwater is a complex and site specific issue and that the general information contained in this guide may not be sufficient to assess any and all particular site conditions. Any stormwater management practice should be installed with the consultation of an experienced professional who can address specific site conditions.

Cover photo credits: Forestry Images; North Fayette Township; Pittsburgh City Photographer Collection, 1901-2002, AIS.1971.05 Archives Service Center, University of Pittsburgh; Southwestern Pennsylvania Commission; Upper St. Clair

Introduction

This quick resource guide was developed to provide information to municipalities on how to improve winter maintenance operations by utilizing **best management practices (BMPs)** for the two most utilized materials in winter maintenance operations: **road salt** (chloride-based deicers) and **abrasives**. Solid and liquid chemicals (known as deicers) and abrasives (such as sand) may be used in combination with a mechanical removal method (such as plowing) to minimize accidents during the winter months.

In this guide, we begin with a brief history of winter maintenance practices and the concerns associated with them. Winter maintenance chemicals and their associated impacts are explained and recommendations for winter maintenance BMPs that reduce chlorides are also provided. Alternatives to deicers, application rates and additional considerations including MS4 minimum control measures, specifically for MCM6: Pollution Prevention/Good Housekeeping, are also discussed. The section on MS4 considerations is not intended to be comprehensive, but provides a good starting point for improving your program.

Some of the BMPs covered in this booklet will include:

- Calibration of equipment
- Brine
- Anti-icing
- Pre-wetting
- Retrofitting trucks and equipment

The BMPs that are covered in this quick resource guide are intended to provide the most efficient and effective way to reduce chlorides in the environment without compromising public safety. The BMPs have been proven to: improve the level of service and safety, reduce impacts, and save money and resources. Although there is an initial start-up cost required to begin the process of implementing BMPs, the costs are shown to be recovered after implementation.



Figure 1: Liberty Avenue, March 5, 1917 Source: Pittsburgh City Photographer Collection, 1901-2002, AIS.1971.05 Archives Service Center, University of Pittsburgh

History and Background

Over time, the traveling public's view of snow on roadways changed significantly. In the 18th and 19th centuries horse-drawn carts traded wheels for ski-like runners in the winter. The more packed snow on the roads, the better. In areas where covered bridges were located, snow was added so travel was not interrupted. By the mid 1800s the first snow plow was invented. In 1862, Milwaukee became the first major municipality to try one.

In the 18th and 19th centuries, "snow was never a threat" to road travel, "but rather it was an asset" - Eric Sloane

In the early 1920s, car-mounted snow plows were first invented and since then snow and ice management has continued to evolve. In addition to the removal of snow and ice by plowing or other mechanical means, chemicals have been utilized to further improve winter driving conditions. The most common chemical utilized is sodium chloride (NaCl), or more commonly referred to as road salt. Figure 2 from the Salt Institute illustrates an increasing trend of salt use. Along with the increased use of salt, levels of chloride in surface and groundwater and associated impacts will also increase.

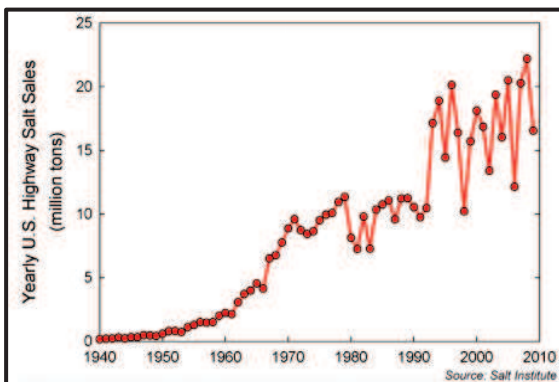


Figure 2: Yearly US Highway Salt Sales. Source: Salt Institute

Concerns with Winter Maintenance Practices

Negative impacts have proven to be associated with the use of snow and ice control materials and have become a real concern in some states.

As of June 2016, there are no ambient water quality standards for chlorides, chloride or salinity in Pennsylvania; therefore no TMDLs have been established. Although ambient water criteria are not yet adopted, the **Municipal Separate Storm Sewer System (MS4)** program does require that permittees comply with **Minimum Control Measures (MCMs)** that would apply to maintenance practices that deal with use and storage of both deicers and abrasives. These topics will be covered in greater detail under the MS4 Considerations section.

Due to the amounts of deicers used in Pennsylvania during the winter months, it is probable that impairments may exist. Municipalities can take a proactive management approach by adopting BMPs that other states have found effective at reducing the amounts of chemical needed. BMPs can improve the level of service and provide cost savings while making snow and ice management move conveniently and reduce environmental impacts.

The Commonwealth of Pennsylvania Department of Environmental Protection (DEP) Bureau of Point and Non-Point Source Managements draft rationale for the development of ambient water quality criteria for chloride protection of aquatic life use stated that: "The existing chloride criterion in PA was developed primarily for the protection of potable water supplies. Although this criterion, a maximum of 250 mg/l, may be protective of instream aquatic life uses when applied, it is not applied in all waters of the Commonwealth, but rather only at the point of water supply intake, pursuant to 25 Pa. Code § 96.3(d) (relating to water quality protection requirements)".

The impacts from road salt and abrasives are shown below in Figure 3.

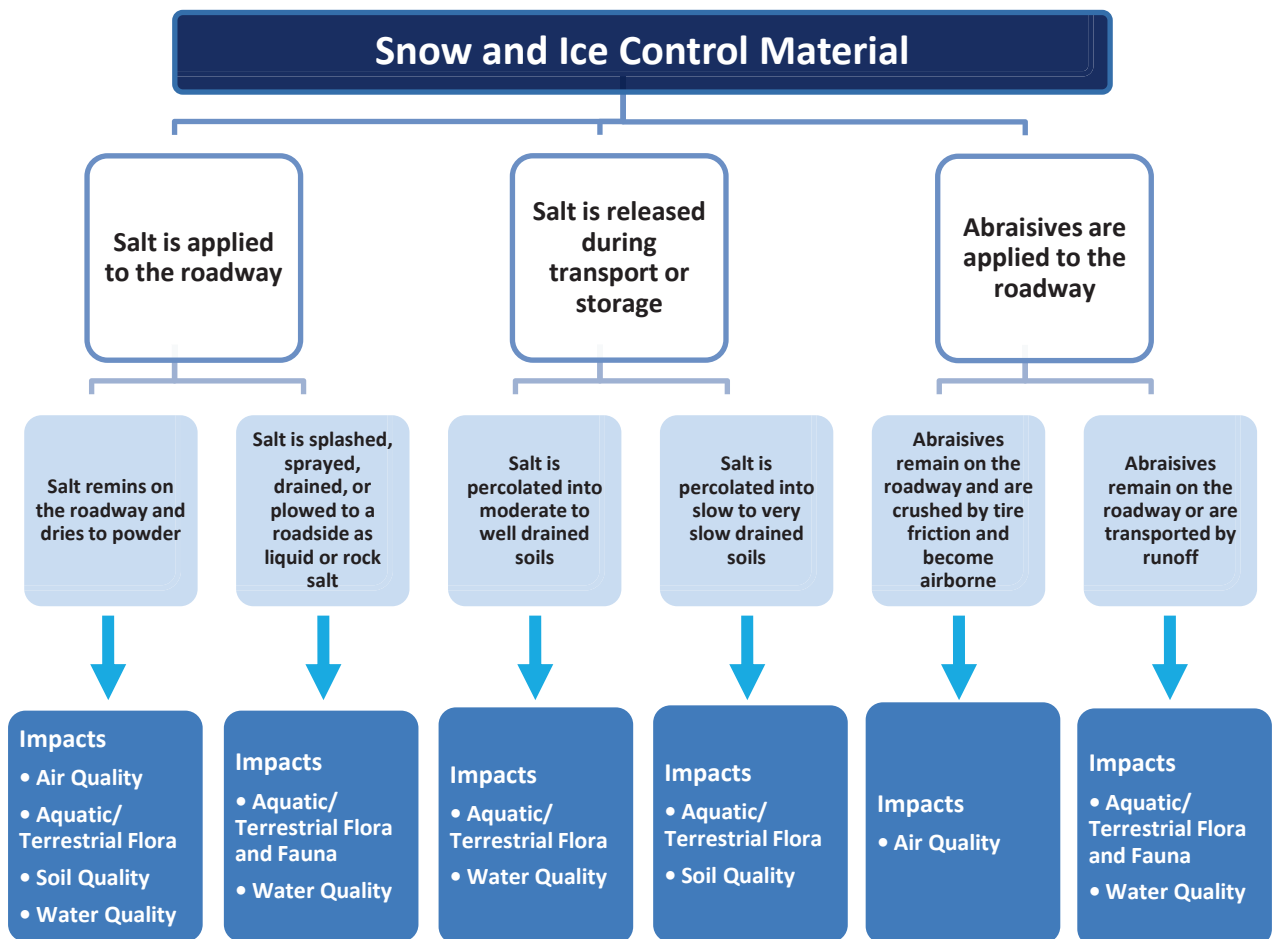


Figure 3: Impacts from road salt and abrasives. Source: Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment

It takes only one teaspoon of road salt to permanently pollute 5 gallons of water.

Once in the water, there is no way to remove the chloride, and at high concentrations, chloride can harm fish and plant life. Less is more when it comes to applying road salt.

Source: MN Pollution Control Agency

Many states have chloride impaired waterways and have US Environmental Protection Agency (EPA) approved **Total Maximum Daily Load (TMDL)** plans for chlorides. According to the EPA National Summary of Impaired Waters and TMDL Information website, the following states have an EPA established or approved TMDL for chlorides, chloride or salinity: AR, CA, GA, CO, IL, KS, KY, LA, MN, OH, NH, OK, SD, TX, VA, WV and WY.

One state that has implemented BMPs to reduce chlorides as a result of TMDLs is New Hampshire. TMDLs are in place to reduce pollutants in impaired waterways so that they meet water quality standards. TMDLs focus on identifying sources of impairment and implementing corrective actions based on the best available data and information. Additional monitoring and data collection will occur to track progress and better characterize pollutant sources, loadings and the effectiveness of control measures and BMPs.

During the development of the Chloride Reduction Implementation Plan for Dinsmore Brook Watershed in New Hampshire, the following key issues that lead to the over-application of road salt were identified:

- Key Issue #1: Not knowing that certain conditions may not warrant salt application
- Key Issue #2: Not knowing and/or tracking how much material is being applied
- Key Issue #3: Not knowing how much material is needed to achieve desired results
- Key Issue #4: Over-application of chlorides due to liability concerns
- Key Issue #5: Decisions are made without knowledge of new technologies and practices

The key issues above offer valuable insight to understanding why road salt was over-applied. A municipality may use this information to develop/revise a winter maintenance plan to reduce rates applied prior to a TMDL needing to be issued. Particular practices that are associated with the above issues and overlap with the MS4 permit MCMs could be a topic of focus for staff education. In New Hampshire, they addressed Key Issue #4 by creating state legislation that reduces the liability from slip and fall claims for the private sector salt applicators.

One common issue found in DEP/EPA audits is that the Stormwater Management Program does not identify pollutants of concern, “impairments” or address TMDLs.

For more information about the Integrated Water Quality Report (formerly 303(d) and TMDL list):

<http://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/Integrated%20Water%20Quality%20Report-2016/Pages/default.aspx>

Helpful Tips

- **New Hampshire legislation for salt applicators**
 - [RSA 489-C: Salt Applicator Certification Option](#)
 - [RSA 508:22 Liability Limited for Winter Maintenance](#)
- **For more information on the state of New Hampshire and their management of chlorides, please see <http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/index.htm>.**

Winter Maintenance Chemicals

Chloride-Based Deicers and Associated Impacts

Sodium Chloride (NaCl): Road Salt

Road salt or sodium chloride (NaCl), is the cheapest and most readily available chemical that efficiently melts ice and can be easily applied to our roadways and parking lots. The purpose of using salt on roadways is to prevent or minimize the snow and ice bond to the pavement, keep the snow and ice in a condition so that it is easily plowed off, and prevent the formation of snow and ice on the road.

Sodium (Na) can impact soil chemistry and release nutrients such as calcium, magnesium and potassium into the groundwater and surface water leading to increased nutrient concentrations impacting the aquatic environment. The USEPA has set an advisory limit for drinking water for public water systems at 20mg Na/L to assist doctors in making recommendations for those patients on a salt-restricted diet. **Chloride (Cl-)** is highly soluble, very mobile, and its density allows for it to settle to the bottom of a waterbody. Chloride is toxic to aquatic life at levels above 230 mg/l. There is no natural process by which chlorides are broken down, metabolized or taken up by vegetation.

Other Commonly Used Chlorides for Winter Maintenance

- **Calcium Chloride (CaCl)** – CaCl, the second most commonly used chemical, is available in flake, pellet or liquid. It is effective at lower temperatures with a practical melting temperature of -20°F. In liquid form it can be used to pre-wet salt or applied directly as an anti-icing technique which can help in preventing snow and ice from bonding to the pavement and reduce the application amount needed. Several disadvantages to CaCl include a higher cost, environmental impact due to chloride, corrosiveness to metal, difficulty handling and storage, and it can contribute to slippery conditions if applied incorrectly.
- **Potassium chloride (KCl)** - KCl is a naturally occurring material (muriate of potash) that is also used as fertilizer. It is available in liquid or crystal form with a practical melting temperature of 20°F. KCl can be damaging to concrete, has environmental impacts due to chloride and can inhibit plant growth and burn foliage.
- **Magnesium Chloride (MgCl)** - MgCl is available in liquid or crystal form that melts faster than rock salt with a practical melting temperature of 5°F. MgCl attracts moisture and can lead to slippery conditions if applied incorrectly. MgCl is corrosive and contributes to the chloride load in our waters. It is important to note that additives to road salt like ferrocyanide, which is used as an anti-caking compound in large salt supplies, can have impacts on both the environmental and human health due to cyanide ions being released by certain types of bacteria, as well as from exposure to sunlight.

The improper management of chlorides can have negative impacts. Impacts can vary and include, but are not limited to: infrastructure and vehicle impacts; human impacts associated with drinking water supply; and, environmental impacts.

Infrastructure and Vehicle Impacts

Within the Southwestern Pennsylvania Commission (SPC) region, there are a 5,281 state bridges and 1,341 local bridges over 20' long. According to the 2013 Structural Scorecard Report from the American Society of Engineers, 22.33% of state bridges and 33.56% of local bridges over 20' are classified as structurally deficient. Chloride use accelerates corrosion, including penetrating/deteriorating concrete on bridge decking and parking garage structures, damage to reinforcing rods, and compromising structural integrity. As infrastructure is replaced or repaired, it is recommended that suitable alternative(s) to chlorides be utilized to minimize future infrastructure impacts.



Figure 4: Significant damage from many years of salt and deicing chemical use from a leaking expansion joint. Source: Bridge retrofit using fiber reinforced polymer, cenews.com

Vehicle parts damaged from chlorides include: brake linings, frames, bumpers, and body corrosion. The cost of corrosion damage and protection practices for highways and auto industry have been reported to cost \$16-19 billion per year (*City of Madison Wisconsin, Report to The Salt Use Subcommittee for the Commission on the Environment, 2006*).

Human Impacts: Drinking Water

Rivers are a common drinking water supply in the region. The USEPA requires drinking water to be monitored for sodium. Public water suppliers are to report to local health authorities any concentration above 20 mg sodium per liter of water (20mg/l). Chloride is not toxic to human health at low levels but does pose taste and odor issues at concentrations exceeding 250 mg/l. In rural areas, private wells located near a road or parking lot may be impacted due to the improper storage of salt.



Figure 5: Salt and your drinking water. Source: Healthyfoodstar.com

Environmental Impacts

Chloride remains in a solution and is not subject to any significant natural removal methods. Chlorides are toxic to aquatic life at high concentrations.

Study results are conflicting in regards to what time of the year aquatic ecosystems are at the greatest risk for exposure times to chlorides. Some studies suggest that during the summer months at times when there is low stream baseflow

(ground water and surface water connection) there are higher chloride concentrations. The highest concentrations of chlorides are present when chlorides have been applied to roads and parking lots, running off into streams throughout the winter months.

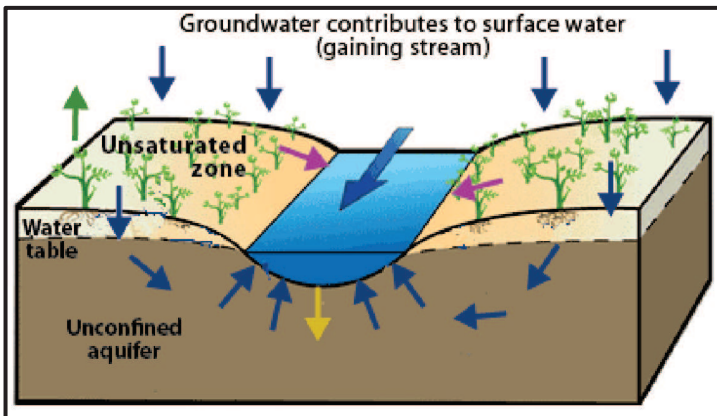


Figure 6: Groundwater contributes to surface water. Source: United States Geological Survey

Figure 6 shows how streams and groundwater can be interconnected, depending on the geology of the area. With this figure it is easy to see how groundwater may become impacted by chlorides that are transported to streams via runoff or how groundwater that is impacted can affect water quality in a stream.

Impacts can also occur in ponds and lakes. Over time chloride levels increase and a higher water density is created and settles at the deepest part of ponds and lakes where current velocities are low. This can lead to a chemical stratification (i.e., impedes turnover/mixing in the fall/spring preventing dissolved oxygen within the upper layers of the water from reaching the bottom layers and nutrients within the bottom layers from reaching the top layers). This results in the bottom layer of the water body becoming void of oxygen and becoming unable to support aquatic life.

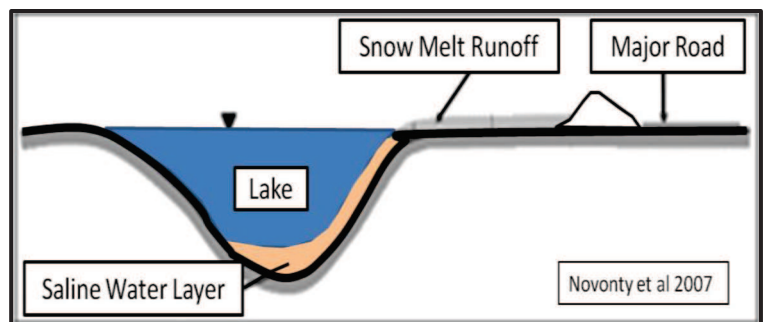


Figure 7: Stratification

Studies show that when safe and sustainable snowfighting practices are implemented the impact of road salt on the environment is minimal and manageable. Source: Salt Institute

Acetate and Formate-Based Deicers and Associated Impacts

Non-chloride deicers are acetate and formate-based deicers. Acetate-based deicers such as potassium acetate (KAc), sodium acetate (NaAc), calcium magnesium acetate (CMA) and formate-based deicers such as sodium formate (NaFm) and potassium formate (KFm) are the most commonly used.

Sodium acetate (NaAc) has excellent melting properties and works at lower temperatures than NaCl. CMA generally works as a deicer similar to NaCl, yet it can require 50% more by weight than NaCl to achieve the same results (Wegner and Yaggim 2001).

Impacts from acetate-based deicers can include but are not limited to: elevated biochemical oxygen demand (BOD) in waterways and potential oxygen depletion, increased turbidity and hardness in waterways, and the leaching of heavy metals (Fay et al, June 2015).

Agriculturally-Derived Deicers and Associated Impacts

Various types of agriculturally/naturally-derived products have been developed for snow and ice control. Product types can include but are not limited to corn-based products such as corn syrup, and steeps and other derivatives; beet juice, cane molasses, distiller's grain and cheese brine by-product. See Figure 10 for more details. These products are used as additives and/or mixed with solids, liquids and abrasives to improve performance. They can also reduce deicer corrosiveness and enhance longevity of deicer treatments. Some common issues with these products are linked to high levels of phosphates, nitrates or total organic content when used on roadways adjacent to nutrient-impaired waterways.



Figure 8: Agricultural brines. Source: Deeprout.com

Beet juice is an effective alternative to salt alone because it lowers the freezing point of water to as low as -20 degrees. Salt only prevents water from freezing at temperatures of 5 degrees or higher. Source: Deicing with Beet Juice, Deeprout.com

Suitable products have been verified by third party organizations that have evaluated both environmental and health impacts, as well as their performance. As of December 2013, there were nearly 100 products identified on the Pacific Northwest Snow Fighters Qualified Products List. Also in 2013, nine manufacturers

offering over 20 different products were provided in the *Design for the Environment—Recognized Products* report.



Figure 9: Solar Roadway. Source: PVBuzz.com

Helpful Tips

- Model specifications have also been developed in other states. Ohio has developed *Ohio's Model Specifications for Natural/Agricultural-Based Deicing Liquid* and Ohio's DOT developed a contract for agricultural-based (called natural) deicing liquids.
- For more information see: <http://www.dot.state.oh.us/Divisions/Operations/Maintenance/SnowandIce/Snow%20and%20Ice%20Best%20Practices/Agricultural%20De-icer%20Contract%20124-11.pdf>

Category	Potential for Corrosion Impairment ³					Environmental Impact ³		
	Atmospheric Corrosion to Metals	Concrete Matrix	Concrete Reinforcing	Water Quality/Aquatic Live	Air Quality	Soils	Vegetation	Type
Chloride Based Deicers	High: Will initiate and accelerate corrosion	Low/moderate: Will exacerbate scaling; low risk of paste attack	High: Will initiate corrosion of rebar	Moderate: Excessive chloride loading/metals contaminants; ferrocyanide additives	Low: Leads to reduced abrasives use	Moderate/high: Sodium accumulation breaks down soil structure and decreases permeability and soil stability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis	Sodium Chloride
	High: Will initiate and accelerate corrosion; higher potential for corrosion related to hydroscopic properties	Low/moderate: Will exacerbate scaling; low risk of paste attack	High: Will initiate corrosion of rebar	Moderate: Excessive chloride loading; heavy metal contamination	Low: Leads to reduced abrasives use	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis	Calcium Chloride
	High: Will initiate and accelerate corrosion; higher potential for corrosion related to hydroscopic properties	Moderate/high: Will exacerbate scaling; risk of paste deterioration from magnesium	High: Will initiate corrosion of rebar, evidence suggests MgCl2 has the highest potential for corrosion of chloride produces	Moderate: Excessive chloride loading; heavy metal contamination	Low: Leads to reduced abrasives use	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	High: Spray causes foliage damage; osmotic stress harms roots; chloride toxicosis	Magnesium Chloride
Acetate Based Deicers	Low/moderate: Potential to initiate and accelerate corrosion due to elevated conductivity	Moderate/high: Will exacerbate scaling; risk of paste deterioration from magnesium reactions	Low: Probably little or no effect	High: Organic content leading to oxygen demand	Low: Leads to reduced abrasives use	Low/moderate: Improves soil structure; increases permeability; potential for metals to mobilize	Low: Little or no adverse effect; osmotic stress at high levels	Calcium Magnesium Acetate
	Low/moderate: Potential to initiate and accelerate corrosion due to elevated conductivity	N/A	Low: Probably little or no effect	High: Organic content leading to oxygen demand	Low: Leads to reduced abrasives use	N/A	N/A	Potassium Acetate
Carbohydrates	Low: Potential to initiate and accelerate corrosion due to elevated conductivity claims of mitigation of corrosion require further evaluation	Low: Probably little or no effect	Low: Probably little or no effect; claims of mitigation of corrosion require further evaluation	N/A	N/A	N/A	N/A	Sodium Acetate
	Low: Potential to initiate and accelerate corrosion due to elevated conductivity claims of mitigation of corrosion require further evaluation	Low: Probably little or no effect	Low: Probably little or no effect; claims of mitigation of corrosion require further evaluation	High Organic matter leading to oxygen demand; nutrient enrichment by phosphorus and nitrogen; heavy metals	Low: Leads to reduced abrasive use	Low: Probably little or no effect; limited information available	Low: Probably little or no effect	Beet Juice
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Molasses
								Corn Syrup

Figure 10: Impairments Associated with Commonly Used Deicing Chemicals. Source: NCHRP Report 577

Winter Maintenance Best Management Practice Recommendations

Almost all chloride applied to roads, sidewalks and parking lots will reach our lakes and streams via runoff or infiltration. The BMPs within this guide focus on source control, and applying less material. Stormwater management BMPs that use capture and infiltration methods (e.g., swales, ponds, and catchment basins) primarily slow or catch water and allow suspended solids to settle out and for infiltration to occur. These BMPs do not work well for removing chlorides due to their high solubility. Chlorides do not degrade in the environment; instead they accumulate and therefore infiltration is not a good practice for addressing chloride impairments specifically.

Benefits of implementing winter maintenance BMPs can include:

- **Improved Level of Service:** A winter maintenance plan that is informative, knowledgeable and well-executed results in consistent services to the public.
- **Improved Safety:** A good understanding of materials, application rates, weather, and equipment can minimize dangerous road conditions.
- **Reduction of Impacts:** Understanding and implementing BMPs will reduce the amount of impacts associated with these products and reduce pollutants for the protection of infrastructure and the environment.
- **Save Money and Resources:** Knowing how to use the right treatment at the right time will save time, money, and materials.

BMPs	Description
Alternative Snow-Removal Methods	<ul style="list-style-type: none"> • Use mechanical means to remove snow, such as, plowing, shoveling or blowing as much as possible.
Calibration and Equipment Maintenance Retrofitting	<ul style="list-style-type: none"> • Calibrate your equipment. This will save chemical cost and reduce environmental impacts. Keep a record of your calibration. Each truck will be calibrated based on how it operates, and should be calibrated for varying types of materials. • Do not overfill your truck. Only put the amount of salt in your truck that you need for the route. • Retrofit trucks for use of on-board application regulators with temperature sensors that monitor air and pavement temperatures (or purchase hand-held unit); equip trucks with GPS; tanks and equipment for anti-icing and/or pre-wetting practices (with brine). Use ground speed control on your spreader. • Retrofit your trucks with applicator regulators or if Road Weather Information System (RWIS) is available in your area, use RWIS to determine when to apply deicers and which ones to use.
Anti-icing	<ul style="list-style-type: none"> • Anti-icing is the proactive method of preventing snow and ice from bonding to pavement. It can be more than 50% more efficient than deicing. This can reduce the amount of chemical needed by 30%.
Pre-wetting	<ul style="list-style-type: none"> • Pre-wetting is the process of coating a solid deicer with a liquid before it is spread on a roadway. Deicing chemicals must form brine before they can begin melting ice. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. Pre-wetting salt can reduce application rates by 20%.
Resource Management	<ul style="list-style-type: none"> • Create a winter snow and ice control policy that will outline levels of service, application rates and plowing frequency. • Keep a log of winter storm events, time, and application rates to help describe maintenance activities and results.
Good Housekeeping and Education	<ul style="list-style-type: none"> • Know the limits of deicing; choose the proper material and apply the correct amount. Rock salt is not effective at temperatures below 15°F. • Don't mix salt and sand. Salt is for melting and sand is for traction on top of the ice; they work against each other. • Attend training workshops and stay up-to-date with new technologies and practices.

Alternative Snow-Removal Method BMPs

There are various alternatives to using chlorides. The most common BMPs are calibration of equipment, use of brine, anti-icing, pre-wetting and retrofitting equipment.

Calibration of Equipment

Calibration of equipment allows you to monitor the amount of materials you apply and test application rates to ensure efficient use of materials. Calibrating equipment is the first step to reducing salt use and saving money. Knowing staff and their habits is also an important component of managing the amount of salt applied.

Knowing how much deicing material that is being applied by equipment is critical to every winter maintenance program. It is important to understand that each truck or piece of equipment can apply different amounts of deicer. Variations in spinner speed, RPMs, spinner throw distance and/or patterns, and belt speed can affect and vary the amount of salt being applied. It is important for the operators of each truck to know their equipment capabilities and identify any issues.

Calibration procedures should be part of yearly training prior to the winter season. Appendix 2 provides example calibration spreadsheets from the state of New Hampshire. Online manuals are available for most types of spreaders. The goal is to know how much material you are putting down for every setting on each of your trucks that you use. Each truck must be independently calibrated.



Figure 11: An example of anti-icing BMP, where a brine solution is placed on a roadway prior to a winter storm. Photo credit: Darrel Lewis, Armstrong County.

Helpful Tips

The Salt Institute: Snowfighters Handbook: Safe and Sustainable Snowfighting
http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_H_B_2012.pdf

LTAP: Technical Information Sheet #168 Winter Operations Strategies
http://www.dot7.state.pa.us/BPR_PDF_FILES/Documents/LTAP/Techsheets/techSheet168-color.pdf

LTAP: Technical Information Sheet #111: New Chemical Application Guidelines for Winter Operations
http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_111_revised%202009.pdf

Brine

Brine is commonly used for anti-icing and for pre-wetting practices. Brine is a mixture of salt and water mixed together to 23% salinity. The *Brine Making: NH Best Management Practice* fact sheet can be found in Appendix 2 or can be found at: <http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/documents/bmp-brine.pdf>.

This fact sheet goes into the detail of how brine is made and also states that brine can be safely stored for up to a year, however its concentration should be tested before use. A 23% brine solution may be stored outside; however, if temperatures get below 0°F, the brine may freeze. A circulator pump will reduce the risk of freezing. Using salt with minimal debris will greatly reduce the amount of equipment clogging – solar salt is commonly used.

The Minnesota Department of Transportation Research Services provides technical information on *Salt Brine Blending to Optimize Deicing and Anti-Icing Performance*
<http://www.dot.state.mn.us/research/documents/201220.pdf>.

Anti-Icing

The key to maintaining ice-free surfaces is to create a brine layer between the pavement and winter precipitation to prevent ice from forming and make it easier to remove if it does form. **Anti-icing** is a proactive method of applying a brine solution to the roadway, preventing snow and ice from bonding to pavement. It can be more than 50% more efficient than deicing. Typically anti-icing is most effective if applied 1-2 hours before the precipitation begins; however, it can be applied up to 24 hours in advance.

LEAVE SOME PAVEMENT BARE It's always best to use stream nozzles instead of fan tip to avoid creating a slippery condition. If the anti-icing liquid freezes the bare pavement will still provide a traction surface.
Source: NH Fact Sheet BMP

Anti-icing advantages:

- Anti-icing returns road surfaces to normal faster, resulting in fewer accidents and delays.
- Salt needs moisture to be effective. Applying brine jumpstarts the melting process.
- Brine sticks to the road surface. It will not bounce and scatter like road salt.
- Application of brine to a road surface can result in 25%-30% less salt needed.
- The time required to treat lanes is reduced, therefore labor costs can be reduced if snow falls on the weekend or during hours where overtime would be paid.

Knowing when to employ anti-icing is dependent on weather and pavement conditions. Figure 12 below can act as a guide in assisting you with making the determination when to anti-ice.

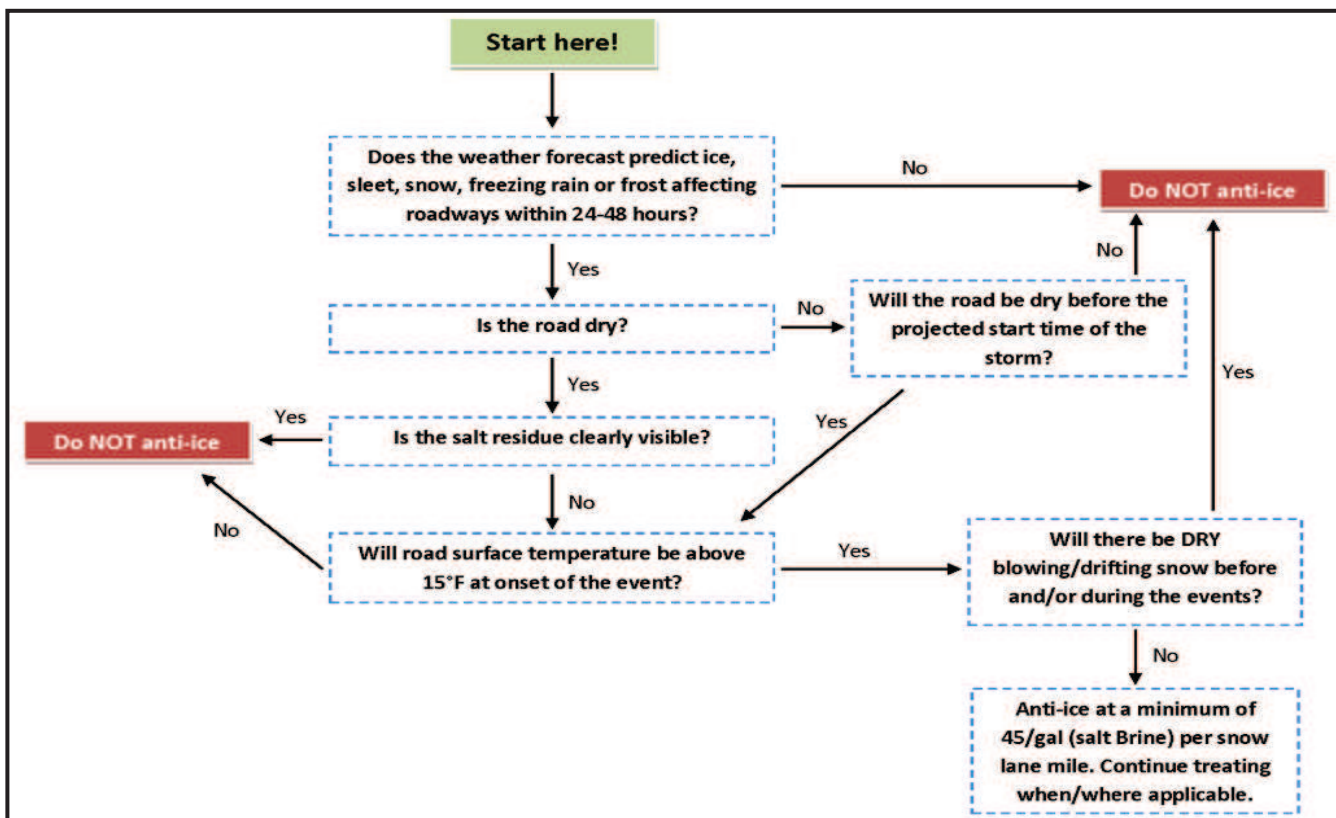


Figure 12: Anti-ice Decision Tree. Source: PennDOT Maintenance Manual

For more information, see the links below and the resources section in Appendix 4:

- http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_129.pdf
- <http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm>

Pre-wetting

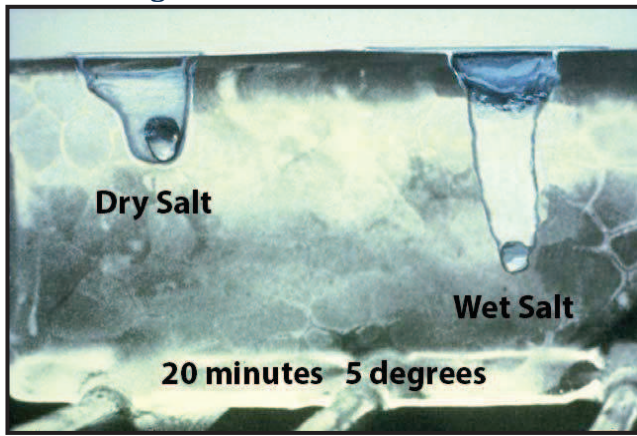


Figure 13: Pre-wetted salt works faster than dry salt. Image source: Wisconsin DOT Transportation Bulletin

reduces the total amount of deicer needed to obtain the desired results. As seen in Figure 14, Michigan DOT found a cost savings of one-third over the use of dry salt and 78% of the pre-wetted salt remained within the center of the roadway when applied.

Pre-wetting can be accomplished by applying the liquid chemical onto the material at the spinner as the material is being applied, or over the truck bed or loader bucket at the stockpile. If the liquid chemical is to be added at the stockpile, care should be taken to perform this operation on an impervious pad to alleviate leaching problems.

Pre-wetting salt is being used by more agencies than ever before. Their experience has proven the cost-effectiveness and increased safety of pre-wetted salt. The Salt Institute recommends the application rates to the right in gallons of liquid per ton of salt for the three commonly used chemicals.

As with any recommended application rate, be sure to test and adjust the rates based on current weather and pavement conditions within your municipality.

Dry salt needs to form a brine to start its melting action. **Pre-wetting** is the process of coating a solid deicer with a liquid before it is spread on a roadway. Pre-wetting your chemicals accelerates the brine making process, which improves the melting action of the material. In some cases, depending on the liquid used, this process can also lower the material's effective working temperature allowing for chemical deicers to work at lower pavement temperatures.

Pre-wetting also reduces the amount of bounce and scatter on the roadway, which keeps the material on the roadway. It also

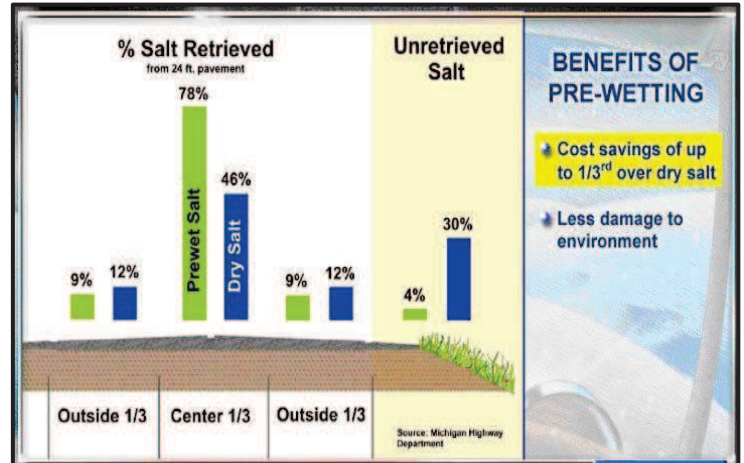


Figure 14: Benefits of Pre-Wetting. Image Source: Michigan Highway Department

Prewetting Agent	Application Rate (gallons per ton of salt)
Salt Brine	8 – 10
Calcium Chloride	6 – 12
Magnesium Chloride	6 – 8

Source: "Pre-wetting Salt: Another Cost Effective Tool for Your Winter Maintenance Toolbox." Source: The Salt Institute.

Helpful Tips

- A good rule of thumb is to use 8-10 gallons of pre-wetting liquid for every ton of deicer.
- If you are pre-wetting, don't forget to reduce your application rates accordingly.
- For more information about anti-icing please see:
 - FHWA: Manual of Manual of Practice for an Effective Anti-icing Program: A Guide For Highway Winter Maintenance Personnel <http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm>
 - http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_0.aspx

Retrofitting Trucks

Retrofitting trucks with equipment for the use of on-board application regulators, temperature sensors that monitor air and pavement temperatures, and anti-icing or pre-wetting practices can help significantly reduce the amount of salt used. Retrofitting trucks and investing in equipment can be costly, but you may discover that over a few years, with reduced materials applied, the equipment pays for itself. Below are a few examples of the cost savings that can be associated with retrofitting existing equipment to use anti-icing and pre-wetting practices.

Adding pre-wet capabilities to plow and spreader trucks requires investment to purchase the saddle tanks, pumps and nozzles that are capable of applying a liquid at the spreader's spinner. During initial start-up programs, modification of existing equipment may be the most economical.



Figure 15: Salt skirt retrofitted on a municipal truck to target salt application at the center line. Source: Minnesota DOT.

The example data below shows how the cost savings can be realized through simple calculations.

Example Base Data	Example Material Cost Savings
<p>Salt Usage: 1,000 tons of salt per year</p> <p>Cost of Salt: \$45.00 per ton</p> <p>Cost of Calcium Chloride (CaCl): \$0.85 per gallon</p> <p>Rate: 10 Gallons CaCl per ton of salt</p> <p>Percent Reduction of Salt: 30%</p>	<p>Amount of Salt Saved: 1000 tons x 30% reduction = 300 tons/year</p> <p>Cost of Salt Saved: 300 tons x \$45.00/ton = \$13,500</p> <p>Amount of CaCl Used: 10 gallons/ton x 700 tons = 7,000 gallons</p> <p>Cost of CaCl Used: 7,000 gallons x 0.85/gallon = \$5,950</p>
<p>Annual Net Material Savings: \$13,500 - \$5,950 = \$7,550</p> <p>Annual Labor Cost Savings: Less Salt to Spread + Return Trips to Re-Salt Eliminated</p>	

Figure 16: Cost savings example. Source: PennDOT LTAP Technical Information Sheet #129 (Prices reflected as of 2006)

Local Highlight: North Fayette Township, Allegheny County



North Fayette Township began utilizing brine in 2013. In their very first year of operations, in 2014, they went from spending \$311,000 to \$202,000 on winter maintenance operations for a savings of \$109,000.

North Fayette experiences, on average, 30 snowfall events per year. For each pass (township-wide), they use about 90 tons of salt to treat 100 lane miles. It takes between 5 and 10 tons of salt to make enough brine to treat all of their roads. Utilizing brine for pre-treating roadways, North Fayette estimates that 80 tons of salt during each snowfall event is saved, which equates to an average savings of about \$4,700 per event. The potential savings is around \$141,000 a year.

Helpful Tips from North Fayette:

- One ton of salt can yield between 1,600 to 1,800 gallons of salt brine depending on the size of the salt crystals used
- The adjusted salt brine price for North Fayette Township is around 14 cents per gallon
- Average yearly costs associated with manufacturing brine is approximately \$46,000 a year
- By pre-treating roads prior to a snow event, it is estimated that they saved 80 tons of salt per event

Their upfront costs consisted of:

- Equipment and retrofit: \$18,000/truck (GPS, spreader controls, tanks and equipment)
- Original mixing equipment and tank: \$95,000
- Pre-wetting tower for brine: \$10,000

Alternatives to Deicers

There are various alternatives to using deicers near sensitive aquatic resources. Some alternatives may have their own impacts; be sure to research and select the alternative that is most suitable.

Abrasives

Abrasives serve to provide a temporary friction layer on the road surface and are relatively inexpensive. They are commonly used on roads with low levels of service (LOS) or in areas that may need immediate traction; such as hills, curves, and intersections or other problem areas. Abrasives provide limited effectiveness on snowy or icy roads with higher vehicle speed and have substantial clean-up costs due to repeated applications that are needed. Abrasives can negatively impact water quality and aquatic species, air quality, vegetation and soil. Abrasives accumulate in stormwater inlets and pipes and travel into waterways via stormwater runoff and snowmelt. It is estimated that 50% to 90% of sand applied may remain somewhere in the environment after clean-up (Parker, 1997).

If you use a 50/50 salt/sand mix, you're generally either half right or half wrong. Using a salt/sand mix leads to overapplication of both materials.

Source: MN Snow and Ice Control

Under the current PennDOT publications, abrasives (antiskid materials) fall into two categories: 1) Aggregates and 2) Cinders, coke, crushed coal boiler bottom ash, or burned anthracite coal mine refuse. Although abrasive piles need to have salt applied to them so that they do not freeze, applying a salt/abrasive mix to the road is generally not recommended. Salt reduces the effectiveness of abrasives, and abrasives reduce the effectiveness of salt. However, a salt/abrasive mix may be helpful in certain situations such as a freezing rain event where the salt is washed away quickly. Some reports state that a abrasive/salt mixture can be effective in increasing friction in icy situations by sticking the abrasive to the surface, like sandpaper.

Recommended Abrasives Applications		
Road Type	Recommended Practices	Use of Dry Abrasives
High Speed Urban Roads	Plow and apply chemicals to achieve bare pavement.	Inappropriate
Low Speed Urban Roads	Abrasives should be limited to parts of the road where motorists must brake, accelerate, or maneuver. Even then, abrasives should be applied only when it will likely take a long time to provide bare pavement.	Only in certain locations, and when snow pack will persist
Urban Intersections	Abrasives should be used only when an intersection might be snow or ice-covered beyond a normal period.	Only when snow pack will persist
Rural Roads, Paved	Abrasives should be applied on hills and curves only on low-speed low-volume roads. Paved rural roads should be plowed and chemical applied to achieve bare pavement.	Inappropriate
Rural Roads, Gravel	The recommended approach should be to simply groom the snow pack.	Only on low speed sections (perhaps hills and curves)
Rural Intersections	The preferred approach for paved roads is to plow and apply chemicals to achieve bare pavement. On gravel parts of intersections, abrasives may be applied over the part of the road where speeds less than 30 mph are expected.	Only on low speed approach length of gravel roads

Snow Fences

Blowing snow can impair motorists' visibility, cause accidents and make clearing the road more difficult. Reductions of blowing snow can be reduced by constructing snow fences. By reducing the amount of snow blowing across the road, snow fences can improve motorist's visibility, and reduce the amount of drifting snow on the road. New lightweight plastic fencing makes snow fences more portable and convenient to install than previous versions that were made of wood. Living

snow fences are made up of trees or vegetation that are strategically planted to act in the same manner as a traditional snow fence. Living snow fences are ideal in situations where a natural setting is desired, are more aesthetically pleasing and do not have the maintenance associated with them as portable snow fences.

Pervious Pavement

The University of New Hampshire’s research suggests that porous asphalt, if installed correctly and functioning as designed, reduces the formation of ice on the pavement surface, so that the use of deicing chemicals may be drastically reduced. It is very important that sand and abrasives not be used for winter maintenance, as they will clog the pores. It is recommended that vacuum sweeping be performed at least twice a year.

The National Ready Mixed Concrete Association has produced a new *Pervious Concrete Pavement Maintenance and Operations Guide* which provides more detail on maintenance including specific recommendations on Winter Maintenance. The guide lists a number of deicing chemicals that should never be used and suggests some significant limitations on the type of equipment to be used for mechanical removal. The guide can be downloaded at:

http://www.perviouspavement.org/downloads/pervious_maintenance_operations_guide.pdf.

Application Rates

Pennsylvania experiences a broad range of winter conditions so there is no one single set of application rate standards that will give “proper application rates” for all storm conditions because no two storms are exactly alike. Generally speaking, only apply enough chemical deicer to permit plows to remove the snow or melt ice. Several resources for application rate guidelines are provided in this section and are included in the resources at the end of this document.

Some of the resources may provide guidelines that you are used to using, while others that are recommended for the reduction of chloride may be a new concept. As stated earlier in this document, some of the reasons that lead to the over-application of chlorides can be due to not knowing that certain conditions may not warrant salt application; not knowing and/or tracking how much material is being applied; not knowing how much material is needed to achieve desired results; and decisions being made without knowledge of new technologies and practices.

It is recommended that you research BMPs and associated application rates. Test, document, and refine your practices based on your findings.



Figure 17: Over-application. Source: Howard County, Maryland

Helpful Tips

There are many resources available to help with your winter maintenance program.

- Minnesota Snow and Ice Control Field Handbook for Snowplow Operators: Second Revision <http://www.mnltap.umn.edu/publications/handbooks/documents/snowice.pdf>
- Winter Parking Lot and Sidewalk Maintenance Manual <https://www.pca.state.mn.us/sites/default/files/parkinglotmanual.pdf>
- FHWA: Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel <http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm>
- The Salt Institute: Snowfighters Handbook: Safe and Sustainable Snowfighting http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_HB_2012.pdf

Additional Considerations

In addition to applying chlorides to roads, parking lots and sidewalks, salt can also impact the environment from chemicals at storage areas and snow storage/dump areas.

Storage Recommendations for Deicing Chemicals

General rules for salt facilities and piles:

- Locate away from water sources
- Locate on an impervious surface
- Adequate drainage controls to prevent runoff
- After loading materials clean up any spills that occur
- Locate all salt and deicing areas outside the 100-year floodplain, areas of localized flooding and away from stormwater facilities
- Cover all salt and deicing material storage piles with tarps, hard shelters or within dikes or berms



Figure 18: Salt Storage Area. Source: SPC regional partners

The Pennsylvania Department of Environmental Protection (PADEP) has established minimum requirements for exposed salt storage piles under its National Pollutant Discharge Elimination System (NPDES) Industrial General Permit. (Note: This information was accurate as of June 2016. Please check for any changes that may occur when new permits are issued.)

For piles less than 3,000 tons:	For piles greater than 3,000 tons:
Recommendations and BMPs from the Salt Institute’s Salt Storage Handbook must be incorporated. These piles must be covered by a permanent structure and be located on an impermeable base.	Recommendations and BMPs from the Salt Institute’s Voluntary Salt Storage Guidelines for Distribution Stockpiles must be incorporated. These piles must be on an impermeable base and must be covered at all times with canvas, polyethylene or other synthetic material, except when receiving salt, building the stockpile, or loading out to customers, and then only the working face may be exposed.

Many states have considerations for siting new municipal deicing storage/salt facilities. These are good practices to consider within each municipality.

Ohio	<ul style="list-style-type: none"> • Avoid locating within 300 feet of any well, whether used for drinking, irrigation, or industrial water supply. • Avoid locating within 100 feet of features that have the capability to serve as a rapid pathway for salty water to migrate, such as storm drains and ditches (including roadside ditches). Avoid locating within 300 feet of dry wells (drains directly into subsurface). • Avoid locating within the 100-year floodplain of a stream or within 300 feet of a stream, river, lake, pond, or wetland.
New Jersey	<ul style="list-style-type: none"> • Locate at least 200 hundred feet from streams, wells, reservoirs and ground water sources. • Avoid wellhead protection areas. • Top elevation of the pad and access way should be higher than the 100-year storm level. • Divert storm water away from storage area.
Connecticut	<p>Per Connecticut guidance, in order to prevent a new salt storage facility from becoming a source of pollution, it should not be located in any of the following:</p> <ul style="list-style-type: none"> • Within a 100-year flood plain • Within 250 feet of a well that is utilized for potable water • Within an Aquifer Protection Area • Where adjacent surface water bodies are tributary to public water supply reservoirs, unless it is not feasible to locate the facility in a less sensitive area • In areas where the groundwater has been classified as GAA or GA, unless it is not feasible to locate the facility in a less sensitive area

Snow Storage/Dump Area Recommendations



Figure 19: Dumping snow into a waterway is not recommended. Photo Credit: Flickr.com

Consideration must also be given to the disposal of snow removed from roadways. This snow may contain higher concentrations of roadway salts and sediments. Snow storage areas should be located in upland areas only, where abrasives and other debris will remain after snowmelt for later removal. Large quantities of snow (and the sand and debris) may also cause blockage of storm drainage systems, and may result in increased chance for localized flooding, so do not locate them on or close to drainage systems.

Once the winter season is over and all the snow/ice has melted clean, remove all debris and sediment from storm drains, ditches and basins. Complete street sweeping practices per MS4 permit requirements.

Do not dump accumulated snow:

- Into waterways, wetlands, on top of storm drains
- On stream or river banks that slope toward the water, where sand and debris can get into the watercourse
- In areas immediately adjacent (within at least 100 feet) of private or public drinking water well supplies (due to the possible presence of road salt)
- In stormwater management/green infrastructure BMP areas



Figure 20: Snow dump area. Source: Minnesota DOT

Salt Truck Wash Water Management

Salt truck wash water and runoff from salt storage facilities can contain high levels of sodium, chloride, cyanide, and other associated pollutants. When possible, capture, treat, and recycle salt-containing wash water or storage facility runoff. Capture and recycle salt-containing wash water or storage facility runoff for use as salt-brine in salt pre-wetting and anti-icing materials, or properly route the collected runoff to a wastewater treatment facility. For additional information regarding wash water containment and recycling see the Vehicle Washing fact sheet in Appendix 4.

The *Innovative Environmental Management of Winter Salt Runoff Problems at INDOT Yards* publication describes beneficial salt truck wash water reuse. The report states six key factors for the reuse of salt truck wash water involves: 1) wash water collection, 2) wash water pretreatment, 3) temporary wash water storage, 4) brine manufacturing hardware and operational details, 5) product brine storage, and 6) brine application procedures and timing.

Helpful Tips

- Bring extra salt back to the pile, do not use it up on the route if not needed. Clean out salt from truck thoroughly before washing truck.
- The Salt Institute: Salt Storage Handbook: Safe and Sustainable Salt Storage <http://www.saltinstitute.org/wp-content/uploads/2013/09/Salt-Storage-Handbook-2015.pdf>.

MS4 Considerations

Stormwater regulations associated with the Federal Clean Water Act (CWA) are administered under the Municipal Separate Storm Sewer System (MS4) Program by the EPA. In Pennsylvania, the MS4 program is managed by PADEP, with oversight from EPA. MS4s are conveyances or systems of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains that are owned and operated by a public entity, are designed or used for collecting or conveying stormwater, and are not a combined sewer or part of a publicly-owned treatment works. A municipality is bound by USEPA regulations for an MS4 when all or a portion of a municipality lies within an urbanized area, as determined by the US Census Bureau.

Chloride reduction also affects these MS4 municipalities. Currently, there are over 200 MS4 municipalities in the Southwestern Pennsylvania region. Winter BMPs are directly tied to Minimum Control Measure (MCM) 6, which focuses on Good Housekeeping and Pollution Prevention within the municipality to reduce the amount of pollution that is discharged to waterways, including chlorides. Municipal activities, including winter maintenance practices must be identified and staff training on pollution reduction, which includes chloride reduction, is a requirement of the program. Regulating authorities will also expect to see logs of specific municipal activities, such as snow removal, deicing and anti-icing. Standard operating procedures (SOPs) should be created for these winter maintenance activities.

Record-keeping and documentation is a very important aspect when developing and implementing your municipal pollution prevention and good housekeeping program. There are many resources and companies that offer tracking, reporting and record-keeping services, which may be the right option for you, depending on budget constraints and technology preferences. It is also fairly simple to keep your efforts organized and documented by using inexpensive three-ring binders. These binders should be updated, organized, and easily accessible to staff responsible for MS4 compliance.

For a more information on the MS4 Program, refer to SPC's "Quick Resource Guide to the MS4 Program" found at http://spcwater.org/ed_facts.shtml.



Figure 21: Municipal facilities and activities (Source: SPC, regional partners, and the Chesapeake Stormwater Network)

Helpful Tips

There are several available plans that give good operations and maintenance guidance:

- City of Hamilton Public Works Department Operations and Maintenance Division: Road Salt Management Plan (TOE02129a)
- Good Housekeeping O&M Program <http://www.lancasterintermunicipalcommittee.org/OM%20Program%20Template.pdf>
- BMP Fact Sheet: GH-23 Salt Storage <http://www.lancasterintermunicipalcommittee.org/GH%2023%20Salt%20Storage.pdf>

When developing and implementing a municipal pollution prevention and good housekeeping program, priorities should be based on a series of principles. Documentation and processes help fine-tune your winter maintenance program. Consider the topics below and the proper documentation needed for your winter maintenance MCM6 MS4 permit compliance.

Develop Salt Management Policies and Objectives	<ul style="list-style-type: none"> ✓ Adopt a salt management policy that commits to measurable improvements in salt management practices ✓ Review current practices to form a benchmark ✓ Document policies, procedures and guidelines for your salt management practices, including: level of service for each roadway type, salt/sand application rates, managed salt/sand storage, good housekeeping practices, equipment calibration and re-calibration, training, snow disposal, incorporation of salt management consideration into road design and construction, and salt vulnerable areas ✓ Address the following areas of concern in your policies: general road use, salt use in salt vulnerable areas, salt storage and mixing, and snow storage and disposal ✓ Create a policy to minimize the use of potential pollutants, such as road salt and abrasives
Prevent Pollution at its Source	<ul style="list-style-type: none"> ✓ Sweep streets and clean catch basins (abrasives removal, litter, organic debris removal from snow dump areas) ✓ Store solid deicers on impervious surfaces and provide secondary containment at storage sites for liquid deicers (must have secondary containment for valves and hoses) ✓ Re-vegetate eroding slopes from vegetation that may have been killed by the over-application of salt
Manage Clean Water Runoff and Minimize Pollutant Exposure to Clean Water	<ul style="list-style-type: none"> ✓ Have structural cover over storage sites ✓ Site drainage design/runoff diversion ✓ Maximize infiltration of runoff away from potential pollutant sources ✓ Be able to identify where runoff outlets to
Plan for Spills and Accidents	<ul style="list-style-type: none"> ✓ Develop spill prevention and response policies and procedures for ALL facilities that use or store chemicals ✓ Provide secondary containment ✓ Equip the facility to handle any size of spill ✓ Assign a responsible person/team for response ✓ Post procedures and emergency contacts
Practice Preventive Maintenance	<ul style="list-style-type: none"> ✓ Use dry cleanup methods rather than washing (do not dump left over road salt or brine after finished with a run, clean out truck using dry methods prior to washing the truck) ✓ Establish an inspection calendar and incorporate into records/data system (equipment calibration and salt application records) ✓ Establish equipment maintenance and calibration calendar and incorporate those into records/data system
Identify Potential Pollution Sources	<ul style="list-style-type: none"> ✓ Identify all material storage sites, especially those with any outside loading or unloading operations ✓ Plan for new facilities to include stormwater pollution prevention
Improve Data Collection, Mapping, and Records Maintenance	<ul style="list-style-type: none"> ✓ Assign responsibility for monitoring and recording data collection ✓ Maintain chemical usage data for deicers and abrasives ✓ Benchmark the annual amount of salt applied per unit of weather/precipitation, such as degrees below 32°F or per inch of snow ✓ Records for street sweeping activities ✓ Cleaning catch basins and what you do with the materials ✓ If taken to a landfill, you need to be able to show documentation ✓ Make use of application rate guidelines
Train and Reward Employees	<ul style="list-style-type: none"> ✓ Provide targeted training on policies ✓ Provide procedures and best management practices for staff ✓ Annually review the previous year's salt management practices and results to review progress ✓ Emphasize communication and coordination for municipal departments and operations with county and state agencies, organizations and institutions
Educate your Public	<ul style="list-style-type: none"> ✓ Develop public outreach and participation regarding municipal pollution prevention activities ✓ Educate the public on proposed and existing winter maintenance practices ✓ Public education information could include adjusting driving behavior based on roadway condition

Source: Information adapted from NYS Municipal Pollution Prevention And Good Housekeeping Program Assistance, May 2006

MS4 Considerations for Brine and Other Liquids

All liquid containers must be labeled and protected from vehicle impacts and should have secondary containment. Secondary containment can consist of a bunker, berm, building, double-walled tank, etc. Spills from ice control products can occur during production, delivery and transfer so secondary containment is also needed for valves, hoses and pumps.

MS4 Considerations for Abrasives and Anti-Skid Materials

MS4 auditors may request the following street sweeping operations information:

- Does the permittee regularly sweep streets or municipal owned parking lots?
- What is the sweeping schedule?
- Are areas scheduled for sweeping based on aesthetics only, or is consideration given for reducing impacts on the stormwater and surface waters?
- What types of sweepers are used?
- How is street sweeping debris disposed? If the debris is dewatered, how is it done? How is the decanted water disposed?
- Are records kept of the amount of debris collected and amount of debris properly disposed of?
- How does the municipality use the data to further its program or evaluate program effectiveness? Are the data used to help prioritize cleaning frequency?

MS4 auditors may request the following catch basin cleaning operations information:

- Does the municipality have a schedule for routine maintenance or cleaning of basins?
- How many are cleaned and how often?
- Has the municipality targeted certain areas for more frequent maintenance? Does this targeting help minimize stormwater pollution?
- Are goals set for how many basins are inspected and cleaned each year?
- How are basin cleaning and maintenance needs tracked and recorded?
- What information is documented? Does the municipality track how much material is removed from each basin?
- What are the procedures for disposal of waste removed from basins or drains?
- Does flushing occur that could potentially discharge to surface water?
- If the material is removed by wet vacuum, how is the material dewatered? How is the decanted water disposed?
- Does the municipality have a schedule for routine maintenance or inspection of stormwater pipes?
- What are the maintenance procedures for cleaning clogged stormwater pipes?

MS4 auditors may request the following winter maintenance operations information:

- What type of winter anti-icing, deicing, and traction materials are used?
- How are the materials stored? Is the material covered and/or graded with a berm to prevent runoff?
- Does the municipality track the location and volumes of agents applied?
- Is the material picked up after the winter event? Is there a schedule for cleaning up after an event?

Helpful Tips

- Keep in mind that the evaluator will question both managers and field staff regarding procedures used. The evaluator will ascertain the level of understanding at the field level as well as what procedures are deemed appropriate and feasible for your specific winter operations and MS4 maintenance activities.
- Website resources: LTAP Technical Information Sheets
https://www.dot7.state.pa.us/LTAP/Public/PublicDocs_GenInfo.aspx
- Secondary containment options for liquids can be found at www.oregon.gov/ODOT/HWY/OOM/emsdoc/section3.pdf

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Appendix 1: Minnesota Deicing Application Rate Guidelines

Deicing Application Rate Guidelines for Roads

24' of pavement (typical two - lane road)

The Minnesota Snow and Ice Control Field Handbook Manual 2005-1 recommended application rates have proven to be effective. MN application rates may be lower than PA Guidelines. MN and other states have TMDLs issued for Chlorides and as a result, have reduced application rates. Develop your own application rates by adjusting your current rates incrementally downward towards these guidelines. Where temperature rates overlap, select the rate most applicable to your situation.

Pavement Temp. (°F) and Trend ()	Weather Condition	Maintenance Actions	Application Rate in lbs/two - lane mile			
			Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt	Winter Sand (abrasives)
>30° ↑	Snow	Plow, treat intersections only	80 (40/lane mile)	70	100*	Not Recommended
	Frz. Rain	Apply chemical	80 - 160	70 - 140	100 - 200*	Not Recommended
30° ↓	Snow	Plow & apply chemical	80 - 160	70 - 140	100 - 200*	Not Recommended
	Frz. Rain	Apply chemical	150 - 200	130 - 180	180 - 240*	Not Recommended
25 - 30° ↑	Snow	Plow & apply chemical	120 - 160	100 - 140	150 - 200*	Not Recommended
	Frz. Rain	Apply chemical	150 - 200	130 - 180	180 - 240*	Not Recommended
25 - 30° ↓	Snow	Plow & apply chemical	120 - 160	100 - 140	150 - 200*	Not Recommended
	Frz. Rain	Apply chemical	160 - 240	140 - 210	200 - 300*	400
20 - 25° ↑	Snow or Frz. Rain	Plow & apply chemical	160 - 240	140 - 210	200 - 300*	400
20 - 25° ↓	Snow	Plow & apply chemical	200 - 280	175 - 250	250 - 350*	Not Recommended
	Frz. Rain	Apply chemical	240 - 320	210 - 280	300 - 400*	400
15° to 20° ↑	Snow	Plow & apply chemical	200 - 280	175 - 250	250 - 350*	Not Recommended
	Frz. Rain	Apply chemical	240 - 320	210 - 280	300 - 400*	400
15° to 20° ↓	Snow or Frz. Rain	Plow & apply chemical	240 - 320	210 - 280	300 - 400*	500 for freezing rain
0 to 15° ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	300 - 400	Not Recommended	500 - 750 spot treat as needed
			Not Recommended	400 - 600**	Not Recommended	500 - 750 spot treat as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	400 - 600**	Not Recommended	500 - 750 spot treat as needed

From the *Winter Parking Lot and Sidewalk Maintenance Manual*. June 2006, revised 2010. Produced by: Minnesota Pollution Control Agency and Mississippi Watershed Management Organization – 2010 revision. Written by Fortin Consulting Inc.

Deicing Application Rate Guidelines for Parking Lots and Sidewalks

The Minnesota Snow and Ice Control Field Handbook Manual 2005-1 recommended application rates have proven to be effective. MN application rates may be lower than PA Guidelines. MN and other states have TMDLs issued for Chlorides and as a result, have reduced application rates. Develop your own application rates by adjusting your current rates incrementally downward towards these guidelines. Where temperature rates overlap, select the rate most applicable to your situation.

Pavement Temp. (°F) and Trend ()	Weather Condition	Maintenance Actions	Application Rate in lbs/1000 square foot area			
			Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt	Winter Sand (abrasives)
>30°↑	Snow	Plow, treat intersections only	0.75	0.5	0.75	Not Recommended
	Frz. Rain	Apply chemical	1.25	1	1.5	Not Recommended
30°↓	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75	Not Recommended
25 - 30° ↑	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.5	1.25	1.75	Not Recommended
25 - 30° ↓	Snow	Plow & apply chemical	1.25	1	1.5	Not Recommended
	Frz. Rain	Apply chemical	1.75	1.5	2.25	3.25
20 - 25° ↑	Snow or Frz. Rain	Plow & apply chemical	1.75	1.5	2.25	3.25 for frz. rain
20 - 25° ↓	Snow	Plow & apply chemical	2	2	2.75	Not Recommended
	Frz. Rain	Apply chemical	2.5	2	3	3.25
15° to 20° ↑	Snow	Plow & apply chemical	2	2	2.75	Not Recommended
	Frz. Rain	Apply chemical	2.5	2	3	3.25
15° to 20° ↓	Snow or Frz. Rain	Plow & apply chemical	2.5	2	3	3.25 for frz. rain
0 to 15° ↑ ↓	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	3	Not Recommended	5.0 spot treat as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not Recommended	4.5	Not Recommended	5.0 spot treat as needed

From the *Winter Parking Lot and Sidewalk Maintenance Manual*. June 2006, revised 2010. Produced by: Minnesota Pollution Control Agency and Mississippi Watershed Management Organization – 2010 revision. Written by Fortin Consulting Inc.



Hydraulic-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration chart *will* be different than the sand calibration chart).

Calibrations should be performed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration.

Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.



Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting (~2"). This should be kept constant throughout the calibration process. If you find that not enough material is dispensed with this setting, try 2.5" to 3".
Engine Speed: Warm the truck up and run the engine at the typical rate seen during spreading (approximately 2000 rpm).



Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each conveyor/auger setting you are calibrating. Round your numbers to the nearest half foot and record them in column "W" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weigh the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each conveyor/auger setting that is typically used. Average these three values together and record in the orange column in the calibration chart.



Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and conveyor/auger setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration chart in the truck you just calibrated. Also, leave a copy of the calibration chart in the office so you have a copy in case the original is damaged.

Produced in partnership with:



Calibration Chart (Hydraulic Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight:															
Conveyor or Auger Setting	W	A	Discharge Rate (lb/min.)			B Average Discharge Rate $((Run1 + Run2 + Run3)/3)$	D Pounds of Material Discharged per 1000 square ft. ($D = B \times C \div A$)								
	Spread Width (ft.)	$5.28 \times W$	Run 1	Run 2	Run 3		5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)			
1															
2															
3															
4															
5															
EX	14	$5.28 \times 14 =$ 73.92	87	92	93	$(87+92+93) \div 3 =$ 90.67	$12 \times 90.67 \div$ 73.92 = 14.72	$6 \times 90.67 \div$ 73.92 = 7.36	$4 \times 90.67 \div$ 73.92 = 4.91	$3 \times 90.67 \div$ 73.92 = 3.68	$2.4 \times 90.67 \div$ 73.92 = 2.94	$2 \times 90.67 \div$ 73.92 = 2.45			

Calculation Instructions: Multiply the spread width from column **W** by 5.28 and record the answer in column **A**. For each conveyor/auger setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by 3 and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable "**C**". The "**C**" value for each travel speed is shown in red under that given speed. Multiply column **B** by the "**C**" value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$



Pony Motor-Run Spreader Calibration

NH Best Management Practices

WHY CALIBRATE?

You can't reduce your salt use if you don't know how much salt you actually use! The goal of calibrating is to know how much material you are putting down on a roadway or parking lot for every setting on your truck that you use. This is why calibrating your equipment is the first step to reducing salt use and saving money!

REMEMBER:

Each truck must be independently calibrated for each material it will be used to spread (the salt calibration card *will* be different than the sand calibration card).

Calibrations should be performed annually, or after a spreader is serviced.

CALCULATIONS:

There are a few simple calculations you must perform in order to complete the calibration. Once all of the necessary data is recorded, head back inside and warm up! Refer to the reverse side of this fact sheet for calculation instructions.



Step 1: Load the Truck

Partially load the truck. Half of a full load should be more than adequate for calibration purposes.

Step 2: Set Your Controls

Gate Height: Set the gate height to its lowest practical setting to start (approximately 1" to 1.5"). After the truck is calibrated for the lowest gate setting, calibrate for each 1/2" increment greater than the lowest setting. Continue until all gate settings you use are calibrated.

Engine Speed: Set the pony motor speed to the maximum setting, or to the setting you would normally use.



Step 3: Measure Spread Width

Measure the width that the material covers during spreading. Do this for each gate setting you are calibrating. Round your numbers to the nearest half foot and record them in column "W" of the calibration chart (see reverse side).

Step 4: Collect & Weigh Material

You will need either a sheet of canvas, a tarp, or a bucket to collect the material that is dispensed from the spreader, as well as a scale. Weight the object you are using to collect the material in, and record that value in the purple box above the discharge rate column. Collect material for 1 minute. Weigh the collected material and subtract the weight of the tarp/canvas/bucket. Record this value in the first purple column of the calibration chart. Do this 3 times for each gate opening that is typically used. Average these three values together and record in the orange column in the calibration chart.



Step 5: Perform Calculations

Go inside and calculate your discharge rate using the calibration chart for each truck speed and gate setting you normally use. Refer to the reverse side of this fact sheet for calculation instructions. The formula you will be using is shown below:

$$D = \frac{B \times C}{A}$$

Step 6: Distribute Completed Calibration Cards!

Put a copy of the calibration card in the truck you just calibrated. Also, leave a copy of the calibration card in the office so you have a copy in case the original is damaged.

Produced in partnership with:



Calibration Chart (Pony Motor Type)

Material: _____ Truck/Spreader ID: _____

Date: _____ Performed by: _____

Tarp/Canvas/Bucket Weight: _____

Gate Opening	W		A			D							
	Spread Width (ft.)		5.28 x W	Run 1	Run 2	Run 3	Pounds of Material Discharged per 1000 square ft. (D = B x C ÷ A)						
1"							5 mph (C = 12)	10 mph (C = 6)	15 mph (C = 4)	20 mph (C = 3)	25 mph (C = 2.4)	30 mph (C = 2)	
1.5"													
2"													
2.5"													
3"													
EX	14		5.28 x 14 = 73.92	87	92	93	12 x 90.67 ÷ 73.92 = 14.72	6 x 90.67 ÷ 73.92 = 7.36	4 x 90.67 ÷ 73.92 = 4.91	3 x 90.67 ÷ 73.92 = 3.68	2.4 x 90.67 ÷ 73.92 = 2.94	2 x 90.67 ÷ 73.92 = 2.45	
				Average Discharge Rate ((Run1 + Run2 + Run3)/3)									
				90.67									

Calculation Instructions: Multiply the spread width from column **W** by **5.28** and record the answer in column **A**. For each gate setting, add **Run 1**, **Run 2**, and **Run 3** together. Divide the result by **3** and record in column **B** to get the average discharge rate. To find the pounds of material discharge per 1000 square feet, you must know the number of minutes it takes to travel one mile at every truck speed you intend to calibrate for. These numbers are designated as variable "**C**". The "**C**" value for each travel speed is shown in red under that given speed. Multiply column **B** by the "**C**" value for that speed and divide by the **A** column to find the number of pounds of material discharged per 1000 square feet for the given speed. Record these numbers in the **D** columns. The full equation is shown here:

$$D = \frac{B \times C}{A}$$



Snow and Ice Control Treatments – Salt with Salt Brine

Winter weather events present roadway agencies responsible for Snow & Ice removal with options on treatment materials to improve roadway safety. Due to budgetary or equipment-related limitations, some smaller local agencies might not be able to take full advantage of available treatment materials/options (see page 4). In this *Route of Navigation* (RON) technical update, we address the scenario where salt and salt brine might be the only materials being used at the local agency for treating a roadway.

Material Types:

Salt

Salt is sodium chloride, NaCl, a white crystalline substance with its characteristic taste found in natural beds, in seawater, etc. The mineral form is *halite*, also called “rock salt”. Salt used for winter maintenance operations is sometimes referred to as “road salt”.

Salt was first used to treat snow and ice covered roads in the mid-1940s, but its use wasn’t fully embraced until the fifties. Use increased as more agencies became aware of the higher level of service salt could provide in addition to plowing and as the North American road system expanded.

Salt Brine

Salt brine is made by mixing salt in water to approximately a 23% solution by weight (23% salt / 77% water). Salt brine is commonly used in anti-icing operations and for pre-wetting solid rock salt.

The proportion of salt to water is critical to the effectiveness of the brine. Too much or too little salt affects the freezing point depressing qualities of the brine. The proper salt brine mixture is 23.3% at which the freezing point is -6°F **Caution:** If the solution of brine dilutes below its effective concentration, you will not achieve any reduction of ice bonding to the pavement.

Salt brine is widely used because it is:

- Readily available (easy to produce)
- Very economical
- Effective for events occurring at moderate subfreezing temperatures

Green brine is recommended to be used as much as possible. It is the salty water runoff from washing snow plow trucks after each snow storm which is collected in an onsite storm water retention pond that also collects storm water from the salt barn(s), loading area, and remaining site area. This water is beneficially reused by transferring it to a tank specially designed to mix brine.



EPA regulations must be met when using this green brine. This usually means running the wastewater through an oil-water separator, collection and storage, and filtration of heavy metals. Contact your local Ohio EPA office when considering this alternative.

Treating Asphalt, Brick, and Concrete Surfaces:

If conditions and timing allow, operators should apply anti-icing materials to the road prior to a snow fall.

Anti-icing is the application of a deicing material to the roadway prior to a snowfall event to prevent the bond from occurring between the snow and the roadway. Anti-icing materials are typically a brine, or in some cases rock salt. Anti-icing practices can also be used to prevent the formation of black ice on roadways.

Deicing is the application of a deicing material to the roadway after a snowfall event has occurred and the snow has bonded to the roadway. Always plow before applying treatment material to a snow covered roadway. Plowing is the most cost effective means of removing snow and ice from the roadway. Reversing the order will result in plowing deicing material off the roadway. It is usually not cost-effective to apply salt alone at pavement temperatures below 15 degrees Fahrenheit.

Salt's effectiveness can be increased by pretreating and pre-wetting.

Pretreating is mixing a non-caking liquid into the stockpile of salt before it is applied. It does not require changes to an agency's plow trucks and requires no new capital investment for application equipment if it is applied by a vendor.

Pre-wetting is adding a liquid to the salt as it is being applied-either at the spinner or through a soaker pipe in the auger box to reduce bounce and scatter and to accelerate the melting process. Although pre-wetting requires some changes to an agency's plow truck, it provides flexibility to switch the liquid chemical makeup depending on conditions. You can also switch from dry application immediately-just turn down the liquid application rate.

Note the Ohio Department of Transportation may sell salt brine to local government agencies at local sites where salt brine is produced. Contact your local Ohio Department of Transportation facility for more details.

Use an appropriate **amount** of salt.

Use a calibrated, speed-synchronized spreader and good judgment in selecting application rates and truck speeds. Apply just enough material to prevent or loosen the bond between the road and the snow or ice so it can be plowed off.

These guidelines are a starting point. Reduce or increase rates incrementally based on your experience according to your local conditions.



Application Rates:

The following salt application rates are for typical 24' two-lane roads, during the specified pavement temperatures, with the listed precipitation:

Dry Pavement Light Snow Less Than 2"/Hour					
Above 32° F	Above 32° F	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
(Rising)	(Falling)				
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and monitor conditions	Plow and monitor conditions
Wet Pavement Light Snow Less Than 2"/Hour					
Above 32° F	Above 32° F	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
(Rising)	(Falling)				
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 300 to 400 lb./mile #	Plow and treat @ 400 lb. max/mile
Dry Pavement Heavy Snow More Than 2"/Hour					
Above 32° F	Above 32° F	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
(Rising)	(Falling)				
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 50 to 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 300 to 400 lb./mile #	Plow and monitor conditions	Plow and monitor conditions

- Pre-wet the material @ 8 to 10 gallons of salt brine/ton of salt



Wet Pavement Heavy Snow More Than 2"/Hour					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Acceptable	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 100 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 100 to 200 lb./mile #	Plow and treat @ 400 lb. max/mile #	Plow and treat @ 400 lb. max/mile #	Plow and treat @ 400 lb. max/mile #
Freezing Rain					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Recommended	Recommended	Recommended	Recommended	Recommended
Plow and treat @ 100 lb./mile #	Plow if needed and treat @ 200 to 300 lb./mile #	Plow only if needed and treat @ 300 to 400 lb./mile #	Plow if needed and treat @ 400 lb. max/mile #	Plow if needed and treat @ 400 lb. max/mile #	Plow if needed and treat @ 400 lb. max/mile #
Black Ice					
Above 32° F (Rising)	Above 32° F (Falling)	25° F to 32° F	20° F to 25° F	15° F to 20° F	Below 15° F
Bridges and Icy Spots	Recommended	Recommended	Recommended	Recommended	Recommended
Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ^	Apply anti-icing material prior to the formation of black ice ++	Apply anti-icing material prior to the formation of black ice ++

- Pre-wet the material @ 8 to 10 gallons of salt brine/ton of salt

^ - Apply anti-icing brine @ 20 to 40 gallons/lane mile

++ - Do not apply liquid anti-icing material when the pavement temperature is below 20° F.

Additional Treatment Materials:

For information about additional treatment materials commonly used for winter roadway maintenance, please refer to the separate RON Technical Update on *Snow and Ice Control Treatments – Popular Materials*. http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/LTAP/Documents/Popular_Materials_for_Snow_and_Ice_Control_Treatments.pdf

Information Sources:

Federal Highway Administration – www.fhwa.dot.gov

Ohio DOT – www.dot.state.oh.us; Scott Lucas, Office of Maintenance Operations – 614-644-6603

Salt Institute – www.saltinstitute.org

Minnesota Local Road Research Board – www.lrrb.org

DISCLAIMER: This RON Technical Update is provided for purposes of general information. Interested persons should refer to the resources referenced herein for additional information as needed.

Appendix 4: Document Sources and Additional Resources

Best Management Practices

- Pennsylvania Stormwater Best Management Practices Manual - Special Management Areas (Brownfields, Highways and Roads, Karst Areas, Mined Lands, Water Supply Well Areas, Surface Water Supplies and Special Protection Waters)
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-48478/08_Chapter_7.pdf
- Pre-wetting Winter Materials. PennDOT LTAP Technical Information Sheet #129. 2006.
http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_129.pdf
- Transportation Association of Canada - Synthesis of Best Practices Road Salt Management
<http://tac-atc.ca/en/bookstore-and-resources/free-resources-and-tools/syntheses-practice>
- Transportation Research Circular E-C063: Proactive Snow and Ice Control Toolbox, June 7–9, 2004
<http://onlinepubs.trb.org/onlinepubs/circulars/ec063.pdf>

Blowing/Drifting Snow Control: Snow Fences

- Controlling Blowing and Drifting Snow with Snow Fences and Road Design
<http://www.esf.edu/willow/Isf/Litterature/Tabler%202003%20-%20Controlling%20Blowing%20and%20Drifting%20Snow.pdf>
- LTAP Technical Information Sheet #63: Snow Fences
- Natural Resource Conservation Service: Tree Plantings in CRP Living Snow Fences, Field Windbreaks, and Shelterbelts
https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs141p2_000874.pdf
- NCHRP Synthesis 449 http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf

Cost Benefits

- Benefit-Cost of Various Winter Maintenance Strategies. Clear Roads. September 2015.
http://clearroads.org/wp-content/uploads/dlm_uploads/FR_CR.13-03_Final.pdf
- Winter Maintenance. Pennsylvania DOT LTAP presentation. September 2014.
- The Real Cost of Salt use for Winter Maintenance in the Twin Cities Metropolitan Area.
<https://www.pca.state.mn.us/sites/default/files/wq-iw11-06bb.pdf>

General Resources

- Environment Canada, Road Salt Case Studies
<https://www.ec.gc.ca/sels-salts/default.asp?lang=En&n=CBE1C6ED-1>
- Highway Deicing: Road Salt Use in the United States. Transportation Research Board.
<http://onlinepubs.trb.org/onlinepubs/sr/sr235/017-030.pdf>
- PennDOT LTAP Technical Information Sheet #63: Snow Fences
- Road Salt Moving Toward the Solution. Special Report December 2010
http://www.caryinstitute.org/sites/default/files/public/reprints/report_road_salt_2010.pdf
- Source Water Protection Practices Bulletin Managing Highway Deicing to Prevent Contamination of Drinking Water. July 2009
www.epa.gov/safewater

Guidance Manuals

- A Guide for Selecting Anti-icing Chemicals, Version 1.0.IIHR, Technical Report No. 420, 2001
http://dot.alaska.gov/stwddes/research/assets/pdf/anti_icing_guide.pdf.
- Controlling Blowing and Drifting Snow with Snow Fences and Road Design
<http://www.esf.edu/willow/Isf/Litterature/Tabler%202003%20-%20Controlling%20Blowing%20and%20Drifting%20Snow.pdf>
- Federal Highway Administration (FHWA), Manual of Practice for an Effective Anti-icing Program: A Guide for Highway Winter Maintenance Personnel, FHWARD_ 95-202, June 1996
<http://www.fhwa.dot.gov/reports/mopeap/eapcov.htm>
- Manual of Practice for Anti-icing of Local Roads. October 1996. A Publication of the Technology Transfer Center University of New Hampshire.
http://www.itap.org/login/resource/entryupload/uploads/20100217122816_resource_yZm9.pdf

- Minnesota Snow and Ice Control Field Handbook for Snowplow Operators. Minnesota Local Road Research Board. August 2005. <http://www.lrrb.org/media/reports/200501REV.pdf>
- Road Salt Management. Adapted from Pollution Prevention/Good Housekeeping for Municipal Operations (USEPA). May 2006. Massachusetts Nonpoint Source Pollution Management Manual. <http://projects.geosyntec.com/npsmanual/Fact%20Sheets/Road%20Salt%20Management.pdf>
- The Snow fighters Handbook. The Salt Institute. 2012 http://www.saltinstitute.org/wp-content/uploads/2013/07/Snowfighters_HB_2012.pdf
- Winter Parking Lot and Sidewalk Maintenance Manual. June 2006, Revised: June2008. Fortin Consulting Inc., Minnesota Pollution Control Agency (MPCA), Minnesota Department of Transportation & Circuit Training and Assistance Program. <http://www.pca.state.mn.us/publications/parkinglotmanual.pdf>
- PADOT Maintenance Manual. Chapter 4: Winter Services. Updated January 2015. <http://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2023/Pub%2023-Chapter%204%20.pdf>

MS4 Resources

- PennDOT LTAP: Sheet#167 Summer/2015 Abrasives and Anti-Skid Material http://www.dot7.state.pa.us/BPR_pdf_files/Documents/LTAP/TechSheets/TS_167.pdf
- Pollution Prevention and the MS4 Program: A Guide on Utilizing Pollution Prevention Activities to Meet MS4 General Permit Requirements <https://www.pca.state.mn.us/sites/default/files/wq-strm4-26.pdf>

Road Salt and the Environment

- Acute Toxicity of Sodium Chloride to Freshwater Aquatic Organisms. A Watershed Restoration Plan for the Root River Watershed. SEWRPC Community Assistance Planning Report No. 316. Appendix E.
- Environmental Impacts of Road Salt and Alternatives in the New York City Watershed. By William Wegner and Marc Yaggi. Stormwater July 2001. www.stormh2o.com/julyaugust-2001/salt-road-environmental-impacts.aspx
- Highway Deicing: Road Salt Impacts on Drinking Water. Transportation Research Board. <http://onlinepubs.trb.org/onlinepubs/sr/sr235/099-112.pdf>
- Highway Salt and Our Environment. The Salt Institute. 2004. <http://www.saltinstitute.org/news-articles/road-salt-and-the-environment/>
- Increase in Urban Lake Salinity by Road Deicing Salt. Novotny, E., D. Murphy, and H. Stefan. 2008. Science of the Total Environment 406 (2008) 131-144. <http://www.ncbi.nlm.nih.gov/pubmed/18762321>
- Rationale for the Development of Ambient Water Quality Criteria for Sulfate Protection of Aquatic Life Use. Commonwealth of Pennsylvania DEP Bureau of Point and Non-Point Source Management.
- Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment. Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf
- Winter Operations and Salt, Sand, and Chemical Management. Center for Environmental Excellence by AASHTO. 2013. http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/8_1.aspx

Road Salt Management Plan Examples

- City of Hamilton's Road Salt Management Plan TOE 021Salt Management Plan (TOE02129a) 2003 [http://www2.hamilton.ca/Hamilton.Portal/Inc/PortalPDFs/ClerkPDFs/committee-of-the-whole/2003/Apr15/TOE02129\(a\).pdf](http://www2.hamilton.ca/Hamilton.Portal/Inc/PortalPDFs/ClerkPDFs/committee-of-the-whole/2003/Apr15/TOE02129(a).pdf)
- Twin Cities Metropolitan Area, Chloride Management Plan, February 2016 <https://www.pca.state.mn.us/sites/default/files/wq-iw11-06ff.pdf>

Road Salt Storage

- Recommendations for Salt Storage Guidelines for Protecting Ohio's Water Resource, February 2013. <http://www.epa.ohio.gov/portals/35/owrc/SaltStorageGuidance.pdf>
- State Oversight of Road Salt Storage in Midwestern and Northeastern U.S. <http://www.epa.ohio.gov/portals/35/owrc/StateSaltOversightSummary.pdf>

- Virginia Transportation Research Council, Research Report, Recycling of Salt-Contaminated Stormwater Runoff for Brine Production at Virginia Department of Transportation Road-Salt Storage Facilities. May 2008.
www.virginiadot.org/vtrc/main/online_reports/pdf/08-r17.pdf

Salt Wash Water Reuse

- FHWA Road Weather Management Best Practices
http://www.ops.fhwa.dot.gov/weather/best_practices/1024x768/transform2.asp?xslname=publications_title.xslt&xmlname=publications.xml
- Innovative Environmental Management of Winter Salt Runoff Problems at INDOT Yards, 2004
<http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1601&context=jtrp>

Snow Dumps and Regulations

- NH Department of Environmental Services: Environmental Fact Sheet WMB-3 2015, Snow Disposal Guidelines
<http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-3.pdf>
- Private Snow Disposal Sites (On-Site Snow Storage Only) Operations Guidance---draft Prepared by Scott R Wheaton, MOA Watershed Management Services Winter 2003
<http://anchoragewatershed.com/Documents/privtsnobmps.pdf>

Useful Organizations and Websites

- American Association of State Highway and Transportation Officials
<http://www.transportation.org>
- Cornell Local Roads Program: Workshops on snow and ice control
www.clrp.cornell.edu
- Fortin Consulting, Inc. Road Salt Training (Minnesota)
<http://www.fortinconsulting.com/our-work/road-salt/certification/>
- Maine Road Salt Risk Assessment Project. Margaret Chase Smith Policy Center, University of Maine
http://mcspolicycenter.umaine.edu/?q=RoadSalt_Background
- Minnesota Pollution Control Agency Road Salt Education Program
www.pca.state.mn.us/programs/roadsalt.html
- Pennsylvania Department of Transportation (PADOT) Local Technical Assistance Program (LTAP)
<https://www.dot7.state.pa.us/LTAP/default.aspx>
- Road Salt and Water Quality. 1996. Environmental Fact Sheet, New Hampshire Department of Environmental Services.
www.des.nh.gov
- Transportation Resource Board of the National Academies
www.trb.org
- US Federal Highway Administration
<http://environment.fhwa.dot.gov>
- The Salt Institute
www.saltinstitute.org
- Safe Winter Roads
www.safewinterroads.org

The Southwestern Pennsylvania Commission (SPC) hereby gives public notice that it is the policy of the Commission to assure full compliance with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, Executive Order 12898 on Environmental Justice, and related statutes and regulations in all programs and activities. Title VI and other related statutes require that no person in the United States of America shall, on the grounds of race, color, sex, national origin, age, or disability, be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which SPC receives federal financial assistance. Any person who believes they have been aggrieved by an unlawful discriminatory practice by SPC under Title VI has a right to file a formal complaint with the Commission. Any such complaint must be in writing and filed with SPC's Title VI Coordinator within one hundred eighty (180) days following the date of the alleged discriminatory occurrence. For more information, or to obtain a Title VI Discrimination Complaint Form, please see our website at: www.spcregion.org or call 412-391- 5590.



Funding for the development of this booklet was provided by the Southwestern Pennsylvania Commission Water Resource Center and the Pennsylvania Department of Environmental Protection's Environmental Education Grants Program

Southwestern Pennsylvania Commission Water Resource Center

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In 2013, SPC formed the Water Resource Center (WRC) to address various water issues within the region. WRC's Mission is to promote regional collaboration on water topics; be a leader in facilitating coordination and education; and provide technical assistance to its member governments.

**For an electronic version of this guide, visit:
www.spcwater.org**

ORDINANCES

**ILLICIT DISCHARGE DETECTION AND ELIMINATION
ORDINANCE**

BILL NO.: 4 of 2015
INTRODUCED: October 26, 2015
BY: Lucille D'Alfonso
ENACTED: November 23, 2015
ORDINANCE NO: 4 of 2015

MS4 ILLICIT DISCHARGE DETECTION AND ELIMINATION ORDINANCE

**AN ORDINANCE OF THE CITY OF MONESSEN,
WESTMORELAND COUNTY, PENNSYLVANIA, TO
PROVIDE FOR THE HEALTH, SAFETY, AND GENERAL
WELFARE OF THE CITIZENS WITHIN THE CITY OF
MONESSEN THROUGH THE REGULATION OF NON-
STORM WATER DISCHARGES TO THE STORM
DRAINAGE SYSTEM TO THE MAXIMUM EXTENT
PRACTICABLE AS REQUIRED BY FEDERAL AND
STATE LAW.**

Article I - General Provisions

- Section 101 Purpose
- Section 102 Applicability
- Section 103 Responsibility for Administration
- Section 104 Compatibility with Other Requirement
- Section 105 Severability
- Section 106 Ultimate Responsibility
- Section 107 Erroneous Permit

Article II - Definitions

Article III – Prohibitions

- Section 301 Prohibition of Illegal Discharges
- Section 302 Prohibition of Illicit Connections

Article IV – Watercourse Protection

- Section 401 Responsibilities of the Property Owner
- Section 402 Use of Best Management Practices
- Section 403 Operation and Maintenance Agreements
- Section 404 Notification of Spills

Article V – Industrial or Construction Activity Discharge

- Section 501 Submission of Notice of Intent to the City

Article VI – Compliance Monitoring

- Section 601 Inspection by Land Owner
- Section 602 Right of Entry
- Section 603 Search Warrants

Article VII – Violations, Enforcement and Penalties

- Section 701 Violations
- Section 702 Warning Notice
- Section 703 Notice of Violation
- Section 704 Compensatory Action
- Section 705 Suspension and Revocation
- Section 706 Penalties
- Section 707 Criminal Prosecution
- Section 708 Appeals
- Section 709 Enforcement Measures after Appeal
- Section 710 Cost of Abatement of the Violation
- Section 711 Violations Deemed a Public Nuisance
- Section 712 Remedies Not Exclusive

Article VIII – References

Appendix A – List of Streets with MS4

Appendix B – Operation and Maintenance (O&M) Agreement Form

ARTICLE I - GENERAL PROVISIONS

Section 101 Purpose

The purpose of this Ordinance is to provide for the health, safety, and general welfare of the citizens within the City of Monessen (City) through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This ordinance establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirement of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this ordinance are:

- A. To regulate the contribution of pollutants to the MS4 by storm water discharges by any user.
- B. To prohibit illicit connections and discharges to the MS4.
- C. To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.

Section 102 Applicability

This ordinance shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by the City. The majority of the City is a combined storm and sewage sewer system which is exempted from this ordinance.

The streets with separate storm sewer systems for which this ordinance applies are located in the Grand Boulevard Sewer Shed and are listed in Appendix A. This ordinance will be amended periodically as additional combined sewer systems are separated.

Section 103 Responsibility for Administration

The City shall administer, implement, and enforce the provisions of this ordinance. Any powers granted or duties imposed upon the City may be delegated in writing by the Mayor of the City to persons or entities acting in the beneficial interest of or in the employ of the City.

Section 104 Compatibility with Other Requirements

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation, or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation, or other provision of law, whichever provision is more restrictive or imposes higher protective standards for human health or the environment shall control.

Section 105 Severability

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this ordinance.

Section 106 Ultimate Responsibility

The standards set forth in this ordinance are minimum standards; therefore this ordinance does not intend or imply that compliance by any person will ensure that there will be no contamination, pollution, or unauthorized discharge of pollutants.

Section 107 Erroneous Permit

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency, employee or designee of the City purporting to validate such a violation.

ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Authorized Enforcement Agency – Employees or designees of the Mayor of the City of Monessen designated to enforce this ordinance.

Best Management Practices (BMPs) – Schedule of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices identified in the Pennsylvania Stormwater Best Management Practices Manual (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-68851/363-0300-002.pdf>) issued by the Pennsylvania Department of Environmental Protection to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural". In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large scale retention ponds and constructed wetlands, to small scale underground treatment systems, infiltration facilities, filter strips, low impact buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

City – City of Monessen, Westmoreland County, Pennsylvania.

Clean Water Act – The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Commonwealth – The Commonwealth of Pennsylvania

Conservation District – The Westmoreland County Conservation District, a conservation district as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Construction Activity – Activities subject to NPDES Stormwater Permits. These include construction projects resulting in earth disturbance of one acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolitions.

DEP – The Pennsylvania Department of Environmental Protection.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials. Earth disturbance activity is subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

EPA – The United States Environmental Protection Agency.

Hazardous Material – Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Discharge – Any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Article III of this ordinance.

Illicit Discharge Detection and Elimination Program – A document that describes the process to effectively detect and eliminate illegal discharges into the stormwater system.

Illicit Connections – An illicit connection is defined as either of the following:

- Any drain or conveyance, whether on the surface or subsurface that allows an illegal discharge to enter the storm drain system including but not limited to any conveyances that allow any non-storm water discharge including sewage, process wastewater and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,
- Any drain or conveyance connected from a commercial or industrial land use to the storm drain system that has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Industrial Activity – Activities subject to NPDES Industrial Storm Water Permits as defined in 40 CFR, Section 122.26 (b)(14).

Municipal Separate Storm Sewer System (MS4) – The system of conveyances (including sidewalks, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned and operated by the City of Monessen and

designed or used for collecting or conveying stormwater, and that is not used for collecting or conveying sewage.

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit – Means a permit issued by the Conservation District or DEP (under authority delegated pursuant to 33 U.S.C. § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis. .

Non-Stormwater Discharge – Any discharge to the storm drain system that is not composed entirely of storm water.

Notice of Intent (NOI) – Notice of Intent to the DEP to discharge stormwater associated with industrial activity from a facility including construction sites.

Operation and Maintenance (O&M) Agreement – An agreement between the City and land owner covering stormwater control facilities that are privately owned.

Person – Any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or the owner's agent.

Pollutant – Anything which causes or contributes to pollution. Pollutant may include, but are not limited to: paint, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; wastes and residues that result from constructing a building or structure; building and deck cleaning mixtures; and noxious or offensive matter of any kind.

Premises – Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Regulated Activity – Any activity that may affect stormwater runoff and any activities that may contribute non-stormwater discharges to a regulated small MS4.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Storm Drainage System – Publicly owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human made or altered drainage channels, reservoirs, and other drainage structures.

Stormwater – Any surface flow, runoff, and drainage consisting entirely of water from the surface of the land resulting from natural precipitation or snow or ice melt.

Stormwater Management Plan (SWMP) – A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to

stormwater, stormwater conveyance systems, and/or receiving water to the maximum extent practicable.

Wastewater – Any water or other liquid, other than uncontaminated stormwater, discharged from a facility.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

ARTICLE III – PROHIBITIONS

Section 301 Prohibition of Illegal Discharges

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except discharges allowed under a state or federal permit or as provided in Subsection E below.
- C. No person shall throw, drain, or otherwise discharge, cause, or allow others under its control to throw, drain, or otherwise discharge into the MS4 any pollutants or waters containing any pollutants, other than stormwater.
- D. The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited.
- E. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:

- Diverted stream flows	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	- Routine external building wash down (which does not use detergents or other compounds)

- F. Discharges or flow from firefighting, and other discharges specified in writing by the City as being necessary to protect public health and safety are authorized.
- G. Discharges associated with dye testing are authorized, however this activity requires a verbal notification to the City prior to the time of the test.

- H. The prohibition shall not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the EPA, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.
- I. In the event that the City determines that any of the discharges identified above significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the City will notify the responsible person(s) to cease the discharge.

Section 302 Prohibition of Illegal Connections

- A. The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.
- B. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.
- C. A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.
- D. Improper connections in violation of this ordinance must be disconnected and redirected, if necessary, to an approved onsite wastewater management system or the sanitary sewer system upon approval of the City or the Mon Valley Sewage Authority.
- E. Any drain or conveyance that has not been documented in plans, maps or equivalent, and which may be connected to the storm sewer system, shall be located by the owner or occupant of that property upon receipt of written notice of violation from the City requiring that such locating be completed. Such notice will specify a reasonable time period within which the location of the drain or conveyance is to be determined, that the drain or conveyance be identified as storm sewer, sanitary sewer or other, and that the outfall location or point of connection to the storm sewer system, sanitary sewer system or other discharge point be identified. Results of these investigations are to be documented and provided to the City.

ARTICLE IV – WATERCOURSE PROTECTION

Section 401 Responsibilities of the Land Owner

Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structure will not become a hazard to the use, function, or physical integrity of the watercourse.

Section 402 Use of Best Management Practices

The City adopts the requirements of the Pennsylvania Stormwater Best Management Practices Manual (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-68851/363-0300-002.pdf>) identifying BMPs for any activity, operation, or facility which may cause or contribute to pollution or contamination of stormwater, the storm drain system, or waters of the Commonwealth. The owner or operator of such activity, operation, or facility shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Further, any person responsible for a property or premise that is, or may be, the source of an illicit discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the MS4. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of stormwater associated with industrial activity, to the extent practicable, shall be deemed compliance with the provisions of the section. These BMPs shall be part of a SWMP as necessary for compliance with requirements of the NPDES permit.

Section 403. Operation and Maintenance Agreements

- A. Prior to completing construction of a SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix B) covering all stormwater control facilities which are to be privately owned.
1. The owner, successor and assigns shall operate and maintain all facilities in accordance with the approved schedule and plan in the O&M Agreement.
 2. The owner shall convey to the City conservation easements to assure access for periodic inspections by the City and maintenance, as necessary.
 3. The owner shall keep on file with the City the name, address, and telephone number of the person or company responsible for operation and maintenance activities. In the event of a change, new information shall be submitted by the owner to the City within ten (10) working days of the change.
- B. The owner is responsible for operation and maintenance of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the City may perform the services required and

charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 404 Notification of Spills

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into stormwater, the storm drain system, or waters of the Commonwealth, said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of a release of non-hazardous materials, said person shall notify the City in person or by telephone or facsimile no later than the next business day. Notifications in person or by telephone shall be confirmed by written notice addressed and mailed to the City within three (3) business days of the telephone notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least five (5) years.

Failure to provide notification of a release as provided above is a violation of this ordinance.

ARTICLE V – INDUSTRIAL OR CONSTRUCTION ACTIVITY DISCHARGE

Section 501. Submission of Notice of Intent to the City

- A. Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the City prior to the allowing of discharges to the MS4.
- B. The operator of a facility, including construction sites, required to have an NPDES permit to discharge stormwater associated with industrial or construction activity shall submit a copy of the Notice of Intent (NOI) to the City at the same time the operator submits the original NOI to DEP.
- C. The copy of the NOI may be delivered to the City either in person or by mailing it to:

Notice of Intent to Discharge Stormwater
City of Monessen, City Clerk
1 Wendell Ramey Lane
4th Floor, Room 423
Monessen, Pennsylvania 15062
- D. A person commits an offense if the person operates a facility that is discharging stormwater associated with industrial activity without having submitted a copy of the NOI to the City.

ARTICLE VI – COMPLIANCE MONITORING

Section 601 Inspection by Landowner

Stormwater management BMPs shall be inspected (and documented) by the landowner, or the owner's designee according to the following list of minimum frequencies:

- A. Annually for the first five (5) years following construction.
- B. Once every three (3) years thereafter.
- C. During or immediately after the cessation of a 10-year or greater storm.

Section 602 Right of Entry

Upon presentation of proper credentials, the City, the Conservation District, DEP, or their authorized agents, shall be permitted to enter any property within the City and inspect facilities subject to regulation under this ordinance as often as may be necessary to determine compliance with this ordinance.

- A. If a discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the City, the Conservation District, and DEP.
- B. Facility operators shall allow the City, the Conservation District, and DEP ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.
- C. The City, the Conservation District, and DEP shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the City, the Conservation District, or DEP to conduct monitoring and/or sampling of the facility's stormwater discharge.
- D. The City, the Conservation District, and DEP have the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operation condition by the discharger at its own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy.
- E. Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the City, the Conservation District, or DEP and shall not be replaced. The costs of clearing such access shall be borne by the operator.
- F. Unreasonable delays in allowing the City, the Conservation District, or DEP access to a permitted facility is a violation of a stormwater discharge permit and of this ordinance. A person who is the operator of a facility with an NPDES permit to discharge stormwater

associated with industrial or construction activity commits an offense if the person denies the City, the Conservation District, or DEP reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this ordinance.

Section 603 Search Warrants

If the City, the Conservation District, or DEP has been refused access to any part of the premises from which stormwater is discharged, and is able to demonstrate probable cause to believe that there may be a violation of this ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this ordinance or any order issued under this ordinance, or to protect the overall public health, safety, and welfare of the City, then the City, the Conservation District, or DEP may seek issuance of a search warrant from any court of competent jurisdiction.

ARTICLE VII – VIOLATIONS, ENFORCEMENT AND PENALTIES

Section 701 Violations

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. It is unlawful for any person to modify, remove, fill, landscape, or alter any approved SWM BMPs, facilities, areas, or structures without the written approval of the City. Any person who has violated or continues to violate the provisions of this ordinance, may be subject to the enforcement actions outlined in this section or may be restrained by injunction or otherwise abated in a manner provided by law.

In the event the violation constitutes an immediate danger to public health or public safety, the City is authorized to enter upon the subject private property, without giving prior notice, to take any and all measures necessary to abate the violation and/or restore the property. The City is authorized to seek costs of the abatement as outlined in this ordinance.

Section 702 Warning Notice

When the City finds that any person has violated, or continues to violate, any provision of this ordinance, or any order issued under this ordinance, the City may serve upon that person a written Warning Notice, specifying the particular violation believed to have occurred and requesting the discharger to immediately investigate the matter and to seek a resolution whereby any offending discharge will cease. Investigation and/or resolution of the matter in response to the Warning Notice in no way relieves the alleged violator of liability for any violations occurring before or after receipt of the Warning Notice. Nothing in this subsection shall limit the authority of the City to take any action, including emergency action or any other enforcement action, without first issuing a Warning Notice.

Section 703 Notice of Violation

Whenever the City finds that a person has violated a prohibition or failed to meet a requirement of this ordinance, the City may order compliance by written notice of violation to the responsible person.

A. The Notice of Violation shall contain:

1. The name and address of the alleged violator;
2. The address when available or a description of the building, structure or land upon which the violation is occurring, or has occurred;
3. A statement specifying the nature of the violation;
4. A description of the remedial measures necessary to restore compliance with this ordinance and a time schedule for the completion of such remedial action;
5. A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

6. A statement that the determination of violation may be appealed to the City by filing a written notice of appeal within three (3) days of service of notice of violation; and
7. A statement specifying that, should the violator fail to restore compliance within the established time schedule, the work will be done by the City or a designated contractor and the expense shall be charged to the violator.

B. Such notice may require without limitations:

1. The performance of monitoring, analyses, and reporting;
2. The elimination of illicit connections or discharges;
3. That violating discharges, practices, or operations shall cease and desist;
4. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;
5. Payment of a fine to cover administrative and remediation costs; and
6. The implementation of source control or treatment BMPs.

Section 704 Compensatory Action

In lieu of enforcement proceedings, penalties, and remedies authorized by this ordinance, the City may impose upon a violator alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops creek cleanup, etc.

Section 705 Suspension and Revocation

A. Any approval or permit issued by the City may be suspended or revoked for:

1. Non-compliance with or failure to implement any provision of an approved SWM Site Plan or O&M Agreement.
2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to a Regulated Activity.
3. The creation of any condition or the commission of any act which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.

B. A suspended approval may be reinstated by the City when:

1. The City has inspected and approved the corrections to the violations that caused the suspension.
2. The City is satisfied that the violation has been corrected.

- C. An approval that has been revoked by the City cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.
- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the City may provide a limited time period for the owner to correct the violation. In these cases, the City will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the City may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.
- E. The City may, without prior notice, suspend MS4 discharge access when it is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the MS4 or water of the Commonwealth.

Section 706 Penalties

- A. In the event the alleged violator fails to take the remedial measures set forth in the notice of violation or otherwise fails to cure the violations described therein within seven calendar days, or such greater period as authorized by the City shall deem appropriate, after the City has taken one or more of the actions described above, the City may impose a penalty.
- B. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$ _____ for each violation, recoverable with costs. Each calendar day, after receipt of the notice of violation, that the violation remains unremedied shall be a separate offense and penalties shall be cumulative.
- C. In addition, the City may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 707 Criminal Prosecution

Any person that has violated or continues to violate this ordinance shall be liable to criminal prosecution to the fullest extent of the law, and shall be subject to a criminal penalty of \$ _____ per violation per day and/or imprisonment for a period of time not to exceed _____ days. Each act of violation and each day upon which any violation shall occur shall constitute a separate offense.

Section 708 Appeals

- A. Any person receiving a Notice of Violation may appeal the determination of the City. The notice of appeal must be received within three (3) calendar days from the date of the Notice of Violation. Hearing on the appeal before Council, or Council's designee shall take place

within three (3) business days from the date of receipt of the notice of appeal. The decision of Council, or Council's designee, shall be final.

- B. Any person aggrieved by any decision of the City, relevant to the provisions of this Ordinance, may appeal to the Westmoreland County Court of Common Pleas within thirty (30) days of the City's decision.

Section 709 Enforcement Measures After Appeal

In the event of an appeal if the violation has not been corrected, in accordance with the requirements set forth in the Notice of Violation, within five (5) business days of the decision of Council or Council's designee upholding the decision of the City, then representatives of the City shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the City or designated contractor to enter upon the premises for the purposes set forth above.

Section 710 Cost of Abatement of the Violation

Within thirty (30) calendar days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within five (5) calendar days. The City shall respond in writing within five (5) business days to the written protest of the property owner with a final determination. If the amount due is not paid within a thirty (30) calendar days or by the expiration of the time in which to file an appeal, the charges shall be a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Section 711 Violations Deemed a Public Nuisance

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provision of this ordinance is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

Section 712 Remedies Not Exclusive

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the City to seek cumulative remedies.

The City may recover all attorney's fees, court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

ARTICLE VIII - REFERENCES

1. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
2. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (April 15, 2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.

MS4 Illicit Discharge Detection and Elimination Ordinance

Ordinance Number _____

ENACTED and **ORDAINED** at a regular meeting of the

City of Monessen Council

on this _____ day of _____, 20____

This Ordinance shall take effect immediately.

(Name)

(Title)

(Name)

(Title)

(Name)

(Title)

ATTEST:

Secretary

APPENDIX A

MS4 Streets

Anderson Court
Arch Avenue
Balazia Avenue
Center Drive
Circle Drive
City Park Road
Colonial Drive
Columbus Drive
Coolidge Drive
Crest Drive
Crestcent Drive
Delrose Drive
Euclid Drive
Fairfield Drive
Grand Boulevard (1)
Hale Avenue
Hartung Court
Helen Avenue
High Street
Jackson Drive
Jefferson Drive
Jo Ann Drive
Keystone Drive
Lee Drive

McKinley Avenue
Mellon Avenue
Merando Drive
Monessen Boulevard
Overhill Drive
Park Manor Drive
Pennsylvania Boulevard
Pioneer Drive
Pleasant Drive
Rex Boulevard
Ridge Avenue
Scenery Drive
Shady Drive
Shaw Drive
Skurkay Street
Spring Drive
Stanton Drive
State Road
Surrey Street
Washington Drive
Westmoreland Drive
Willow Drive
Woodcrest Avenue

(1) Grand Boulevard from Pleasant Drive to Parente Boulevard

APPENDIX B**WITNESSETH**

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of Westmoreland County, Pennsylvania, Deed Book _____ at page _____ (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the City (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the City, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the City, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the City and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the City requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the SWM Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the City, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the City shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs in accordance with condition number 2 above, the City or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the City is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.
5. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the City.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the City from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or City.
8. The City intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Westmoreland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the City:

For the Landowner:

ATTEST:

_____ (City)

County of Westmoreland, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ day of _____, 20____.

NOTARY PUBLIC

(SEAL)

ORDAINED AND ENACTED into law this 23rd day of November, 2015.

ATTEST:

CITY OF MONESSEN

By



Holly Minno
City Clerk

By



Louis Mavrakis
Mayor

**OPERATIONS AND MAINTENANCE
ORDINANCE**

BILL NO.: 1 of 2016
INTRODUCED: March, 28, 2016
BY: Councilman Chiaravalle
ENACTED: April 21, 2016
ORDINANCE NO: 1 of 2016

MS4 OPERATIONS AND MAINTENANCE ORDINANCE

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- Section 102. Statement of Findings
- Section 103. Purpose
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Article II - Definitions

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- Section 301. General Requirements

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- Section 604. Suspension and Revocation
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ARTICLE I - GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "MS4 Operations and Maintenance Ordinance."

Section 102. Statement of Findings

The governing body of the City of Monessen (City) finds that:

- A. Inadequate maintenance of stormwater facilities contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases pollution of water resources.
- B. Reasonable regulation of connections and discharges to municipal separate storm sewer systems is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.
- C. Reasonable regulation of connections and discharges to the waters of the Commonwealth of Pennsylvania (Commonwealth) is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.
- D. Stormwater is an important water resource, which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
- E. Federal and state regulations require certain municipalities to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES). Permittees are required to enact, implement, and enforce a prohibition of non-stormwater discharges to the permittee's regulated small municipal separate storm sewer systems (MS4s) and/or to the waters of the Commonwealth.

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the City and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

- A. Provide standards to meet NPDES permit requirements.
- B. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
- C. Preserve the natural drainage systems as much as possible.

- D. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- E. Prevent scour and erosion of stream banks and streambeds.
- F. Provide proper operation and maintenance of all facilities and all SWM BMPs that are implemented within the municipality.

Section 104. Statutory Authority

The City also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Section 105. Applicability

All activities related to proper operation and maintenance of approved stormwater management BMPs and all activities that may contribute non-stormwater discharges to a regulated small MS4 and/or to the waters of the Commonwealth are subject to regulation by this Ordinance.

Section 106. Repealer

Any other ordinance provision(s) or regulation of the City inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 107. Severability

The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this ordinance shall be held invalid, such invalidity shall not affect the other provisions.

Section 108. Compatibility with Other Requirements

Actions taken under this Ordinance do not affect any responsibility, permit or approval for any activity regulated by any other code, law, regulation, or ordinance.

ARTICLE II - DEFINITIONS

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

Best Management Practice (BMP) – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "nonstructural." In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

Conservation District – The Westmoreland Conservation District, a conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

DEP – The Pennsylvania Department of Environmental Protection.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials. Earth disturbance activity is subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

Municipality – City of Monessen, Westmoreland County, Pennsylvania.

Non-Stormwater Discharge – Any discharge to the storm drain or the waters of the Commonwealth that is not composed entirely of stormwater.

NRCS – USDA Natural Resources Conservation Service (previously SCS).

Regulated Activities – Any activity that may affect stormwater runoff and any activity that may contribute non-stormwater discharges to a regulated small MS4 or the waters of the Commonwealth.

State Water Quality Requirements – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

Stormwater – Any surface flow, runoff, and drainage consisting entirely of water from the surface of the land resulting from natural precipitation or snow or ice melt.

USDA – United States Department of Agriculture.

Waters of this Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

ARTICLE III – STORMWATER MANAGEMENT REQUIREMENTS

Section 301. General Requirements

- A. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual)², No. 363-2134-008 (April 15, 2000), as amended and updated.
- B. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s) by the developer. Such stormwater flows shall be subject to the requirements of this Ordinance.
- C. For all regulated activities, SWM BMPs shall be implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
- D. Various BMPs and their design standards are listed in the BMP Manual¹.

ARTICLE IV - OPERATION AND MAINTENANCE

Section 401. Responsibilities of Developers and Landowners

- A. Facilities, areas, or structures used as Stormwater Management BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.
- B. Operation and Maintenance (O&M) Plans for stormwater management approved pursuant to 25 Pa. Code §102 after the date of this Ordinance shall be recorded as a restrictive deed covenant that runs with the land.
- C. The City may take enforcement actions against an owner for any failure to satisfy the provisions of this Ordinance.

Section 402. Operation and Maintenance Agreements

- A. Prior to completing construction of a SWM Site Plan, the property owner shall sign and record an O&M Agreement (see Appendix A) covering all stormwater control facilities which are to be privately owned.
 - 1. The owner, successor and assigns shall operate and maintain all facilities in accordance with the approved schedule(s) in the SWM Site Plan.
 - 2. The owner shall convey to the City conservation easements to assure access for periodic inspections by the City and maintenance, as necessary.
 - 3. The owner shall keep on file with the City the name, address, and telephone number of the person or company responsible for operation and maintenance activities. In the event of a change, new information shall be submitted by the owner to the City within ten working days of the change.
- B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the City may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

ARTICLE V - PROHIBITIONS

Section 501. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in Subsection C below and (2) discharges allowed under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:

- Discharges from firefighting activities, and other discharges specified in writing by the City as being necessary to protect public health and safety.	- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Routine external building wash down (which does not use detergents or other compounds)	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Flows from riparian habitats and wetlands	- Water from individual residential car washing
- Air conditioning condensate	- Water from crawl space pumps
- Diverted stream flows	

- D. In the event that the City or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

Section 502. Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs.

ARTICLE VI - ENFORCEMENT AND PENALTIES

Section 601. Right-of-Entry

Upon presentation of proper credentials, the City may enter at reasonable times upon any property within the City to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Section 602. Inspection

SWM BMPs should be inspected by the landowner, or the owner's designee (including the City for dedicated and owned facilities), according to the following list of minimum frequencies:

1. Annually for the first 5 years following construction.
2. Once every 3 years thereafter.
3. During or immediately after the cessation of a 10-year or greater storm.

Section 603. Enforcement

It is unlawful for any person to modify, remove, fill, landscape, or alter any approved SWM BMPs, facilities, areas, or structures without the written approval of DEP or WCD, and the City.

Section 604. Suspension and Revocation

- A. Any approval or permit issued by the City may be suspended or revoked for:
1. Non-compliance with or failure to implement any provision of an approved SWM Site Plan or O&M Agreement.
 2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to a Regulated Activity.
 3. The creation of any condition or the commission of any act which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.
- B. A suspended approval may be reinstated by the City when:
1. The City has inspected and approved the corrections to the violations that caused the suspension.
 2. The City is satisfied that the violation has been corrected.
- C. An approval that has been revoked by the City cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the City may provide a limited time period for the owner to correct the violation. In these cases, the City will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the City may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

Section 605. Penalties

- A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$1,000.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.
- B. In addition, the City may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 606. Appeals

- A. Any person receiving a Notice of Violation may appeal the determination of the City. The Notice of Appeal must be received within three (3) calendar days from the date of the Notice of Violation. Hearing on the appeal before Council, or Council's designee shall take place within three (3) business days from the date of receipt of the notice of appeal. The decision of Council, or Council's designee, shall be final.
- B. Any person aggrieved by any decision of the City, relevant to the provisions of this Ordinance, may appeal to the Westmoreland County Court of Common Pleas within thirty (30) days of the City's decision.

ARTICLE VII - REFERENCES

1. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
2. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (April 15, 2000), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.

MS4 Operations and Maintenance Ordinance

(Ordinance Number)

ENACTED and ORDAINED at a regular meeting of the

_____ on this _____ day of _____, 20_____.

This Ordinance shall take effect immediately.

(Name)

(Title)

(Name)

(Title)

(Name)

(Title)

ATTEST:

Secretary

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APPENDIX A**OPERATION AND MAINTENANCE (O&M) AGREEMENT
STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)**

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between _____, (hereinafter the "Landowner"), and The City of Monessen, Westmoreland County, Pennsylvania, (hereinafter "City");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of _____ County, Pennsylvania, Deed Book _____ at page _____. (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the City, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the City, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the City and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the City requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the City Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the SWM Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the City, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the City shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the City or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the City is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.
5. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the City.

- 6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create or affect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
- 7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the City from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or City.
- 8. The City intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Westmoreland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the City:

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____ day of _____, 20____, do hereby certify that _____ whose name(s) is/are signed to the foregoing Agreement bearing date of the _____ day _____, 20____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_____.

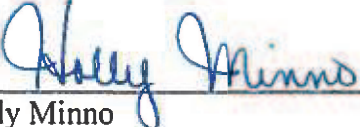
NOTARY PUBLIC

(SEAL)

ORDAINED AND ENACTED into law this 21st day of April, 2016.

ATTEST:

CITY OF MONESSEN

By 
Holly Minno
City Clerk

By 
Louis Mavrakis
Mayor



**STORMWATER MANAGEMENT
ORDINANCE**

STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. 1247

CITY OF MONESSEN

WESTMORELAND COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held On
September 14, 2021

ATTEST


Cheryl Gordon
City Clerk

CITY OF MONESSEN


Matt Shorraw
Mayor and President of Council

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City of Monessen
Stormwater Management Ordinance

ARTICLE I General Provisions

- §101. *Short Title*
- §102. *Findings*
- §103. *Purpose*
- §104. *Statutory Authority*
- §105. *Applicability*
- §106. *Repealer*
- §107. *Severability*
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- §201. *Interpretations and word usage*
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ARTICLE III Stormwater Management Performance Standards

- §301. *Stormwater Management Performance Districts*
- §302. *General Requirements*
- §303. *Exemption from performance standards*
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- §305. *Waivers / Modifications / Demonstrated Equivalency*
- §306. *Small Project*
- §307. *General Standards*
- §308. *Watershed Standards*
- §309. *Design Criteria for Stormwater Management Facilities and BMPs*
- §310. *Erosion and Sedimentation Controls*
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ARTICLE IV Stormwater Management Plan Requirements

- §401. *General Requirements*
- §402. *Stormwater Management Plan Contents*
- §403. *Other Permits/Approvals*
- §404. *Operation and Maintenance Program*
- §405. *Fees and Financial Guarantees*

ARTICLE V Stormwater Management Plan Submission and Review Procedures

- §501. *Preapplication Phase*
- §502. *Stormwater Management Plan Submission and Review*
- §503. *Status of Stormwater Management Plan after Approval*
- §504. *Modification of Stormwater Management Plan*
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ARTICLE VI Operation and Maintenance of Stormwater Facilities and BMPs

- §601. *Operation and Maintenance Responsibilities*
- §602. *Stormwater Facility and BMP Operations and Maintenance Plan Requirements*
- §603. *Operations and Maintenance Agreement for Privately Owned Stormwater Facilities and BMPs*
- §604. *Stormwater and BMP Operation and Maintenance Fund*

ARTICLE VII Fees, Financial Guarantees and Dedication of Public Improvements

- §701. *Guarantee of Completion*
- §702. *Release of Completion Guarantee*
- §703. *Default of Completion Guarantee*
- §704. *Dedication of Public Improvements*
- §705. *Maintenance Guarantee*
- §706. *Fee Schedule*

ARTICLE VIII Enforcement Procedures and Remedies

- §801. *Right of Entry*
- §802. *Enforcement Generally*
- §803. *Suspension and Revocation*
- §804. *Preventative Remedies*
- §805. *Violations and Penalties*
- §806. *Additional Remedies*
- §807. *Appeals*

REFERENCES

APPENDICES

- Appendix A** Combination Sanitary Storm Sewer System (CS4) and Municipal Separate Storm Sewer System (MS4) Districts
- Appendix B** Monessen Watershed Subareas
- Appendix C** Operation and Maintenance (O&M) Agreement
- Appendix D** Small Project Stormwater Management Site Plan
- Appendix E** Stormwater Management Plan Checklist
- Appendix F** Fees
- Appendix G** Streets with Municipal Separate Storm Sewer System (MS4)

City of Monessen
Stormwater Management Ordinance

ARTICLE I General Provisions

§101. *Short Title*

This Ordinance shall be known and may be cited as the City of Monessen Stormwater Management Ordinance.”

§102. *Findings - The City Council of the City of Monessen finds that:*

- A. Stormwater runoff from lands modified by human activities threatens public health and safety by causing decreased infiltration of rainwater and increased runoff flows and velocities, which overtax the carrying capacity of existing streams and storm sewers, causes property damage and risk to public safety, and greatly increases the cost to the public to manage stormwater.
- B. Inadequate planning and management of accelerated stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of stream-beds and stream-banks thereby elevating sedimentation), destroying aquatic habitat and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals and pathogens. Groundwater resources are also impacted through loss of recharge.
- C. The City of Monessen is located in the Monongahela River Watershed and as such will endeavor to cooperate with other municipalities located in the watershed(s) to address issues of stormwater management, water quality, pollution and flooding.
- D. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth in the City of Monessen.
- E. Stormwater can be an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
- F. Public education on the control of pollution of stormwater is an essential component in successfully managing stormwater.
- G. A comprehensive program of stormwater management, including reasonable regulation of land development and redevelopment causing loss of natural infiltration, is fundamental to the public health, safety, welfare, and the protection of the people of the City of Monessen and all the people of the Commonwealth, their resources, and the environment.
- H. The use of open space conservation, green infrastructure, low impact development (LID), and riparian buffers are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices, LID, and riparian buffers contribute to the restoration or maintenance of pre-development hydrology.
- I. Stormwater structures are considered vital infrastructure and can pose a significant hazard.

Outlets and waterways which carry stormwater shall be maintained free of obstructions to allow for non-restricted flow of stormwater to avoid impoundment of water.

- J. Occupancy and modification of floodplains shall be avoided wherever there is a practicable alternative to reduce long and short-term adverse impacts in order to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.
- K. Federal and State regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their municipal separate storm sewer systems (MS4) under the National Pollutant Discharge Elimination System (NPDES). The City of Monessen is subject to MS4 requirements within its designated MS4 District. Refer to Appendix A.
- L. The Westmoreland Conservation District (WCD) is a recognized regulatory agency with authority in the county and this municipality to regulate erosion and sediment controls and stormwater management related to land development activities. Because WCD's authority crosses municipal boundaries they are enabled to oversee environmental issues for the general benefit of all county residents.
- M. The Westmoreland County Integrated Water Resources Plan (2018) addresses all water resources and provides a decision-making tool for development and redevelopment with respect to those resources including stormwater and its management. Refer to www.paiwrp.com and www.westmorelandstormwater.org.

§103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the City of Monessen and its watersheds by minimizing the harms and maximizing the benefits described in this Section of this Ordinance, through provisions designed to:

- A. Manage stormwater runoff impacts at their source by regulating activities that cause problems, reduce runoff volumes and mimic natural hydrology.
- B. Maintain existing flows and quality of streams and watercourses.
- C. Prevent scour and erosion of streambanks and streambeds.
- D. Utilize and preserve the existing natural drainage systems as much as possible.
- E. Restore and preserve the natural and beneficial values served by streamside and waterbody floodplains.
- F. Focus on infiltration of stormwater, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- G. Promote stormwater runoff prevention and emphasize infiltration and evapotranspiration through the protection and conservation of natural resource systems and the use of non-structural BMPs and other creative methods of improving water quality and managing stormwater runoff.
- H. Promote the use of green infrastructure in development and redevelopment where it can also improve stormwater management within the broader watershed in which the project is located.
- I. Meet legal water quality requirements under state law, including regulations at 25 Pa.Code, Chapter 93.4a, to protect and maintain "existing uses" and maintain the level of water quality to support those uses in all streams, and to protect and maintain water quality in "special protection" streams.

- J. Provide review procedures and performance standards for stormwater planning and management.
- K. Provide for proper operations and maintenance of all permanent stormwater management BMPs that are implemented in the City of Monessen.
- L. Provide a mechanism to identify controls necessary to meet the NPDES and MS4 permit requirements, and to encourage infrastructure improvements that lead to separation of storm sewer systems from sanitary sewer systems.
- M. Assist in detecting and eliminating illicit stormwater discharges into the City of Monessen's separate storm sewer system.

§104. *Statutory Authority*

- A. The City of Monessen is empowered to regulate land use activities that affect stormwater runoff by the authority of the Stormwater Management Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, and the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.
- B. The City of Monessen is also empowered to regulate land use activities that affect stormwater runoff by the authority of Third Class City Code and the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

§105. *Applicability*

- A. All regulated activities as defined by this ordinance are subject to regulation by this Ordinance.
- B. This Ordinance applies to any land development or regulated earth disturbance activities within the City of Monessen, and all stormwater runoff entering into the City of Monessen's separate or combined storm sewer system from lands within the boundaries of the municipality.
- C. Earth disturbance activities and associated stormwater management controls are also regulated under existing State law and implementing regulations. This Ordinance shall operate in coordination with those parallel requirements; the requirements of this Ordinance shall be no less restrictive in meeting the purposes of this Ordinance than State law.

§106. *Repealer*

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

§107. *Severability*

If any word, phrase, section, sentence, clause or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, invalidity or illegality by a court of competent jurisdiction, shall not affect or impair any of the remaining words, phrases, sections, sentences, clauses or parts of this Ordinance. It is hereby declared to be the intent of the City Council of the City of Monessen that this Ordinance would have been adopted had such unconstitutional, illegal or invalid word, phrase, section, sentence, clause or part thereof not been included herein.

§108. *Compatibility with Other Requirements*

- A. Approvals issued and actions taken under this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance. To the extent that this Ordinance imposes more rigorous or stringent requirements for stormwater management, the specific requirements contained in this Ordinance shall be followed.
- B. Conflicting provisions in other municipality ordinances or regulations shall be construed to retain the requirements of this Ordinance addressing state water quality requirements.

§109. *Erroneous Permit*

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the City of Monessen purporting to validate such a violation.

§110. *Prohibitions*

Shall be consistent with PAG-13 NPDES General Permit for stormwater discharges from MS4 communities and as listed here.

A. Prohibited discharges

- 1. No person in the City of Monessen shall introduce, or cause to introduce, permit or allow stormwater discharges in the MS4 District into the municipality separate storm sewer system which are not composed entirely of stormwater, except as permitted by this Ordinance, or
 - a. as provided in paragraph 2. below, or
 - b. discharges as authorized under a State or Federal permit.
- 2. Permissible discharges, based on a finding by the municipality that the discharge(s) do not significantly contribute to pollution to surface waters of the Commonwealth, are recommended to be discharged safely to a vegetated area or infiltration BMP, but can also be discharged to a storm sewer system, include but are not limited to:
 - a. Discharges from firefighting activities.
 - b. Potable water sources including dechlorinated water line and fire hydrant flushings.
 - c. Non-contaminated irrigation drainage from agricultural practices.
 - d. Routine external building washdown (which does not use detergents or other compounds).
 - e. Non-contaminated air conditioning condensate.
 - f. Water from individual residential car, boat or other residential vehicle washing that does not use detergents or other compounds.
 - g. Springs.
 - h. Non-contaminated water from basement or crawl space sump pumps.
 - i. Non-contaminated water from foundation or from footing drains.
 - j. Flows from riparian habitats and wetlands.
 - k. Lawn watering.

- l. Pavement wash-waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used.
 - m. Splash pad (recreational spray patio with no standing water) discharges.
 - n. Non-contaminated groundwater.
3. If the municipality determines that any of the discharges identified in paragraph 2 above significantly contributes to pollution of waters of the Commonwealth, or is so notified by DEP, the municipality will notify the landowner and/or the responsible person to cease the discharge.
4. Upon notice provided by the municipality under paragraph 3. above, the discharger will have a reasonable period not to exceed 30 days, as determined by the municipality, to cease the discharge consistent with the degree of pollution caused by the discharge.
5. Nothing in this Section shall affect, limit or alleviate a discharger's responsibilities under State or Federal law.

B. Prohibited connections

The following sources, activities or connections are prohibited, except as provided in subsection A. 1. and 2. above:

1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-storm water discharge including but not limited to, sewage, process wastewater and wash water, to enter the separate storm sewer system, and any connections to the storm drain system from indoor drains and sinks.
2. Any drain or conveyance connected from a commercial, industrial or other non-residential land use to the separate storm sewer system which has not been documented in plans, maps, or equivalent records, and approved by the City of Monessen.
3. Drains carrying non-contaminated stormwater or groundwater shall not be connected to or discharge to any public or private separate sanitary sewer system or facility.

C. Prohibited activities

1. A landowner may not alter the natural flow of surface water on his property by concentrating it in an artificial channel and discharging it upon lower land of his neighbor even though no more water is thereby collected than would naturally have flowed upon the neighbor's land in a diffused [shallow broad path or sheet flow] condition.
2. A landowner may not alter nor neglect maintenance of any BMPs, facilities or structures that were installed under the ordinance without written approval of the municipality.

D. Roof Drains and Sump Pumps

1. Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible.
2. Roof drains and sump pumps shall not discharge into a combination sewer wherever feasible.
3. Roof drains and sump pumps shall not discharge into a separate sanitary sewer.

§111. *Liability Disclaimer*

- A. Neither the granting of any approval under the stormwater management provisions of this Ordinance, nor the compliance with the provisions of this Ordinance, or with any condition imposed by any public body of the City of Monessen or by a City of Monessen official, employee or consultant hereunder, shall relieve any person from any responsibility for damage to person or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the City for damages to persons or property.
- B. The granting of a permit which includes any stormwater management does not constitute a representation, guarantee or warranty of any kind by the City or WCD, or by an official or employee thereof, of the practicability or safety of any structure, use or other plan proposed and shall create no liability upon or cause of action against such public body, official or employee for any damage that may result pursuant thereto.

ARTICLE II Definitions

§201. Interpretations and word usage

For the purposes of this Ordinance, the terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word “includes” or “including” shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The words “shall” and “must” are mandatory; the words “may” and “should” are permissive.

§202. Definition of terms

Act 167– The Stormwater Management Act, Act of October 4, 1978, P. L. 864, No. 167, as amended by the Act of May 24, 1984, No. 63, 32 P.S. §§680.1 *et seq.* The City of Monessen is empowered to regulate land use activities that affect runoff and surface and groundwater quality and quantity by the authority of the Act, the “Storm Water Management Act.”

Accelerated erosion – The removal of the surface of the land through the combined action of human activities and the natural processes at a rate greater than would occur because of the natural process alone.

Agricultural Activity – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops and raising livestock including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops, or pasturing and raising of livestock and installation of Conservation Practices. Except for high tunnels that are exempt pursuant to the provisions of Act 15 of 2018, construction of new buildings or impervious areas is not considered an agricultural activity.

Applicant – A landowner, developer or other person who has filed an application for development or for approval to engage in any regulated earth disturbance activity at a project site in the City of Monessen.

Animal Concentration (heavy use) Areas – A barnyard, chicken coop, feedlot, loafing area, exercise lots, or other similar animal confinement areas that will not maintain a growing crop, or where deposited manure nitrogen is in excess of crop needs, but excluding areas managed as pastures or other cropland, and pasture access ways, if they do not cause direct flow of nutrients to surface water or groundwater.

BMP (best management practice) – Activities, facilities, designs, measures or procedures used to manage stormwater impacts from regulated development activities, to meet State water quality requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance. BMPs include, but are not limited to, infiltration, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, forested buffers, sand filters and detention basins.

Channel – A perceptible natural or artificial waterway which periodically or continuously contains moving water or which forms a connecting link between two bodies of water. It has a defined bed and banks which confine the water.

Chapter 102 – Title 25 Pa Code Chapter 102 Erosion and Sedimentation Control.

Chapter 105 – Title 25 Pa Code Chapter 105 Dam Safety and Waterway Management.

City – The City of Monessen, Westmoreland County, Pennsylvania.

CS4 (combined sanitary storm sewer system) – A sewer system designed to serve as both sanitary sewer and storm sewer.

CS4 District – The area of the city not within the Grand Boulevard Sewer Shed that has a combined sanitary storm sewer system as indicated in Appendix A.

Commonwealth – The Commonwealth of Pennsylvania.

CSO, Combined sewer overflow – An intermittent flow or other untreated discharge from a municipal combined sewer system (including domestic, industrial and commercial wastewater and stormwater) which results from a flow in excess of the dry weather carrying capacity of the system.

Conservation District – The Westmoreland Conservation District (WCD), as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

Conservation Plan – A plan written by an NRCS or SCS certified planner that identifies Conservation Practices and includes site specific BMPs for agricultural plowing or tilling activities and Animal Concentration Areas.

Conservation Practices – Practices installed on agricultural lands to improve farmland, soil and/or water quality which have been identified in a current Conservation Plan.

Conveyance –

- (a) The transportation of runoff via a stormwater facility.
- (b) The ability of a pipe, culvert, swale or similar facility to carry the peak flow from the design storm.

Culvert – A closed conduit for the free passage of surface drainage under a highway, railroad, canal or other embankment.

DEP – The Pennsylvania Department of Environmental Protection.

Demonstrated equivalency – A stormwater management project on an alternative site(s) within the same watershed as the proposed development that will provide equal or better achievement of the purpose of the Ordinance and will not substantially or permanently impair the appropriate use

or development of adjacent property. Examples include streambank stabilization, creation or enhancement of riparian buffers, removal of existing impervious surfaces and establishment of 'green' easements, installation of stormwater management and water quality facilities, etc.

Design criteria –

- (a) Engineering guidelines that define the parameters for design and construction.
- (b) Guidelines for hydrologic and hydraulic design and construction of the BMPs.

Design storm – See “storm frequency.”

Detention – The slowing, dampening or attenuating of runoff flows entering the natural drainage pattern or storm drainage system by temporarily holding water on a surface area in a detention basin or within the drainage system.

Detention basin – A pond, basin, reservoir or underground system constructed to impound or retard surface runoff temporarily.

Developer – A person or entity that seeks to undertake or undertakes the activities associated with changes in land use or seeks to undertake or undertakes any regulated earth disturbance activities at a project site in the City of Monessen. The term “developer” includes, but is not limited to, the term subdivider, owner and builder, even though the person involved in successive stages of a project may change or vary.

Development – An “earth disturbance activity,” as herein defined and any activity, construction, alteration, change in land use or practice that affects stormwater runoff characteristics. The term also includes redevelopment.

Development site – The specific tract of land where any development or earth disturbance activities in the City of Monessen are planned, conducted, undertaken or maintained.

Discharge – The flow or rate of flow from a canal, conduit, channel or other hydraulic structure.

Disturbed Area – A land area where an earth disturbance activity is occurring or has occurred.

Drainage – In general, the removal of surface water from a given area commonly applied to surface water and ground water.

Drainage area – Any of the following activities:

- (a) The area of a drainage basin or watershed, expressed in acres, square miles or other unit of area (also called “catchment area,” “watershed,” “river basin”).
- (b) The area served by a sewer system receiving storm and surface water, or by a watercourse.

Earth disturbance activity – A construction or other human activity which disturbs the surface of the land including, but not limited to, clearing and grubbing, grading, excavations, embankments, road maintenance, land development, building construction, oil and gas activities, well drilling,

mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

Encroachment – Any structure or activity which in any manner changes, expands or diminishes, the course, current or cross-section of any watercourse, floodway or body of water.

Erosion – The process by which land, including channels, is worn away by water, wind, or chemical action.

Erosion control – The application of measures to reduce erosion of land surfaces.

E&S Permit – A permit required for earth disturbance activities where the earth disturbance is associated with harvesting, road maintenance activities, oil and gas activities, and any other such activities.

Erosion and sediment control plan (E&S) – A plan for a project site which identifies BMPs to minimize accelerated erosion and sedimentation of land.

Existing Condition – The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

FEMA – Federal Emergency Management Agency.

Floodplain – Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

Floodway – The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed--absent evidence to the contrary--that the floodway extends 50 feet away from the top of the bank of the stream.

Forest Management/Timber Operations – Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvi-cultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

Grand Boulevard Sewer Shed - The area of the City that has a separate sanitary sewer and is part of the municipal separate storm sewer system (MS4). It is identified as the MS4 District. Refer to Appendix A.

Green Infrastructure – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

Ground cover – Materials and/or vegetation covering the ground surface.

Ground water – Subsurface water occupying the saturation zone, from which wells and springs are fed.

Groundwater recharge – Replenishment of existing natural underground water supplies.

High Tunnel – A structure which meets the following:

- (a) Is used for the production, processing, keeping, storing, sale or shelter of an agricultural commodity as defined in section 2 of the act of December 19, 1974 (P.L.973, No.319), known as the Pennsylvania Farmland and Forestland Assessment Act of 1974, or for the storage of agricultural equipment and supplies.
- (b) Is constructed consistent with all of the following:
 - i. Has metal, wood or plastic frame
 - ii. When covered, has plastic, woven textile or other flexible covering
 - iii. Has a floor made of soil, crushed stone, matting, pavers or a floating concrete slab

Hot spots - Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants that are higher than those typically found in stormwater (e.g., vehicle salvage yards and recycling facilities, vehicle fueling stations, fleet storage areas, vehicle equipment and cleaning facilities, vehicle service and maintenance facilities, and certain industrial/commercial activity areas).

Hydrologic Soil Group (HSG) – Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less permeable as the HSG varies from A to D (NRCS1,2).

Impervious surface – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs, additional indoor living spaces, patios, garages, storage sheds, and similar structures; and any streets or sidewalks. Decks, parking areas, gravel areas, and driveway areas are counted as impervious areas if they directly prevent infiltration.

Infiltration – Any of the following activities:

- (a) The flow or movement of water through the interstices or pores of a soil or other porous medium.
- (b) The absorption of liquid by the soil.

Land development – Any of the following activities:

- (a) The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving:
 - i A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single residential/nonresidential building on a lot or lots regardless of the number of occupants or tenure.
 - ii The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features.
- (b) A subdivision of land.

Land disturbance – Any activity involving the changing, grading, transportation, fill and any other activity which causes land to be exposed to the danger of erosion.

Low Impact Development (LID) – Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

Maintenance – The upkeep necessary for efficient operation of physical properties.

MS4 (municipal separate storm sewer system) - A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (a) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (b) Designed or used for collecting or conveying stormwater;
- (c) Which is not a combined sewer; and
- (d) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.”

MS4 District – The area of the City within the Grand Boulevard Sewer shed with a separate storm sewer system and a separate sanitary sewer system. Refer to Appendix A.

Municipalities Planning Code – Act 247 of 1968, as amended by Act 170 of 1988, 53 P.S. §10101 et seq.

Municipality –City of Monessen, Westmoreland County, Pennsylvania.

Native Vegetation – Plant species that have historically grown in Pennsylvania and are not invasive species, controlled plants or noxious weeds as defined by PA DCNR, or PA Department of Agriculture.

Natural stormwater runoff regime – A watershed where natural surface configurations, runoff characteristics and defined drainage conveyances have attained the conditions of equilibrium.

NPDES – National Pollutant Discharge Elimination System, the Federal government's system for issuance of permits under the Clean Water Act, which is delegated to DEP in Pennsylvania.

NRCS – Natural Resources Conservation Service (previously Soil Conservation Service).

Outfall – “Point source” as described in 40 CFR §122.2 at the point where the City of Monessen storm sewer system discharges to surface waters of the Commonwealth. Also, the point, location or structure where drainage discharges from a sewer, drain or other conduit as well as the conduit leading to the ultimate discharge point.

Outlet control structure – The means of controlling the relationship between the head water elevation and the discharge, placed at the outlet or downstream end of any structure through which water may flow.

Overland flooding – Flooding that occurs for a variety of reasons all stemming from excessive stormwater runoff including too much rain in too little time, added impervious development, change in land use, malfunction or clogging of existing stormwater systems.

Peak discharge – The maximum rate of stormwater runoff from a specific storm event.

Peak flow – Maximum flow.

Pennsylvania DEP – Pennsylvania Department of Environmental Protection.

Perimeter BMPs – BMPs placed or constructed along the perimeter of an earth disturbance area, or to capture and treat stormwater runoff prior to leaving the site.

Permanent Stabilization – Long term protection of soil and water resources from accelerated erosion.

Pervious Area – Any material or surface that allows water to pass through at a rate equal to or greater than natural ground cover.

Performance standard – A standard which establishes an end result or outcome which is to be achieved but does not prescribe specific means for achieving it.

Person – An individual, partnership, public or private association or corporation, firm, trust, estate, municipality, governmental unit, public utility or any other legal entity whatsoever which is recognized by law as the subject of rights and duties. Whenever used in any section prescribing

or imposing a penalty, the term “person” shall include the members of a partnership, the officers, members, servants and agents of an association, officers, agents and servants of a corporation, and the officers of a municipality or county, but shall exclude any department, board, bureau or agency of the Commonwealth.

Point source – Any discernible, confined and discrete conveyance including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in State regulations at 25 Pa.Code §92.1.

Pollutant – Any contaminant or other alteration of the physical, chemical or biological integrity of surface water which causes or has the potential to cause pollution as defined in Section 1 of the Clean Water Law.

Pollutant Reduction Plan (PRP) – A plan required by the MS4 permit to calculate existing pollutants of concern and the minimum reduction in loading from stormwater discharges, and to select the best management practices to achieve the minimum reductions.

Project site – The specific area of land where any development or regulated earth disturbance activities in the City of Monessen are planned, conducted, undertaken or maintained.

Qualified Professional – Any person licensed by the Pennsylvania Department of State or otherwise qualified under Pennsylvania law to perform the work required by this Ordinance.

Record drawings – Drawings showing the stormwater management system of a site as built, created after the completion of construction and intended for use as a permanent record of the stormwater management system.

Redevelopment – Earth disturbance activities on land which has previously been disturbed or developed.

Regulated development activity – Any earth disturbance activities or any activities that involve the change of land cover, alteration or development of land in a manner that may affect stormwater runoff as listed in the Regulated Development Activity table. This includes earth disturbance on any portion of, part, or during any stage of, a larger common plan of development. With regard to road maintenance activities the term only includes activities involving 1 acre or more of earth disturbance. Refer to the Regulated Development Activity Table in Article III of this ordinance.

Release Rate – The percentage of existing conditions peak rate of runoff from a site or subarea to which the proposed conditions peak rate of runoff must be reduced to protect downstream areas.

Release rate percentage – The watershed factor determined by comparing the maximum rate of runoff from a subbasin to the contributing rate of runoff to the watershed peak rate at specific points of interest.

Resource extraction – Any activity that involves withdrawing materials from the natural environment.

Retention basin – A pond, basin, usually enclosed by artificial dikes, that is used to retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

Retention Volume/Removed Runoff – The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or immediately after a storm event.

Return period – The average interval in years over which an event of a given magnitude can be expected to recur.

Riparian Buffer – A permanent area of native vegetation including herbaceous material, shrubs and/or trees located adjacent to streams, lakes, ponds and wetlands.

Road maintenance – Earth disturbance activities within the existing road cross-section, such as grading and repairing existing unpaved road surfaces, cutting road banks, cleaning or clearing drainage ditches and other similar activities.

Runoff – That part of precipitation which flows over the land.

Runoff characteristics – The surface components of any watershed which affect the rate, amount and direction of stormwater runoff. These may include, but are not limited to, vegetation, soils, slopes and manmade landscape alterations.

SALDO – Subdivision and Land Development Ordinance.

Sediment – Mineral or organic solid material that is being transported or has been moved from its site of origin by air, water or ice and has come to rest.

Sedimentation – The process by which mineral or organic matter is accumulated or deposited by moving water, wind or gravity.

Separate sanitary sewer system – A sewer collection system designed to serve exclusively as a sanitary sewer.

Separate storm sewer system – A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) primarily used for collecting and conveying stormwater runoff. Refer to MS4.

Small project – Regulated development activities that, measured on a cumulative basis from 5 years prior to the application, create additional impervious areas of 501 to 3,000 square feet or involve earth disturbance activity an area of 2,501 to 5,000 square feet and do not involve the alteration of stormwater facilities or water courses.

Stabilization – The proper placing, grading, constructing, reinforcing, lining and covering of soil, rock or earth to ensure resistance to erosion, sliding or movement.

State water quality requirements – As defined under State regulations– protection of designated and existing uses (See 25 Pa.Code, Chapters 93 and 96)–including:

- (a) Each stream segment in Pennsylvania has a “designated use,” such as “cold water fishery” or “potable water supply,” which are listed in 25 Pa.Code, Chapter 93. These uses must be protected and maintained, under State regulations.
- (b) “Existing uses” are those attained as of November 1975, regardless whether they have been designated in 25 Pa.Code, Chapter 93. Regulated earth disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.
- (c) Water quality involves the chemical, biological and physical characteristics of surface water bodies. After regulated earth disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed and structural integrity of the waterway, to prevent these impacts.

Storage facility – Any surface or sub-surface facility that stores stormwater runoff, see “detention basin” and “retention basin.”

Storm frequency – The average interval in years over which a storm event of a given precipitation volume can be expected to occur. The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours) used in the design and evaluation of stormwater management systems. Also see Return Period.

Storm sewer – A sewer that carries intercepted surface runoff, street water and other drainage but excludes domestic sewage and industrial waste.

Stormwater – Runoff from the surface of the land resulting from precipitation; snowmelt or ice melt; and drainage.

Stormwater collection systems – Natural or manmade structures that collect and transport stormwater through or from a drainage area to the point of final outlet including, but not limited to, any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets and pumping stations.

Stormwater management facility – A constructed measure for detention, retention, infiltration, and water quality treatment of stormwater runoff.

Stormwater management plan – The plan for managing stormwater runoff rate, volume and water quality as required by the Stormwater Management Act, 32 P.S. §680.1 *et seq.*

Stormwater Management Performance District – An area designated by the Watershed Stormwater Performance District Map which includes standards for stormwater rate, volume and water quality. Refer to Appendix A.

Subdivision – As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247, as amended.

Swale – A low-lying stretch of land which gathers or carries surface water runoff.

Top of Streambank – First substantial break in slope between the edge of the streambed and surrounding terrain. It can be either natural or man-made lying parallel to the watercourse.

USDA – United States Department of Agriculture.

Watercourse – A channel or conveyance of surface water, such as a run, stream or creek, having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Waters of the Commonwealth – Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

Watershed – The entire region or area drained by a river or other body of water whether natural or artificial. A “designated watershed” is an area delineated by the Pennsylvania DEP and approved by the Environmental Quality Board for which Counties are required to develop watershed stormwater management plans.

Watershed stormwater management plan – The plan for managing stormwater runoff throughout a designated watershed as required by the Pennsylvania Stormwater Management Act (Act 167), 32 P.S. §680.1 *et seq.*

Wetland – Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

ARTICLE III Stormwater Management Performance Standards.

§301. Stormwater Management Performance Districts.

The City of Monessen is located in the Monongahela River Watershed, which is not included in a Stormwater Management Performance District As recommended by the Westmoreland Conservation District for areas not covered by a Stormwater Performance District, the release rate shall be 80% of the pre-development peak flow as set by the City of Monessen. For more information refer to www.westmorelandstormwater.org.

§302. General Requirements.

- A. Preparation and implementation of a stormwater management site plan is required for all regulated activities unless preparation of a SWM site plan is specifically exempted.
- B. Projects that propose greater than 1 acre of earth disturbance are subject to NPDES Permit requirements and will require a Stormwater Management Plan.
- C. No regulated activities, unless exempted, shall commence until the municipality issues written approval of an SWM Plan, which demonstrates compliance with the requirements of this Ordinance.
- D. Regulated Development Activities shall be as follows:

[REGULATED DEVELOPMENT ACTIVITY TABLE]

SWM Plan Requirement	New Impervious Area for New and Redevelopment	Disturbed Area*	Next Steps
Exempt	0	Less than 1 acre	Comply with Exemption section of this ordinance
No-Harm	500 square feet or less	2,500 square feet or less	Comply with No-Harm section of this ordinance
Waiver / Modification / Demonstrated Equivalency	Less than 1 acre, subject to municipal approval	Less than 1 acre	Comply with Waiver / Modification / Demonstrated Equivalency section of this ordinance
Small Project (per definition), refer to Appendix C	501 square feet to 3,000 square feet	2,501 to 5,000 square feet	Submit Small Project Site Plan complete with all attachments
Stormwater Management Plan meeting the Ordinance requirements	Greater than 3,000 square feet	Greater than 5,000 square feet	Consult a qualified professional

*The above Table is only applicable for new development or redevelopment projects with earth disturbance less than 1 acre and that have not had cumulative impacts, within 5 years preceding the permit application date, that are in excess of the square foot limits.

§303. Exemption from performance standards.

- A. The following regulated activities are specifically **exempt** from the Stormwater Management Plan preparation and submission requirements set forth in this Ordinance:
1. Agricultural activity limited to plowing or tilling activities, for animal concentrated (heavy) use areas provided the activities are performed according to the requirements of Chapter 102, or Conservation Practices being installed as part of the implementation of a Conservation Plan written by an NRCS or SCS-certified planner. This exemption does not include any other type of earth disturbance subject to NPDES permit requirements such as earth disturbance equal to or greater than one (1) acre.
 2. A high tunnel, if proof is provided that the high tunnel is exempt pursuant to the provisions of Act 15 of 2018. Such an exemption does not exempt high tunnels from other requirements applicable under Federal, State or municipal laws.
 3. Forest management and timber operations provided the activities are performed according to the requirements of Chapter 102.
 4. Resource extraction activities provided they are done in accordance with applicable PA DEP regulations.
 5. Roadway resurfacing and maintenance projects, which do not increase impervious area, and underground infrastructure projects are exempt from the provisions of this ordinance, provided the activities meet the requirements of all other municipal, state and federal requirements,
 6. Domestic landscaping and/or vegetable gardening.
 7. Voluntary Green Infrastructure (GI) or the retrofit of stormwater management infrastructure as conversion to green infrastructure BMPs to correct existing problems, that are solely intended to better manage runoff from existing development, are not part of new development or redevelopment, and that do not fall under the requirements of this or other development ordinances.
- B. The City of Monessen may deny or revoke any exemption pursuant to this Section at any time for any project that the City of Monessen believes may pose a threat to public health, safety, property or the environment.

§304. No-Harm Option]

Applicants may request approval of a ‘no-harm option’ regarding stormwater management for their project. ‘No-harm option’ requests must meet the following criteria deemed appropriate by the City of Monessen *and in compliance with all Commonwealth laws and regulations:*

- A. Project located near or adjacent to significantly larger body of water.
- B. Project able to discharge directly into existing flood control feature.

- C. Project of a small size 500 square feet or less of new impervious surface or 2,500 square feet or less of land use changes. Refer to the Regulated Development Activity Table in Article III this ordinance.
- D. Project will generate less than 0.5 cubic feet per second for the ten-year storm peak rate increase as compared to pre-development peak rate.
- E. Project is not part of a larger development being 'piecemealed' in order to avoid stormwater management regulations.
- F. Project is not part of a larger development which has grown 'piecemeal' over the past five years without SWM.
- G. Project is a small percentage <5% of a much larger site and is incidental to the much larger site
- H. Project is not located in a neighborhood, watershed, or location where known stormwater problems exist, such as overland flooding like flooding of structures or roadways.
- I. Project does not discharge to a combined sewer.
- J. Project will not degrade water quality of the receiving stream. Refer to the Westmoreland County Integrated Water Resources Plan www.westmorelandstormwater.org for maps of impaired streams to determine if the project area is not within an impaired stream corridor or provide documentation that further degradation will not occur.

To qualify for the 'no-harm' option, applicant may, at the request of the municipality, submit calculations, drawings, and details showing that the project meets the above criteria. Projects approved for the 'no-harm' option may be exempted from constructing all or some of the usual stormwater management practices regularly required for similar projects. To be approved, no-harm requests must be reviewed and approved by both the City Engineer and by the WCD, but final approval rests with the City of Monessen.

§305. *Waivers / Modifications / Demonstrated Equivalency*

- A. If the City of Monessen, in conjunction with the City Engineer, WCD, or DEP as applicable, determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the City may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to this Section paragraphs B, C and D *and in compliance with all Commonwealth laws and regulations*. The request for a waiver, modification, or demonstrated equivalency shall originate with the Landowner, shall be in writing, include a study of downstream effects, and accompany the Stormwater Management Plan submission to the City. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification or demonstrated equivalency. The City Engineer and WCD shall review the request to determine if it meets the requirements of the Ordinance including this Section, paragraphs B, C and D. If acceptable to the City and WCD, and the regulated stormwater activity involving earth disturbance is less than one (1) acre, the City may grant the waiver or modification. If the regulated stormwater activity involving earth disturbance is equal to or greater than one acre, the plan will be subject to the NPDES requirements of DEP.
- B. Waivers, modifications, or demonstrated equivalency of the requirements of this Ordinance may be approved by the City if enforcement will exact undue hardship because of unique physical circumstances or pre-existing site conditions peculiar to the land in question,

provided that the modifications or demonstrated equivalency will not be contrary or detrimental to the public interest and shall achieve the intended outcome, and that the purpose of the Ordinance is preserved. Hardship must be due to such unique physical circumstances or pre-existing site conditions and not the circumstances or conditions generally created by the provisions of the Stormwater Management Ordinance; and there is no possibility that the property can be developed in strict conformity with the provisions of the Stormwater Management Ordinance. Cost or financial burden shall not be considered a hardship. Hardship cannot have been created by the landowner or developer. Modification or demonstrated equivalency shall not substantially or permanently impair the appropriate use or development of adjacent property(s) not under the Landowner's control. Modification or demonstrated equivalency may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance.

- C. No waiver, modification or demonstrated equivalency of any regulated stormwater activity involving earth disturbance greater than or equal to one (1) acre may be granted by the City unless that action is approved in advance by the Department of Environmental Protection (DEP) or the Westmoreland Conservation District (WCD).

- D. Applicants may request approval of a demonstrated equivalent stormwater activity for their project in lieu of performing traditional stormwater management. Demonstrated equivalent stormwater activity requests will be evaluated by the City Engineer and the WCD on a case-by-case basis. Prior approval of a demonstrated equivalent stormwater activity on a site does not set a precedent for future approval of the same or other alternative activities on any site. The approval of a demonstrated equivalent stormwater activity does not excuse the applicant from following standard E&S and SWM practices as applicable on the original site.
 - 1. Demonstrated equivalent stormwater activities shall only be approved when the following criteria are met:
 - a) Traditional stormwater management activities on the site are precluded by a particular site limitation, such as contaminated soil, steep slopes, existing buildings/infrastructure, combined sewer;
 - b) Construction of traditional stormwater management activities on the site would require extra permits or lead to excessive permitting activities and delays;
 - c) The site in question does not already have a stormwater management problem; and
 - d) The site in question is not already contributing to water quality problems in the receiving stream.
 - 2. Approvable demonstrated equivalent stormwater activities may include the following:
 - a) Restoration of an existing degraded wetland, stream channel, floodplain, or riparian buffer, including daylighting of a stream.
 - b) Restoration, retrofit or upgrade an existing stormwater management feature (inadequate detention pond, for example).

- c) Creation of new stormwater management features, especially green infrastructure, for a previously unmanaged site
 - d) Provide a water-based benefit to the public other than stormwater management (for example, extend a public sewer to an area not already served).
 - e) Treatment of abandoned mine drainage.
3. The proposal for demonstrated equivalency shall be accompanied by documentation or methodology quantifying the equivalency of the proposed project to what would have been originally required. Acceptable documentation or methodology may include use of the Worksheets and Checklist found in PA DEP NPDES permit application, Appendix E or approved method showing the proposed equivalency:
- a) Controls approximately the same amount of runoff volume as what would originally have been proposed
 - b) Improves approximately the same amount of runoff quality as would have been originally proposed
 - c) Is located within an impaired watershed or stream segment which will benefit from the proposed project. Impairment may include stream impairment, reduced stream buffer, and pollutant loading. Refer to the Westmoreland County Integrated Water Resources Plan at website www.westmorelandstormwater.org.
4. The demonstrated equivalent stormwater activity shall:
- a) Be constructed concurrently with the project for which it is being applied;
 - b) Be constructed according to plans approved by the municipality and the WCD including any erosion control and stormwater management practices as applicable;
 - c) Obtain all necessary permits;
 - d) Be located on land owned by or controlled by the applicant or by a cooperating public or private entity(s) (school, church, club, municipality, etc.);
 - e) Be protected by a perpetual easement or deed restriction, or landowner agreement;
 - f) Be located in the same general watershed as the project for which it is being applied; and
 - g) Have an Operation and Maintenance Plan (O&M) specifying who is responsible for what tasks.

§306. Small Project

- A. When a regulated development activity (refer to Table in Section 302 of this ordinance) creates impervious area between 501 and 3,000 square feet, or total earth disturbance of 2,501 to 5,000 square feet, the stormwater management requirements are as follows. Refer also to Appendix C.
- B. For new impervious surfaces, the first 2 inches of runoff shall be permanently removed from the runoff flow and shall not be released to waters of the Commonwealth. Removal options include reuse, evaporation, transpiration and infiltration.
- C. Facilities, to the greatest extent possible and subject to City approval, shall be designed to drain the permanently removed runoff volume in a period no greater than 72 hours. Runoff

volumes in excess of 2 inches shall be safely conveyed to a stable vegetated area, natural watercourse, the curb or gutter line of roadway or existing storm collection/conveyance/control system as applicable.

- D. This method is exempt from the requirements of Section 402 of this ordinance.
- E. A Small Project Stormwater Management Plan must be submitted to the City of Monessen and the WCD and shall consist of the following items and related support material needed to determine compliance with Sections 307 to 311 of this ordinance. The applicant can also use protocols listed in Appendix C.
 - 1. Narrative: General description of proposed stormwater management techniques, including calculations, assumptions and criteria used in the design of the stormwater management facilities and BMPs, and construction specifications of the materials to be used for stormwater management facilities and BMPs.
 - 2. Stormwater Management Plan: Showing locations of all stormwater management facilities and BMPs, especially green infrastructure, limits of disturbance, including the type and amount of proposed impervious area, structures, roads, paved areas and buildings;
 - 3. Small Project Stormwater Management Worksheet for each BMP proposed.
 - 4. Signed agreement page for operation and maintenance of stormwater facilities and BMPs (Refer to Appendix C); and
 - 5. Erosion and Sediment Control Plan including all reviews and letters of adequacy from the Conservation District.

§307. General Standards.

- A. Proposed land development must consider avoiding, minimizing, and mitigating impacts to the site that may increase stormwater runoff from the proposed project. Applied sequentially, these three low impact development strategies should be an overall guide as a project is planned and carried out.
- B. The Westmoreland County Integrated Water Resources Plan provides an online decision-making tool to assist developers, designers, property owners in addressing all water resources during development and redevelopment and should be consulted. Refer to website www.paiwrp.com and website www.westmorelandstormwater.org.
- C. The following provisions shall be considered the overriding performance standards against which all proposed stormwater control measures shall be evaluated and shall apply throughout the City of Monessen.
 - 1. Any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. For alteration or development taking place in stages, the cumulative development must be used in determining conformance with this ordinance. Such measures shall include such actions as are required:
 - a. To assure that the maximum rate of stormwater runoff is no greater after development than prior to development activities for the 2-, 10-, 50-, and 100-year storms. Rainfall data shall be obtained from NOAA Atlas 14, the E&S manual, Table 5.1 for NRCS calculations, and PennDOT Publication 584,

- D. The project plan shall specify permanent stormwater BMPs to be implemented, operated and maintained to meet legal water quality, rate and volume requirements. If methods other than low impact development (LID) and green infrastructure methods are proposed to achieve the volume and rate controls required under this ordinance, the SWM Plan must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.
- E. To protect and maintain water quality, additional stormwater runoff created by the development project must be captured, stored and treated. In addition, post construction stormwater infiltration of runoff must replicate preconstruction infiltration of runoff to the maximum extent possible with the exception of **hot spots**. As a minimum, this shall be a volume of additional runoff generated by a 2-year, 24-hour storm. Preferred BMP's for a **hot spot** include storm inlet filters, proprietary stormwater quality devices, underground detention tanks, detention ponds with forebays, tree planting, green roof. Permeable pavement, infiltration BMP's, and rain gardens are not recommended for hotspots.
- F. In addition to the provisions set forth in paragraphs A. through C., inclusive, as set forth above, all regulated development activities within the City of Monessen shall be designed, implemented, operated and maintained to meet the purposes of this Ordinance, through these two elements:
 - 1. Erosion and sediment control during the earth disturbance activities (e.g., during construction).
 - 2. Water quality, rate and volume protection measures after completion of earth disturbance activities (e.g., post-construction stormwater management), including operations and maintenance.
- G. No regulated development activities within the City of Monessen shall commence until the requirements of this Ordinance are met.
- H. All best management practices (BMPs) used to meet the requirements of this Ordinance shall conform to the State water quality requirements, and any more stringent requirements as determined by the City of Monessen.
- I. LID and green infrastructure techniques described in the PA DEP Stormwater BMP Manual 2006 or most current edition are encouraged.
- J. Projects must comply with the City's approved MS4 permit, including compliance with the six Minimum Control Measures (MCM's) and with the City's Pollutant Reduction Plan (PRP).]

§308. Watershed Standards

- A. The stormwater management performance standards in this Ordinance are intended to implement the provisions, standards and criteria contained in the Pennsylvania Stormwater Management Act (Act 167), 32 P.S. §680.1 *et seq.* If there is any discrepancy between the provisions of this Ordinance and the provisions, standards and criteria of the Act, or if a stormwater management plan is subsequently approved and adopted by the appropriate governmental agency or body, then the provisions, standards and criteria of the current watershed plan shall govern.
- B. Management of stormwater runoff is a key objective of 25 Pa.Code, Chapter 93, of the DEP Regulations, because runoff can change the physical, chemical, and biological integrity of waterbodies thereby impacting rate, volume and water quality.

- C. The project plan shall describe how these rate, volume and water quality protection requirements will be met. Infiltration BMPs shall be evaluated and utilized to the maximum extent possible to manage the net change in stormwater runoff generated so that post construction discharges do not degrade the physical, chemical or biological characteristics of the receiving waters. These BMPs may be used to satisfy all or part of the requirements found within this Ordinance.
- D. Refer to the Stormwater Performance Districts outlined in Appendix A, and the Westmoreland County Integrated Water Resources Plan (IWRP) at www.westmorelandstormwater.org. The project plan shall describe how the proposed project will address performance standards, impairments, and pollutant loading found in the IWRP. The release rate shall be 80% of the pre-development peak flow as set by the City of Monessen.

§309. *Design Criteria for Stormwater Management Facilities and BMPs*

A. General Criteria.

1. Applicants may select runoff control techniques, or a combination of techniques, which are most suitable to control stormwater runoff from the development site. Refer to the Acceptable Computation Methodologies table of this ordinance. All controls must be subject to approval of the City Engineer and the WCD. The City Engineer may request specific information on design and/or operating features of the proposed stormwater controls in order to determine their suitability and adequacy in terms of the standards of this Ordinance.
2. If the proposed development site is located in an impaired water shed according to Category 4 of the PA Integrated Water Quality Monitoring and Assessment Report, or in a watershed with a TMDL according to Category 5 of the same Report, the applicant shall identify the source and cause of impairment and shall propose, if required or applicable the use of BMPs to mitigate any impacts to the waters.
3. The applicant should consider the effect of the proposed stormwater management techniques on any special soil conditions or geological hazards which may exist on the development site. In the event such conditions are identified on the site, the City Engineer may require in depth studies by a competent geotechnical engineer. Not all stormwater control methods may be advisable or allowable at a particular development site.
4. The applicant shall consider the effect of the proposed stormwater management techniques on existing stream impairments and pollutant loading. Refer to the Westmoreland County Integrated Water Resources Plan (IWRP) at www.westmorelandstormwater.org.
5. The applicant shall consider existing conditions on the site for the prior five years to determine prevailing land use and impervious cover and shall consider 20% of existing impervious cover as meadow for pre-existing conditions on redevelopment sites.
6. The stormwater management practices to be used in developing a stormwater management plan for a particular site shall be selected according to the following order of preference:

- a. Site planning for locating proposed buildings, impervious areas and grading which minimizes disruption of the natural site characteristics especially utilizing low impact development techniques.
 - b. Minimization of impervious areas and promotion of retentive grading.
 - c. Implementation of non-structural measures (refer to the PA DEP Stormwater BMP Manual 2006 or current edition).
 - d. Implementation of innovative / green infrastructure structural measures (refer to the PA DEP Stormwater BMP Manual 2006 or current edition).
 - e. Stormwater detention/retention structures.
7. Any BMP which is a dam, culvert, stream obstruction or encroachment or outfall as defined in 25 Pa.Code, Chapter 105, shall be designed according to the requirements in those regulations.
 8. Drainage easements shall be provided for all stormwater conveyance and BMPs serving multiple properties and not located within a public right of way. Easements shall include ingress and egress to a public right of way, and shall be recorded at the County with the final plan. Terms of easement shall prohibit excavation or placement of fill or structures and any alteration that may adversely affect the flow of stormwater within any portion of the easement.
 9. No person shall install, create, modify, remove, fill, landscape or otherwise alter or place any structure, soil, rock, material or vegetation in or on, or otherwise adversely affect, any stormwater management facility or any area within a stormwater easement without the written approval of the City of Monessen and approval of the WCD.
 10. Persons engaged in land development activities shall provide the required [financial security, O&M Agreements] to the [municipality] as outlined in the Appendix B.

B. Criteria for Stormwater Management Facilities and BMPs.

1. If stormwater management facilities and BMPs are utilized for the development site, the facilities shall be designed such that post-development peak runoff rates from the developed site are controlled to the 80% release rate for the 2-, 10-, 50- and 100-year storm frequencies. Rainfall data shall be obtained from NOAA Atlas 14 or other source as approved by the municipality.
2. All stormwater management facilities and BMPs shall be equipped with outlet/overflow structures to provide rate discharge control for the designated storm frequencies. Provision shall also be made to safely pass the entire post-development 100-year storm without breaching or otherwise damaging the facilities, downstream or neighboring properties.
3. Release of stormwater flow from a development site must be to an existing stormwater conveyance or easement whether natural or man-made. Calculations and information shall be presented as to the ownership, responsible party, capacity, and stability of such conveyance. Release of 'sheet flow' as from a level spreader, when it is the only option available will be permitted on a case-by-case basis as approved by the municipality and WCD.
4. All stormwater management facilities and BMPs shall be designed to control volume and water quality as defined by 80% release rate for the 2, 10, 50 and 100-year storm frequencies.

5. Shared stormwater management facilities and BMPs, which provide control of runoff for more than one development site within a single subarea may be considered and are encouraged. Such facilities shall meet the criteria contained in this Section. In addition, runoff from the development sites involved shall be conveyed to the facility in a manner that avoids adverse impacts (such as flooding or erosion) to channels and properties located between the development site and the shared storage facilities.
6. Where stormwater management facilities and BMPs will be utilized, multiple use facilities, such as wetlands, lakes, ballfields or similar recreational/open space uses are encouraged wherever feasible, subject to the approval of the City of Monessen.
7. Other considerations which shall be incorporated into the design of the stormwater management facilities and BMPs include:
 - a. Inflow and outflow structures shall be designed and installed to prevent erosion and embankments, cuts, fills and bottoms of impoundment type structures should be protected from soil erosion.
 - b. Control and removal of debris both in the storage structure and in inlet or outlet devices shall be a design consideration.
 - c. Inflow and outflow structures, pumping stations and other structures shall be designed and protected, using safety benches, trash racks, energy dissipaters and other means to minimize safety hazards.
 - d. . In appropriate instances as determined by the City, access may be restricted to include fencing in a minimum height of seven feet.
 - e. Interior slopes of storage ponds shall not exceed a ratio of three to one horizontal to vertical dimension with a combination of interior and exterior slopes not exceeding five.
 - f. Landscaping shall be provided for the facility which stabilizes disturbed areas and preserves the natural and beneficial values of the surrounding area. Woody vegetation shall not be located or planted on a BMP dam.
 - g. Facility shall be located to facilitate maintenance, with an associated easement of adequate area considering the frequency and type of equipment that will be required.
 - h. Underground detention / retention / infiltration facilities with an associated easement of adequate area shall be equipped with open grate inlet or manhole access to facilitate visual inspections

C. Criteria for Collection/Conveyance Facilities.

1. All stormwater runoff collection or conveyance facilities, whether storm sewers or other open or closed channels, shall be designed in accordance with the following basic standards:
 - a. All building sites shall use measures to provide drainage away from and around the structure in order to prevent any potential flooding damage as much as practical. Such measures shall include grading the surrounding lawn or pavement area so that it slopes away from the structure by a minimum of 5% slope over a minimum distance of 10 feet; raising the floor of the structure so that it is a minimum of 6 inches above the predominate surrounding land elevation and a minimum of one foot above the base flood elevation in a floodplain; eliminating or waterproofing penetrations thru the structure's

walls or foundation; constructing berms, curbs, or swales to divert surface water around the structure; arranging roof and area drains to carry water away from the structure and to a stormwater BMP. Connection to a sanitary sewer is not allowed.

- b. Developers proposing a land development or subdivision shall arrange internal drainage within the subdivision so that surface water is safely directed and channeled away from all structures within and adjacent to the development site to stormwater BMP.
 - c. Developers shall provide to all persons constructing a structure within a land development site, standards including drawings and specifications to ensure that those persons adhere to the general site plans and stormwater management plans for the development. Persons constructing a structure within a land development site shall submit to the municipal engineer and WCD drawings, calculations, and other information to show how they will meet the stormwater management requirements of the development site.
 - d. Lots located on the high side or low side of streets shall extend roof, trench and area drains to a stable vegetated area, natural watercourse, the curb or gutter line of roadway or storm collection/conveyance/control system (if applicable) in accordance with the approved stormwater management plan for the development site.
 - e. For all building sites and lots, the inclusion of rain barrels, rain gardens, drywells and other strategies for infiltration of roof runoff close to its source is required unless soil conditions prohibit their use.
 - f. Collection/conveyance facilities should not be installed parallel and less than 10 feet from the top or bottom of an embankment, greater than or equal to 15 feet height to avoid the possibility of failing or causing the embankment to fail, unless documented to be stable by a geotechnical analysis.
 - g. All collection/conveyance facilities shall be designed to convey the 100-year storm peak flow rate from the contributing drainage area and to carry it to the nearest suitable outlet such as a stormwater control facility, curbed street, storm sewer or natural watercourse. Where feasible avoid discharging into combination sewers in the CS4 District. Refer to Appendix A.
 - h. Where drainage swales or open channels are used, they shall be suitably lined to prevent erosion and designed to avoid erosive velocities.
2. Wherever storm sewers are proposed to be utilized, they shall comply with the following additional criteria:
- a. Where practical, designed to traverse under seeded and planted areas. If constructed within 10 feet of road paving, walks or other surfaced areas, drains shall have a narrow trench and maximum compaction of backfill to prevent settlement of the superimposed surface or development.
 - b. Preferably installed after excavating and filling in the area to be traversed is completed, unless the drain is installed in the original ground with a minimum of 3 feet cover and/or adequate protection during the fill construction.
 - c. *Designed.*
 - i. With cradle when traversing fill areas of indeterminate stability.
 - ii. With anchors when gradient exceeds 20 percent.

- iii. With encasement or special backfill requirements when traversing under a paved area
- iv. With encasement when installing within 18" vertical and 5' horizontal of a utility line or below a nearby sewer line.
- v. All joints to be soil or watertight.
- d. Designed to adequately handle the anticipated stormwater flow and be economical to construct and maintain. The minimum pipe size shall be 18 inches in diameter, with the exception of roof drains, foundation drains or similar conveyance.
- e. Drainpipe, trenching, bedding and backfilling requirements and appropriate grates, catch basins, stormwater inlets, manholes and other appurtenances shall conform to the requirements of the City and/or applicable PennDOT specifications, Publication 408.
- f. All corrugated metal pipe shall be polymer coated, and with paved inverts where prone to erode. Pipe within a municipality right-of-way shall be reinforced concrete pipe or high-performance polypropylene pipe with a minimum diameter of 18 inches.
- g. Storm inlets and structures shall be designed to be adequate, safe, self-cleaning and unobtrusive and consistent with municipality standards with sufficient capture and conveyance capacity and spacing of inlets and cleanouts for maintenance.
- h. Where a proposed sewer or conveyance connects with an existing storm sewer or conveyance system, the applicant shall demonstrate that sufficient capacity exists in the downstream system to handle the additional flow to its outfall.
- i. Storm sewer outfalls shall be equipped with energy dissipation devices to prevent erosion and conform with applicable requirements of the Pennsylvania DEP for stream encroachments (Section 7 of the Dam Safety and Encroachments Act, 32 P.S. §693.1, et seq., and the rules and regulations promulgated thereunder at 25 Pennsylvania Code §105.441-105.449).
- j. The use of storm sewers is permitted in the MS4 District, but not recommended to be utilized in the CS4 District unless no other alternative is practical and feasible as determined by the City Engineer and the WCD. Refer to Appendix A.

D. Criteria for Riparian Buffers

1. If a riparian buffer is required by PA DEP as part of an NPDES permit, then DEP regulations will govern.
2. If a Riparian Buffer is used to meet stormwater management requirements and/or MS4 pollutant load reduction credits it shall meet the following requirements:
 - a. In order to protect and improve water quality, a Riparian Buffer Easement may be created and recorded as part of any subdivision or land development that encompasses a Riparian Buffer.
 - b. Except as required by PA Code Title 25 Chapter 102, the Riparian Buffer Easement shall be a minimum of 35 feet measured from the top of the nearest bank (on each side), or an average of 35 feet with no distance from top of bank less than 25 feet.

- c. Minimum Management Requirements for Riparian Buffers:
 - i. Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement.
 - ii. Whenever practicable, invasive vegetation shall be actively removed and the Riparian Buffer Easement shall be planted with native trees, shrubs and other vegetation to create a diverse native plant community appropriate to the intended ecological context of the site.
 - iii. There shall be no earth disturbance beyond which is necessary to establish or maintain a planted buffer.
- 3. The Riparian Buffer Easement shall be enforceable by the municipality and shall be recorded in the appropriate County Recorder of Deeds Office, so that it shall run with the land and shall limit the use of the property located therein. The easement shall allow for the continued private ownership and shall count toward the minimum lot area a required by Zoning, unless otherwise specified in the municipal Zoning Ordinance.
- 4. Any permitted use within the Riparian Buffer Easement shall be conducted in a manner that will maintain the extent of the existing 100-year floodplain, improve or maintain the stream stability, and preserve and protect the ecological function of the floodplain.
- 5. Stormwater drainage pipes and all other linear utility lines as approved by the City shall be permitted within the Riparian Buffer Easement, but they shall cross the Easement in the shortest practical distance. Other stormwater management facilities and BMPs are not permitted within the Riparian Buffer Easement.
- 6. The following conditions shall apply when public and/or private recreation trails are permitted within Riparian Buffers:
 - a. Trails shall be for non-motorized use only.
 - b. Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.
- 7. Septic drain fields and sewage disposal systems shall not be permitted within the Riparian Buffer Easement and shall comply with setback requirements established under 25 Pa. Code Chapter 73.

E. Criteria for Stream Restoration Project

- 1. A stream restoration project may be eligible for stormwater management and/or MS4 load reduction credits if it meets qualifying criteria set by the City and as follows:
 - a. Existing conditions, such as channel or streambank erosion and an actively enlarging or incising urban stream condition, shall be documented prior to restoration.
 - b. Projects should be located on 1st to 3rd order (small) streams to be effective.
 - c. Project should address a minimum of 100 linear feet of stream channel and both sides where need to do so is evident.
 - d. Upstream impervious area should be sufficiently treated to address peak flows that may exceed engineering design thresholds or compromise channel form and function.

- e. Utilize a comprehensive approach employing a mix of techniques appropriate to the site, creating long-term stability of the streambed, streambanks and floodplain.
- f. Armored length of streams (ie. using riprap or gabions) may be used to maintain channel stability, but the same length shall not be included in the load reduction calculation.
- g. Project shall maximize floodplain reconnection, with minimal channel invert elevation increase (ie bank height ratio = 1.0 or less) to achieve the objective.
- h. Project shall include a minimum 35-foot permanent riparian buffer.
- i. Project shall include an O&M plan identifying O&M activities, frequencies and responsible parties.

§310. *Erosion and Sedimentation Controls.*

- A. No regulated development activities within the City of Monessen shall commence until approval by the City of Monessen and the WCD of an erosion and sediment control plan for construction activities.
- B. Any earth disturbance activity of 5,000 square feet or more requires an erosion and sedimentation control plan under 25 Pa.Code §102.4(b). Refer to the PA DEP Erosion and Sediment Pollution Control Manual 2012 or most recent version.
- C. In addition, under Title 25 Pa.Code, Chapter 92, a DEP NPDES construction activities permit is required for regulated development activities.
- D. Evidence of any necessary permit(s) for regulated development activities from the appropriate DEP regional office or Westmoreland Conservation District must be provided to the City prior to the start of the regulated development activity. The issuance of an NPDES construction permit (or permit coverage under the Statewide General Permit (PAG-2) may satisfy the requirements under subsection 1 upon review and approval by the City.
- E. A copy of the erosion and sediment control plan and any permit required by DEP or the City shall be available at the project site at all times.

§311. *Water Obstructions and Encroachments*

- A. No regulated development activities which require Chapter 105 (Water Obstructions and Encroachment) permit from either PA DEP or Westmoreland Conservation District shall commence until all permits have received PA DEP or WCD approval, and City approval.
- B. Evidence of any necessary Chapter 105 permit from PA DEP / WCD shall be provided to the City.
- C. Proposed development shall avoid the long and short term adverse impacts associated with the occupancy and modification of floodplains as designated by FEMA, to the extent possible wherever there is a practicable alternative in order to reduce the risk of flood loss, minimize the impacts of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by flood plains.
- D. Any proposed development found to be within the base floodplain of a waterway shall include the identification of impacts, an evaluation of practicable alternatives outside the floodplain via a hydrologic and hydraulics analyses, and when impacts cannot be avoided, the development of measures to minimize the impacts and restore and preserve the

floodplain as appropriate. Findings shall be presented at a public meeting and a determination made by the City Council of the City of Monessen.

- E. Any proposed stormwater management plan should be consistent with the provisions of the PA Floodplain Management Act 166 of 1978 and applicable municipal floodplain ordinances.

ARTICLE IV Stormwater Management Plan Requirements.

§401. General Requirements.

No development plan, subdivision plat or land development plan shall be approved; no permit authorizing construction or development issued; nor any earth disturbance activity subject to this Ordinance shall be initiated or undertaken unless and until a stormwater management plan for such activity is reviewed and approved in accord with the provisions of this Ordinance.

- A. No regulated development activities within the City shall commence until approval by the City of a stormwater management plan which demonstrates compliance with State water quality requirements after construction is complete. Refer to the Regulated Development Activity Table located in Article III of this ordinance.
- B. The stormwater management plan must be designed, implemented and maintained to meet State water quality requirements, and any other more stringent requirements as determined by the City.
- C. To control post-construction stormwater impacts from regulated development activities, State water quality requirements can be met by BMPs, including site design and green infrastructure, which provide for replication of pre-construction stormwater infiltration and runoff conditions, so that post-construction stormwater discharges do not degrade the physical, chemical or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:
 1. By maximizing the use of the site's natural characteristics.
 2. *Infiltration*. Replication of pre-construction stormwater infiltration conditions.
 3. *Treatment*. Use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff.
 4. *Streambank and Streambed Protection*. Management of volume and rate of post-construction stormwater discharges, using detention / retention and other means, to prevent physical degradation of receiving waters (e.g., from scouring).
- D. In the absence of an existing stormwater conveyance or easement whether natural or man-made for release of stormwater flow from a development site, an easement must be provided. Information shall be presented as to the ownership, responsible party, and agreement for said easement.
- E. The stormwater management plan must meet DEP regulations that require municipalities to ensure design, implementation, and maintenance of best management practices (BMPs) that control runoff from new development and redevelopment after regulated development activities are complete. These requirements include the need to implement post-construction stormwater facilities and BMPs with assurance of long-term operations and maintenance of those BMPs.
- F. Evidence of any necessary permit(s), such as Chapter 102 erosion and sedimentation control or Chapter 105 stream encroachment, for regulated development activities from WCD or the appropriate DEP regional office must be provided to the municipality. The issuance of an NPDES construction permit (or permit coverage under the Statewide General Permit (PAG-2) may satisfy the requirements of paragraph (A) above, after review and approval by the municipality.

- G. Appropriate sections from the City's Subdivision and Land Development Ordinance (SALDO), and other applicable local ordinances, shall be followed in preparing the SWM Plans.
- H. The City of Monessen shall not approve any SWM Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Plan is found to be deficient, the City may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, the City may accept submission of modifications.
- I. *Professional Certification.* The stormwater management plan (including all calculations) must be prepared and sealed by a qualified professional with training and expertise in hydrology and hydraulics. Documentation of qualifications may be required by the City.

§402. Stormwater Management Plan Contents.

General Format. The stormwater management plan shall include a narrative and a set of plan drawings. Refer to checklist Appendix E.

- A. A narrative describing the overall stormwater management concept for the project.
 - 1. A determination of site conditions in accordance with the PA DEP Stormwater BMP Manual. A detailed site evaluation shall be completed for projects proposed environmentally sensitive areas, such as brownfields.
 - 2. *Runoff Calculations.* Stormwater runoff design calculations for determining pre- and post-development discharge rates, for designing proposed stormwater control facilities and to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, must be submitted with the stormwater management plan. All calculations shall be prepared using the methods and data prescribed by general requirements in Section 302 of this Ordinance. Refer to the Acceptable Computation Methodologies table in Article III Section 307 of this Ordinance.
 - a. Runoff volume and rate shall be calculated according to generally accepted methods such as those listed under Stormwater Management Performance Standards, General Standards.
 - b. Detention/retention requirements, including volume, routing, etc. for BMPs shall be calculated using commonly acceptable standard method(s).
 - c. Water quality calculations shall be determined by using the PA DEP Stormwater BMP Manual 2006 or current edition Worksheets 12 and 13.
 - 3. Expected project time schedule for the installation of all temporary and permanent stormwater control measures and devices. If the development is to be constructed in stages, the applicant must describe how stormwater facilities and BMPs will be sequentially installed to manage stormwater runoff safely during each stage of development.
 - 4. The effect of the project (in terms of runoff rate, volumes, and water quality) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.
 - 5. If appropriate, the narrative should provide justification as to why any preferred stormwater management techniques, such as LID and green infrastructure, as listed

in this Ordinance, are not proposed for use. Refer to the PA DEP Stormwater BMP Manual 2006 or most recent edition for list of acceptable management techniques.

6. Operation and maintenance program and responsible party(s) for permanent stormwater facilities and BMPs. Refer to Article VI of this ordinance.

- B. The stormwater management plan drawings shall be drawn to a scale of not less than 1-inch equals 50 feet. All sheets shall contain a title block with name and address of applicant and designer, scale, north arrow, legend and date of preparation.

1. *Existing and Proposed Features.* The plan shall show the following:

- a. *Watershed Location.* The City of Monessen is within the Monongahela River Watershed. Provide a key map (using USGS Topo maps) showing the location of the development site within the watershed. and watershed subarea(s). On all site drawings, show the boundaries of the watershed and subarea(s) as they are located on the development site and identify watershed name. name Refer to Appendix A Monongahela River Watershed and Appendix B Monessen Watershed Subareas Map.
- b. *Floodplain Boundaries.* Identify 100-year floodplains on the development site (as appropriate) based on the municipality Flood Insurance Study maps.
- c. *Natural Features.* Show all bodies of water (natural or artificial), watercourses (permanent and intermittent), swales, wetlands, and other natural drainage courses on the development site, or which will be affected by runoff from the development.
- d. *Soils.* Provide an overlay showing soil types and boundaries within the development site (consult WCD, SCS and U.S. Geological Survey for information).
- e. *Contours.* Show existing and final contours at intervals of 2 feet; in areas with slopes greater than 15 percent, 5-foot contour intervals may be used.
- f. *Land Cover.* Show existing and final land cover classifications, including existing and proposed improvements, as necessary to support and illustrate the runoff calculations performed.
- g. *Drainage Area Delineations.* Show the boundaries of the drainage areas and points of interest employed in the runoff calculations performed.
- h. *Utilities and easements.* Show the locations and easements of existing utilities, stormwater management or drainage controls and/or structures, such as sanitary sewers, water, gas, electric, telecommunications, storm sewers, swales, culverts, and any easements, which are located on the development site, or which are off site but may be affected by runoff from the development.
- i. Identify if the development site is within the municipal separate sanitary sewer system (MS4) or within the combination sanitary storm sewer system (CS4). Refer to Appendix A.
- j. For a listing of streets with a separate storm sewer system refer to Appendix G. Streets not listed in Appendix G have combination sanitary and storm sewers and are within the CS4 District. Refer to Appendix G.

2. *Proposed Stormwater Facilities and BMPs.* All proposed stormwater runoff control Measures must be shown on the plan including methods for collecting, conveying and storing stormwater runoff onsite, which are to be used both during and after

construction. Erosion and sedimentation controls shall be shown in accordance with applicable City and WCD requirements. The plan shall provide information on the exact type, location, sizing, design and construction of all proposed facilities and relationship to the existing watershed drainage system.

- a. If the development is to be constructed in stages, the applicant must demonstrate that stormwater facilities will be installed to manage stormwater runoff safely during each stage of development.
 - b. A schedule for the installation of all temporary and permanent stormwater control measures and devices shall be included in the narrative and shown on the site plan.
 - c. Operation and maintenance program and responsible party(s) for permanent stormwater BMPs shall conform to the requirements of DEP and shall be approved by the City. Refer to Article VI of this ordinance.
3. *Easements, Rights of Way, Deed Restrictions.* BMPS and stormwater management facilities that provide control for more than one lot shall be located on a separate dedicated lot or in an easement. All existing and proposed easements for any BMPs and stormwater management facilities and controls for access, inspections, maintenance, repair, preservation, and use shall be shown on the plan and, if required, dedicated to the entity, association or person required. The easement and the purpose for the same shall be set forth on the plan and in the agreement required by the Ordinance.

§403. *Other Permits/Approvals.*

A list of any approvals/permits relative to stormwater management that will be required from other governmental agencies (e.g., Chapter 102 Erosion and Sedimentation Control, PennDOT HOP, Chapter 105 Water Obstruction and Encroachment Permit from PA DEP) and anticipated dates of submission/receipt should be included with the stormwater plan submission. Copies of permit applications may be requested by the City where they may be helpful for the plan review.

§404. *Operation and Maintenance Plan.*

The application shall contain a proposed operation and maintenance plan (O&M) for all stormwater control facilities in accordance with the following and as described in Article VI of this ordinance:

- A. Identify the responsible party and their responsibilities as described in Article VI Section 601 (e.g., municipality, property owner, private corporation, homeowner's association or other entity).
- B. Include an operation and maintenance plan for all stormwater facilities, outlining the routine maintenance actions and schedules necessary to ensure proper operation of the stormwater control facilities as described in Article VI Section 602.
- C. Submit any legal agreements required to implement the maintenance program and an executed O & M Agreement as required by this Ordinance. Refer to Article VI Section 603 and Appendix C.

- D. A record of inspections and repairs performed shall be provided to the City and WCD in accordance with the approved O & M Plan.
- E. Identify method of financing continuing operation and maintenance if the facility is to be owned by other than the City or governmental agency. Refer to Article VI Section 604.

§405. *Financial Guarantees*

Submit fees and financial guarantees in accordance with the provisions of this Ordinance. Refer to the Article VI Section 604 and Appendix F.

ARTICLE V Stormwater Management Plan Submission and Review Procedures.

§501. Preapplication Phase.

- A. The Westmoreland County Integrated Water Resources Plan provides an online decision-making tool to assist developers, designers, property owners in addressing all water resources during development and redevelopment and should be consulted. Refer to www.paiwrp.com for the decision-making tool and www.westmorelandstormwater.org.
- B. Applicants should refer to the Westmoreland County Integrated Water Resources Plan (IWRP) located at www.westmorelandstormwater.org, for mapping of impaired streams, riparian buffers and pollutant loading to determine appropriate BMPs to address sources of impairments.
- C. Before submitting the stormwater management plan, and any other plan required by a reviewing agency, applicants are urged to consult with the City, Westmoreland County Department of Planning and Development and Westmoreland Conservation District, and PennDOT where applicable, on the requirements for safely managing the development site in a manner consistent with the City ordinances, applicable watershed stormwater management plan and Federal and State requirements. These agencies may also be helpful in providing necessary data for the stormwater management plan.
- D. Applicants are encouraged to submit a sketch plan with a narrative description of the proposed stormwater management controls for general guidance and discussion with the City and other agencies.
- E. The pre-application phase is not mandatory; any review comments provided by the City or other agencies are advisory only and do not constitute any legally binding action on the part of the City or any County agency.

§502. Stormwater Management Plan Submission and Review.

- A. *Submission of Plans.* Stormwater management plan application shall be submitted with the preliminary and final subdivision/land development applications or if no subdivision or land development is involved, then with the application for development. Copies of the SWM Plan shall be submitted to the following agencies as determined by City:
 - 1. Two copies to the City.
 - 2. One copy to the City Engineer (when applicable).
 - 3. One copy to the Westmoreland Conservation District (when applicable).
 - 4. One copy to the local Sanitary Authority (when applicable).
 - 5. One copy to the Westmoreland County Department of Planning and Development. (if applicable)
 - 6. One copy to the Westmoreland County Department of Public Safety / local emergency management coordinator (when applicable)
 - 7. One copy to DEP (when applicable)
- B. *Notification of Affected Municipalities.* The City shall notify municipalities upstream and downstream of the development site which may be affected by the stormwater runoff and proposed controls for the site. Copies of the plans will be made available to the affected municipalities upon request. Comments received from any affected municipalities will be considered by the City Engineer and County agencies in their reviews.

- C. *Review by City Engineer and Westmoreland Conservation District (WCD).* Stormwater management plans shall be reviewed by the City Engineer and WCD. A pre-application meeting with the City Engineer and WCD is recommended. BMPs shall be shown on all stormwater management plans and erosion and sedimentation control plans, as applicable. At its discretion, the City and/or WCD may also engage other specialists in hydrology or hydraulics to assist with the stormwater management plan review. The WCD will review the plan for general compliance with the watershed plan standards and criteria and watershed-wide impacts and, where appropriate, may consult with adjacent municipalities and counties for their comments. If the WCD review identifies the improper application of the watershed standards and criteria or the possibility of harmful impacts downstream from the development site's proposed stormwater management system, the applicant and City Engineer will be notified so that the necessary modifications can be made to promote safe stormwater management.

The City and the WCD shall notify the applicant in writing within 45 days whether the SWM site plan is approved or disapproved. If the SWM site plan involves a subdivision and land development plan, the notification shall occur within 90 days, unless the applicant is notified that a longer notification period is provided by other statute regulation or ordinance. If modifications are required, the review period may be extended by the City and the WCD, in order for the applicant to address inadequacies.

- D. A disapproved stormwater management plan may be resubmitted, with the revisions addressing the City's and/or WCD's concerns, to the City and the WCD in accordance with this Article.
- E. *City Engineer Review.* The City Engineer shall upon receipt of WCD's review, approve or disapprove the stormwater management plan based on the requirements of the City ordinances, the standards and criteria of the watershed plan, applicable State and Federal requirements and good engineering practice. The City Engineer shall submit a written report, along with supporting documentation, stating the reasons for approval or disapproval.
- F. *Status of the Engineer's Determination.* The approval/disapproval of the site's stormwater management plan by the municipality engineer shall be submitted to the City Council for final action. Final approval of the plan rests with the City.
- G. *Permits Required from other Governmental Agencies.* Where the proposed development requires a permit from the Pennsylvania DEP, PennDOT, or an erosion/sedimentation permit or Chapter 105 permit from the Westmoreland Conservation District, then final stormwater management plan approval shall be conditional upon receipt of such permits. However, no building permit shall be issued, nor construction or development started, until the permits are received, the O & M Agreement, easement and/or right-of-ways are recorded, and copies filed with the City.
- H. Reviews by the City and WCD may be subject to fees as outlined in Article VII section 706 of this Ordinance.

§503. *Status of Stormwater Management Plan after Approval.*

- A. Upon final stormwater management plan approval and receipt of all necessary permits, fees, financial guarantees and agreements, easements and right-of-ways the applicant may

commence to install or implement the approved stormwater management plan, BMPs plan or erosion and sedimentation plan controls.

- B. If site development or building construction does not begin within one year of the date of final approval of the stormwater management plan, then before doing so, the applicant shall re-submit the stormwater management plan, BMPs plan or erosion or sedimentation plan to verify that no condition has changed on the property, adjacent to the site or within the watershed that would affect the feasibility or effectiveness of the previously approved stormwater management controls. Further, if for any reason development activities are suspended for two year or more, then the same requirement for re-submission of the stormwater management plan shall apply.
- C. The applicant shall submit a fee with the re-submission of the stormwater management plan. The fee for the re-submission shall be the same as the fee for a new stormwater management plan.

§504. *Modification of Stormwater Management Plan.*

If the request for a plan modification is initiated before construction begins, the stormwater management plan must be resubmitted and reviewed according to the procedures, contained in this ordinance.

- A. If the request for a plan modification is initiated after construction is underway, the City Engineer and / or the WCD shall have the authority to approve or disapprove the modification based on field conditions; provided:
 - 1. The requested changes in stormwater controls do not result in any modifications to other approved municipality land use/development requirements (e.g., building setbacks, yards, etc.).
 - 2. The performance standards in this Ordinance are met. Notification of the Engineer's and / or WCD's action shall be sent to the City which may issue a stay of the plan modification within five days and require the permittee to re-submit the plan modification for full stormwater management plan review in accordance with this ordinance.
- B. It shall be unlawful to, and no person shall, alter, replace, modify, landscape or remove, or otherwise adversely affect, any permanent stormwater management facilities, BMP controls, or any area within a stormwater easement or dedicated or designated area for stormwater facilities and BMPs required by an approved stormwater management plan, BMP operations and maintenance plan, or to allow the property to remain in a condition which does not conform to an approved stormwater management plan, BMP operations and maintenance plan, unless an exception is granted in writing by the municipality and/or approval is secured from all relevant agencies of the Commonwealth.

§505. *Inspection of Stormwater Management Facilities and BMPs.*

- A. The City Engineer or a designated representative shall inspect the implementation, construction, condition, operation and maintenance of the temporary and permanent stormwater management system and controls for the development site. The City or a designated representative shall have the right to temporarily locate on any BMP in the City

such devices as are necessary to conduct monitoring and/or sampling the discharge from such BMP.

- B. The permittee shall notify the City Engineer and the WCD 48 hours in advance of the completion of the following key development phases:
 - 1. At the completion of preliminary site preparation including stripping of vegetation, stockpiling of topsoil and construction of temporary stormwater management control facilities.
 - 2. At the completion of rough grading but prior to placing topsoil, permanent drainage or other site development improvements and ground covers.
 - 3. Before the commencement and during construction of the permanent stormwater facilities and BMPs at such times as specified by the plan and City Engineer.
 - 4. Completion of permanent stormwater management facilities and BMPs including established ground covers and plantings.
 - 5. Completion of final grading, vegetative control measures or other site restoration work done in accordance with the approved plan and permit.
- C. The City and/or WCD may conduct inspections during construction as it deems appropriate.
- D. No work shall commence on any subsequent phase until the preceding one has been inspected and approved. If there are deficiencies in any phase, the City Engineer and/or WCD shall issue a written description of the required corrections and stipulate the time by which they must be made.
- E. If, during construction, the contractor or permittee identifies any site condition, such as subsurface soil conditions, alterations in surface or subsurface drainage, which could affect the feasibility of the approved stormwater facilities, or erosion and sedimentation controls he/she shall notify the City Engineer and/or WCD within 24 hours of the discovery of such condition and request a field inspection. The City Engineer and/or WCD shall determine if the condition requires a modification of the stormwater management plan, BMPs plan or erosion and sedimentation control plan. If the conditions affect the BMP's design or construction, work shall be terminated until an approved correction is received in writing. All cost for the review shall be borne by the permittee.
- F. In cases where stormwater facilities or erosion and sedimentation controls are to be installed in areas of landslide-prone soils or other special site conditions exist, the City may require special precautions such as a geotechnical study, soil tests and core borings, full-time inspectors and/or similar measures. All costs of any such measures shall be borne by the permittee.

§506. *Record Drawings, Completion Certificate, and Final Inspection*

- A. The permittee shall be responsible for providing record drawings of all stormwater management facilities and BMPs as built and included in the approved Stormwater Management Plan. The record drawings and an explanation of any discrepancies with the construction plans shall be submitted to the City and WCD.
- B. The record drawing submission shall include a certification of completion signed by the professional engineer and qualified personnel responsible for verifying that all permanent stormwater management facilities and BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent stormwater management facilities and BMPs must also be submitted, at the central location

of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.

- C. After receipt of the completion certification, the City and/or WCD may conduct a final inspection.

ARTICLE VI Operation and Maintenance of Stormwater Facilities and BMPs

§601. *Operation and Maintenance Responsibilities*

- A. The stormwater management plan for the development site shall contain an operation and maintenance (O&M) plan prepared by the developer and approved by the City and/or WCD. The operation and maintenance plan shall outline the responsible party(ies) and required routine maintenance actions and schedules necessary to insure proper operation of the stormwater control facility(ies).
- B. The stormwater management plan for the development site shall establish responsibilities for the continuing O&M of all stormwater facilities and BMPs, consistent with the following:
 - 1. If a development consists of structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the City, stormwater facilities and BMPs should also be dedicated to and maintained by the municipality, except for those individual on-lot facilities and BMPs for privately owned structures.
 - 2. If a development site is to be held in single ownership or if sewers and other public improvements are to be privately owned, operated and maintained, then the operation and maintenance of stormwater facilities and BMPs should be the responsibility of the owner or private management entity.
 - 3. Person(s) responsible for operation and maintenance of stormwater facilities and BMPs shall be named with contact information provided.
- C. The City Council, upon recommendation of the City Engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the stormwater management plan. The City Council reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management facilities and BMPs.
- D. If the development site involves land located in both the City of Monessen and Rostraver Township, then the plan shall be reviewed by the City, Rostraver Township and Conservation District to determine if all activities both within and without the municipality meets the requirements of this Ordinance.
- E. Stormwater facilities and BMPs shall be inspected by the owner/responsible party named in the O&M plan after every storm event. or as approved in the O&M plan. The owner shall document the inspections with reports that shall include photographs, written reports detailing the condition of the facility, measured drawings as necessary to document conditions of the facility(ies) and repair completed. The report shall be provided to the City within two weeks of the inspection.

§602. *Stormwater Facility and BMP Operations and Maintenance Plan Requirements*

- A. No regulated development activities within the City will be considered complete until approval by the City of BMP operations and maintenance plan which describes how the

permanent (i.e., post-construction) stormwater facilities and BMPs will be properly operated and maintained.

- B. The following items shall be included in the BMP operations and maintenance plan:
1. Map(s) of the project area, in a form that meets the requirements for recording at the Office of the Recorder of Deeds of Westmoreland County, refer to the <http://www.wcdeeds.us/dts/> . The contents of the maps(s) shall include, but not be limited to:
 - a. Ownership and operation and maintenance responsibilities of stormwater facilities and BMPs.
 - b. Clear identification of the location and nature of permanent stormwater facilities and BMPs.
 - c. The location of the project site relative to highways, municipality boundaries or other identifiable landmarks.
 - d. Existing and final contours at intervals of 2 feet are required if the general slope of the site is less than 15 percent, and at vertical intervals of 5 feet if the general slope is equal to or greater than 15 percent.
 - e. Existing streams, lakes, ponds, or other bodies of water within the project site area.
 - f. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved.
 - g. The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines of the project site.
 - h. Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.
 - i. Proposed final structures, roads, paved areas, and buildings.
 - j. A 15 foot wide access easement around all stormwater facilities and BMPs that would provide ingress to and egress from a public right-of-way.
 2. A description of how each permanent stormwater facilities and BMPs will be operated and maintained, and the identity of the person(s) responsible for operations and maintenance.
 3. The name of the project site, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
 4. A statement, signed by the landowner, acknowledging that the stormwater facilities and BMPs are fixtures that can be altered or removed only after approval by the City.
- C. Each stormwater facility and BMP shall be recorded with the County as permanent real estate appurtenances, and as deed restrictions or conservation easements that run with the land. Prior to final approval of the stormwater plan the property owner shall sign and record an O&M agreement for those facilities and BMPs. Refer to Appendix B of this ordinance.
- D. If the owner fails, refuses or neglects to maintain any stormwater facility and/or BMP, the City reserves the right to conduct maintenance work and charge and assess the owner any and all costs, expenses incurred and fees set by the City. The City reserves the right to take enforcement actions for failure to perform required O&M. Refer to article VII of this ordinance.

- E. The owner shall submit a financial guarantee for timely installation and proper construction of stormwater facilities and BMPs as specified in Article VII of this ordinance.

§603. *Operations and Maintenance Agreement for Privately Owned Stormwater Facilities and BMPs*

- A. Prior to final approval of the site's stormwater management plan the property owner shall sign and record a maintenance agreement covering all stormwater facilities and BMPs which are to be privately owned. The agreement (refer to Appendix B) shall stipulate that:
 - 1. The owner, successors and assigns shall maintain all facilities in accordance with the approved maintenance schedule and shall keep all facilities in a safe and functional manner and consistent with the surrounding natural area.
 - 2. The owner, successors and assigns shall convey to the City easements and/or rights-of-way to assure access for periodic inspections by the City and maintenance, if required.
 - 3. The owner, successors and assigns shall keep on file with the City the name, address and telephone number of the person or company responsible for maintenance activities; and in the event of a change, new information will be submitted to the City within 10 days of the change.
 - 4. If the owner, successors and assigns fails to maintain the stormwater facilities and BMPs following due notice by the City to correct the problem(s), the City may perform the necessary maintenance work or corrective work and the owner shall reimburse the municipality for all costs.
- B. Other items may be included in the agreement where determined necessary to guarantee the satisfactory inspection and maintenance of all stormwater facilities and BMPs for a 10 year period. The maintenance agreement shall be subject to the review and approval of the City's Solicitor and the City Council and shall be in a form such as may be recorded in the Office of the Recorder of Deeds in the County in which the facility is located.
- C. The property owner shall sign an operations and maintenance agreement with the City covering all stormwater facilities and BMPs that are to be privately owned. The agreement shall be substantially the same as the agreement in the Appendix of this Ordinance.

§604. *City of Monessen Stormwater Facility and BMP Operation and Maintenance Fund*

- A. Persons installing stormwater facilities or BMPs shall be required to pay a specified amount to the City stormwater facilities and BMPs fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:
 - 1. If the stormwater facilities and/or BMPs are to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the City for a period of four years, Refer to Appendix F. After that period of time, inspections will be performed at the expense of the City.
 - 2. If the stormwater facilities and/or BMPs are to be accepted, owned and maintained by the City, the deposit shall cover the estimated costs for maintenance and

inspections for 10 years. The City Engineer will establish the estimated costs utilizing information submitted by the applicant.

3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The City Engineer shall determine the present worth equivalents which shall be subject to the approval of the City Council of the City of Monessen.
- B. If stormwater facilities and BMPs are proposed that also serves as a recreation facility (e.g., ball field, lake), the City may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purposes, or the City may accept the maintenance fund deposit on behalf of the agency managing the recreation resource and make said fees available to the agency's maintenance department.
 - C. If at some future time stormwater facilities and BMPs (whether publicly or privately owned) are eliminated due to the installation of storm sewers or other stormwater facilities and BMPs, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after costs of abandonment are paid will be returned to the depositor.

ARTICLE VII Fees, Financial Guarantees and Dedication of Public Improvements

§701. *Guarantee of Completion*

A completion guarantee or financial security in the form of a bond, cash deposit, cashier's check or other negotiable securities acceptable to the municipality shall provide for, and secure to the municipality, the completion of any improvements which may be required on or before the date fixed in the formal action of approval or accompanying agreement for completion of the improvements. The guarantee or security shall cover any and all stormwater management facilities, BMPs, erosion and sedimentation controls and other required improvements (collectively, "improvements") and shall be equal to 110% of the cost of completion estimated as of 90 days following the date scheduled for completion by the developer. Annually the City may adjust the amount of financial security by comparing the actual cost of the improvements which have been completed and the estimated cost for the completion of the remaining improvements as of the expiration of the 90th day after either the original date scheduled for completion or a rescheduled date of completion. Subsequent to said adjustment, the City may require the developer to post additional security in order to assure that the financial security equals said 110%. Any additional security shall be posted by the developer in accordance with this subsection. The amount of the guarantee or financial security required shall be determined utilizing the provisions of §509 (g) of the Municipalities Planning Code.

§702. *Release of Completion Guarantee*

The completion guarantee or financial security shall be returned or released upon written certification by the City Engineer or a designated agent that improvements and facilities have been installed and completed in accordance with the approved plan and specifications. The procedures for requesting and obtaining a release of the completion guarantee shall be in a manner prescribed by the §510 of the Municipalities Planning Code.

§703. *Default of Completion Guarantee*

If improvements are not installed in accordance with the approved final plans, the City Council may enforce any corporate bond or any security by appropriate legal and equitable remedies. If proceeds of such bond or other security are insufficient to pay the cost of installing or making repairs or corrections to all the improvements covered by said security, the City Council may at its option install part of such improvements in all or part of the development and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the improvements. All proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for the installation of the improvements covered by such security and not for any other City purpose.

§704. *Dedication of Public Improvements*

When streets, sanitary sewers, stormwater management facilities, BMPs, erosion and sedimentation controls or other required improvements in the development have been completed in accordance with the final plans, such improvements shall be deemed private until such time as they have been offered for dedication to the City and accepted by separate ordinance or resolution or until they have been condemned for use as a public facility. The City shall be under no obligation

to accept such facilities or controls unless and until the City so determines that it is in the best interest of the City to do so.

- A. Prior to acceptance of any improvements or facilities, the municipality engineer shall inspect the same to ensure that the same are constructed in accordance with the approved plans and are functioning properly.
- B. The owner shall submit as-built plans for all facilities proposed for dedication.

§705. *Maintenance Guarantee*

Prior to acceptance of any improvements or facilities, the applicant shall provide financial security to secure the structural integrity and functioning of the improvements. The security shall:

- A. Be in the form of a bond, cash, cashier's check or other negotiable securities acceptable to the City.
- B. Be for a term of 18 months.
- C. Be in an amount equal to 15 percent of the actual cost of the improvements and facilities so dedicated.

§706. *Fee Schedule*

The City Council may adopt by resolution, from time to time, a reasonable schedule of fees to cover the cost of pre-submitted and pre-construction meetings, plan reviews, inspections and other activities necessary to administer, monitor and enforce the provisions of this Ordinance. All fees shall be set in accordance with the applicable provisions of the Municipalities Planning Code, 53 P.S. §10101 *et seq.*, and any dispute over the fee amount shall be resolved in the manner prescribed by the Municipalities Planning Code.

ARTICLE VIII Enforcement Procedures and Remedies

§801. *Right of Entry*

Upon presentation of proper credentials, duly authorized representatives of the City may enter at reasonable times upon any property to inspect, investigate or ascertain the condition of the subject property in regard to an aspect related to stormwater management regulated by this Ordinance. Prohibitions and unreasonable delays in allowing the City access to a stormwater management facility pursuant to this Ordinance is a violation of this Ordinance. The failure of any person or entity to grant entry or to undertake any action which impedes or prevents entry is prohibited and constitutes a violation of this Ordinance. Unless in the event of an emergency, the City shall notify the property owner and/or developer within twenty-four hours prior to entry.

§802. *Enforcement Generally*

- A. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Plan, unless specifically exempted in Article III Section 303 of this Ordinance.
- B. It shall be unlawful to alter any BMPs, facilities or structures that were installed under the Ordinance without written approval of the City.
- C. In the event that the applicant, permittee, developer, owner or his/her agent fails to comply with the requirements of this Ordinance or fails to conform to the requirements of any permit a written notice of violation shall be issued. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s). Upon failure to comply within the time specified, unless otherwise extended by the City, the applicant, permittee, developer, owner or his/her agent shall be subject to the enforcement remedies of this Ordinance. Such notice may require without limitation:
 1. Whenever the City finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the City may order compliance by written notice to the responsible person. Such notice may require without limitation, any or all of the following:
 - a. The performance of monitoring, analyses, and reporting.
 - b. The elimination of prohibited connections or discharges.
 - c. Cessation of any violating discharges, practices, or operations.
 - d. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property.
 - e. Payment of a fine to cover administrative and remediation costs.
 - f. The implementation of stormwater management measures or facilities.
 - g. Operation and maintenance of stormwater management measures and/or facilities
 - h. Assessment and payment of any and all costs and expenses relative to corrective measures taken or to be taken and reasonable costs, expenses and attorney fees incurred by the City in and related to enforcement and collection proceedings.
 2. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the

work will be done by the City or designee and the expense thereof shall be charged to the violator.

3. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the City from pursuing any and all other remedies available in law or equity.

§803. *Suspension and Revocation*

- A. Any approval or permit issued by the City pursuant to this Ordinance may be suspended or revoked for:
 1. Non-compliance with or failure to implement any provision of the approved SWM Plan or O&M Agreement.
 2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation related to the Regulated Activity.
 3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.
- B. A suspended approval may be reinstated by the City when:
 1. The City has inspected and approved the corrections to the violations that caused the suspension.
 2. The City is satisfied that the violation has been corrected.
- C. An approval that has been revoked by the City cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.
- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the City may provide a limited time period for the owner to correct the violation. In these cases, the City may provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the City may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

§804. *Preventative Remedies*

- A. In addition to other remedies, the City may institute and maintain appropriate actions by law or in equity to restrain, correct or abate a violation, to prevent unlawful construction, to recover damages and to prevent illegal occupancy of a building or premises.
- B. In accordance with the Municipalities Planning Code, 53 P.S. §10101 *et seq.*, the City may refuse to issue any permit or grant approval to further improve or develop any property which has been developed in violation of this Ordinance.

§805. *Violations and Penalties*

- A. Any person who has violated or knowingly permitted the violation of the provisions of this Ordinance or has refused, neglected or failed to perform any of the actions required pursuant to the Notice set forth in Section 802. above, upon conviction thereof in an action brought before a magisterial district judge in the manner provided for the enforcement of

summary offenses under the Pennsylvania Rules of Criminal Procedure, shall be guilty of a summary offense, and shall be sentenced to pay a fine of not less than \$100.00 nor more than \$1,000.00 for each violation, plus costs, together with reasonable attorney fees; and, in default or failure of full and timely payment of such fine, costs and fees, to a term of imprisonment not to exceed ninety (90) days or to a term of imprisonment to the extent permitted by law for the punishment of violations of summary offenses, whichever is less. Each day that a violation of this Ordinance continues or each Section of this Ordinance which shall be found to have been violated shall constitute a separate offense and be deemed a public nuisance. No judgment shall commence or be imposed, levied or be payable until the date of the determination of a violation by the magisterial district judge.

- B. If the defendant neither pays nor timely appeals the judgment, the City may enforce the judgment pursuant to applicable rules of civil procedure.
- C. Each day that a violation continues shall constitute a separate violation unless the magisterial district judge further determines that there was a good faith basis for the person violating this Ordinance to have believed that there was no such violation. In such case there shall be deemed to have been only one such violation until the fifth day following the date of the district justice's determination of the violation; thereafter each day that a violation continues shall constitute a separate violation.
- D. All judgments, costs and reasonable attorney fees collected for the violation of this Ordinance shall be paid over to the City.
- E. The Court of Common Pleas, upon petition, may grant an order of stay, upon cause shown, tolling the per diem fine pending a final adjudication of the violation and judgment.
- F. Nothing contained in this Section shall be construed or interpreted to grant to any person or entity other than the City, the right to commence any action for enforcement pursuant to this Section.
- G. Each day that a violation of any provision of this Ordinance shall constitute a separate violation and be deemed a public nuisance.

§806. *Additional Remedies*

In addition to the above remedies, the City may also seek the remedies and penalties under applicable Pennsylvania statutes, or regulations adopted pursuant thereto including, but not limited to, the Third Class City Code, the Stormwater Management Act, 32 P.S. §§693.1 *et seq.*, and the erosion and sedimentation regulations, 25 Pa.Code, Chapter 102. Any activity conducted in violation of this Ordinance or any Pennsylvania approved watershed stormwater management plan may be declared a public nuisance by the City and abatable as such.

§807. *Appeals.*

A. Appeals.

- 1. Any person aggrieved by a decision of the City or any of its authorized persons or agencies, may appeal in writing said decision to either (i) the Zoning Hearing Board for any matter relating to the zoning ordinance or official map of the City, or (ii) the Planning Commission for any other matter hereunder within thirty (30) days of any

decision. Any appeal must be filed with the Planning Commission. If a decision appealed is from an authorized person or agency of the City, a copy of the written appeal must be filed with such person or agency by such appellant within thirty (30) days of such decision.

2. The appellant shall pay to the City at the time of filing the appeal, any and all fees and charges as set forth in a Resolution of the City.

B. Procedure. Any Appeal filed pursuant to this section shall be governed by the Local Agency Law of the Commonwealth of Pennsylvania (2 Pa. C.S.A. §105, specifically 2 Pa. C.S.A. §551-§555).

C. Hearing. The Planning Commission or, if applicable, the Zoning Hearing Board shall schedule a hearing within sixty (60) days of receipt of said Appeal. Written notice of the hearing shall be given to the party filing the Appeal and any authorized person or agency of the City involved, not less than fifteen (15) days prior to said hearing.

D. Hearing Procedure.

1. All testimony may be stenographically recorded and a full and complete record be kept of the proceedings. In the event all testimony is not stenographically recorded and a full and complete record of the proceedings is not provided by the local agency, such testimony shall be stenographically recorded and a full and complete record of the proceedings and shall be kept at the request of any party agreeing to pay the costs thereof.
2. The Planning Commission and Zoning Hearing Board shall not be bound by technical rules of the evidence at the aforesaid hearing, and all relevant evidence of reasonably probative value may be received. Reasonable examination and cross-examination shall be permitted.

E. Adjudication.

The adjudication of the Planning Commission and Zoning Hearing Board shall be in writing, shall contain findings and the reasons for the adjudication, and shall be served upon all parties to the Appeal or their counsel personally, or by mail.

F. Appeal from Adverse Adjudication.

Pursuant to 2 Pa. C.S.A. Section 751 et seq. any person aggrieved by the adjudication of Planning Commission and Zoning Hearing Board who has a direct interest in such adjudication shall have the right to appeal therefrom to the Court vested with jurisdiction of such appeals by or pursuant to Title 42 (Relating to Judiciary and Judicial Procedure).

REFERENCES

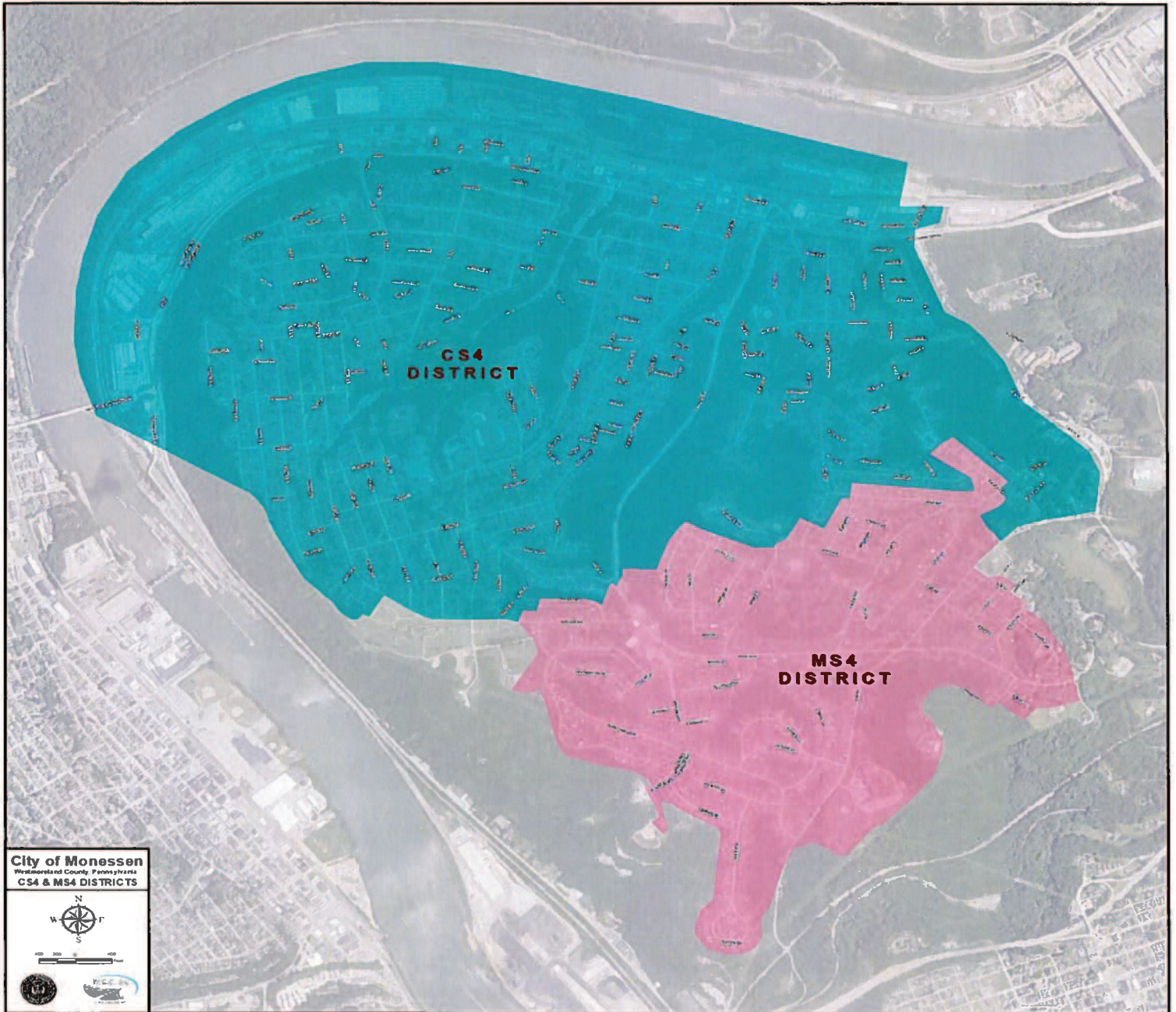
1. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook*. Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: <http://www.nrcs.usda.gov/>.
2. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.
3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.
5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14*, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
6. PennDOT Publication 408 – Construction Specifications, Publication 584 - Drainage Manual current editions.

Appendix A	Combination Sanitary Storm Sewer System (CS4) and Municipal Separate Sanitary Sewer System (MS4) Districts
Appendix B	Monessen Watershed Subareas
Appendix C	Operation and Maintenance (O&M) Agreement
Appendix D	Small Project Stormwater Management Site Plan
Appendix E	Stormwater Management Plan Checklist
Appendix F	Fees
Appendix G	Streets with Municipal Separate Storm Sewer System (MS4)

Stormwater Management Ordinance

APPENDIX A

COMBINATION SANITARY STORM SEWER SYSTEM (CS4) AND MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) DISTRICTS



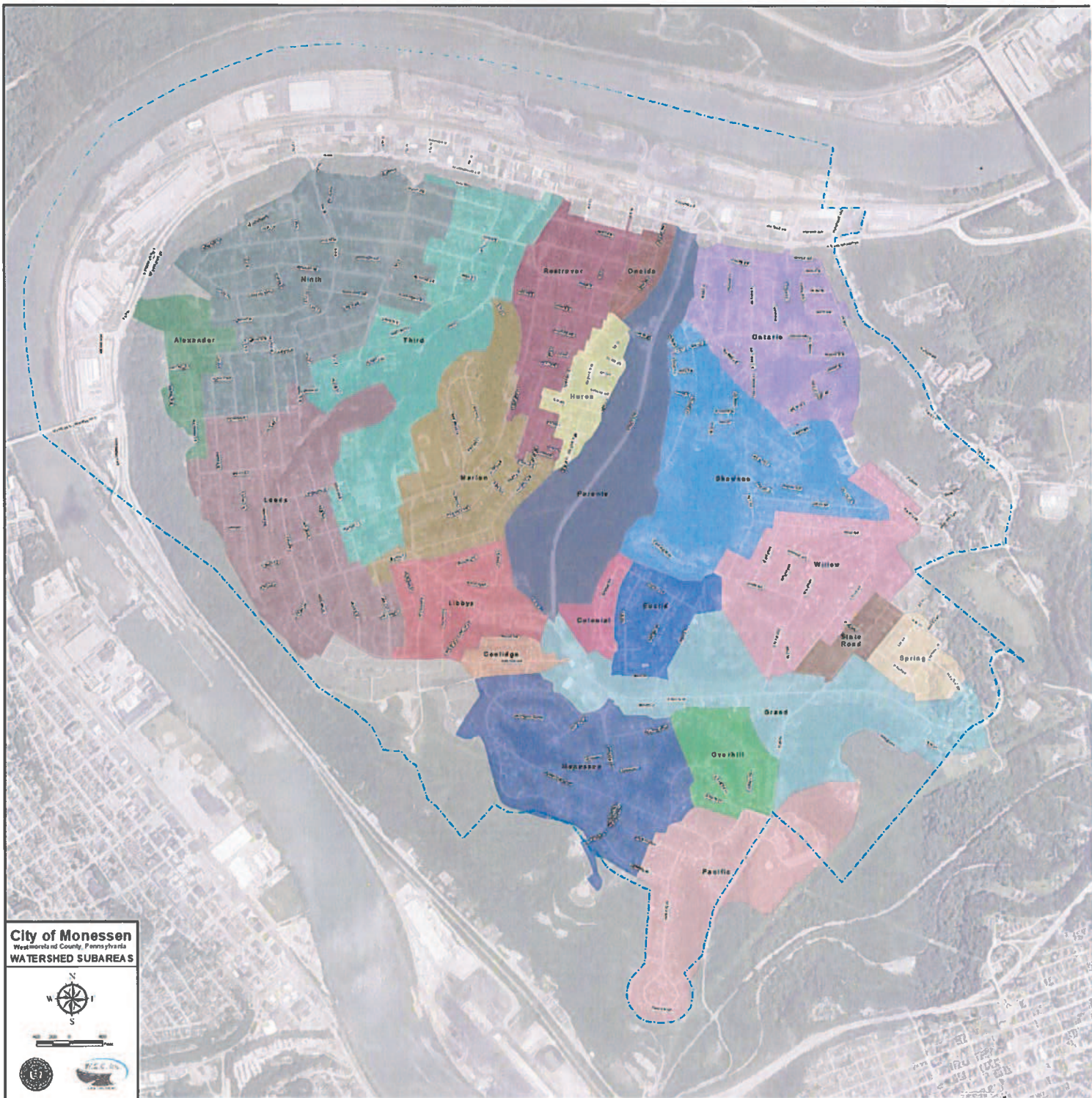
The entire City of Monessen is within the Monongahela River Watershed and has a release rate of 80% of the pre-development peak-flow

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Stormwater Management Ordinance

APPENDIX B

Monessen Watershed Subareas



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Stormwater Management Ordinance

APPENDIX C

OPERATION AND MAINTENANCE (O&M) AGREEMENT STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)]

THIS AGREEMENT, made and entered into this day _____ of _____, 20____, by and between _____ (hereinafter the "Landowner"), and _____, Westmoreland County, Pennsylvania (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of Westmoreland County, Pennsylvania, Deed Book _____ at page _____, (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the Stormwater Management Best Management Practices (SWM BMP) Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the City, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the City, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the City and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the City requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the City's Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the SWM Site Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the City, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the City shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the City or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMPs. It is expressly understood and agreed that the City is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the City.

5. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the City for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the City.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the City from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or City.

8. The City intends to inspect the BMPs at a minimum of once every four years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Westmoreland County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the City:

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of Westmoreland, Pennsylvania

I, _____, a Notary Public in and for the county and state aforesaid, whose commission expires on the day ____ of _____, 20____, do hereby certify that whose name(s) is/are signed to the foregoing Agreement bearing date of the ____ day of _____, 20____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS ____ day of _____, 20 ____.

NOTARY PUBLIC

(SEAL)

Stormwater Management Ordinance

APPENDIX D

City of Monessen

SMALL PROJECT STORMWATER MANAGEMENT PLAN

This small project stormwater management plan has been developed to assist those proposing residential projects to meet the requirements of the *City of Monessen Stormwater Management Ordinance* (SWO) without having to draft a formal stormwater management plan. This small project stormwater management plan is only permitted for projects with new impervious area with 501 to 3,000 square feet, or total earth disturbance of 2,501 to 5,000 square feet, (Section 302 Regulated Development Activity Table of the SWO) and by using the recommendations in this Appendix for Volume Control. Additional information can be found in Chapter 6 of the PA SW BMP Manual 2006 or most recent version.

This appendix shall not be used for larger projects that are developed piece meal or multi-lot projects. This appendix shall be used to design single parcel, on-lot best management practices (BMPs). A blanket access easement shall be provided for City inspections and included on the signed agreement.

For applicants not knowledgeable with SWM BMPs, a pre-application meeting with City Engineer is recommended.

A. What is an applicant required to submit?

All requirements of Section 306 of the City Stormwater Management Ordinance, including:

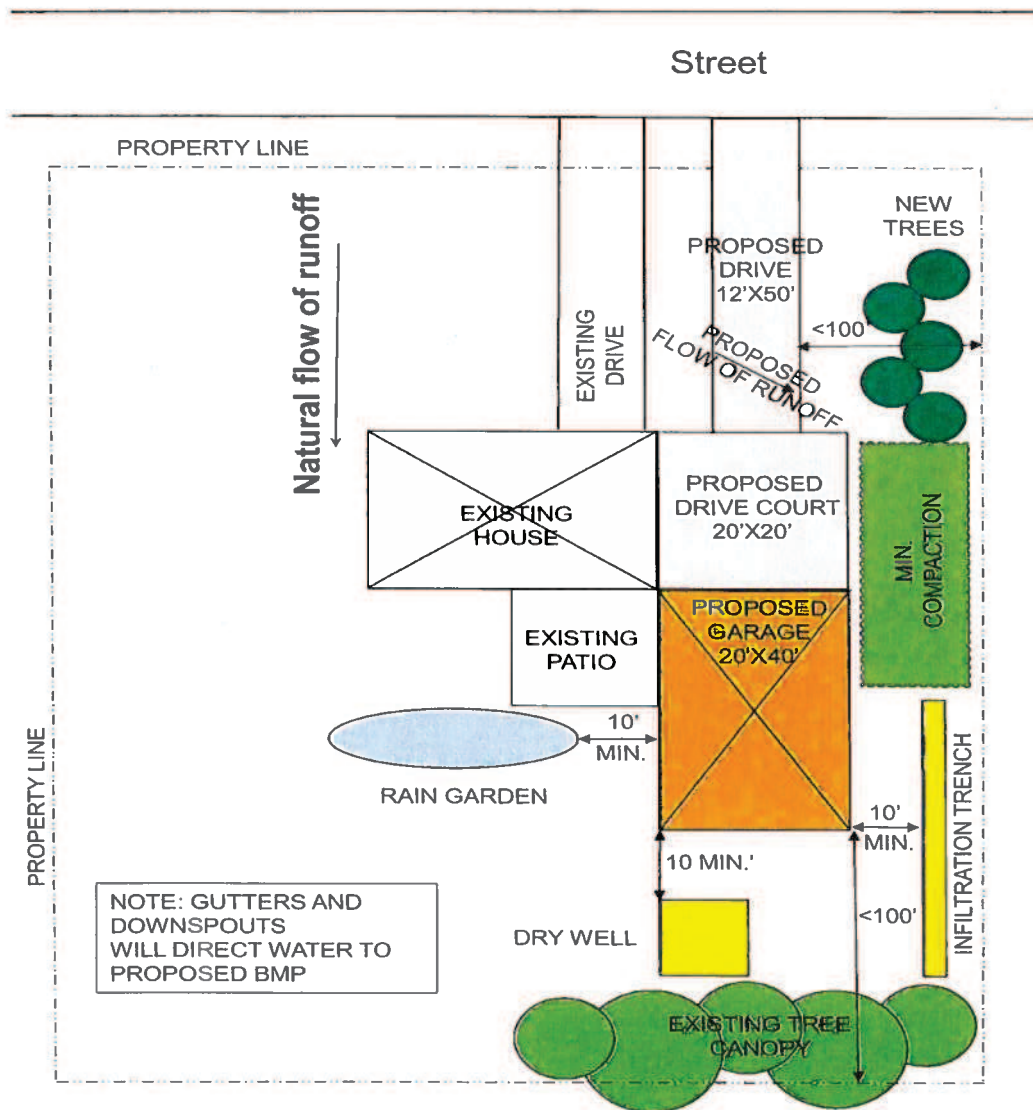
- A narrative including a brief description of the proposed stormwater facilities and BMPs, types of materials to be used, total square footage of proposed impervious areas, volume calculations;
- A sketch plan showing location of existing and proposed structures, driveways, or other paved areas with approximate surface area in square feet; location of any existing or proposed utilities, especially onsite septic system and/or potable water wells showing proximity to infiltration facilities, location and dimensions of all proposed stormwater facilities and BMPs;
- Infiltration Test Report from a licensed geotechnical engineer. The test locations shall be close to the proposed BMP location.
- Small Project Stormwater Management Worksheet;
- Signed agreement page for installation, operation, maintenance, and inspection of stormwater facilities and BMPs (Refer to Appendix C); and
- Conservation District erosion and sediment control “Adequacy” letter as required by Municipal, County or State regulations.
- Review Fees

B. Determination of Required Control Volume and Sizing Stormwater Facilities and BMPs

By following the simple steps outlined below in the provided example and Small Project Stormwater Management Worksheet, an applicant can determine the runoff volume that is required to be controlled and how to choose the appropriate stormwater facility or BMP to permanently remove the runoff volume from the site. Impervious area calculations must include all proposed areas on the lot proposed to be covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including proposed impervious surfaces such as sidewalks, driveways, parking areas, patios or swimming pools. Sidewalks, driveways or patios that are designed and constructed to allow for infiltration (permeable paving systems) are not included in this calculation.

Small Project Sketch Plan: *Example*

Project Name: _____ Date: _____
 Location: _____



Step 1: Determine Total Impervious Surfaces and Required Control Volume:

TABLE 1: Example

New Impervious Surface	Dimensions (width x length) (FT)	Area in SF	2" storm Multiplier 0.167	Required Control Volume 2" in CF
<i>Garage Roof</i>	<i>20'x40'</i>	<i>800 SF</i>	<i>0.167</i>	<i>133 CF</i>
<i>Driveway Court</i>	<i>20'x20'</i>	<i>400 SF</i>	<i>0.167</i>	<i>67 CF</i>
<i>Driveway</i>	<i>12'x50'</i>	<i>600 SF</i>	<i>0.167</i>	<i>100 CF</i>
		SF		CF
		SF		CF
		SF		CF

Total Required Control Volume (enter in Table 2): 300 CF

In Table 1, as in the example above and as shown on the Figure 1 example sketch plan, list each of the new improvements that create impervious area on the property along with their dimensions and total area in square feet in the first three columns. Then, depending on the design storm required by the municipality, multiply the area in square feet by the design storm multiplier to determine required control volume and list in the last column. Add each of the required control volumes together to equal the Total Required Control Volume and enter in Table 2.

Step 2: Sizing the Selected Volume Control BMP(s)

Several Best Management Practices (BMPs) are suitable for small stormwater management projects. However, their application depends on the volume required to be controlled, how much land is available, and the site constraints. Proposed residential development activities can apply both nonstructural and structural BMPs to control the volume of runoff from the site. A number of these different volume control BMPs are described below. Note that Figure 1 is an example of how these BMPs can be utilized on a property to control the total required control volume.

Credit can be taken for non-structural best management practices (BMPs) on a site to reduce the total volume required to be controlled. Credits must follow the requirements listed in this Appendix. Fill out Table 2 with proposed non-structural BMP credits and structural BMP control volumes entered in Tables 6 and 10 to meet the total required control volume.

TABLE 2: Example

Required Control Volume (from Table 1)	300 CF
Non-structural BMP Credit (from Table 6)	137 CF
Adjusted Required Control Volume (after credits) (from Table 1 - Table 6)	163 CF
Structural BMP Control Volume (from Table 10)	202 CF
TOTAL Volume Controlled (from Table 6 +Table 10)	338 CF

NOTE: Total Volume Controlled shall be **greater than or equal to** Required Control Volume.

Step 3: Choosing and Measuring Non-Structural BMPs

1. Tree Planting and Preservation

Trees and forests reduce stormwater by capturing, storing and evapotranspiring rainfall through their roots and leaves. Tree roots and leaf litter also create soil conditions that promote infiltration of rainwater into the soil and that breakdown excessive nutrients and pollutants. For more information refer to the PA DEP BMP Manual 5.6.3.

Considerations for credit:

- New tree plantings must be at least 6 feet in height and have at least a 2-inch caliper trunk, and the quantity entered in Table 3
- New tree plantings must be native to Pennsylvania. Refer to <http://www.dcnr.pa.gov/Conservation/WildPlants/Pages/default.aspx>
- Existing trees must have at least a 4" caliper trunk, and must be located within 100 feet of impervious surfaces
- Measure existing tree canopy by determining the square foot area covered within the drip line of the tree(s), and enter the area in Table 4
- Site runoff should be directed via sheet flow to the area(s) of trees being used for volume control

TABLE 3: New Tree(s)

New Trees	Volume Control Multiplier	Tree Quantity	Volume Controlled (CF)
Deciduous	6 CF	2	12 CF
Evergreen	10 CF	3	30 CF

Total Volume Control Credit (new trees) enter in Table 6: 42 CF

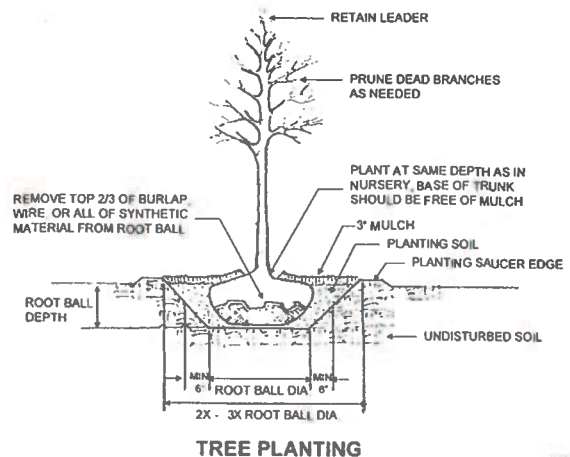
TABLE 4: Existing Tree Canopy

Existing Tree Canopy (SF)	Distance of Impervious to Canopy (FT)	Volume Control Multiplier	Volume Controlled (CF)
SF	0 FT to 20 FT	0.0833	CF
2000 SF	20 FT to 100 FT	0.0416	83 CF

Total Volume Control Credit (ex. trees) enter in Table 6: 83 CF



Remove all synthetic material from the root ball before planting



WCD 2009 N T 5

2. Minimize Soil Compaction and Revegetate (lawn or meadow seeding)

When soil is overly compacted during construction it can cause a drastic reduction in the permeability of the soil and rarely is the soil profile completely restored. Runoff from overly compacted vegetated areas can resemble increased runoff from impervious areas. Minimizing soil compaction during the construction process, or restoring and amending compacted soils and revegetating them after construction can greatly increase natural infiltration on a site. For more information refer to the PA DEP BMP Manual 5.6.2 and 5.6.3.

Considerations for credit:

- Area(s) shall not be stripped of topsoil and areas shall be protected from construction vehicles and lay down space with construction fencing or mats. Enter square foot area in Table 5.
- Soil ripping and soil amendments can be used to restore the soils
- Vegetation should be used, especially native plants and meadow mixes as an alternative to lawn

TABLE 5: Minimize Soil Compaction Example

Type of stabilization	Area of minimal compaction (SF)	Volume Control Multiplier	Volume Controlled (CF)
Meadow	SF	0.0275	CF
Lawn	600 SF	0.0208	12 CF

Total Volume Control Credit (min. compaction) enter in Table 6: 12 CF



Plywood sheets protect lawn from compaction



Fencing protects areas from compaction

Step 4: Determining Non-Structural BMP Credit:

TABLE 6: Non-Structural BMP Credit Summary: Example

Non- structural BMP	Storage Volume Credit (CF)
New Tree	42 CF
Existing Tree Canopy	83 CF
Minimized Soil Compaction	12 CF
TOTAL (enter in Table 2)	137 CF

Step 5: Choosing and Sizing Structural BMPs

1. Infiltration Trench

An infiltration trench is a linear stormwater management BMP consisting of a continuously perforated pipe at a minimum slope in a stone-filled trench. During small storm events, infiltration trenches can significantly reduce volume and serve in the removal of fine sediments and pollutants. Runoff is stored in the pipe and between the stones and infiltrates through the bottom of the facility and into the surrounding soil matrix. Runoff should be pretreated using vegetative buffer strips or swales to limit the amount of coarse sediment entering the trench which can clog and render the trench ineffective. In all cases, an infiltration trench should be designed with a positive overflow to a stable outlet point. For more information refer to the PA DEP BMP Manual 6.4.4. Website link:

<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>

Design Considerations:

- Continuously perforated pipe (min 4" diameter) set at a minimum slope (1%) in a stone filled, nearly level-bottomed trench on un-compacted soils.
- The trench width and depth can vary, but it is recommended that infiltration trenches be no wider than four (4) feet, and a minimum of thirty (30) inches and maximum six (6) feet in depth.
- Stone fill should be clean, angular stone, separated from soil layers by four (4) inches of straw (top and bottom) or a nonwoven geotextile (top, sides, and bottom).
- A minimum of 6" of topsoil can be placed over trench and vegetated.
- Cleanouts or inlets should be installed at both ends and at intersections of the infiltration trench and at appropriate intervals to allow access to the perforated pipe.
- The discharge or outlet from the infiltration trench should be safely conveyed to a stable vegetated area, natural watercourse, the curb or gutter line of roadway or existing storm collection/conveyance/control system as applicable.
- Volume of facility = Depth x Width x Length x Void Space of the gravel bed (assume 40%).

Maintenance:

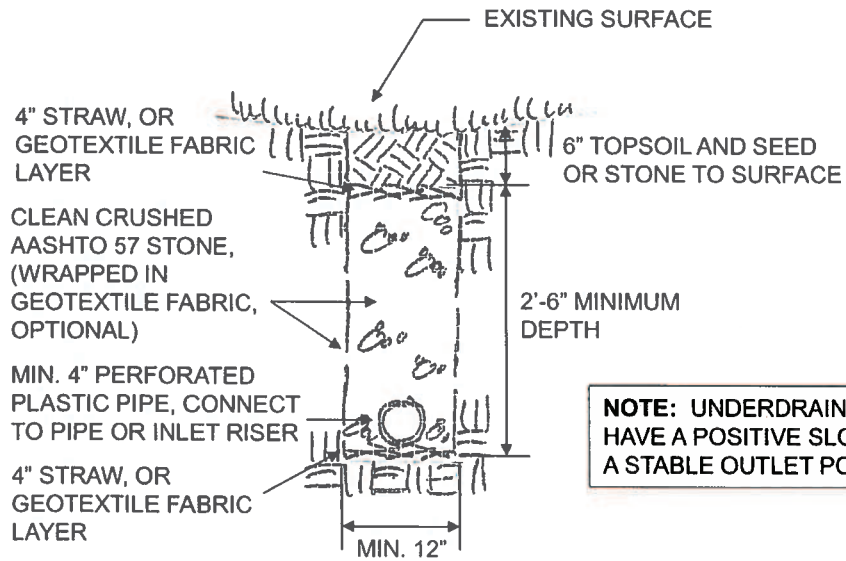
- Cleanouts, catch basins and inlets should be inspected at least two times a year and cleaned out as necessary to maintain function of the system.
- The vegetation along the surface of the infiltration trench should be maintained in good condition and any bare spots should be re-vegetated as soon as possible.
- Vehicles should not be parked or driven on the trench and care should be taken to avoid soil compaction by lawn mowers.

TABLE 7 - Determining size of infiltration trench for volume control: Example

Required Control Volume (CF) From Table 2	Storage Volume Divider	Trench Volume (CF)	Trench Depth (FT)	Trench Width (FT)	Trench Length (FT)	Volume Controlled
163	0.4	413 CF	3FT	3FT	46FT	165 CF

Total Volume Control Credit (Inf. trench) **enter in Table 10:** 165 CF

Infiltration Trench Construction:



Perforated pipe covered with stone and wrapped in fabric



Perforated pipe covered in stone with straw separation layers

2. Rain Garden

A rain garden is a landscaped shallow depression that uses mulch, soil mix, and deep rooted plants to capture, adsorb and infiltrate stormwater runoff from roofs, and pavement. For more information refer to the PA DEP BMP Manual 6.4.5. Website link:

(<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>)

Design considerations:

- A rain garden should be located on nearly level to gently sloping ground and no closer than 10 feet to a building foundation and 25 feet from septic field or wellhead.
- A rain garden can vary in length, width and depth, but should have a ponding depth of 6 to 12 inches, and a total surface depth of no greater than 18 inches.
- Side slopes within the garden should not exceed 3:1 horizontal to vertical.
- The rain garden should be constructed in layers with a (min 4”) perforated underdrain in a clean angular stone envelope, separated from soil layers by four (4) inches of straw (top and bottom) or a nonwoven geotextile (top, sides, and bottom), covered with 12 inches to 36 inches of 50-30-20 topsoil-sand-compost mix or as approved by the municipality, and 3 inches of shredded bark mulch or vegetated cover. Soil depth should be determined by plant choices and control volume requirements.
- Vegetation should be deep rooted and tolerant of wet and dry conditions, salts and environmental stress.
- An emergency overflow should be set in the rain garden such as a vertical pipe or inlet box, with basket type grate set even with the ponding depth, below the surrounding ground elevation and connected to the perforated underdrain and an outlet pipe.
- The outlet from the rain garden should be safely conveyed to a stable vegetated area, natural watercourse, the curb or gutter line of roadway or existing storm collection/conveyance/control system as applicable.

Maintenance:

- Cleanouts, catch basins and inlets should be inspected at least two times a year and cleaned out as necessary to maintain function of the system. Detritus should be removed from the rain garden as necessary to prevent clogging of the overflow outlet.
- The vegetation should be maintained in good condition and replaced as necessary. Rain garden plants may need to be watered during dry spells.
- Rain garden should be weeded and shredded bark mulch should be amended as necessary to prevent volunteer weeds.

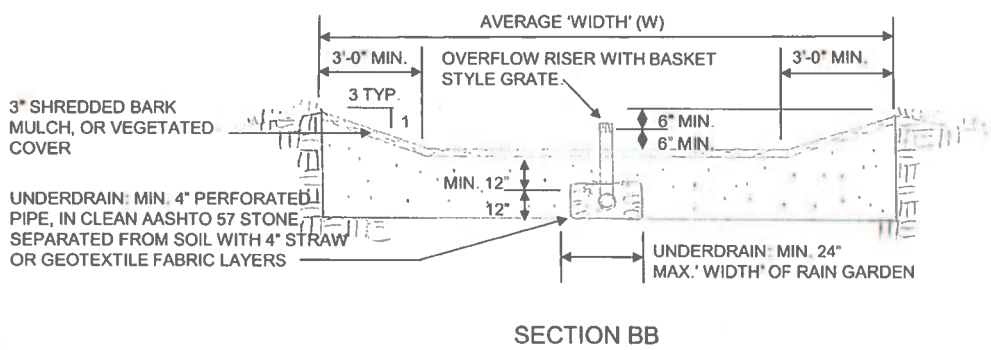
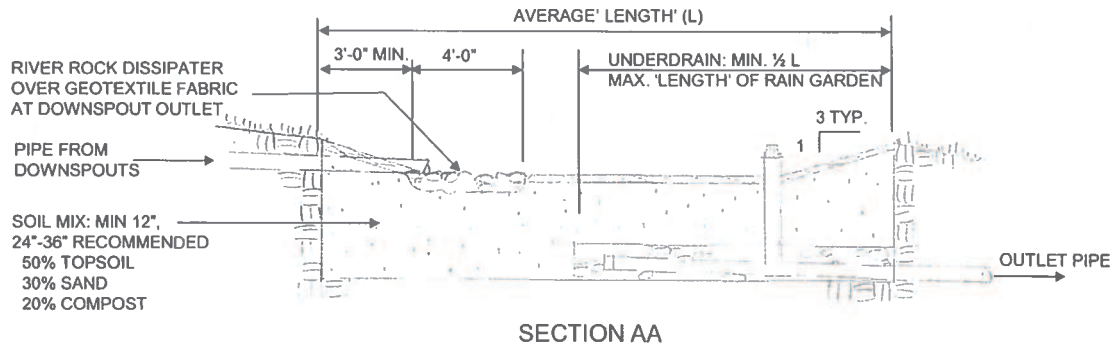
TABLE 8 – Determining Size of Rain Garden for volume control: *Example*

(surface volume, soil storage volume should **each** be greater than or equal to required control volume)

Required Control Volume (CF) from Table 2	Ponding Depth (0.5 FT to 1.0 FT) Divider	Rain Garden Surface Area (SF)	Rain Garden Width (FT)	Rain Garden Length (FT)	Soil Mix Depth (1 FT to 3 FT) Multiplier	Soil Storage Volume Multiplier	Soil Storage Volume (<= RCV)	Volume Controlled (soil)
165 CF	0.5	330 SF	12 FT	28FT	2 FT	0.3	202 CF	202 CF

Total Volume Control Credit (rain garden) **enter in Table 10:** 202 CF

Rain Garden Construction:



Mark rain garden location to avoid utilities



Excavate rain garden at least 10' from foundation



Separate underdrain layer from soil with fabric or straw



Use decorative but tolerant plants for seasonal interest

3. Dry Well / Seepage Pit

A dry well or seepage pit is a subsurface storage facility that temporarily stores stormwater runoff from roofs and infiltrates it into the surrounding soils. Roof downspouts connect directly to a dry well or seepage pit that is an excavated pit filled with clean angular stone with an overflow pipe to ensure the system will not be overwhelmed. Prefabricated chamber systems or perforated pipe sections are commercially available for use as dry wells and should be designed, constructed and maintained according to the manufacturer’s recommendations. For more information on dry wells and seepage pits refer to the PA DEP BMP Manual 6.4.6. Website link: (<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>)

Design considerations:

- A dry well / seepage pit should be located on nearly level to gently sloping ground and no closer than 10 feet to a building foundation and 25 feet from septic field or wellhead.
- A dry well / seepage pit can vary in length, width and depth, but should be a minimum depth of 3 feet.
- A downspout should direct water to the surface, a system of perforated pipes should distribute the water throughout the system with an inspection/cleanout pipe to the surface, and an over flow pipe should outlet excess water during intense storms.
- The storage system can be clean angular stone, separated from soil layers by four (4) inches of straw (top and bottom) or a nonwoven geotextile (top, sides, and bottom).
- The outlet from the dry well / seepage pit should be safely conveyed to a stable vegetated area, natural watercourse, the curb or gutter line of roadway or existing storm collection/conveyance/control system as applicable.

Maintenance:

- Drywells and seepage pits should be inspected at least 4 times a year, and after each storm event exceeding 1 inch.
- Remove sediment, debris, detritus and any other waste material from the system as necessary.
- Regularly clean out gutters and downspouts to ensure proper connections and to maintain effectiveness of the system.
- Replace any filter screen or clean out any sump box that may intercept roof runoff as necessary.

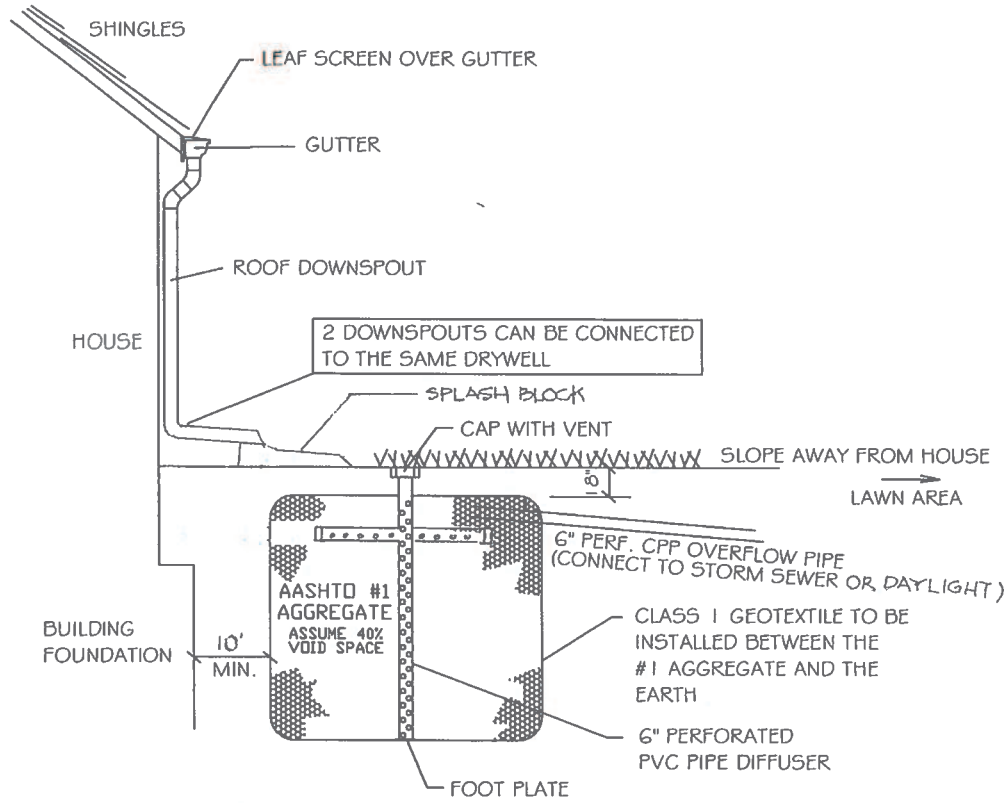
Table 9: Determining Size of Dry Well (stone filled) for volume control: *Example*

Required Control Volume (CF) from Table 2	Storage Volume Divider	Dry Well Volume (CF)	Dry Well Depth (FT)	Dry Well Width (FT)	Dry Well Length (FT)	Volume Controlled (CF)
165	0.4	413 CF	5 FT	9 FT	9.2 FT	165 CF

Total Volume Control Credit (dry well) **enter in Table 10:** 165 CF

NOTE: Applicants are required to utilize the manufacturer’s recommendations for sizing proprietary stormwater infiltration systems, and to submit supporting documentation for meeting the required control volume and maintenance requirements.

Dry Well (stone filled) Construction:



Excavate a drywell at least 10' from foundation

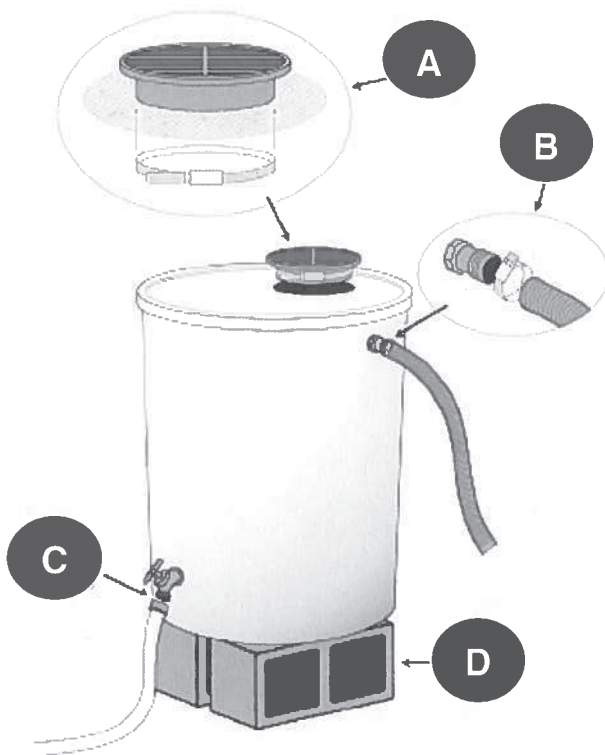
Separate stone fill from soil with straw layers or fabric

A. Alternative BMP Capture and Re-Use (rain barrel / cistern)

Rain barrels and cisterns are above or below ground containers used for temporary storage of rainwater, to be used for landscape irrigation and other similar uses after the rain has ended. A rain barrel or cistern **cannot be used** as a volume control because infiltration is not guaranteed after a storm event, but they are viable alternative method to capture and reuse stormwater.

Considerations:

- Rain barrels and cisterns should be directly connected to a downspout with a mosquito screen
- There should be a means to release the water after a storm event to provide storm volume for the next event
- An overflow, near the top of the container should direct water to a vegetated area away from any structures
- Barrels can be connected in series to provide more volume collection



ANATOMY OF A RAIN BARREL

A – hole in top for downspout connection, with screen for mosquitoes

B – hole on side near top for overflow hose

C – hole on side near

Step 6: Determining BMP Volume Control

TABLE 10: Structural BMP Volume Control Summary:

Structural BMP	Storage Volume (CF)	
Infiltration Trench		CF
Rain Garden	202	CF
Dry Well		CF
TOTAL (enter in Table 2)	202	CF

Use Small Project Stormwater Management Worksheet

Step 7: Post-Installation Operation and Maintenance Requirements

It is the property owner's responsibility to properly maintain any stormwater facilities and BMPs in accordance with the minimum maintenance requirements listed in this Appendix. The property owner shall submit a signed agreement (refer to Appendix C), to the City for installation, and maintenance of any proposed stormwater management facilities and BMPs. It is also the property owner's responsibility to inform any future owners of the function, operation and maintenance needed for any BMPs on the property prior to the purchase of the property.

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SMALL PROJECT STORMWATER MANAGEMENT WORKSHEET

City of Monessen

Project Name: _____ Date: _____

Location: _____

TABLE 1: Determination of Control Volume Requirements:

New Impervious Surface	Area in SF	2" storm Multiplier (0.167)	Required Control Volume 2" in CF
	SF		CF
	SF		CF
	SF		CF
	SF		CF
	SF		CF
	SF		CF

Total Required Control Volume (enter in Table 2): _____ **CF**

TABLE 2: Determination of Volume Controlled:

Required Control Volume (Table 1)	CF
Non-structural BMP Credit (Table 6)	-
Adjusted Required Control Volume (after credits) (Table 1 – Table 6)	CF
Structural BMP Control Volume (Table 10)	CF
TOTAL Volume Controlled (Table 6 + Table 10)	CF

NOTE: Total Volume Controlled shall be **greater than or equal to** Required Control Volume.

Determining Non-Structural BMP Credit:

TABLE 3: New Tree(s)

New Trees	Volume Control Multiplier	Tree Quantity	Volume Controlled (CF)
Deciduous	6 CF		CF
Evergreen	10 CF		CF

Total Volume Control Credit (new trees) enter in Table 6: _____ **CF**

TABLE 4: Existing Tree Canopy

Existing Tree Canopy (SF)	Distance of Impervious to Canopy (FT)	Volume Control Multiplier	Volume Controlled (CF)
SF	0 FT to 20 FT	0.0833	CF
SF	20 FT to 100 FT	0.0416	CF

Total Volume Control Credit (ex. trees) enter in Table 6: _____ **CF**

TABLE 5: Minimize Soil Compaction

Type of stabilization	Area of minimal compaction (SF)	Volume Control Multiplier	Volume Controlled (CF)
Meadow	SF	0.0275	CF
Lawn	SF	0.0208	CF

Total Volume Control Credit (min. compaction) enter in Table 6: _____ CF

TABLE 6: Non-Structural BMP Credit Summary:

Non- structural BMP	Storage Volume Credit (CF)
New Tree	CF
Existing Tree Canopy	CF
Minimized Soil Compaction	CF
TOTAL (enter in Table 2)	CF

Sizing of Structural BMPs:**TABLE 7: Infiltration Trench (stone filled)**

Required Control Volume (CF)	Storage Volume Divider	Trench Volume (CF)	Trench Depth (FT)	Trench Width (FT)	Trench Length (FT)	Volume Controlled
CF	0.4	CF	FT	FT	FT	CF

Total Volume Control Credit (Inf. trench) enter in Table 10: _____ CF

TABLE 8: Rain Garden (surface & soil storage volume should be greater than or equal to required control vol.

Required Control Volume (CF)	Ponding Depth (0.5 FT to 1.0 FT) Divider	Rain Garden Surface Area (SF)	Rain Garden Width (FT)	Rain Garden Length (FT)	Soil Mix Depth (1 FT to 3 FT) Multiplier	Soil Storage Volume Multiplier	Soil Storage Volume (<= RCV)	Volume Controlled (soil)
CF	FT	SF	FT	FT	FT	0.3	CF	CF

Total Volume Control Credit (rain garden) enter in Table 10: _____ CF

TABLE 9: Dry Well (stone filled)

Required Control Volume (CF)	Storage Volume Divider	Dry Well Volume (CF)	Dry Well Depth (FT)	Dry Well Width (FT)	Dry Well Length (FT)	Volume Controlled (CF)
CF	0.4	CF	FT	FT	FT	CF

Total Volume Control Credit (dry well) enter in Table 10: _____ CF

TABLE 10: Structural BMP Volume Control Summary:

Structural BMP	Volume Controlled (CF)
Infiltration Trench	CF
Rain Garden	CF
Dry Well	CF
TOTAL (enter in Table 2)	CF

Stormwater Management Ordinance

APPENDIX E

City of Monessen

Stormwater Management Plan Checklist

See City's Stormwater Ordinance for complete requirements

Project Name: _____ Date: _____

Location: _____ Performance District: _____

Type of Plan: ___ Residential, ___ Commercial, ___ Institutional, ___ Industrial, ___ Recreational, ___ Other

Owner: _____ Contact Information: _____

Plan Preparer: _____ Contact Information: _____

Submission Requirements

- Checklist
- Application
- Fees
- Location map (USGS)
- Construction Plans
- Three sets of the PCSM plans and narrative
- E&S plan, as submitted for approval
- Operation and Maintenance Plan and Agreement
- Municipal notification(s)
- Financial guarantees, maintenance fund

General Requirements

Narrative:

- Project description, including CS4/MS4 District, existing and proposed features and improvements, soils and limitations, landform, land cover, drainage areas, utilities, proposed SWM facilities and BMPs, easements and other information required by the [Municipality] stormwater ordinance
- stormwater BMP calculations
- Project schedule
- Construction sequence, including phases if applicable
- Justification for SWM facilities and/or BMPs
- Operation and Maintenance requirements and responsible party(s)

Post-Construction Stormwater Management (PCSM) Plans:

- Location map (USGS) and Index Map
- Plan notes (construction, BMP operation, BMP maintenance, critical inspection milestones, et. al.)
- CS4 or MS4 District
- Existing natural features
- Soils; infiltration test pit locations and profiles, and limitations
- Landform; existing and proposed contours at 2' intervals, or 5' intervals for slopes >15%
- Landscape Plans - existing and proposed land covers; ~~improvements~~
- Drainage Area Plans; existing and proposed conditions
- Utilities; existing and proposed

- SWM facilities and BMPs; existing and proposed
- Easements, including offsite easements for drainage
- Stormwater construction details and sections (as applicable)
- Stormwater construction notes and sequence
- Operation and Maintenance requirements and responsible party(s)

Stormwater Management Ordinance

APPENDIX F FEE SCHEDULE

(See Regulated Development Activity Table §302)

Fee Schedule is subject to change by ordinance or resolution of City Council

Exemptions

(Sites with 0 square feet of new impervious area and less than 1 acre of disturbed areas)

1. Application Fee: \$100
2. Review Fee: \$300 + Subsequent Review Fee (if required): \$100/hour
3. Site Inspection Fee: \$300.00 per inspection (if required)

No-Harm Evaluations

(Sites 500 square feet or less of new impervious area or 2,500 square feet or less of disturbed area)

1. Application Fee: \$100
2. Review Fee: \$300 + Subsequent Review Fee (if required): \$100/hour
3. Site Inspection Fee: \$300.00 per inspection (if required)

Waiver / Modification / Demonstrated Equivalency (Subject to City Approval)

(Sites with less than 1 acre of new impervious area and less than 1 acre of disturbed area)

1. Application Fee: \$100
2. Review Fee: \$600 + Subsequent Review Fee (if required): \$100/hour
3. Site Inspection Fee: \$300 per inspection (if required)

Small Project Site Plan

(Sites with 501 to 3,000 square feet of new impervious area or 2,501 to 5,000 square feet of disturbed area)

1. Application Fee: \$100
2. Review Fee: \$500 + Subsequent Review Fee (if required): \$100/hour
3. Site and Construction Inspection Fee: \$600.00
4. Post-Construction Inspections Deposit: \$1,200 (\$300/inspection for 4 inspections)
5. Post-Construction Maintenance Deposit: To be determined according to ordinance (deposit, bond, or nonrefundable payment)

Stormwater Management Site Plan

(Sites with more than 3,000 square feet of new impervious area or more than 5,000 square feet of disturbed area)

1. Application Fee: \$500
2. Review Fee: \$600 + Subsequent Review Fee (if required): \$100/hour
3. Site and Construction Inspection Fee: \$1,000.00
4. Post-Construction Inspections Deposit: \$1,600 (\$400/inspection for 4 inspections)
5. Post-Construction Maintenance Deposit: To be determined according to ordinance (deposit, bond, or nonrefundable payment)

NOTE: All Subsequent Review Fees may be invoiced to the applicant.

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Stormwater Management Ordinance

APPENDIX G

STREETS WITH MUNICIPAL SEPARATE STORM SEWER SYSTEM

MS4 Streets

Grand Boulevard Sewer Shed

Anderson Court	McKinley Avenue
Arch Avenue	Mellon Avenue
Balazia Avenue	Merando Drive
Center Drive	Monessen Boulevard
Circle Drive	Overhill Drive
City Park Road	Park Manor Drive
Colonial Drive	Pennsylvania Boulevard
Columbus Drive	Pioneer Drive
Coolidge Drive	Pleasant Drive
Crest Drive	Rex Boulevard
Crestcent Drive	Ridge Avenue
Delrose Drive	Scenery Drive
Euclid Drive	Shady Drive
Fairfield Drive	Shaw Drive
Grand Boulevard (1)	Skurkay Street
Hale Avenue	Spring Drive
Hartung Court	Stanton Drive
Helen Avenue	State Road
High Street	Surrey Street
Jackson Drive	Washington Drive
Jefferson Drive	Westmoreland Drive
Jo Ann Drive	Willow Drive
Keystone Drive	Woodcrest Avenue
Lee Drive	

(1) Grand Boulevard from Pleasant Drive to Parente Boulevard

MS4 Streets

Non-Grand Boulevard Sewer Shed

Street	From	To
Alexander Avenue	Spruce Street	Alley between Walnut Avenue and Maple Avenue
Alley between Schoonmaker Avenue and Donner Avenue	Second Street	Third Street
Summit Avenue	Ella Street	Alexander Avenue
Donner Avenue	First Street	Midway between Third Street and Fourth Street
Donner Avenue	Fourth Street	Midway between Eighth Street and Ninth Street
Fifth Street	Schoonmaker Avenue	Monongahela River
Maple Avenue	Western most 300 feet	
Schoonmaker Avenue	First Street	Second Street
Schoonmaker Avenue	Fourth Street	Sixth Street
Second Street	McKee Avenue	Monongahela River
Walnut Street	Ella Street	Alexander Avenue

ENVIRONMENTAL PROTECTION AGENCY (EPA)
STORMWATER PHASE II FINAL RULE
FACT SHEET SERIES

AN OVERVIEW

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE



Stormwater Phase II Final Rule

An Overview

Stormwater Phase II Final Rule Fact Sheet Series

Overview

1.0 – Stormwater Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Stormwater Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial “No Exposure”

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Why Is the Phase II Stormwater Program Necessary?

Since the passage of the Clean Water Act (CWA), the quality of our Nation's waters has improved dramatically. Despite this progress, however, degraded waterbodies still exist. According to the 2000 National Water Quality Inventory (Inventory), a biennial summary of State surveys of water quality, approximately 40 percent of surveyed U.S. waterbodies are still impaired by pollution and do not meet water quality standards. A leading source of this impairment is polluted runoff. In fact, according to the Inventory, 13 percent of impaired rivers, 18 percent of impaired lake acres and 32 percent of impaired estuaries are affected by urban/suburban stormwater runoff.

Phase I of the U.S. Environmental Protection Agency's (EPA) stormwater program was promulgated in 1990 under the CWA. Phase I relies on National Pollutant Discharge Elimination System (NPDES) permit coverage to address stormwater runoff from: (1) “medium” and “large” municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, (2) construction activity disturbing 5 acres of land or greater, and (3) ten categories of industrial activity.

The Stormwater Phase II Final Rule is the next step in EPA's effort to preserve, protect, and improve the Nation's water resources from polluted stormwater runoff. The Phase II program expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted stormwater runoff. See Fact Sheets 2.0 and 3.0 for overviews of the Phase II programs for MS4s and construction activity.

Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation. The environmental problems associated with discharges from MS4s in urbanized areas and discharges resulting from construction activity are outlined below.

MS4s in Urbanized Areas

Stormwater discharges from MS4s in urbanized areas are a concern because of the high concentration of pollutants found in these discharges. Concentrated development in urbanized areas substantially increases impervious surfaces, such as city streets, driveways, parking lots, and sidewalks, on which pollutants from concentrated human activities settle and remain until a storm event washes them into nearby storm drains. Common pollutants include pesticides, fertilizers, oils, salt, litter and other debris, and sediment. Another concern is the possible illicit connections of sanitary sewers, which can result in fecal coliform bacteria entering the storm sewer system. Stormwater runoff picks up and transports these and other harmful pollutants then discharges them – untreated – to waterways via storm sewer systems. When left uncontrolled, these discharges can result in fish kills, the destruction of spawning and wildlife habitats, a loss in aesthetic value, and contamination of drinking water supplies and recreational waterways that can threaten public health.

Construction Activity

Uncontrolled runoff from construction sites is a water quality concern because of the devastating effects that sedimentation can have on local waterbodies, particularly small streams. Numerous studies have shown that the amount of sediment transported by stormwater runoff from construction sites with no controls is significantly greater than from sites with controls. In addition to sediment, construction activities yield pollutants such as pesticides, petroleum products, construction chemicals, solvents, asphalts, and acids that can contaminate stormwater runoff. During storms, construction sites may be the source of sediment-laden runoff, which can overwhelm a small stream channel's capacity, resulting in streambed scour, streambank erosion, and destruction of near-stream vegetative cover. Where left uncontrolled, sediment-laden runoff has been shown to result in the loss of in-stream habitats for fish and other aquatic species, an increased difficulty in filtering drinking water, the loss of drinking water reservoir storage capacity, and negative impacts on the navigational capacity of waterways.

Are Municipally Operated Sources Exempted by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 Affected by the Final Rule?

Provisions within ISTEA temporarily delayed the deadline for Phase I industrial activities (with the exception of power plants, airports, and uncontrolled sanitary landfills) operated by municipalities with populations of less than 100,000 people to obtain an NPDES stormwater discharge permit. Congress delayed the permitting deadline for these facilities to allow small municipalities additional time to comply with NPDES requirements. The Phase II Final Rule ended this temporary exemption from permitting. Since March 10, 2003, all ISTEA-exempted municipally operated industrial activities were required to obtain permit coverage.

How Was the Phase II Final Rule Developed?

EPA developed the Phase II Final Rule during extensive consultations with a cross-section of interested stakeholders brought together on a subcommittee chartered under the Federal Advisory Committee Act, and with representatives of small entities participating in an advisory process mandated under the Small Business Regulatory Enforcement Fairness Act. In addition, EPA considered comments submitted by over 500 individuals and organizations during a 90-day public comment period on the proposed rule.

Why Does Part of the Phase II Final Rule Use a Question and Answer Format?

The provisions pertaining to operators of small MS4s are written in a “readable regulation” form that uses the “plain language” method. Questions and answers are used to create more reader-friendly and understandable regulations. The plain language method uses “must” instead of “shall” to indicate a requirement and words like “should,” “could,” or “encourage” to indicate a recommendation or guidance.

Who Is Covered by the Phase II Final Rule?

The final rule “automatically” covers two classes of stormwater dischargers on a nationwide basis:

- (1) Operators of small MS4s located in “urbanized areas” as delineated by the Bureau of the Census. A “small” MS4 is any MS4 not already covered by Phase I of the NPDES stormwater program. See Fact Sheets 2.1 and 2.2 for more information on small MS4 coverage.
- (2) Operators of small construction activities that disturb equal to or greater than 1 (one) and less than 5 (five) acres of land. See Fact Sheet 3.0 for more information on small construction activity coverage.

Waivers

Permitting authorities may waive “automatically designated” Phase II dischargers if the dischargers meet the necessary criteria. See Fact Sheets 2.1 (small MS4 waivers overview), 3.0 (construction waivers overview) and 3.1 (construction rainfall erosivity waiver) for details.

Phased-in Permit Coverage

Permitting authorities may phase-in permit coverage for small MS4s serving jurisdictions with a population under 10,000 on a schedule consistent with a State watershed permitting approach.

Additional Designations by the Permitting Authority

Small MS4s located outside of urbanized areas, construction activity disturbing less than 1 acre, and any other stormwater discharges can be designated for coverage if the NPDES permitting authority or EPA determines that stormwater controls are necessary. See Fact Sheet 2.1 for more information on the designation of small MS4s located outside of urbanized areas.

What Does the Phase II Final Rule Require?

Operators of Phase II-designated small MS4s and small construction activity are required to apply for NPDES permit coverage, most likely under a general rather than individual permit, and to implement stormwater discharge management controls (known as “best management practices” (BMPs)). Specific requirements for each type of discharge are listed below.

Small MS4s

- A regulated small MS4 operator must develop, implement, and enforce a stormwater management program designed to reduce the discharge of pollutants from their MS4 to the “maximum extent practicable,” to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. The rule assumes the use of narrative, rather than numeric, effluent limitations requiring implementation of BMPs.
- The small MS4 stormwater management program must include the following six minimum control measures: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping. See Fact Sheets 2.3 through 2.8 for more information on each measure, including BMPs and measurable goals.
- A regulated small MS4 operator must identify its selection of BMPs and measurable goals for each minimum measure in the permit application. The evaluation and assessment of those chosen BMPs and measurable goals must be included in periodic reports to the NPDES permitting authority. See Fact Sheet 2.9 for more information on permitting and reporting.

Small Construction Activity

- The specific requirements for stormwater controls on small construction activity will be defined by the NPDES permitting authority on a State-by-State basis.
- Many NPDES permitting authorities have adapted their existing Phase I general permits for large construction activity to also include small construction activity. Where this has occurred, a

stormwater pollution prevention plan is required for small construction activity. See Fact Sheet 3.0 for more information on potential program requirements and appropriate BMPs for small construction activity.

What Is the Phase II Program Approach?

The Phase II program, based on the use of federally enforceable NPDES permits:

- Encourages the use of general permits;
- Provides flexibility for regulated operators to determine the most appropriate stormwater controls;
- Allows for the recognition and inclusion of existing NPDES and non-NPDES stormwater programs in Phase II permits;
- Includes public education and participation efforts as primary elements of the small MS4 program;
- Attempts to facilitate and promote watershed planning and to implement the stormwater program on a watershed basis; and
- Works toward a unified and comprehensive NPDES stormwater program with Phase I of the program.

How Does the Phase II Final Rule Address the Phase I Industrial “No Exposure” Provision?

In addition to establishing a deadline for ISTEAs and designating two new classes of dischargers, the Phase II Final Rule revises the “no exposure” provision originally included in the 1990 regulations for Phase I of the NPDES stormwater program. The provision was remanded to EPA for further rulemaking and, subsequently, included in its revised form in the Phase II rule.

Under the Phase II Final Rule, a conditional no exposure exclusion is available to operators of *all* categories of Phase I regulated industrial activity (except category (x) construction activity) who can certify that all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. To obtain the no exposure exclusion, written certification must be submitted to the NPDES permitting authority. The final rule includes a *No Exposure Certification* form for use only by operators of industrial activity in areas where EPA is the NPDES permitting authority. See Fact Sheet 4.0 for more information on the conditional no exposure exclusion for industrial activity.

What Resources are Available for Phase II Communities?



EPA is committed to providing tools to facilitate implementation of the final Phase II stormwater program in an effective and cost-efficient manner. The stormwater Web site includes fact sheets, case studies, guidance documents, the National Menu of BMPs, and the Measurable Goals Guidance, as well as other compliance assistance information. This information can be accessed at EPA's stormwater Web site at www.epa.gov/npdes/stormwater.


What Is the Schedule for the Phase II Rule?

- The Phase II Final Rule was published in the *Federal Register* on December 8, 1999 (64 *FR* 68722).
- The Conditional No Exposure Exclusion option is available in States where EPA is the permitting authority (see <http://www.epa.gov/npdes/authorization>).
- The NPDES permitting authorities were required to issue general permits for Phase II-designated small MS4s and small construction activity by December 9, 2002.
- Operators of Phase II “automatically” designated regulated small MS4s and small construction activity were required to obtain permit coverage within 90 days of permit issuance.
- The NPDES permitting authority may phase-in coverage for small MS4s serving jurisdictions with a population under 10,000 on a schedule consistent with a State watershed permitting approach.
- Operators of regulated small MS4s must fully implement their stormwater management programs by the end of the first permit term, typically a 5-year period.


For Additional Information

Contacts

-  U.S. EPA Office of Wastewater Management
<http://www.epa.gov/npdes/stormwater>
Phone: 202-564-9545
-  Your NPDES Permitting Authority. Most States and Territories are authorized to administer the NPDES Program, except the following, for which EPA is the permitting authority:

Alaska	Guam
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American Samoa	
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Reference Documents

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 - Measurable Goals Guidance for Phase II Small MS4s
 - Stormwater Case Studies
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SMALL MS4 PROGRAM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE



Stormwater Phase II Final Rule

Small MS4 Stormwater Program Overview

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Industrial “No Exposure”

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s requires operators of “medium” and “large” MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a stormwater management program as a means to control polluted discharges from these MS4s. The Stormwater Phase II Rule extends coverage of the NPDES stormwater program to certain “small” MS4s but takes a slightly different approach to how the stormwater management program is developed and implemented.

What Is a Phase II Small MS4?

A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all small MS4s located in “urbanized areas” (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority), and on a case-by-case basis those small MS4s located outside of UAs that the NPDES permitting authority designates. For more information on Phase II small MS4 coverage, see Fact Sheets 2.1 and 2.2.

What Are the Phase II Small MS4 Program Requirements?

Operators of regulated small MS4s are required to design their programs to:

- Reduce the discharge of pollutants to the “maximum extent practicable” (MEP);
- Protect water quality; and
- Satisfy the appropriate water quality requirements of the Clean Water Act.

Implementation of the MEP standard will typically require the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures.

The Phase II Rule defines a small MS4 stormwater management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

The six MS4 program elements, termed “minimum control measures,” are outlined below. For more information on each of these required control measures, see Fact Sheets 2.3 – 2.8.

- 1 *Public Education and Outreach***
Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.
- 2 *Public Participation/Involvement***
Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.
- 3 *Illicit Discharge Detection and Elimination***
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
- 4 *Construction Site Runoff Control***
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary stormwater detention ponds).
- 5 *Post-Construction Runoff Control***
Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- 6 *Pollution Prevention/Good Housekeeping***
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

What Information Must the NPDES Permit Application Include?

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA issued a Menu of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own list. For more information on application requirements, see Fact Sheet 2.9.

What Are the Implementation Options?

The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's stormwater program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

What Kind of Program Evaluation/Assessment Is Required?

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the “maximum extent practicable” and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program’s measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program. For more information on program evaluation/assessment, see Fact Sheet 2.9.

For Additional Information

Contacts

- ☞ U.S. EPA Office of Wastewater Management
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Stormwater Phase II Final Rule

Who's Covered? Designation and Waivers of Regulated Small MS4s

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4.0 – Conditional No Exposure
Exclusion for Industrial Activity

Who Is Affected by the Phase II Small MS4 Program?

The Stormwater Phase II Final Rule applies to operators of *regulated small* municipal separate storm sewer systems (MS4s), which are designated based on the criteria discussed in this fact sheet. In this fact sheet, the definition of an MS4 and the distinction between small, medium, and large MS4s is reviewed. Conditions under which a small MS4 may be designated as a *regulated small* MS4, as well as the conditions for a waiver from the Phase II program requirements, are outlined. This fact sheet also attempts to clarify possible implementation issues related to determining one's status as an operator of a regulated small MS4.

What Is a Municipal Separate Storm Sewer System (MS4)?

What constitutes an MS4 is often misinterpreted and misunderstood. The term MS4 does not solely refer to municipally-owned storm sewer systems, but rather is a term of art with a much broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. An MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, gutters, and ditches. The regulatory definition of an MS4 is provided below.

According to 40 CFR 122.26(b)(8), "*municipal separate storm sewer* means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (ii) Designed or used for collecting or conveying stormwater;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

What Is a Small, Medium, or Large MS4?

- ❑ EPA’s NPDES (National Pollutant Discharge Elimination System) stormwater permitting program labels MS4s as either “small,” “medium,” or “large” for the purposes of regulation.
- ❑ A **small MS4** is any MS4 that is not already covered by the Phase I stormwater program. Small MS4s include Federally-owned systems, such as military bases.
- ❑ The Phase I stormwater program covers *medium* and *large* MS4s. Phase I MS4s were automatically designated nationwide as **medium MS4s** if they were located in an incorporated place or county with a population between 100,000 - 249,999 or as **large MS4s** if located in an incorporated place or county with a population of 250,000 or greater. Many MS4s in areas below 100,000 in population, however, have been individually brought into the Phase I program by NPDES permitting authorities. Such already regulated MS4s do not have to develop a Phase II program.

Are All Small MS4s Covered by the Phase II Final Rule?

No. The universe of small MS4s is quite large since it includes every MS4 except for the approximately 900 medium and large MS4s already regulated under the Phase I stormwater program. Only a select sub-set of small MS4s, referred to as **regulated small MS4s**, is covered by the Phase II Final Rule, either through automatic nationwide designation or designation on a case-by-case basis by the NPDES permitting authority.

How Is A Small MS4 Designated as a Regulated Small MS4?

A small MS4 can be designated by the permitting authority as a **regulated** small MS4 in one of three ways:

① Automatic Nationwide Designation

The Phase II Final Rule requires nationwide coverage of all operators of small MS4s that are located within the boundaries of a Bureau of the Census-defined “urbanized area” (UA) based on the latest decennial Census. Once a small MS4 is designated into the program based on the UA boundaries, it cannot be removed from the program on that basis that a subsequent decennial UA calculation shows that the small MS4 is no longer within the UA boundaries. However, the designated small MS4 remains eligible for a waiver if it meets the criteria.

❑ Urbanized Areas

An **urbanized area (UA)** is a densely settled core of census tracts and/or census blocks that have population of at least 50,000, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas.

More information about urbanized areas maps is available at: <http://www.epa.gov/npdes/stormwater/urbanmaps>

Additionally, information about urbanized areas is available directly from the U.S. Bureau of the Census at: <http://www.census.gov/geo/www/ua/2010urbanruralclass.html>

② Potential Designation by the NPDES Permitting Authority – Required Evaluation

An operator of small MS4 located outside of a UA have been designated as a regulated small MS4 if the NPDES permitting authority determined that its discharges cause, or have the potential to cause, an adverse impact on water quality. The Phase II Final Rule required the NPDES permitting authority to develop a set of designation criteria and apply them, *at a minimum*, to all small MS4s located outside of a UA serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000 people/square mile.

❑ Designation Criteria

EPA recommended that the NPDES permitting authority use a balanced consideration of the following designation criteria on a watershed or other local basis:

- ✓ Discharge to sensitive waters;
- ✓ High population density;
- ✓ High growth or growth potential;
- ✓ Contiguity to a UA;
- ✓ Significant contributor of pollutants to waters of the United States; and
- ✓ Ineffective protection of water quality concerns by other programs.

③ Potential Designation by the NPDES Permitting Authority – Physically Interconnected

Under the final rule, the NPDES permitting authority was required to designate any small MS4 located outside of a UA that contributes substantially to the pollutant loadings of a *physically interconnected* MS4 regulated by the NPDES stormwater program. The final rule did not set a deadline for designation of small MS4s meeting this criterion.

Physically interconnected means that one MS4 is connected to a second MS4 in such a way that it allows for *direct* discharges into the second system.

State and EPA permitting authorities can be contacted to obtain a full list of regulated MS4s, including both the automatically designated MS4s and those that were additionally designated.

Are Waivers from the Phase II Permit/Program Requirements Possible?

Yes, two waiver options are available to operators of automatically designated small MS4s if discharges do not cause, or have the potential to cause, water quality impairment.

The first applies where:

- (1) the jurisdiction served by the system is less than 1,000 people within the urbanized area;
- (2) the system is not contributing substantially to the pollutant loadings of a physically interconnected regulated MS4; and
- (3) if the small MS4 discharges any pollutants identified as a cause of impairment of any water body to which it discharges, stormwater controls are not needed based on wasteload allocations that are part of an EPA approved or established “total maximum daily load” (TMDL) that addresses the pollutant(s) of concern.

TMDLs are water quality assessments that determine the source or sources of pollutants of concern for a particular waterbody, consider the maximum amount of pollutants the waterbody can assimilate, and then allocate to each source a set level of pollutants that it is allowed to discharge (i.e., a “wasteload allocation”). Small MS4s that are not given a wasteload allocation would meet the third criterion above.

The second applies where:

- (1) the jurisdiction served by the system is less than 10,000 people;
- (2) an evaluation of all waters of the U.S. that receive a discharge from the system shows that stormwater controls are not needed based on wasteload allocations that are part of an EPA approved or established TMDL that addresses the pollutant(s) of concern or an equivalent analysis; and
- (3) it is determined that future discharges from the small MS4 do not have the potential to result in exceedances of water quality standards.

The NPDES permitting authority is required to periodically review any waivers granted to MS4 operators to determine whether any information required for granting the waiver has changed. Minimally, such a review needs to be conducted once every five years.

Can More than One MS4 in the Same Political Jurisdiction Be Automatically Designated?

Yes. Since the final rule provides automatic coverage of all small MS4s within a UA, the result would likely be coverage of several governments and agencies with multiple, perhaps overlapping, jurisdictions. For example, a city that is located within a UA and operates its own small MS4 could be designated alongside the State’s department of transportation (DOT) and the county’s DOT if the State and county operate roads that are within the borders of the city. All three entities would be responsible for developing a stormwater management program for the portion of their respective MS4s within the city limits. In such a case, the permittees are strongly encouraged to work together to form a unified stormwater management program.

Who Is Responsible if the Small MS4 Operator Lacks the Necessary Legal Authority?

Some regulated small MS4s may lack the necessary legal authority to implement one or more of the required minimum control measures that comprise the Phase II stormwater management program. For example, a local government that is a small MS4 operator may be in a State that does not have an enabling statute that allows local regulatory control of construction site runoff into the sewer system. Another example is a State DOT that may not have the legal authority to require and enforce controls on illicit discharges into its system. In these situations the small MS4 is encouraged to work with the neighboring regulated small MS4s. As co-permittees, they could form a shared stormwater management program in which each permittee is responsible for activities that are within their individual legal authorities and abilities.

For Additional Information

Contacts

- ☞ U.S. EPA Office of Wastewater Management
Phone: 202-564-9545
<http://www.epa.gov/npdes/stormwater>

- ☞ Your NPDES Permitting Authority. Most States and Territories are authorized to administer the NPDES Program, except the following, for which EPA is the permitting authority:

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 - Measurable Goals Guidance for Phase II Small MS4s
 - Stormwater Case Studies

- ☞ Census Urbanized Area Information
<http://www.epa.gov/npdes/stormwater/urbanmaps>
 - General Information:
<http://www.census.gov/geo/www/ua/uacubndy.html>



Stormwater Phase II Final Rule

Urbanized Areas: Definition and Description

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4.0 – Conditional No Exposure
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As discussed in Fact Sheet 2.1, *Who's Covered? Designation and Waivers of Regulated Small MS4s*, the Phase II Final Rule covers all small municipal separate storm sewer systems (MS4s) located within an “urbanized area” (UA). UAs constitute the largest and most dense areas of settlement. UA calculations delineate boundaries around these dense areas of settlement and, in doing so, identify the areas of concentrated development. UA designations are used for several purposes in both the public and private sectors. For example, the Federal Government has used UAs to calculate allocations for transportation funding, and some planning agencies and development firms use UA boundaries to help ascertain current, and predict future, growth areas.

What Is an Urbanized Area (UA)?

The Bureau of the Census determines UAs by applying a detailed set of published UA criteria (see 55 *FR* 42592, October 22, 1990) to the latest decennial census data. Although the full UA definition is complex, the Bureau of the Census' general definition of a UA, based on population and population density, is provided below.

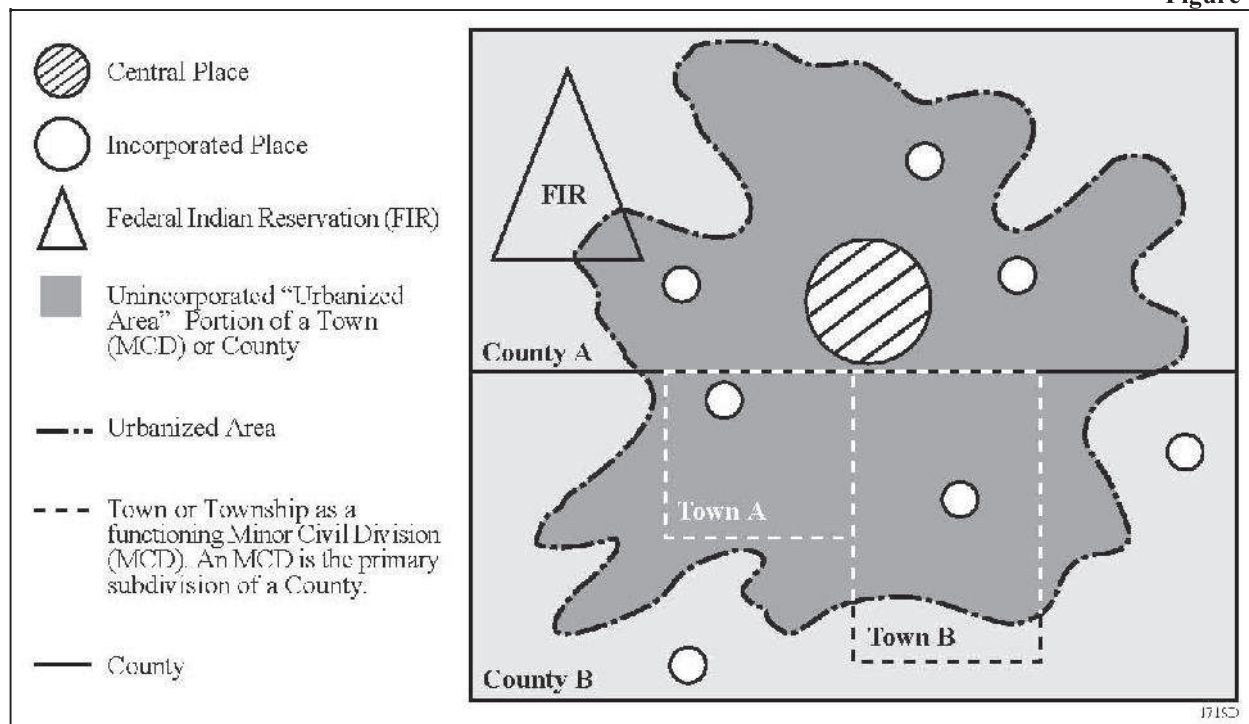
An *urbanized area* (UA) is a densely settled core of census tracts and/or census blocks that have population of at least 50,000, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas.

The basic unit for delineating the UA boundary is the census block. Census blocks are based on visible physical boundaries, such as the city block, when possible, or on invisible political boundaries, when not. An urbanized area can comprise places, counties, Federal Indian Reservations, and minor civil divisions (MCDs - towns and townships).

How Can Status as a Regulated Small MS4 Be Determined?

The drawing below (see Figure 1) is a simplified UA illustration that demonstrates the concept of UAs in relation to the Phase II Final Rule. The “urbanized area” includes within its boundaries incorporated places, a portion of a Federal Indian reservation, an entire MCD, a portion of another MCD, and portions of two counties. Any and all operators of small MS4s located within the boundaries of the UA are covered under the Phase II Final Rule, regardless of political boundaries. Operators of small MS4s located outside of the UA are subject to potential designation into the Phase II MS4 program by the NPDES permitting authority.

Figure 1



Operators of small MS4s can determine if they are located within a UA, and therefore covered by the Phase II storm water program, by contacting one or more of the institutions listed below for more detailed information on the location of the UA boundary. EPA and the States have compiled a list of municipalities to be covered under the Phase II Rule, but the urbanized area boundaries are important in some cases for determining the specific area within a municipality’s boundaries that is covered (e.g., a county included in Phase II might only be required to implement their program for the urbanized area of the county).

The State or NPDES Permitting Authority (may be the State or the U.S. EPA Region)

Storm Water Coordinators: The NPDES permitting authority may be the State or the U.S. EPA Region. The Storm Water Coordinators for each U.S. EPA Region are listed in the *For Additional Information* section in Fact Sheet 2.9. These regional contacts can assist with UA information and provide the names of State storm water contacts. Regional and State contact information can also be obtained from OWM.

State Data Centers: Each State’s Data Center receives listings of all entities that are located in UAs, as well as detailed maps and electronic files of UA boundaries. The Bureau of the Census web site includes a list of contact names and phone numbers for the data in each State at www.census.gov/sdc/www.

State Planning/Economic/Transportation Agencies:

These agencies typically use UAs to assess current development and forecast future growth trends and, therefore, should have detailed UA information readily available to help determine the UA boundaries in any given area.

County or Regional Planning Commissions/Boards

As with State agencies, these entities are likely to have detailed UA data and maps to help determine UA boundaries.

U.S. EPA

NPDES Website: Information about urbanized areas maps is available at EPA’s website: <http://www.epa.gov/npdes/stormwater/urbanmaps>

Enviromapper Website: EPA modified a Web-based geographic program called *Enviromapper*. This allows MS4 operators to enter a location and see a detailed map of the UA boundary (called “city boundaries”). *Enviromapper* can be accessed at <http://www.epa.gov/emefdata/em4ef.home>

❑ The Bureau of the Census

The site provides information on downloading UA maps and other electronic files for use with computerized mapping systems.

<http://www.census.gov/geo/www/ua/2010urbanruralclass.html>

How Will Subsequent Censuses Affect the Determination of Status as a Regulated Small MS4?

Any additional automatic designations of small MS4s based on subsequent census years is governed by the Bureau of the Census' definition of a UA in effect for that year and the UA boundaries determined as a result of the definition. Once a small MS4 is designated into the program based on the UA boundaries, it cannot be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 remains regulated unless, or until, it meets the criteria for a waiver (see Fact Sheet 2.1 for more information on the regulated small MS4 waiver option).

For Additional Information

Contacts

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<http://www.census.gov/geo/www/ua/uaucbndy.html>

MINIMUM CONTROL MEASURES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE

Public Education and Outreach Minimum Control Measure



[Photo](#): Rawpixel Ltd.

This fact sheet profiles the Public Education and Outreach minimum control measure, one of six measures an operator of a Phase II-regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) stormwater permit. This fact sheet outlines the Phase II Final Rule requirements modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy them. It is important to keep in mind that the regulated small MS4 operator typically has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements in its NPDES permit.

Public Education and Outreach Minimum Control Measure

Why Is Public Education and Outreach Necessary?

An informed and knowledgeable community is crucial to the success of a stormwater management program since it helps to ensure the following:

- **Greater support** for the program as the public gains a greater understanding of the reasons why it is necessary and important. Public support is particularly beneficial when operators of small MS4s attempt to institute new funding initiatives for the program or seek volunteers to help implement the program.
- **Greater compliance** with the program as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 needs to:

- Implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of stormwater discharges on local waterbodies and the steps that can be taken to reduce stormwater pollution.
- Determine the appropriate best management practices (BMPs) complying with permit conditions for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

Three main action areas are important for successful implementation of a public education and outreach program:

1. Forming Partnerships

Operators of regulated small MS4s are encouraged to utilize partnerships with other governmental entities to fulfill this minimum control measure's requirements. It is generally more cost-effective to use an existing program, or to develop a new regional or state-wide education program, than to have numerous operators developing their own local programs. Operators also are encouraged to seek assistance from nongovernmental organizations (e.g., environmental, civic, and industrial organizations), since many already have educational materials and perform outreach activities.

2. Using Educational Materials and Strategies

Operators of regulated small MS4s may use stormwater educational information provided by their State, Tribe, EPA Region, or environmental, public interest, or trade organizations instead of developing their own materials. Operators should strive to make their materials

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and activities relevant to local situations and issues, and incorporate a variety of strategies to ensure maximum coverage. Some examples include:

- **Brochures or fact sheets** for general public and specific audiences.
- **Recreational guides** to educate groups such as golfers, hikers, paddlers, climbers, fishermen, and campers.
- **Alternative information sources**, such as web sites, bumper stickers, refrigerator magnets, posters for bus and subway stops, and restaurant placemats.
- **A library of educational materials** for community and school groups.
- **Volunteer citizen educators** to staff a **public education task force**.
- **Event participation** with educational displays at home shows and community festivals.
- **Educational programs** for school-age children.
- **Storm drain stenciling** of storm drains with messages such as “Do Not Dump—Drains Directly to Lake.”
- **Stormwater hotlines** for information and for citizen reporting of polluters.
- **Economic incentives** to citizens and businesses (e.g., rebates to homeowners purchasing mulching lawnmowers or biodegradable lawn products).
- **Tributary signage** to increase public awareness of local water resources.

3. Reaching Diverse Audiences

The public education program should use a mix of appropriate local strategies to address the viewpoints and concerns of a variety of audiences and communities, including minority and disadvantaged communities, as well as children. Printing posters and brochures in more than one language or posting large warning signs (e.g., cautioning against fishing or swimming) near storm sewer outfalls are methods that can be used to reach audiences less likely to read standard materials. Directing materials or outreach programs toward specific groups of commercial, industrial, and institutional entities likely to have significant stormwater impacts is also recommended. For example, information could be provided to restaurants on the effects of grease clogging storm drains and to auto garages on the effects of dumping used oil into storm drains.

What Are Appropriate Measurable Goals?

M measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The MS4 permit will specify any actions and deadlines that permittees must meet for permit compliance. The permit may also direct require permittees to develop measurable goals that guide implementation of MS4 chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an

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integrated approach that fully addresses the requirements and intent of the minimum control measure. Finally, they should allow the MS4 to make improvements to its program over each 5-year permit term by providing data on program successes and shortfalls.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any permit requirements to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 could develop a stormwater public education campaign for radio and television. The goal of the campaign might be to increase the number of dog owners who pick up after their pets. To measure the program's progress towards this goal, the program manager might perform a stormwater public awareness survey at the beginning, during, and at the end of the permit term to gauge any change in pet owner behavior over time. As another example, an MS4 might want to encourage "do-it-yourselfers" to recycle used motor oil by establishing and advertising a municipal drop-off center. The MS4 could measure progress toward this goal by tracking the amount of motor oil collected and correlating those data to the timing of public service announcements and other advertisements to see if their message is being received.

For Additional Information

Contacts

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Your NPDES Permitting Authority

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- Guam
- District of Columbia
- Johnston Atoll
- Idaho (until 7/1/2021, which is the date when Idaho becomes authorized to implement the Stormwater NPDES program)
- Midway and Wake Islands
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- Northern Mariana Islands
- New Hampshire
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Reference Documents

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 - [National Menu of Best Management Practices for Stormwater Phase II](#)
 - [Measurable Goals Guidance for Phase II Small MS4s](#)
- [Getting In Step](#)

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Public Participation/Involvement Minimum Control Measure



This fact sheet profiles the Public Participation/Involvement minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator typically has a great deal of flexibility in determining how to satisfy the minimum control measure requirements in its NPDES permit.

Public Participation/Involvement Minimum Control Measure

Why Is Public Participation and Involvement Necessary?

The public can provide valuable input and assistance to a regulated small MS4's municipal stormwater management program and, therefore, EPA suggests that the public be given opportunities to play an active role in both the development and implementation of the program. An active and involved community is crucial to the success of a stormwater management program because it allows for:

- **Broader public support** since citizens who participate in the development and decision making process are partially responsible for the program and, therefore, may be less likely to challenge the program and more likely to take an active role in its implementation.
- **Shorter implementation schedules** due to fewer obstacles in the form of public and legal challenges and increased sources in the form of citizen volunteers.
- **A broader base of expertise** and **economic benefits** since the community can be available, and free, intellectual resource.
- **A conduit to other programs** as citizens involved in the stormwater program development process provide important cross-connections and relationships with other community and government programs. This benefit is particularly valuable when trying to implement a stormwater program on a watershed basis, as encouraged by EPA.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 must:

- Comply with applicable State, Tribal, and local public notice requirements.
- Determine the appropriate best management practices (BMPs) complying with permit conditions for this minimum control measure. Possible implementation approaches, BMPs (i.e., the program actions and activities), and measurable goals are described below.

What Are Some Guidelines for Developing and Implementing This Measure?

Operators of regulated small MS4s should include the public in developing, implementing, updating, and reviewing their stormwater management programs. The public participation program should make every effort to reach out and engage all economic and ethnic groups. EPA recognizes that there are challenges associated with public involvement. Nevertheless, EPA strongly believes that these challenges can be addressed through an aggressive and inclusive program. Challenges and example practices that can help ensure successful participation are discussed below.

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Implementation Challenges

The best way to handle common notification and recruitment challenges is to know the audience and think creatively about how to gain its attention and interest. Traditional methods of soliciting public input are not always successful in generating interest, and subsequent involvement, in all sectors of the community. For example, municipalities often rely solely on advertising in local newspapers to announce public meetings and other opportunities for public involvement. Since there may be large sectors of the population who do not read the local press, the audience reached may be limited. Therefore, alternative advertising methods should be used whenever possible, including website postings, radio or television spots, postings at bus or subway stops, announcements in neighborhood newsletters, announcements at civic organization meetings, distribution of flyers, mass mailings, door-to-door visits, telephone notifications, and multilingual announcements. These efforts, of course, are tied closely to the efforts for the public education and outreach minimum control measure (see Fact Sheet 2.3).

In addition, advertising and soliciting help should be targeted at specific population sectors, including ethnic, minority, and low-income communities; academia and educational institutions; neighborhood and community groups; outdoor recreation groups; and business and industry. The goal is to involve a diverse cross-section of people who can offer a multitude of concerns, ideas, and connections during the program development process.

Possible BMPs

There are a variety of practices that could be incorporated into a public participation and involvement program, such as:

- **Public meetings/citizen panels** allow citizens to discuss various viewpoints and provide input concerning appropriate stormwater management policies and BMPs.
- **Volunteer water quality monitoring** gives citizens firsthand knowledge of the quality of local water bodies and provides a cost-effective means of collecting water quality data.
- **Volunteer educators/speakers** who can conduct workshops, encourage public participation, and staff special events.
- **Storm drain stenciling** is an important and simple activity that concerned citizens, especially students, can do.
- **Community clean-ups** along local waterways, beaches, and around storm drains.
- **Citizen watch groups** can aid local enforcement authorities in the identification of polluters.
- **“Adopt A Storm Drain” programs** encourage individuals or groups to keep storm drains free of debris and to monitor what is entering local waterways through storm drains.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The MS4 permit will specify any actions and deadlines that permittees must meet for permit compliance. The permit may also

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direct require permittees to develop measurable goals that guide implementation of MS4 chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, greatly depend on the needs and characteristics of the operator and the area served by the small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any permit requirements to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 could conclude as part of its Illicit Discharge Detection and Elimination program that a certain section of town has a high incidence of used motor oil dumping. The watershed has numerous automotive businesses including small repair shops, large auto dealerships, gas stations, and body shops. In addition, there are several large apartment complexes with areas that could be used as “do-it-yourself” oil change areas. The MS4 organizes a public meeting in the watershed to not only educate residents about stormwater issues and permit requirements, but also to ask for input regarding possible dumping areas and to determine if the community needs an oil recycling facility or some other way to safely dispose of used motor oil. In this way, the MS4 might better understand who the target audience is for illegal dumping control while implementing a valuable service for the watershed community.

For Additional Information

Contacts

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Illicit Discharge Detection and Elimination Minimum Control Measure



[Photo](#) by U.S. EPA

This fact sheet profiles the Illicit Discharge Detection and Elimination minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator typically has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements in its NPDES permit.

What Is an “Illicit Discharge”?

Federal regulations define an illicit discharge as “...any discharge to an MS4 that is not composed entirely of stormwater...” with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges (see Table 1) are considered “illicit” because MS4s are not designed to accept, process, or discharge such non-stormwater wastes.

Why Are Illicit Discharge Detection and Elimination Efforts Necessary?

Discharges from MS4s often include wastes and wastewater from non-stormwater sources. A study conducted in 1987 in Sacramento, California, found that almost one-half of the water discharged from a local MS4 was not directly attributable to precipitation runoff. A significant portion of these dry weather flows were from illicit and/or inappropriate discharges and connections to the MS4.

Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the MS4 from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

What Is Required?

Recognizing the adverse effects illicit discharges can have on receiving waters, the Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement and enforce an illicit discharge detection and elimination program. This program must include the following:

- A storm sewer system map, showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls.
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal, or local law) on non-stormwater discharges into the MS4, and appropriate enforcement procedures and actions.
- A plan to detect and address non-stormwater discharges, including illegal dumping, into the MS4.

Table 1. Pollutants Associated with Illicit Discharges

TSS (Total Suspended Solids)
VSS (Volatile Suspended Solids)
TOC (Total Organic Carbon)
COD (Chemical Oxygen Demand)
NO ₃ /NO ₂ (Nitrate + Nitrite)
TKN (Total Kjeldahl Nitrogen)
Phosphorus as PO ₄
Cu (Total Copper)
Pb (Total Lead)
Zn (Total Zinc)

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- The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste.
- The determination of appropriate best management practices (BMPs) to meet permit requirements for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

Does This Measure Need to Address All Illicit Discharges?

No. The illicit discharge detection and elimination program does not need to address the following categories of non-stormwater discharges or flows unless the operator of the regulated small MS4 identifies them as significant contributors of pollutants to its MS4:

- Water line flushing.
- Landscape irrigation.
- Diverted stream flows.
- Rising ground waters.
- Uncontaminated ground water infiltration.
- Uncontaminated pumped ground water.
- Discharges from potable water sources.
- Foundation drains.
- Air conditioning condensation.
- Irrigation water.
- Springs.
- Water from crawl space pumps.
- Footing drains.
- Lawn watering.
- Individual residential car washing.
- Flows from riparian habitats and wetlands.
- Dechlorinated swimming pool discharges.
- Street wash water.

What Are Some Guidelines for Developing and Implementing This Measure?

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated small MS4 operators gain a thorough awareness of their systems. This awareness allows them to determine the types and sources of illicit discharges entering their system; and establish the legal, technical, and educational means needed to eliminate these discharges. Permittees could meet these objectives in a variety of ways depending on their individual needs and abilities, but some general guidance for each requirement is provided below.

The Map

The storm sewer system map is meant to demonstrate a basic awareness of the intake and discharge areas of the system. It is needed to help determine the extent of discharged dry weather flows, the possible sources of the dry weather flows, and the particular waterbodies these flows may be affecting. An existing map, such as a topographical map, on which the location of major pipes and outfalls can be clearly presented demonstrates such awareness.

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EPA recommends collecting all existing information on outfall locations (e.g., review city records, drainage maps, storm drain maps), and then conducting field surveys to verify locations. It probably will be necessary to walk (i.e., wade through small receiving waters or use a boat for larger waters) the streambanks and shorelines for visual observation. More than one trip may be needed to locate all outfalls.

Legal Prohibition and Enforcement

EPA recognizes that some permittees may have limited authority under State, Tribal or local law to establish and enforce an ordinance or other regulatory mechanism prohibiting illicit discharges. In such a case, the permittee is encouraged to obtain the necessary authority, if possible.

The Plan

The plan to detect and address illicit discharges is the central component of this minimum control measure. The plan is dependent upon several factors, including the permittee's available resources, size of staff, and degree and character of its illicit discharges and NPDES permit requirements. As guidance only, the four steps of a recommended plan are outlined below:

Locate Problem Areas

EPA recommends that priority areas be identified for detailed screening of the system based on the likelihood of illicit connections (e.g., areas with older sanitary sewer lines). Methods that can locate problem areas include: visual screening; water sampling from manholes and outfalls during dry weather; the use of infrared and thermal photography, cross-training field staff to detect illicit discharges, and public complaints.

Find the Source

Once a problem area or discharge is found, additional efforts usually are necessary to determine the source of the problem. Methods that can find the source of the illicit discharge include: dye-testing buildings in problem areas; dye- or smoke-testing buildings at the time of sale; tracing the discharge upstream in the storm sewer; employing a certification program that shows that buildings have been checked for illicit connections; implementing an inspection program of existing septic systems; and using video to inspect the storm sewers.

Remove/Correct Illicit Connections

Once the source is identified, the offending discharger should be notified and directed to correct the problem. Education efforts and working with the discharger can be effective in resolving the problem before taking legal action.

Document Actions Taken

As a final step, all actions taken under the plan should be documented. This illustrates that progress is being made to eliminate illicit connections and discharges. Documented actions should be included in annual reports and include information such as: the number of outfalls

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screened; any complaints received and corrected; the number of discharges and quantities of flow eliminated; and the number of dye or smoke tests conducted.

Educational Outreach

The Center for Watershed Protection and Robert Pitt (2004) researched the most cost-effective and efficient techniques that can be employed to identify and correct inappropriate discharges. Data from Montgomery County, Maryland, was analyzed and it was determined that staff identify and correct about six inappropriate discharges per year as a result of regular screening. By contrast, over 185 inappropriate discharges are corrected each year in Montgomery County as a direct result of citizen complaints and calls to a storm water compliant hotline. Public education and labeling of outfalls and other storm drain infrastructure is an important element of establishing a successful citizen hotline. Outreach to public employees, businesses, property owners, the general public, and elected officials regarding ways to detect and eliminate illicit discharges is an integral part of this minimum measure.

Suggested educational outreach efforts include:

- Developing **informative brochures and guidance** for specific audiences (e.g., carpet cleaning businesses) and school curricula.
- Designing a program to **publicize and facilitate public reporting** of illicit discharges.
- **Coordinating volunteers** for locating, and visually inspecting, outfalls or to stencil storm drains.
- Initiating **recycling programs** for commonly dumped wastes, such as motor oil, antifreeze, and pesticides.

What Are Appropriate Measurable Goals?

The MS4 permit will specify any actions and deadlines that permittees must meet for permit compliance. The permit may also require permittees to develop measurable goals that guide implementation of your chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any requirement to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 could establish a measurable goal of responding to all complaints received by the citizen complaint hotline within 24 hours to minimize water quality impacts or recurrent dumping. A complaint tracking system could be used to log response and enforcement activity.

Illicit Discharge Detection and Elimination Minimum Control Measure

The educational outreach measurable goals for this minimum control measure could be combined with the measurable goals for the Public Education and Outreach minimum control measure (see Fact Sheet 2.3).

For Additional Information

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 - [Measurable Goals Guidance for Phase II Small MS4s](#)
- [Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments](#)
- Center for Watershed Protection and R. Pitt. (2004). [Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments](#).
- U.S. EPA Office of Water. (1993). [Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems: A User's Guide](#). EPA/600/R-92/238.

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Construction Site Runoff Control Minimum Control Measure



[Photo](#) by U.S. EPA

This fact sheet profiles the Construction Site Runoff Control minimum control measure, one of six measures that the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator typically has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements in its NPDES permits.

Construction Site Runoff Control Minimum Control Measure

Why Is the Control of Construction Site Runoff Necessary?

Polluted stormwater runoff from construction sites often flows to MS4s and ultimately is discharged into local rivers and streams. Of the pollutants listed in Table 1, sediment is usually the main pollutant of concern. According to the 2000 National Water Quality Inventory, States and Tribes report that sedimentation is one of the most widespread pollutants affecting assessed rivers and streams, second only to pathogens (bacteria). Sedimentation impairs 84,503 river and stream miles (12% of the assessed river and stream miles) and 31% of the impaired river and stream miles). Sources of sedimentation include agriculture, urban runoff, construction, and forestry. Sediment runoff rates from construction sites, however, are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally during several decades. The resulting siltation, and the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our nation's waters. For example, excess sediment can quickly fill rivers and lakes, requiring dredging and destroying aquatic habitats.

Table 1. Pollutants Commonly Discharged from Construction Sites

Sediment
Solid and sanitary wastes
Phosphorus (fertilizer)
Nitrogen (fertilizer)
Pesticides
Oil and grease
Concrete truck washout
Construction chemicals
Construction debris

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in stormwater runoff to their MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. The small MS4 operator is required to:

- Have an ordinance or other regulatory mechanism requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites.
- Have procedures for site plan review of construction plans that consider potential water quality impacts.
- Have procedures for site inspection and enforcement of control measures.
- Have sanctions to ensure compliance (established in the ordinance or other regulatory mechanism).
- Establish procedures for the receipt and consideration of information submitted by the public.
- Determine the appropriate best management practices (BMPs) complying with permit conditions for this minimum control measure. Suggested BMPs (i.e., the program actions/activities) and measurable goals are presented below.

Construction Site Runoff Control Minimum Control Measure

What Are Some Guidelines for Developing and Implementing This Measure?

Further explanation and guidance for each component of a regulated small MS4's construction program is provided below.

Regulatory Mechanism

Through the development of an ordinance or other regulatory mechanism, the small MS4 operator must establish a construction program that controls polluted runoff from construction sites with a land disturbance of greater than or equal to one acre. Because there may be limitations on regulatory legal authority, the small MS4 operator is required to satisfy this minimum control measure only to the maximum extent practicable and allowable under State, Tribal, or local law.

Site Plan Review

The small MS4 operator must include in its construction program requirements for the implementation of appropriate BMPs on construction sites to control erosion and sediment and other waste at the site. To determine if a construction site is in compliance with such provisions, the small MS4 operator should review the site plans submitted by the construction site operator before ground is broken.

Site plan review aids in compliance and enforcement efforts since it alerts the small MS4 operator early in the process to the planned use or non-use of proper BMPs and provides a way to track new construction activities. The tracking of sites is useful not only for the small MS4 operator's recordkeeping and reporting purposes, which are required under their NPDES stormwater permit (see Fact Sheet 2.9), but also for members of the public interested in ensuring that the sites are in compliance.

Inspections and Penalties

Once construction commences, BMPs should be in place and the small MS4 operator's enforcement activities should begin. To ensure that the BMPs are properly installed, the small MS4 operator is required to develop procedures for site inspection and enforcement of control measures to deter infractions. Procedures could include steps to identify priority sites for inspection and enforcement based on the nature and extent of the construction activity, topography, and the characteristics of soils and receiving water quality. Inspections give the MS4 operator an opportunity to provide additional guidance and education, issue warnings, or assess penalties. In early 2002, EPA's Office of Compliance established a national workgroup to address issues related to the construction industry. The workgroup has developed a construction industry compliance assistance Web site as a tool for builders and developers (www.cicacenter.org). Inspectors can use the Web site to find plain language explanations of the major environmental laws affecting the construction industry as well as guidance that can be distributed developers and construction site operators.

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To conserve staff resources, one possible option for small MS4 operators is to have inspections performed by the same inspector that visits the sites to check compliance with health and safety building codes.

Information Submitted by the Public

A final requirement of the small MS4 program for construction activity is the development of procedures for the receipt and consideration of public inquiries, concerns, and information submitted regarding local construction activities. This provision is intended to further reinforce the public participation component of the regulated small MS4 stormwater program (see Fact Sheet 2.4) and to recognize the crucial role that the public can play in identifying instances of noncompliance.

The small MS4 operator is required only to *consider* the information submitted, and may not need to follow-up and respond to every complaint or concern. Although some form of enforcement action or reply is not required, the small MS4 operator is required to demonstrate acknowledgment and consideration of the information submitted. A simple tracking process in which submitted public information, both written and verbal, is recorded and then given to the construction site inspector for possible follow-up will suffice.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The MS4 permit will specify any actions and deadlines that permittees must meet for permit compliance. The permit may also require permittees to develop measurable goals that guide implementation of MS4 chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any permit requirements to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 program goal might be to educate at least 80 percent of all construction site operators and contractors about proper selection, installation, inspection, and maintenance of BMPs by the end of the permit term, which will help to ensure compliance with erosion and sediment control requirements. This goal could be tracked by documenting attendance at local, State, or Federal training programs. Attendance can be encouraged by decreasing permitting fees for those contractors who have been trained and provide proof of attendance when applying for permits.

Construction Site Runoff Control Minimum Control Measure

Are Construction Sites Covered Under the NPDES Stormwater Program?

Yes. On March 10, 2003, Phase II NPDES regulations came into effect that extended coverage to construction sites that disturb one to five acres in size, including smaller sites that are part of a larger common plan of development or sale (see Fact Sheet 3.0 for information on the Phase II construction program). Sites disturbing five acres or more were regulated previously. Most states have been authorized to implement the NPDES stormwater program and have issued, or are developing state-specific construction general permits. EPA remains the permitting authority in a few states, territories, and on most land in Indian Country, however. For construction (and other land disturbing activities) in areas where EPA is the permitting authority, operators must meet the requirements of the EPA Construction General Permit (CGP). Permitting authority information can be found in Appendix B of the CGP. CGP permit requirements include the submission of a Notice of Intent and the development of a stormwater pollution prevention plan (SWPPP). The SWPPP must include a site description and measures and controls to prevent or minimize pollutants in stormwater discharges.

Even though all construction sites that disturb more than one acre are covered by national NPDES regulations, the construction site runoff control minimum measure for the small MS4 program is needed to induce more localized site regulation and enforcement efforts, and to enable operators of regulated small MS4s to more effectively control construction site discharges into their MS4s.

To aid operators of regulated construction sites in their efforts to comply with both local requirements and their NPDES permit, the Phase II Final Rule includes a provision that allows the NPDES permitting authority to reference a “qualifying State, Tribal or local program” in the NPDES general permit for construction. This means that if a construction site is located in an area covered by a qualifying local program, then the construction site operator’s compliance with the local program constitutes compliance with their NPDES permit. A regulated small MS4’s stormwater program for construction could be a “qualifying program” if the MS4 operator requires a SWPPP, in addition to the requirements summarized in this fact sheet.

The ability to reference other programs in the NPDES permit is intended to reduce confusion between overlapping and similar local and NPDES permitting authority requirements, while still providing for both local and national regulatory coverage of the construction site. The provision allowing NPDES permitting authorities to reference other programs has no impact on, or direct relation to, the small MS4 operator’s responsibilities under the construction site runoff control minimum measure profiled here.

Construction Site Runoff Control Minimum Control Measure

Is a Small MS4 Required to Regulate Construction Sites that the Permitting Authority has Waived from the NPDES Construction Program?

No. If the NPDES permitting authority waives requirements for stormwater discharges associated with small construction activity (see 40 CFR § 122.26(b)(15)(i)), the small MS4 operator is not required to develop, implement, and/or enforce a program to reduce pollutant discharges from such construction sites.

For Additional Information

Contacts

A list of names and telephone numbers for the U.S. EPA's Office of Wastewater Management (Headquarters), each EPA Regional Office, and State Offices is located at www.epa.gov/npdes/npdes-stormwater-program (click on "Contact Us" and then "Stormwater").

Your NPDES Permitting Authority

Most States and Territories are authorized to administer the NPDES Program, except the following, for which EPA is the permitting authority:

- Guam
- District of Columbia
- Johnston Atoll
- Idaho (until 7/1/2021, which is the date when Idaho becomes authorized to implement the Stormwater NPDES program)
- Midway and Wake Islands
- Massachusetts
- Northern Mariana Islands
- New Hampshire
- Puerto Rico
- New Mexico
- Trust Territories
- American Samoa

Reference Documents

- [EPA's Stormwater Web Site](#)
 - [Phase II Final Rule Fact Sheet Series](#)
 - [Stormwater Phase II Final Rule \(64 FR 68722\)](#)
 - [National Menu of Best Management Practices for Stormwater Phase II](#)
 - [Measurable Goals Guidance for Phase II Small MS4s](#)
- [Construction Industry Compliance Assistance Center](#)

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Post-Construction Runoff Control Minimum Control Measure



[Photo](#) by U.S. EPA

This fact sheet profiles the Post-Construction Runoff Control minimum control measure, one of six measures that the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program in order to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements for post-construction runoff control, modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy those requirements. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements in its NPDES permit.

Post-Construction Runoff Control Minimum Control Measure

Why Is the Control of Post-Construction Runoff Necessary?

Post-construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly affect receiving waterbodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction stormwater discharges is the most cost-effective approach to stormwater quality management.

There are generally two forms of substantial impacts of post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in stormwater runoff. As runoff flows over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Increased impervious surfaces (e.g., parking lots, driveways, and rooftops) interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process include streambank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in post-construction runoff to their MS4 from new development and redevelopment projects that result in the land disturbance of greater than or equal to 1 acre. The small MS4 operator is required to:

- Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs).
- Have an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal or local law.
- Ensure adequate long-term operation and maintenance of controls.
- Determine the appropriate best management practices complying with permit conditions for this minimum control measure.

What Is Considered a “Redevelopment” Project?

The Phase II Final Rule applies to “redevelopment” projects that alter the “footprint” of an existing site or building in such a way that there is a disturbance of equal to or greater than 1 acre of land. Redevelopment projects do not include such activities as exterior remodeling.

Post-Construction Runoff Control Minimum Control Measure

Because redevelopment projects may have site constraints not found on new development sites, the Phase II Final Rule provides flexibility for implementing post-construction controls on redevelopment sites that consider these constraints.

What Are Some Guidelines for Developing and Implementing This Measure?

This section includes some non-structural and structural BMPs that could be used to satisfy the requirements of the post-construction runoff control minimum measure. It is important to recognize that many BMPs are climate-specific, and not all BMPs are appropriate in every geographic area. Because the requirements of this measure are closely tied to the requirements of the construction site runoff control minimum measure (see Fact Sheet 2.6), EPA recommends that small MS4 operators develop and implement these two measures in tandem.

Non-Structural BMPs

- **Planning Procedures.** Runoff problems can be addressed efficiently with sound planning procedures. Local master plans, comprehensive plans, and zoning ordinances can promote improved water quality in many ways, such as guiding the growth of a community away from sensitive areas to areas that can support it without compromising water quality.
- **Site-Based BMPs.** These BMPs can include buffer strip and riparian zone preservation, minimization of disturbance and imperviousness, and maximization of open space.

Structural BMPs

- **Stormwater Retention/Detention BMPs.** Retention or detention BMPs control stormwater by gathering runoff in wet ponds, dry basins, or multichamber catch basins and slowly releasing it to receiving waters or drainage systems. These practices can be designed to both control stormwater volume and settle out particulates for pollutant removal.
- **Infiltration BMPs.** Infiltration BMPs are designed to facilitate the percolation of runoff through the soil to ground water, and, thereby, result in reduced stormwater runoff quantity and reduced mobilization of pollutants. Examples include infiltration basins/trenches, dry wells, and porous pavement.
- **Vegetative BMPs.** Vegetative BMPs are landscaping features that, with optimal design and good soil conditions, remove pollutants, and facilitate percolation of runoff, thereby maintaining natural site hydrology, promoting healthier habitats, and increasing aesthetic appeal. Examples include grassy swales, filter strips, artificial wetlands, and rain gardens.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The MS4 permit will specify any

Post-Construction Runoff Control Minimum Control Measure

actions and deadlines that permittees must meet for permit compliance. The permit may also direct require permittees to develop measurable goals that guide implementation of MS4 chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, should reflect needs and characteristics of the operator and the area served by its small MS4. Furthermore, the measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any permit requirement to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 program goal might be to reduce by 30 percent the road surface areas directly connected to storm sewer systems (using traditional curb and gutter infrastructure) in new developments and redevelopment areas over the course of the first permit term. Using “softer” stormwater conveyance approaches, such as grassy swales, will increase infiltration and decrease the volume and velocity of runoff leaving development sites. Progress toward the goal could be measured by tracking the linear feet of curb and gutter not installed in development projects that historically would have been used.

For Additional Information

Contacts

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Reference Documents

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 - [National Menu of Best Management Practices for Stormwater Phase II](#)
 - [Measurable Goals Guidance for Phase II Small MS4s](#)
- Other EPA Web sites
 - Ordinance Database: <http://www.epa.gov/owow/nps/ordinance>
 - Urban Nonpoint Source Guidance: <http://www.epa.gov/owow/nps/urbanmm/index.html>
 - Low Impact Development Web site: <http://www.epa.gov/owow/nps/lid>

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Pollution Prevention/Good Housekeeping Minimum Control Measure



This fact sheet profiles the Pollution Prevention/Good Housekeeping for Municipal Operations minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements modified December 9, 2016 and effective on January 9, 2017. It offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator typically has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements in its NPDES permit.

Why Is Pollution Prevention/Good Housekeeping Necessary?

The Pollution Prevention/Good Housekeeping for municipal operations minimum control measure is a key element of the small MS4 stormwater management program. This measure requires small MS4 operators to examine and subsequently alter their own actions to help ensure a reduction in the amount and type of pollution that: (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and (2) results from actions such as environmentally damaging land development and flood management practices or poor maintenance of storm sewer systems.

While this measure is meant primarily to improve or protect receiving water quality by altering municipal or facility operations, it also can result in a cost savings for the small MS4 operator, since proper and timely maintenance of storm sewer systems can help avoid repair costs from damage caused by age and neglect.

What Is Required?

Recognizing the benefits of pollution prevention practices, the rule requires an operator of a regulated small MS4 to:

- Develop and implement an operation and maintenance program with the ultimate goal of preventing or reducing pollutant runoff from municipal operations into the storm sewer system.
- Include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and stormwater system maintenance. To minimize duplication of effort and conserve resources, the MS4 operator can use training materials that are available from EPA, their State or Tribe, or relevant organizations.
- Determine the appropriate best management practices (BMPs) to meet permit requirements for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

The intent of this control measure is to ensure that existing municipal, State or Federal operations are performed in ways that will minimize contamination of stormwater discharges. EPA encourages the small MS4 operator to consider the following components when developing their program for this measure:

Pollution Prevention/Good Housekeeping Minimum Control Measure

- **Maintenance activities, maintenance schedules, and long-term inspection procedures** for structural and non-structural controls to reduce floatables and other pollutants discharged from the separate storm sewers.
- **Controls for reducing or eliminating the discharge of pollutants** from areas such as roads and parking lots, maintenance and storage yards (including salt/sand storage and snow disposal areas), and waste transfer stations. These controls could include programs that promote recycling (to reduce litter), minimize pesticide use, and ensure the proper disposal of animal waste.
- **Procedures for the proper disposal of waste** removed from separate storm sewer systems and areas listed in the bullet above, including dredge spoil, accumulated sediments, floatables, and other debris.
- **Ways to ensure that new flood management projects assess the impacts on water quality** and examine existing projects for incorporation of additional water quality protection devices or practices. EPA encourages coordination with flood control managers for the purpose of identifying and addressing environmental impacts from such projects.

The effective performance of this control measure hinges on the proper maintenance of the BMPs used, particularly for the first two bullets above. For example, structural controls, such as grates on outfalls to capture floatables, typically need regular cleaning, while non-structural controls, such as training materials and recycling programs, need periodic updating.

What Are Appropriate Measurable Goals?

The MS4 permit will specify any actions and deadlines that permittees must meet for permit compliance. The permit may also require permittees to develop measurable goals that guide implementation of MS4 chosen actions to meet permit requirements and to determine program effectiveness. The measurable goals, as well as the BMPs, should consider the needs and characteristics of the operator and the area served by its small MS4. The measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure.

EPA has developed a Measurable Goals Guidance for Phase II MS4s that is designed to help program managers comply with any permit requirement to develop measurable goals. The guidance presents an approach for MS4 operators to develop measurable goals as part of their stormwater management plan. For example, an MS4 program goal might be to incorporate the use of road salt alternatives for highway deicing and reduce traditional road salt use by 50 percent in the first year of the permit term.

For Additional Information

Contacts

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Reference Documents

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 - [Stormwater Phase II Final Rule \(64 FR 68722\)](#)
 - [National Menu of Best Management Practices for Stormwater Phase II](#)
 - [Measurable Goals Guidance for Phase II Small MS4s](#)

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PERMITTING AND REPORTING
THE PROCESS AND REQUIREMENTS
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)
STORMWATER PHASE II
FINAL RULE



Stormwater Phase II Final Rule

Permitting and Reporting: The Process and Requirements

Stormwater Phase II Final Rule Fact Sheet Series

Overview

1.0 – Stormwater Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Stormwater Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

The Stormwater Phase II Final Rule requires operators of certain small municipal separate storm sewer systems (MS4s) to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage because their stormwater discharges are considered "point sources" of pollution. All point source discharges, unlike nonpoint sources such as agricultural runoff, are required under the Clean Water Act (CWA) to be covered by federally enforceable NPDES permits. Those systems already permitted under the NPDES Phase I stormwater program, even systems serving less than 100,000 people, are not required to be permitted under the Phase II stormwater program.

NPDES stormwater permits are issued by an NPDES permitting authority, which may be an NPDES-authorized State or a U.S. EPA Region in non-authorized States. Issued MS4 permit conditions must be satisfied (i.e., development and implementation of a stormwater management program) and periodic reports must be submitted on the status and effectiveness of the program.

This fact sheet explains the various permit options that are available to operators of regulated small MS4s and details the permit application and reporting requirements. Program requirements for regulated small MS4s are explained in Fact Sheets 2.0 through 2.8.

What Permitting Options Are Available to Operators of Regulated Small MS4s?

Unlike the Phase I program that primarily utilizes individual permits for medium and large MS4s, the Phase II approach allows operators of regulated small MS4s to choose from as many as three permitting options as listed below. At this time the NPDES permitting authorities have issued general permits for regulated small MS4s. Operators of regulated small MS4s in urbanized areas, whether automatically designated or designated by the permitting authority, should have submitted their permit applications within 90 days of permit issuance. Regulated small MS4 stormwater management programs should be fully developed and implemented by the end of the first permit term, which is typically a 5-year period. The NPDES permitting authority reserves the authority to determine which permitting options are available to the regulated small MS4s. Refer to specific NPDES permitting authority for more details about permitting options in particular states.

□ General Permits

- General permits are strongly encouraged by EPA. The Phase II program has been designed specifically to accommodate a general permit approach.
- General permits prescribe one set of requirements for all applicable permittees. General permits are drafted by the NPDES permitting authority, then published for public comment before being finalized and issued.
- A Notice of Intent (NOI) serves as the application for the general permit. The permittee complies with the permit requirements by submitting an NOI to the NPDES permitting authority that describes the stormwater management plan, including best management practices (BMPs) and measurable goals. A Phase II permittee has the flexibility to develop

an individualized stormwater program that addresses the particular characteristics and needs of its system, provided the basic requirements of the general permit are satisfied.

- Permittees also can choose to share responsibilities for meeting the Phase II program requirements. Those entities choosing to do so may submit jointly with the other municipalities or governmental entities an NOI that identifies who will implement which minimum measures within the area served by the MS4.
- The permittee then follows the Phase II permit application requirements (see discussion in next question below).

Minimize Duplication of Effort

Two permitting options tailored to minimize duplication of effort can be incorporated into the general permit by the NPDES permitting authority. First, the permitting authority can recognize in the permit that another governmental entity is responsible under an NPDES permit for implementing any or all minimum measures. Responsibility for implementation of the measure(s) would rest with the other governmental entity, thereby relieving the permittee of its responsibility to implement that particular measure(s). For example, the NPDES permitting authority could recognize a county erosion and sediment control program for construction sites that was developed to comply with a Phase I permit. As long as the Phase II MS4s in the county comply with the county's construction program, they would not need to develop and implement their own construction programs because such activity would already be addressed by the county.

Second, the NPDES permitting authority can include conditions in a general permit that direct a permittee to follow the requirements of an existing qualifying local program rather than the requirements of a minimum measure. A qualifying local program is defined as a local, State or Tribal municipal stormwater program that imposes requirements that are equivalent to those of the Phase II MS4 minimum measures. The permittee remains responsible for the implementation of the minimum measure through compliance with the qualifying local program.

Individual Permits

- Individual permits are required for Phase I “medium” and “large” MS4s, but not recommended by EPA for Phase II program implementation.
- The permittee can either submit an individual application for coverage by the Phase II MS4 program (see 40 CFR §122.34) or the Phase I MS4 program (see 40 CFR §122.26(d)).

- For individual coverage under Phase II, the permittee must follow Phase II permit application requirements and provide an estimate of square mileage served by the system and any additional information requested by the NPDES permitting authority. A permittee electing to apply for coverage under the Phase I program must follow the permit application requirements detailed at 40 CFR §122.26(d).
- The NPDES permitting authority may allow more than one regulated entity to jointly apply for an individual permit.
- The NPDES permitting authority could incorporate in the individual permit either of the two permitting options explained above in the *Minimize Duplication of Effort* section.

Modification of a Phase I Individual Permit – A Co-Permittee Option

- The operator of a regulated small MS4 could participate as a limited co-permittee in a neighboring Phase I MS4's stormwater management program by seeking a modification of the existing Phase I individual permit. A list of Phase I medium and large MS4s can be obtained from the EPA Office of Wastewater Management (OWM) or downloaded from the OWM web site.
- The permittee must follow Phase I permit application requirements (with some exclusions).
- The permittee must comply with the applicable terms of the Phase I individual permit rather than the minimum control measures in the Phase II Final Rule.

What Does the Permit Application Require?

Operators of regulated small MS4s are required to submit in their NOI or individual permit application the following information:

- Best management practices (BMPs) are required for each of the six minimum control measures:
 - ① Public education and outreach on stormwater impacts
 - ② Public participation/involvement
 - ③ Illicit discharge detection and elimination
 - ④ Construction site stormwater runoff control
 - ⑤ Post-construction stormwater management in new development/redevelopment
 - ⑥ Pollution prevention/good housekeeping for municipal operations

(See Fact Sheets 2.3 through 2.8 for full descriptions of each measure, including examples of BMPs and measurable goals)

- Measurable goals for each minimum control measure (i.e., narrative or numeric standards used to gauge program effectiveness);
- Estimated months and years in which actions to implement each measure will be undertaken, including interim milestones and frequency; and
- The person or persons responsible for implementing or coordinating the stormwater program.

Relying on Another Entity

The Phase II permittee has the option of relying on other entities already performing one or more of the minimum control measures, provided that the existing control measure, or component thereof, is at least as stringent as the Phase II rule requirements. For example, a county already may have an illicit discharge detection and elimination program in place and may allow an operator of a regulated small MS4 within the county's jurisdiction to rely on the county program instead of formulating and implementing a new program. In such a case, the permittee would not need to implement the particular measure, but would still be ultimately responsible for its effective implementation. For this reason, EPA recommends that the permittee enter into a legally binding agreement with the other entity. If the permittee chooses to rely on another entity, they must note this in their permit application and subsequent reports. A Phase II permittee may even rely on another governmental entity regulated under the NPDES storm water program to satisfy all of the permittee's permit obligations. Should this option be chosen, the permittee must note this in its NOI, but does not need to file periodic reports.

What Does the Permit Require?

The operator of a regulated small MS4 has the flexibility to determine the BMPs and measurable goals, for each minimum control measure, that are most appropriate for the system. The chosen BMPs and measurable goals, submitted in the permit application, become the required stormwater management program; however, the NPDES permitting authority can require changes in the mix of chosen BMPs and measurable goals if all or some of them are found to be inconsistent with the provisions of the Phase II Final Rule. Likewise, the permittee can change its mix of BMPs if it determines that the program is not as effective as it could be. Fact Sheets 2.3 through 2.8 further describe each of the minimum control measures, while the permit requirements for evaluation/assessment and recordkeeping activities are described in separate sections below.

Menu of BMPs

The BMPs for minimum measures 3 through 6 (as listed in the permit application requirements section, above) are not

enforceable until the NPDES permitting authority provides a list, or "menu," of BMPs to assist permittees in the design and implementation of their stormwater management programs. The NPDES permitting authority was required to provide this menu as an aid for those operators that are unsure of the most appropriate and effective BMPs to use. Since the menu was intended to serve as guidance only, the operators can either select from the menu or identify other BMPs to meet the permit requirements. EPA has developed a menu of BMPs that can be accessed at EPA's Stormwater Web Site (<http://www.epa.gov/npdes/stormwater>).

What Standards Apply?

A Phase II small MS4 operator is required to design a program that:

- Reduces the discharge of pollutants to the "maximum extent practicable" (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

Compliance with the technical standard of MEP requires the successful implementation of approved BMPs. The Phase II Final Rule considers narrative effluent limitations that require the implementation of BMPs and the achievement of measurable goals as the most appropriate form of effluent limitations to achieve the protection of water quality, rather than requiring that stormwater discharges meet numeric effluent limitations.

EPA issued Phase II NPDES permits consistent with its August 1, 1996, Interim Permitting Approach policy, which calls for BMPs in first-round stormwater permits and expanded or better tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. In cases where information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations should be incorporated into the stormwater permit. Monitoring is not required under the Phase II Rule, but the NPDES permitting authority has the discretion to require monitoring if deemed necessary.

What Evaluation/Reporting Efforts Are Required?

Frequency of Reports

Reports must be submitted annually during the first permit term. For subsequent permit terms, reports must be submitted in years 2 and 4 only, unless the NPDES permitting authority requests more frequent reports.

Required Report Content

The reports must include the following:

- The status of compliance with permit conditions, including an assessment of the appropriateness of the selected BMPs and progress toward achieving the selected measurable goals for each minimum measure;
- Results of any information collected and analyzed, including monitoring data, if any;
- A summary of the stormwater activities planned for the next reporting cycle;
- A change in any identified best management practices or measurable goals for any minimum measure; and
- Notice of relying on another governmental entity to satisfy some of the permit obligations (if applicable).

A Change in Selected BMPs

If, upon evaluation of the program, improved controls are identified as necessary, permittees should revise their mix of BMPs to provide for a more effective program. Such a change, and an explanation of the change, must be noted in a report to the NPDES permitting authority.

What are the Recordkeeping Requirements?

Records required by the NPDES permitting authority must be kept for at least 3 years and made accessible to the public at reasonable times during regular business hours. Records need not be submitted to the NPDES permitting authority unless the permittee is requested to do so.

What Are the Deadlines for Compliance?

As stated previously, the NPDES permitting authorities have issued permits for regulated small MS4s. Operators of regulated small MS4s in urbanized areas, whether automatically designated or designated by the permitting authority, should have submitted their permit applications within 90 days of permit issuance. Regulated small MS4 stormwater management programs should be fully developed and implemented by the end of the first permit term, typically a 5-year period.

What are the Penalties for Noncompliance?

The operator of a regulated small MS4 is required to obtain an NPDES permit that is federally enforceable, thus subjecting the permittee to potential enforcement actions and penalties by the NPDES permitting authority if the MS4 operator does not fully comply with application or permit requirements. This federal enforceability also includes the right for interested parties to sue under the citizen suit provision of the CWA (section 505; 33 USC § 1365).

For Additional Information**Contacts**

☞ U.S. EPA Office of Wastewater Management
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 Phone: 202-564-9545

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Reference Documents

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FEDERAL AND STATE OPERATED MS4s

PROGRAM IMPLEMENTATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE



Stormwater Phase II Final Rule

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The program for small municipal separate storm sewer systems (MS4s) under the Stormwater Phase II Final Rule includes, in addition to local government jurisdictions, certain Federal and State-operated small MS4s. Federal facilities were not designated for regulation by the NPDES Phase I stormwater program for MS4s. The Phase II Final Rule, however, includes the “United States” in the definition of a small MS4, thereby including Federal MS4 operators in the NPDES Phase II stormwater program. Federal and State-operated small MS4s can include universities, prisons, hospitals, roads (i.e., departments of transportation), military bases (e.g., State Army National Guard barracks), parks, and office buildings/complexes.

The small MS4 program, largely designed with municipally-operated small MS4s in mind, raises a number of implementation issues for Federal and State operators of regulated small MS4s were required to obtain an NPDES permit that requires the development and implementation of a management program that includes the following six minimum control measures: public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and good housekeeping/pollution prevention for municipal operations (for more information on each measure, see Fact Sheets 2.3 through 2.8). This fact sheet highlights potential implementation issues related to the minimum control measures, then discusses the implementation options included in the rule that may resolve these issues.

What Are Some Implementation Concerns?

This section profiles the three most common implementation issues raised in the public comments submitted regarding Federal/State implementation of the small MS4 program.

How Does the Final Rule Account for Unique Characteristics?

Federal and State small MS4s possess a number of characteristics that set them apart from their municipal counterparts. For example, whereas municipally-operated MS4s largely serve resident populations, many Federal or State-operated MS4s, such as medical clinics and departments of transportation (DOTs), do not. Other types of Federal and State MS4s, such as military bases, prisons, and State universities, serve populations that are different from a typical municipal population. Their unique characteristics might lead Federal or State MS4 operators to question either the need to implement the entire suite of minimum control measures or their ability to comply fully with their Phase II stormwater permit. Responsibility for developing and managing a stormwater program that comprises the minimum measures lies with the operator of the Federal or State MS4.

What If the Operator Lacks Legal Authority?

Three of the minimum control measures (illicit discharge detection and elimination and the two construction-related measures) require enforceable controls on third party activities to ensure successful implementation of the measure. Some Federal and State operators, however, may not have the necessary legal regulatory authority to adopt these enforceable controls in the same manner as do local governments.

For example, a State DOT that is responsible for the portions of its roads running through urbanized areas may not have the legal authority to impose restrictions on, and penalties against, illicit (i.e., non-stormwater) discharges into its MS4 if the source of the discharge is outside the DOT's right-of-way or jurisdiction. As in the case of local governments that lack such authority, State and Federal MS4s are expected to utilize the authority they do possess and to seek cooperative arrangements.

How Can the Program Be Implemented in Areas Where There Are Multiple Regulated Entities?

Since the final rule provides automatic coverage of all small MS4s within an urbanized area, regardless of political boundaries, coverage of multiple governments and agencies in a single area is likely. For example, a city government that operates a small MS4 within an urbanized area must obtain permit coverage alongside the county, State, and Federal DOTs if they all operate a portion of the roads (i.e., MS4s) in the city. All four entities are responsible for developing and implementing a stormwater management program for their MS4s (or portions thereof) within the urbanized area. EPA encourages State and Federal small MS4 operators to establish cooperative agreements with cities and counties in implementing their stormwater programs.

Are There Implementation Strategies that Help Facilitate Program Implementation?

This section offers two hypothetical strategies for resolving the implementation issues raised above. The best solution may include a creative combination of strategies.

STRATEGY #1

A Focus on Choosing Appropriate BMPs

The final rule requires the permittee to choose *appropriate* best management practices (BMPs) for each minimum control measure. In other words, EPA expects Phase II permittees to develop and update their stormwater management plans and their BMPs to fit the particular characteristics and needs of the permittee and the area served by its MS4. Therefore, the Federal or State operator of a regulated storm sewer system can take advantage of the flexibility provided by the rule to utilize the most suitable minimum control measures for its MS4. Below is an example of tailored activities and BMPs that Federal or State operators can implement for each measure:

- Public Education and Outreach.** Distribute brochures and post fliers to educate employees of a Federal hospital about the problems associated with stormwater runoff and the steps they can take to

reduce pollutants in stormwater discharges. For example, employees could be advised against carelessly discarding trash on the ground or allowing their cars to leak oil/fluids in the parking lot.

- Public Participation/Involvement.** Provide notice of stormwater management plan development and hold meetings at which employees of a Federal office complex are encouraged to voice their ideas and opinions about the effort. Request volunteers to help develop the plan.
- Illicit Discharge Detection and Elimination.** Develop a map of the storm sewer system on a military base. Perform visual dry weather monitoring of any outfalls to determine whether the storm sewer system is receiving any non-stormwater discharges from the base. If a dry weather flow is found, trace it back to the source and stop the discharge. Should a Federal military base identify an illicit discharge, the source of which is traced to the boundary of its system, the Federal operator should refer the discharge to the adjoining regulated MS4 for further action.
- Construction Site Runoff Control.** Require the implementation of erosion and sediment controls, and control of waste, for any Federal or State DOT road construction. The DOT would review site plans for proper controls, perform inspections, and establish penalties in the construction contract if controls are not implemented. If construction is done directly by the regulated DOT instead of a private contractor, the DOT could be penalized by the NPDES permitting authority for non-compliance with its small MS4 permit in the event that controls are not properly implemented.
- Post-Construction Runoff Control.** Require the implementation of post-construction stormwater controls for any new construction on the grounds of a prison. This can be required as part of a construction contract, instituted as internal policy, and considered during site plan review.
- Pollution Prevention/Good Housekeeping for Municipal Operations.** Train maintenance staff at a State university to employ pollution prevention techniques whenever possible. For example, routinely pick up trash/litter from the university grounds, use less salt on the parking lots and access roads in the winter, perform any maintenance of university vehicles under shelter only, limit pesticide use to the minimum needed, use vegetative buffer strips in the parking lots to filter runoff, and keep dumpster lids closed.

STRATEGY #2

Working with Other Entities

There may be instances when the Federal or State permittee has limited capabilities to satisfy one or more of the minimum control measures. As discussed above, the permittee may lack the proper legal authority to enforce controls (although it should try to obtain the necessary legal authority if at all possible).



In the case of limited capabilities, the permittee can work with neighboring operators of regulated small MS4s, preferably on a watershed basis, to form a shared stormwater management program in which each permittee is responsible for activities that are within individual legal authorities and abilities. The final rule allows the permittee to rely on other entities, with their permission, to implement those minimum measures that the permittee is otherwise unable to implement. Three examples are:

- A State DOT with limited regulatory legal authority can reference a local sewer district's illicit detection and elimination program in its permit application, provided the program sufficiently addresses illicit discharges into the DOT's storm sewer system.
- The permittee or NPDES permitting authority can reference such programs as coastal nonpoint pollution control programs, State or local watershed programs, State or local construction programs, and environmental education efforts by public or private entities.
- The permittee can become a co-permittee with a neighboring Phase I MS4 through a modification of the Phase I MS4's individual permit. This would be an option for those Federal and State entities located in close proximity to Phase I MS4s.


Choosing to work with other governmental entities as a co-permittee, or referencing parts of each other's plans, can help resolve issues that may arise where multiple regulated jurisdictions exist in the same area. Permittees can avoid duplicative efforts, as well as territorial or regulatory disputes, by working together to implement the stormwater program. See Fact Sheet 2.9 for more information on permitting options for regulated small MS4s.

For Additional Information


Contacts

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CONSTRUCTION PROGRAM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE



Stormwater Phase II Final Rule

Small Construction Program Overview

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Construction Program

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3.1 – Construction Rainfall
Erosivity Waiver

Industrial “No Exposure”

4.0 – Conditional No Exposure
Exclusion for Industrial Activity

The 1972 amendments to the Federal Water Pollution Control Act, later referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Efforts to improve water quality under the NPDES program traditionally have focused on reducing pollutants in industrial process wastewater and municipal sewage treatment plant discharges. Over time, it has become evident that more diffuse sources of water pollution, such as stormwater runoff from construction sites, are also significant contributors to water quality problems.

Sediment runoff rates from construction sites are typically 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction activity can contribute more sediment to streams than can be deposited over several decades, causing physical and biological harm to our Nation's waters.

In 1990, EPA promulgated rules establishing Phase I of the NPDES stormwater program. Phase I addresses, among other discharges, discharges from large construction activities disturbing 5 acres or more of land. Phase II of the NPDES stormwater program covers small construction activities disturbing between 1 and 5 acres. Phase II became final on December 8, 1999 and small construction permit applications were due by March 10, 2003 (specific compliance dates will be set by the NPDES permitting authority in each State). This fact sheet outlines the construction activities covered by Phase I and Phase II, including possible waiver options from Phase II coverage, and the Phase II construction program requirements.

Who Is Covered Under the Phase I Rule?

Sites Five Acres and Greater

The Phase I NPDES stormwater rule identifies eleven categories of industrial activity in the definition of “stormwater discharges associated with industrial activity” that must obtain an NPDES permit. Category (x) of this definition is construction activity, commonly referred to as “large” construction activity. Under category (x), the Phase I rule requires all *operators* of construction activity *disturbing 5 acres or greater of land* to apply for an NPDES stormwater permit. Operators of sites disturbing less than 5 acres are also required to obtain a permit if their activity is part of a “larger common plan of development or sale” with a planned disturbance of 5 acres or greater. “Disturbance” refers to exposed soil resulting from activities such as clearing, grading, and excavating. Construction activities can include road building, construction of residential houses, office buildings, industrial sites, or demolition.

What Is Meant by a “Larger Common Plan of Development or Sale”?

As defined in EPA's NPDES stormwater general permit for construction activity, a “larger common plan of development or sale” means a contiguous area where multiple separate and distinct construction activities are occurring under one plan (e.g., the operator is building on three half-acre lots in a 6-acre development). The “plan” in a common plan of development or sale is broadly defined as any announcement or piece of documentation

(including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

What Is the Definition of an “Operator” of a Construction Site?

As defined in EPA’s stormwater general permit for construction activity, an “operator” is the party or parties that has:

- ❑ Operational control of construction project plans and specifications, including the ability to make modifications to those plans and specifications; *or*
- ❑ Day-to-day operational control of those activities that are necessary to ensure compliance with a stormwater pollution prevention plan (SWPPP) for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

There may be more than one party at a site performing the tasks related to “operational control” as defined above. Depending on the site and the relationship between the parties (e.g., owner, developer, contractor), there can either be a single party acting as site operator and consequently be responsible for obtaining permit coverage, or there can be two or more operators, all obligated to seek permit coverage. It is important to note that NPDES-authorized States may use a different definition of “operator” than the one above.

How Is the Phase II Construction Rule Related to the Phase I Construction Rule?

In 1992, the Ninth Circuit court remanded for further proceedings portions of EPA’s existing Phase I stormwater regulation related to the category (x) discharges from large construction activity (NRDC v. EPA, 966 F.2d at 1292). EPA responded to the court’s decision by designating under Phase II stormwater discharges from construction activity disturbing less than 5 acres as sources that should be regulated to protect water quality. The Phase II Rule designates these sources as “stormwater discharges associated with *small construction* activity,” rather than as another category under “stormwater associated with *industrial* activity.”

Who Is Covered Under the Phase II Construction Rule?

Sites Between One and Five Acres

The Stormwater Phase II Rule automatically designates, as small construction activity under the NPDES stormwater permitting program, all operators of construction site activities that result in a *land disturbance of equal to or greater than 1 and less than 5 acres*.

Sites Less Than One Acre

Site activities disturbing less than 1 acre are also regulated as small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre and less than 5 acres, or if they are designated by the NPDES permitting authority. The NPDES permitting authority or EPA Region may designate construction activities disturbing less than 1 acre based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to waters of the United States.

Are Waivers Available for Operators of Regulated Construction Activity?

Yes, but only for small, not large, construction activity. Under the Phase II Rule, NPDES permitting authorities have the option of providing a waiver from the requirements to operators of small construction activity who certify to either one of two conditions:

- ① Low predicted rainfall potential (i.e., activity occurs during a negligible rainfall period), where the rainfall erosivity factor (“R” in the Revised Universal Soil Loss Equation [RUSLE]) is less than 5 during the period of construction activity (See Fact Sheet 3.1); *or*
- ② A determination that stormwater controls are not necessary based on either:
 - (A) A “total maximum daily load” (TMDL) that address the pollutant(s) of concern for construction activities; **OR**
 - (B) An equivalent analysis that determines allocations are not needed to protect water quality based on consideration of instream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

Pollutants of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity, or siltation) and any other pollutant that has been identified as a cause of impairment of a receiving waterbody.

The intent of the waiver provision is to waive only those sites that are highly unlikely to have a negative effect on water quality. Therefore, before applying for a waiver, operators of small construction activity are encouraged to consider the potential water quality impacts that may result from their project and to carefully examine such factors as proximity to water resources and sensitivity of receiving waters.

a. What is the Rainfall Erosivity Factor in Waiver ①?

Waiver ① uses the Rainfall Erosivity Factor to determine whether the potential for polluted discharge is low enough to justify a waiver from the requirements. It is one of six variables used by the Revised Universal Soil Loss Equation (RUSLE)—a predictive tool originally used to measure soil loss from agricultural lands at various times of the year on a regional basis—to predict soil loss from construction sites. The Rainfall Erosivity Factor waiver is time-sensitive and is dependent on when during the year a construction activity takes place, how long it lasts, and the expected rainfall and intensity during that time. For information about the rainfall erosivity waiver, see Fact Sheet 3.1. An erosivity calculator for construction sites is available at <http://ei.tamu.edu>.

b. What is a “TMDL” in Waiver ②?

For impaired waters where technology-based controls required by NPDES permits are not achieving State water quality standards, the CWA requires implementation of the TMDL process. The TMDL process establishes the maximum amount of pollutants a waterbody can assimilate before water quality is impaired, then requires that this maximum level not be exceeded.

A TMDL is done for each pollutant that is found to be contributing to the impairment of a waterbody or a segment of a waterbody. To allow a waiver for construction activities, a TMDL would need to address sediment, or a parameter that addresses sediment such as total suspended solids, turbidity, or siltation. Additional TMDLs addressing common pollutants from construction sites such as nitrogen, phosphorus, and oil and grease also may be necessary to ensure water quality protection and allow a waiver from the NPDES stormwater program.

A TMDL assessment determines the source or sources of a pollutant of concern, considers the maximum allowable level of that pollutant for the waterbody, then allocates to each source or category of sources a set level of the pollutant that it is allowed to discharge into the waterbody. Allocations to point sources are called wasteload allocations.

How Would an Operator Qualify for, and Certify to, Waiver ②?

EPA expects that when TMDLs or equivalent analyses are completed, there may be a determination that certain classes of sources, such as small construction activity, would not have to control their contribution of pollutants of concern to the waterbody in order for the waterbody to be in attainment with water quality standards (i.e., these sources were not assigned wasteload allocations). In such a case, to qualify for waiver ②, the operator of the construction site would need to certify that its construction activity will take place, and the stormwater discharges will occur, within the area covered either by the TMDLs or equivalent analysis. A certification form would likely be provided by the NPDES permitting authority for this purpose.

What Does the Phase II Construction Program Require?

The Phase II Final Rule requires operators of Phase II small construction sites, nationally, to obtain an NPDES permit and implement practices to minimize pollutant runoff. It is important to note that, locally, these same sites also may be covered by State, Tribal, or local construction runoff control programs (see Fact Sheets 2.6 and 2.7 for information on the Phase II small MS4's construction program). For the Phase II small construction program, EPA has taken an approach similar to Phase I where the program requirements are not fully defined in the rule but rather in the NPDES permit issued by the NPDES permitting authority.

EPA recommended that the NPDES permitting authorities use their existing Phase I large construction general permits as a guide to developing their Phase II small construction permits. In doing so, the Phase II requirements would be similar to the three general Phase I requirements summarized below.

- Submission of a *Notice of Intent* (NOI) that includes general information and a certification that the activity will not impact endangered or threatened species. This certification is unique to EPA's NOI and is not a requirement of most NPDES-delegated State's NOIs;
- The development and implementation of a *Stormwater Pollution Prevention Plan* (SWPPP) with appropriate BMPs to minimize the discharge of pollutants from the site; and

- ❑ Submission of a *Notice of Termination* (NOT) when final stabilization of the site has been achieved as defined in the permit or when another operator has assumed control of the site.

In July 2003, EPA issued a construction general permit that covers both large and small construction activities. This permit, supporting information, and guidance can be found at <http://www.epa.gov/npdes/stormwater/cgp>.

Can the Permitting Authority Reference a Qualifying Erosion and Sediment Control Program in NPDES Construction Permits?

Yes. The Phase II Rule allows the NPDES permitting authority to include in its NPDES permits for large and for small construction activity conditions that incorporate by reference qualifying State, Tribal, or local erosion and sediment control program requirements. A qualifying program must include the following requirements:

- ❑ Requirements for construction site operators to implement appropriate erosion and sediment control best management practices;
- ❑ Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste that may cause adverse impacts to water quality;
- ❑ Requirements for construction site operators to develop and implement a stormwater pollution prevention plan; and
- ❑ Requirements to submit a site plan for review that incorporates consideration of potential water quality impacts.

In addition to the four elements above, a qualifying program for large construction activities must also include any additional requirements necessary to achieve the applicable technology-based standards of “Best Available Technology” (BAT) and “Best Conventional Technology” (BCT) based on the best professional judgment of the permit writer.

Should a State, Tribal, or local program include one or more, but not all, of the elements listed above, the permitting authority can reference the program in the permit, provided it also lists the missing element(s) as a condition in the permit.

What are Some Recommended BMPs for Small Construction Sites?

The approach and BMPs used for controlling pollutants in stormwater discharges from small construction sites may vary from those used for large sites since their characteristics can differ in many ways. For example, operators of small sites may have more limited access to qualified design personnel and technical information. Also, small sites may have less space for installing and maintaining certain BMPs.

As is the case with all construction sites, erosion and sediment control at small construction sites is best accomplished with proper planning, installation, and maintenance of controls. The following practices have shown to be efficient, cost effective, and versatile for small construction site operators to implement. The practices are divided into two categories: non-structural and structural.

❑ Non-Structural BMPs

- Minimizing Disturbance
- Preserving Natural Vegetation
- Good Housekeeping Practices

❑ Structural BMPs

Erosion Controls

- Mulch
- Grass
- Stockpile Covers

Sediment Controls

- Silt Fence
- Inlet Protection
- Check Dams
- Stabilized Construction Entrances
- Sediment Traps

Most erosion and sediment controls require regular maintenance to operate correctly. Accumulated sediments should be removed frequently and materials should be checked periodically for wear. Regular inspections by qualified personnel, which can allow problem areas to be addressed, should be performed after major rain events.

The BMPs listed above as well as additional erosion and sediment control practices for construction activities are described in detail in the National Menu of BMPs for Stormwater Phase II, which can be found at <http://www.epa.gov/npdes/stormwater>.

For Additional Information

Contacts

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☞ Your local soil conservation district office. They can provide assistance with RUSLE and other conservation related issues. A list of conservation district contacts is available at <http://www.nacdnet.org/resources/cdsonweb.html>

Reference Documents

- ☞ EPA’s Stormwater Web Site
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 - Stormwater Phase II Final Rule Fact Sheet Series
 - Stormwater Phase II Final Rule (64 FR 68722)
 - National Menu of Best Management Practices for Stormwater Phase II
 - Measurable Goals Guidance for Phase II Small MS4s
 - Stormwater Case Studies
 - Construction General Permit and Fact Sheet (68 FR 45817)
<http://www.epa.gov/npdes/stormwater/cgp>
 - EPA Stormwater Management for Construction Activities and Best Management Practices : Developing Pollution Prevention Plans Guidance
 - And many others
- ☞ Construction Industry Compliance Assistance Center:
<http://www.cicacenter.org/>
- ☞ *Agricultural Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, Chapter 2, pp. 21-64, January 1997. <http://www.epa.gov/npdes/pubs/ruslech2.pdf>
- ☞ *Guidance for Water Quality Based Decisions: The TMDL Process*. April 1991. U.S. EPA Office of Water. EPA 440/4-91-001.
<http://www.epa.gov/OWOW/tmdl>



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What is Erosivity?

Erosivity is the term used to describe the potential for soil to wash off disturbed, revegetated earth during storms. The potential for erosion is in part determined by the soil type and geology of the site. For instance, dense, clay-like soils on a glacial plain will erode less readily when it rains than will sandy soils on the side of a hill. Another important factor is the amount and force of precipitation expected during the time the earth will be exposed. While it is impossible to predict the weather several months in advance of construction, for many areas of the country, there are definite optimal periods, such as a dry season when rain tends to fall less frequently and with less force. When feasible, this is the time to disturb the earth, so that the site can be stabilized by the time the seasonal wet weather returns. There are many other important factors to consider in determining erosivity, such as freeze/thaw cycles and snow pack.

How Is Site Erosivity Determined?

The Universal Soil Loss Equation (USLE) was developed by the U.S. Department of Agriculture (USDA) in the 1950s to help farmers conserve their valuable topsoil. The methodology for determining if a site qualifies for the erosivity waiver provided in this guide is based on the *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, dated January 1997. (Note that a more updated version of USLE, the Revised USLE, Version 2 (RUSLE2), is available and can be used as an alternative method for determining if a site qualifies for the erosivity waiver. Information about the RUSLE2 computer program is provided later in this fact sheet.)

Using a computer model supported by decades' worth of soil and rainfall data, USDA established estimates of annual erosivity values (R factors) for sites throughout the country. These R factors are used as surrogate measures of the impact that rainfall had on erosion from a particular site. They have been mapped using iseroindent contours, as shown in Figures 2 through 5.

USDA developed the Erosivity Index Table (EI Table, provided here in Table 1), to show how the annual erosivity factor is distributed throughout the year in two-week increments. Table 1 is based on 120 rainfall distribution zones for the continental U.S. Detailed instructions for calculating a project R factor are provided later in this fact sheet.

¹ This revised fact sheet corrects errors identified in calculating the R factor from the 2001 version, and includes updated information about the USLE.

The Stormwater Phase II rule allows permitting authorities to waive NPDES requirements for small construction sites if the value of the rainfall erosivity factor is less than 5 during the period of construction activity (see § 122.26(b)(15)(i)(A)). Note that the permitting authority has the option to not allow waivers for small construction activity.

If the R factor for the period of construction calculates to less than 5, and the permitting authority allows the use of the waiver, the site owner may apply for a waiver under the low rainfall erosivity provision of the applicable EPA or State NPDES regulations. When applying, owners are encouraged to consider other site-specific factors, such as proximity to water resources and the sensitivity of receiving waters to sedimentation impacts. The small construction operator must certify to the permitting authority that the construction activity will take place during a period when the rainfall erosivity factor is less than 5.

The start and end dates used for the construction activity will be the initial date of disturbance and the anticipated date when the site will have achieved final stabilization as defined by the permit, respectively. If the construction continues beyond this period, the operator will need to recalculate the Erosivity Index for the site based on this new ending date (but keeping the old start date) and either resubmit the certification form or apply for NPDES permit coverage.

What Other Factors Can Affect Waiver Availability and Eligibility?

EPA has established the R factor of less than 5 as the criteria for determining waiver eligibility. However, since the intent is to waive only those construction activities that will not adversely impact water quality, State and Tribal permitting authorities have considerable discretion in determining where, when, and how to offer it. They can establish an R factor threshold lower than 5, or they can suspend the waiver within an area where watersheds are known to be heavily impacted by, or sensitive to, sedimentation. They can also suspend the waiver during certain periods of the year. They may opt not to offer the waiver at all. NOTE: This waiver is not available to sites that will disturb more than 5 acres of land (large construction).

What if My Site Is Not Eligible?

If your site is not eligible for a waiver, you must submit a Notice of Intent, or whichever type of application is required, to obtain coverage under the applicable NPDES construction stormwater permit, and comply with its requirements. For information about EPA's Construction General Permit (CGP), see <http://www.epa.gov/npdes/stormwater/cgp>. State program information is available at http://cfpub.epa.gov/npdes/contacts.cfm?program_id=6&type=STATE.

Examples

1. Construction started and completed in one calendar year.

Find the R factor value of a construction site in Denver, Colorado. Assume the site will be disturbed from March 10 to May 10 of the same year.

The EI distribution zone is 84 (Figure 1). Referring to Table 1, the project period will span from March 1 (from Table 1, the closest date prior to the actual March 10 start date) to May 15 (from Table 1, the closest date after the actual May 10 end date). The difference in values between these two dates is 9.7% ($9.9 - 0.2 = 9.7$). Since the annual erosion index for this location is about 45 (interpolated from Figure 2), the R factor for the scheduled construction project is 9.7% of 45, or 4.4.

Because 4.4 is less than 5, the operator of this site would be able to seek a waiver under the low rainfall erosivity provision.

2. Construction spanning two calendar years.

Find the R factor value for a construction site in Pittsburgh, Pennsylvania. Assume the site will be disturbed from August 1 to April 15.

The EI distribution zone is 111 (Figure 1). Referring to Table 1, the project period will span from July 29 (from Table 1, the closest date prior to the actual August 1 start date) to April 15. The difference in values between July 29 and December 31 is 35% ($100 - 65.0 = 35.0$). The difference between January 1 and April 15 is 8%. The total percentage EI for this project is 43% ($35 + 8 = 43$). Since the annual erosion index for this location is 112 (interpolated from Figure 2), the R factor for the scheduled construction is 43% of 112, or 48.

Since 48 is greater than 5, the operator of this site would not be able to seek a waiver under the low rainfall erosivity provision.

How Do I Compute the R factor for My Project?

1. Estimate the construction start date. This is the day you expect to begin disturbing soils, including grubbing, stockpiling, excavating, and grading activities.
2. Estimate the day you expect to achieve final stabilization, as defined by your permitting authority's regulations or NPDES construction stormwater permit, over all previous disturbed areas. This is your construction end date.
3. Refer to Figure 1 to find your Erosivity Index (EI) Zone based on your geographic location.

4. Refer to Table 1, the Erosivity Index (EI) Table. Find the number of your EI Zone in the left column. Locate the EI values for the dates that correspond to the project start and end dates you identified in Steps 1 and 2. If your specific date is not on the table, either interpolate between dates to obtain your %EI value, or use the closest date prior to your proposed start date and the closest date after your proposed end date. Subtract the start value from the end value to find the % EI for your site. The maximum annual EI value for a project is 100%. NOTE: If your project lasts for one year or more, your EI value is 100%.
5. Refer to the appropriate Isoerodent Map (Figures 2 through 5). Interpolate the annual isoerodent value for your area. This is the annual R factor for your site.
6. Multiply the percent value obtained in Step 4 by the annual isoerodent value obtained in Step 5. This is the R factor for your scheduled project.

Can I Use a Personal Computer to Calculate the R factor?

The computer program used by USDA to evaluate erosion potential is called the Revised Universal Soil Loss Equation, or RUSLE. The current version of RUSLE (RUSLE2) is a Windows-based model that uses extensive databases that are geographically-linked. RUSLE2 can be used to calculate the R factor for a proposed construction site; however, RUSLE2 can require a large investment of time to set up. RUSLE2 can be downloaded free of charge from the Internet at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm. Note that RUSLE2 is an upgrade of RUSLE, and contains more detailed data. Therefore, your calculated R factor may differ based on whether you calculate your R factor using the methods specified above, which utilizes data from *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, January 1997, or whether you calculate your R factor using the more updated RUSLE2. EPA notes that either method of calculation is acceptable for determining eligibility for the construction rainfall erosivity waiver.

Where Can I Get Help?

- A copy of “Chapter 2, Rainfall-Runoff Erosivity Factor (R)” from the *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, January 1997, is available on EPA’s web site at <http://www.epa.gov/npdes/pubs/ruslech2.pdf>.
- Information about RUSLE2, and a download of the program, is available at http://fargo.nserl.purdue.edu/rusle2_dataweb/.
- Your local USDA Service Center may be able to provide assistance with calculating R factors and other conservation-related issues. To find the office nearest you, go to <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/local>.

For Additional Information

Reference Documents

Stormwater Phase II Final Rule Fact Sheet Series

- Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm

Stormwater Phase II Final Rule (64 FR 68722)

- Internet: www.epa.gov/npdes/regulations/phase2.pdf
- Contact the U.S. EPA Water Resource Center (Phone: (202) 564-9545)

Agricultural Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE), Chapter 2, pp. 21-64, January 1997.

- Internet: www.epa.gov/npdes/pubs/ruslech2.pdf

Figure 1. Erosivity Index Zone Map

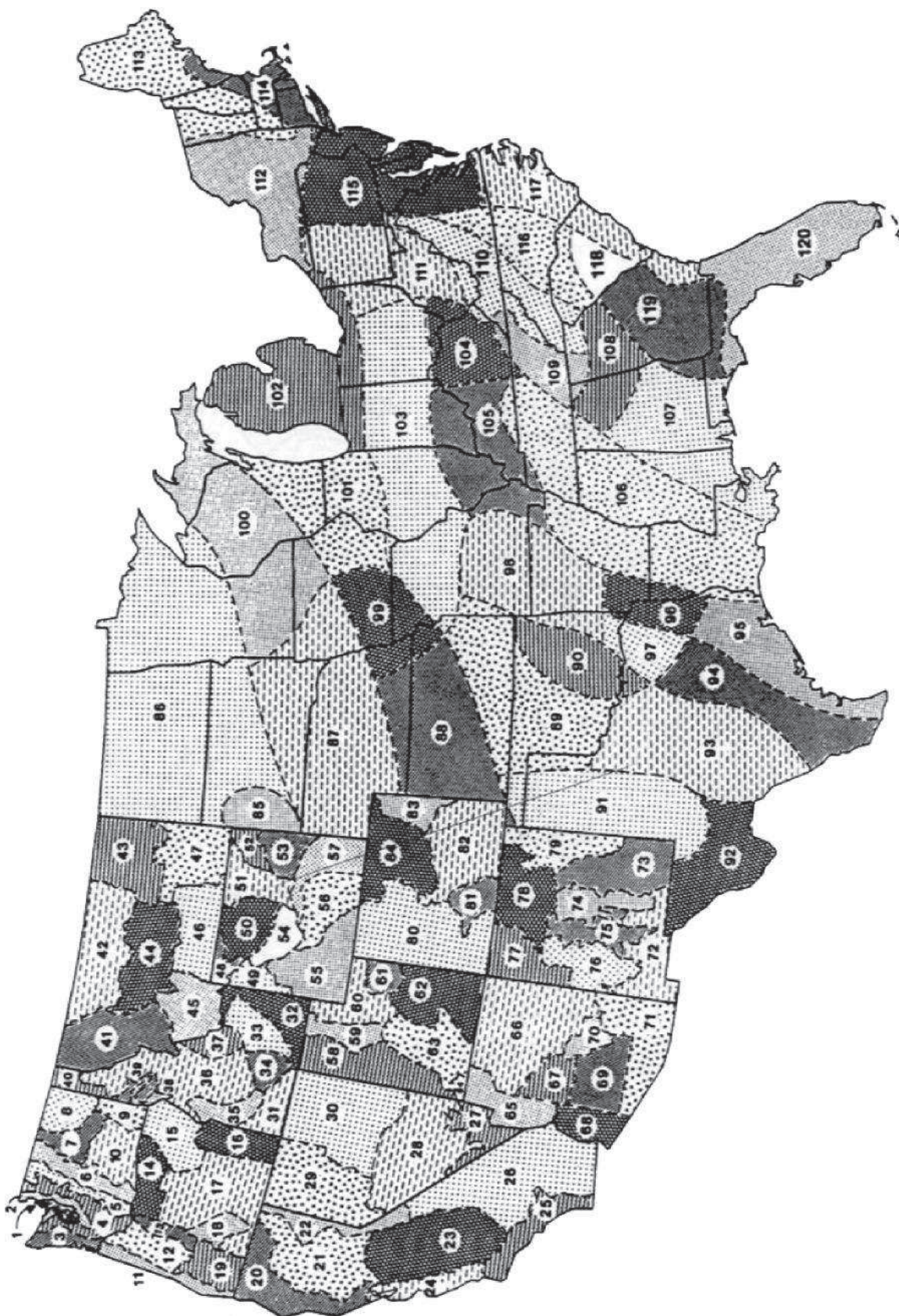
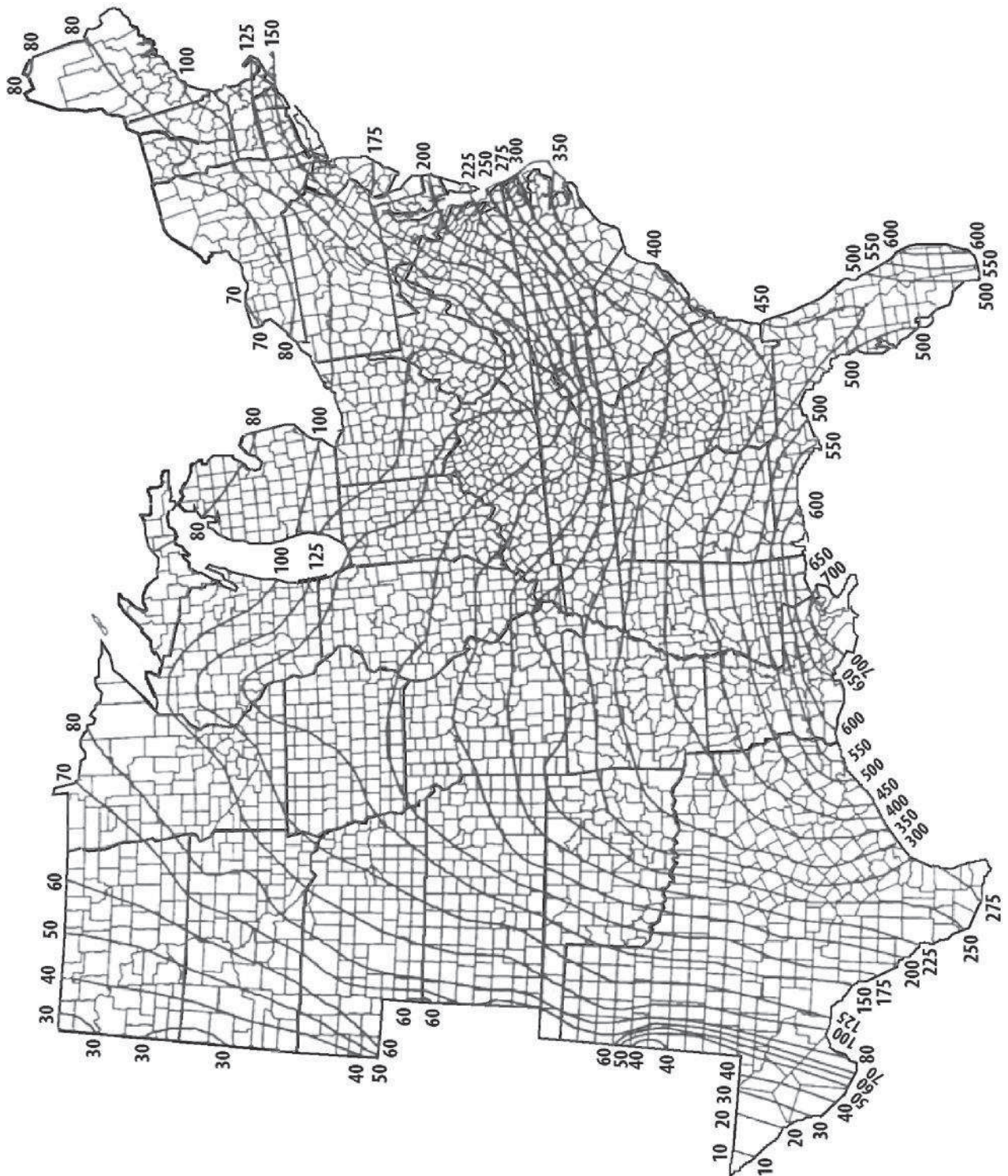
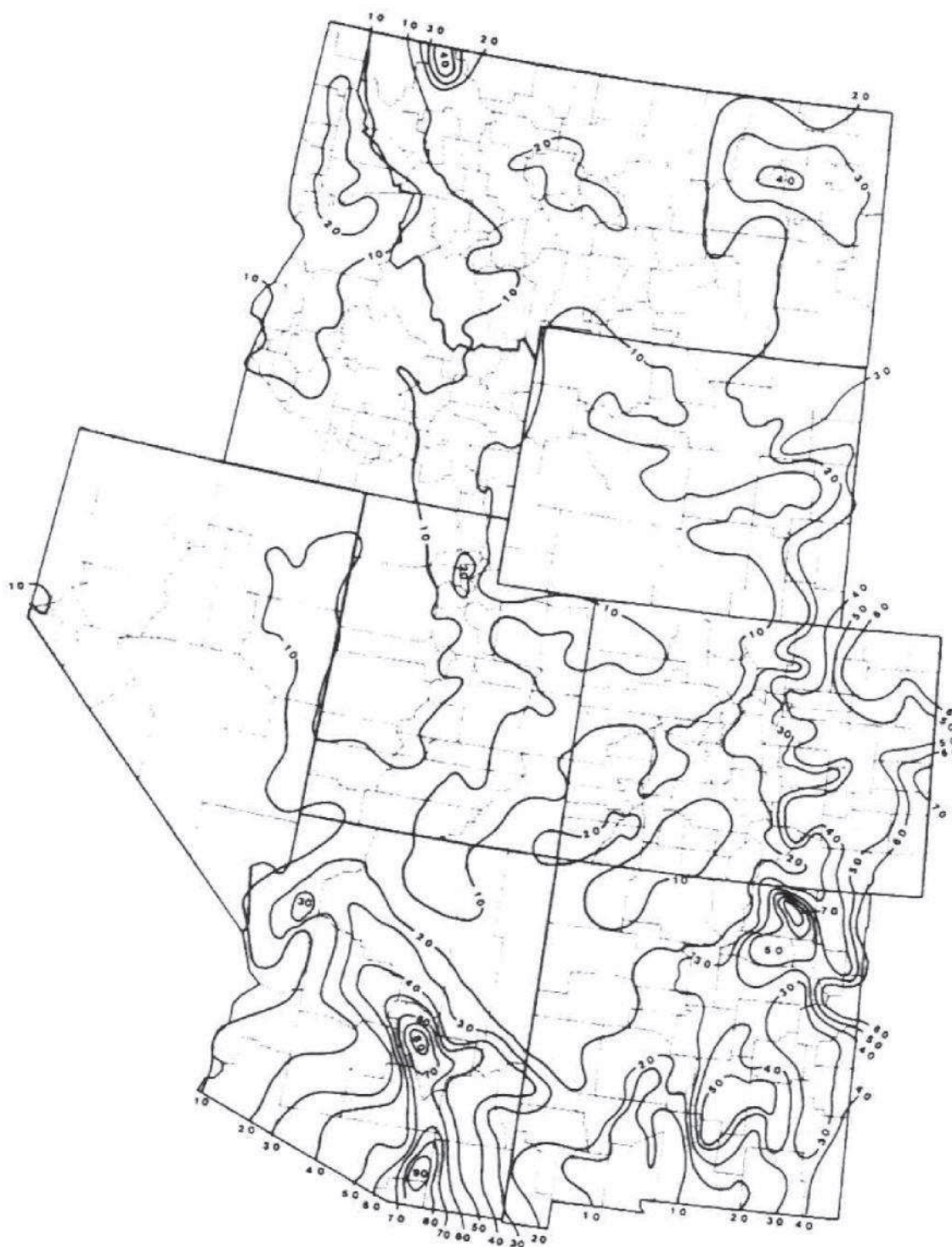


Figure 2. Isoerodent Map of the Eastern U.S.



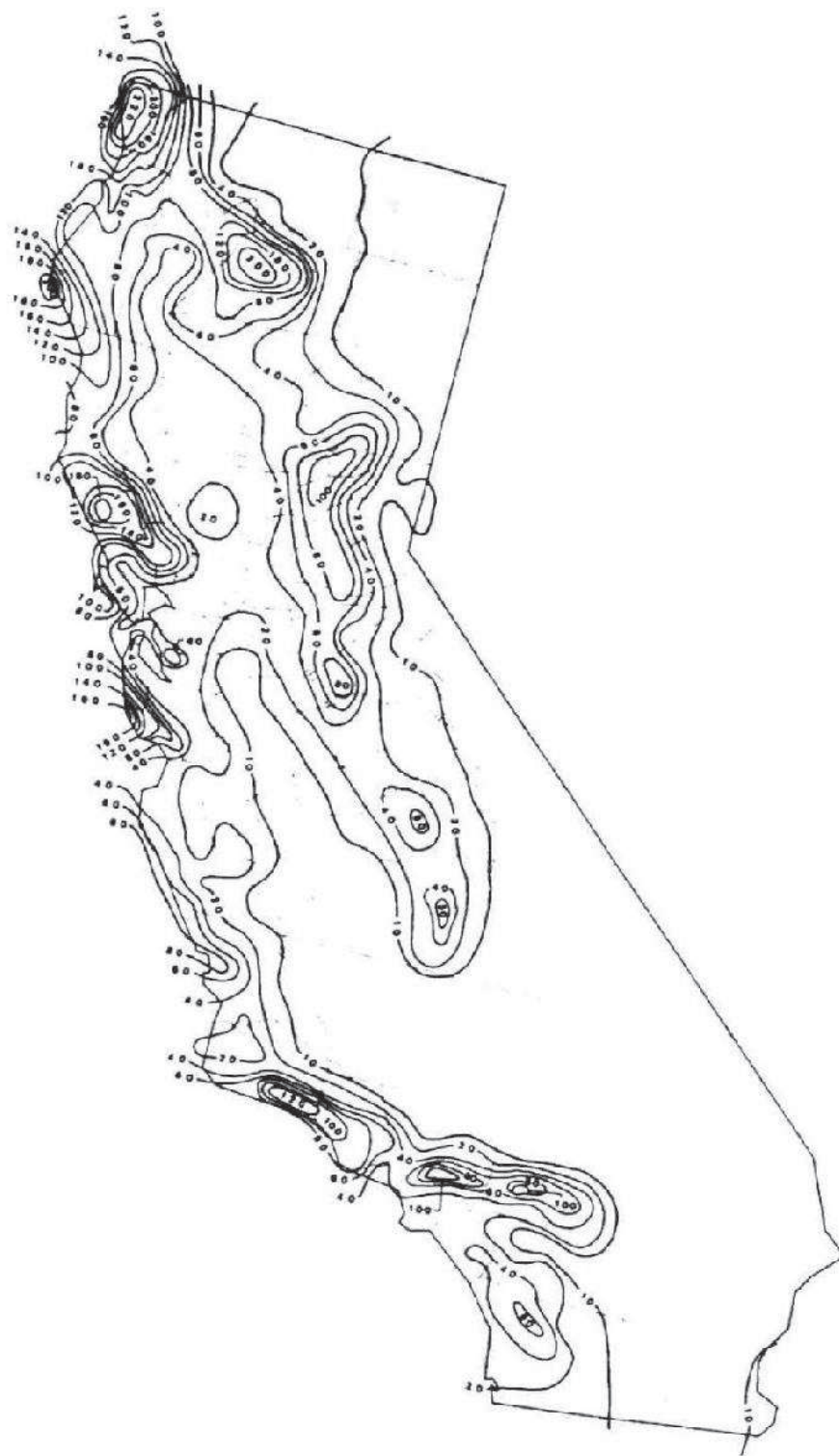
Note: Units for all maps on this page are hundreds ft•tonf•in(ac•h•yr)⁻¹

Figure 3. Isoerodent Map of the Western U.S.



Note: Units for all maps on this page are hundreds $\text{ft} \cdot \text{ton} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$

Figure 4. Isoerodent Map of California



Note: Units for all maps on this page are hundreds $\text{ft} \cdot \text{ton} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$

Figure 5. Isoerodent Map of Oregon and Washington



Note: Units for all maps on this page are hundreds $\text{ft} \cdot \text{ton} \cdot \text{in} \cdot (\text{ac} \cdot \text{h} \cdot \text{yr})^{-1}$

Table 1. Erosivity Index (%EI Values extracted from USDA Manual 703)

All values are at the end of the day listed below - Linear interpolation between dates is acceptable.
EI as a percentage of Average Annual R Value Computed for Geographic Areas Shown in Figure 1

Month Day	Jan 1	Jan 16	Jan 31	Feb 15	Feb 31	Mar 1	Mar 16	Mar 31	Apr 15	Apr 30	May 15	May 30	Jun 14	Jun 29	Jul 14	Jul 29	Aug 13	Aug 28	Sept 12	Sept 27	Oct 12	Oct 27	Nov 11	Nov 26	Dec 11	Dec 31
1	0	4.3	8.3	12.8	17.3	21.6	25.1	28	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53	56	60.8	66.8	71	75.7	82	89.1	95.2	100	
2	0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2	100	
3	0	7.4	13.8	20.9	26.5	31.8	35.3	38.5	40.2	41.6	42.5	43.6	44.5	45.1	45.7	46.4	47.7	49.4	52.8	57.0	64.5	73.1	83.3	92.3	100	
4	0	3.9	7.9	12.6	17.4	21.6	25.2	28.7	31.9	35.1	38.2	42.0	44.9	46.7	48.2	50.1	53.1	56.6	62.2	67.9	75.2	83.5	90.5	96.0	100	
5	0	2.3	3.6	4.7	6.0	7.7	10.7	13.9	17.8	21.2	24.5	28.1	31.1	33.1	35.3	38.2	43.2	48.7	57.3	67.8	77.9	86.0	91.3	96.9	100	
6	0	0.0	0.0	0.5	2.0	4.1	8.1	12.6	17.6	21.6	25.5	29.6	34.5	40.0	45.7	50.7	55.6	60.2	66.5	75.5	85.6	95.9	99.5	99.9	100	
7	0	0.0	0.0	0.0	0.0	1.2	4.9	8.5	13.9	19.0	26.0	35.4	43.9	48.8	53.9	64.5	73.4	77.5	80.4	84.8	89.9	96.6	99.2	99.7	100	
8	0	0.0	0.0	0.0	0.0	0.9	3.6	7.8	15.0	20.2	27.4	38.1	49.8	57.9	65.0	75.6	82.7	86.8	89.4	93.4	96.3	99.1	100.0	100.0	100	
9	0	0.8	3.1	4.7	7.4	11.7	17.8	22.5	27.0	31.4	36.0	41.6	46.4	50.1	53.4	57.4	61.7	64.9	69.7	79.0	89.6	97.4	100.0	100.0	100	
10	0	0.3	0.5	0.9	2.0	4.3	9.2	13.1	18.0	22.7	29.2	39.5	46.3	48.8	51.1	57.2	64.4	67.7	71.1	77.2	85.1	92.5	96.5	99.0	100	
11	0	5.4	11.3	18.8	26.3	33.2	37.4	40.7	42.5	44.3	45.4	46.5	47.1	47.4	47.8	48.3	49.4	50.7	53.6	57.5	65.5	76.2	87.4	94.8	100	
12	0	3.5	7.8	14.0	21.1	27.4	31.5	35.0	37.3	39.8	41.9	44.3	45.6	46.3	46.8	47.9	50.0	52.9	57.9	62.3	69.3	81.3	91.5	96.7	100	
13	0	0.0	0.0	1.8	7.2	11.9	16.7	19.7	24.0	31.2	42.4	55.0	60.0	60.8	61.2	62.6	65.3	67.6	71.6	76.1	83.1	93.3	98.2	99.6	100	
14	0	0.7	1.8	3.3	6.9	16.5	26.6	29.9	32.0	35.4	40.2	45.1	51.9	61.1	67.5	70.7	72.8	75.4	78.6	81.9	86.4	93.6	97.7	99.3	100	
15	0	0.0	0.0	0.5	2.0	4.4	8.7	12.0	16.6	21.4	29.7	44.5	56.0	60.8	63.9	69.1	74.5	79.1	83.1	87.0	90.9	96.6	99.1	99.8	100	
16	0	0.0	0.0	0.5	2.0	5.5	12.3	16.2	20.9	26.4	35.2	48.1	58.1	63.1	66.5	71.9	77.0	81.6	85.1	88.4	91.5	96.3	98.7	99.6	100	
17	0	0.0	0.0	0.7	2.8	6.1	10.7	12.9	16.1	21.9	32.8	45.9	55.5	60.3	64.0	71.2	77.2	80.3	83.1	87.7	92.6	97.2	99.1	99.8	100	
18	0	0.0	0.0	0.6	2.5	6.2	12.4	16.4	20.2	23.9	29.3	37.7	45.6	49.8	53.3	58.4	64.3	69.0	75.0	86.6	93.9	96.6	98.0	100.0	100	
19	0	1.0	2.6	7.4	16.4	23.5	28.0	31.0	33.5	37.0	41.7	48.1	51.1	52.0	52.5	53.6	55.7	57.6	61.1	65.8	74.7	88.0	95.8	98.7	100	
20	0	9.8	18.5	25.4	30.2	35.6	38.9	41.5	42.9	44.0	45.2	48.2	50.8	51.7	52.5	54.6	57.4	58.5	60.1	63.2	69.6	76.7	85.4	92.4	100	
21	0	7.5	13.6	18.1	21.1	24.4	27.0	29.4	31.7	34.6	37.3	39.6	41.6	43.4	45.4	48.1	51.3	53.3	56.6	62.4	72.4	81.3	88.9	94.7	100	
22	0	1.2	1.6	1.6	1.6	1.6	1.6	2.2	3.9	4.6	6.4	14.2	32.8	47.2	58.8	69.1	76.0	82.0	87.1	96.7	99.9	99.9	99.9	99.9	100	
23	0	7.9	15.0	20.9	25.7	31.1	35.7	40.2	43.2	46.2	47.7	48.8	49.4	49.9	50.7	51.8	54.1	57.7	62.8	65.9	70.1	77.3	86.8	93.5	100	
24	0	12.2	23.6	33.0	39.7	47.1	51.7	55.9	57.7	58.6	58.9	59.1	59.1	59.2	59.2	59.3	59.5	60.0	61.4	63.0	66.5	71.8	81.3	89.6	100	
25	0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.1	57.2	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93.0	100	
26	0	2.0	5.4	9.8	15.6	21.5	24.7	26.6	27.4	28.0	28.7	29.8	32.5	36.6	44.9	55.4	65.7	72.6	77.8	84.4	89.5	93.9	96.5	98.4	100	
27	0	0.0	0.0	1.0	4.0	5.9	8.0	11.1	13.0	14.0	14.6	15.3	17.0	23.2	39.1	60.0	76.3	86.1	89.7	90.4	90.9	93.1	96.6	99.1	100	
28	0	0.0	0.0	0.0	0.2	0.5	1.5	3.3	7.2	11.9	17.7	21.4	27.0	37.1	51.4	62.3	70.6	78.8	84.6	90.6	94.4	97.9	99.3	100.0	100	
29	0	0.6	0.7	0.7	0.7	1.5	3.9	6.0	10.5	17.9	28.8	36.6	43.8	51.5	59.3	68.0	74.8	80.3	84.3	88.8	92.7	98.0	99.8	99.9	100	
30	0	0.0	0.0	0.0	0.0	0.2	0.8	2.8	7.9	14.2	24.7	35.6	45.4	52.2	58.7	68.5	77.6	84.5	88.9	93.7	96.2	97.6	98.3	99.6	100	
31	0	0.0	0.0	0.0	0.0	0.2	1.0	3.5	9.9	15.7	26.4	47.2	61.4	65.9	69.0	77.2	86.0	91.6	94.8	98.7	100.0	100.0	100.0	100.0	100	
32	0	0.1	0.1	0.1	0.1	0.6	2.2	4.3	9.0	14.2	23.3	34.6	46.3	54.2	61.7	72.9	82.5	89.6	93.7	98.2	99.7	99.9	99.9	99.9	100	
33	0	0.0	0.0	0.0	0.0	0.6	2.3	4.2	8.8	16.1	30.0	46.9	57.9	62.8	66.2	72.1	79.1	85.9	91.1	97.0	98.9	98.9	98.9	98.9	100	
34	0	0.0	0.0	0.0	0.0	1.8	7.3	10.7	15.5	22.0	29.9	35.9	42.0	48.5	56.9	67.0	76.9	85.8	91.2	95.7	97.8	99.6	100.0	100.0	100	
35	0	0.0	0.0	0.0	0.0	2.5	10.2	15.9	22.2	27.9	34.7	43.9	51.9	56.9	61.3	67.3	73.9	80.1	85.1	89.6	93.2	98.2	99.8	99.8	100	

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI/Zone																									
36	0	0.0	0.0	0.0	0.0	0.9	3.4	6.7	12.7	18.5	26.6	36.3	46.0	53.5	60.2	68.3	75.8	82.6	88.3	96.3	99.3	99.9	100.0	100.0	100
37	0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.9	9.1	19.1	26.7	36.3	47.9	61.4	75.1	84.5	92.3	96.0	99.1	100.0	100.0	100.0	100.0	100
38	0	0.0	0.0	1.1	4.3	7.2	11.0	13.9	17.9	22.3	30.3	43.1	55.1	61.3	65.7	72.1	77.9	82.6	86.3	90.3	93.8	96.4	100.0	100.0	100
39	0	0.0	0.0	0.0	0.0	1.6	6.5	11.0	17.8	24.7	33.1	42.8	50.3	54.9	59.7	68.9	78.1	83.6	87.5	93.0	96.5	99.2	100.0	100.0	100
40	0	0.0	0.0	0.0	0.0	1.5	6.2	10.1	16.3	23.3	32.5	42.2	50.1	55.6	60.5	67.5	74.3	79.4	84.1	91.1	95.8	99.1	100.0	100.0	100
41	0	0.1	0.2	0.2	0.2	0.2	0.2	0.4	1.1	6.8	22.9	40.1	54.9	63.8	70.7	81.5	89.8	96.3	98.7	99.2	99.3	99.4	99.4	99.4	100
42	0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	5.2	17.3	33.8	53.2	66.5	75.9	87.6	93.7	97.5	99.0	99.7	100.0	100.0	100.0	100.0	100
43	0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	2.7	9.5	21.9	42.7	58.6	71.1	84.6	91.9	97.1	99.0	99.8	100.0	100.0	100.0	100.0	100
44	0	1.7	2.3	2.4	2.4	2.4	2.4	2.7	3.5	7.6	18.5	34.3	52.5	64.0	72.3	83.3	90.0	95.1	97.3	98.5	98.9	98.9	98.9	99.2	100
45	0	0.2	0.2	0.3	0.3	0.4	0.6	0.8	1.4	3.7	10.2	22.6	41.8	54.0	64.5	78.7	88.4	96.0	98.7	99.4	99.7	99.7	99.7	99.8	100
46	0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.6	7.5	19.6	32.9	48.9	63.0	73.5	83.3	89.5	95.6	98.3	99.6	100.0	100.0	100.0	100.0	100
47	0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6	5.8	17.0	33.0	52.5	66.4	75.7	85.5	91.3	96.5	98.8	100.0	100.0	100.0	100.0	100.0	100
48	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	8.1	15.4	27.8	40.7	52.6	61.1	69.3	82.6	92.0	98.0	100.0	100.0	100.0	100.0	100
49	0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.7	8.3	20.0	27.5	35.6	44.6	46.0	70.2	81.3	89.2	93.6	98.5	100.0	100.0	100.0	100.0	100
50	0	0.0	0.0	0.0	0.0	0.1	0.4	2.4	8.2	13.7	23.8	38.8	55.1	66.1	73.6	81.8	87.7	93.8	97.0	99.4	100.0	100.0	100.0	100.0	100
51	0	0.0	0.0	0.0	0.0	0.3	1.0	3.1	8.7	18.8	35.8	49.6	60.4	70.2	77.0	84.0	88.8	93.8	96.6	99.1	100.0	100.0	100.0	100.0	100
52	0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.5	6.8	17.5	29.8	46.1	60.5	72.7	86.0	92.8	96.8	98.4	99.7	100.0	100.0	100.0	100.0	100
53	0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.0	9.5	24.2	35.3	48.0	63.1	76.1	87.7	93.5	97.2	98.6	99.5	99.8	99.9	100.0	100.0	100
54	0	0.0	0.0	0.0	0.0	0.2	0.7	2.4	7.2	14.7	27.2	37.2	47.3	58.8	67.6	74.0	79.2	86.7	92.6	97.9	99.8	99.9	100.0	100.0	100
55	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.4	13.3	25.5	31.6	38.8	52.5	66.8	75.5	81.2	87.9	92.8	98.3	100.0	100.0	100.0	100.0	100
56	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.1	11.4	22.3	29.5	38.5	51.1	65.2	77.8	85.6	91.7	95.0	98.7	100.0	100.0	100.0	100.0	100
57	0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	3.5	9.2	21.5	31.0	43.5	60.4	75.1	86.1	91.6	96.2	98.1	99.4	99.9	99.9	100.0	100.0	100
58	0	0.0	0.0	0.0	0.0	0.2	0.9	2.9	8.0	13.2	21.0	29.1	38.0	45.9	54.5	65.4	74.8	82.1	87.5	95.4	98.8	99.7	100.0	100.0	100
59	0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.9	15.6	24.2	31.1	38.3	46.0	54.9	64.2	73.2	81.9	88.5	95.7	98.6	99.4	99.7	100	100
60	0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.5	4.0	9.5	13.3	20.5	33.6	52.8	66.5	76.7	88.1	94.2	98.6	100.0	100.0	100.0	100.0	100
61	0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.0	8.5	15.5	29.8	41.8	46.0	49.2	56.0	65.1	71.6	78.6	91.1	97.3	99.3	100.0	100.0	100
62	0	0.0	0.0	0.1	0.3	0.8	2.1	3.6	6.5	9.7	13.7	16.5	20.8	27.3	40.1	56.9	72.6	83.4	89.4	95.5	98.1	99.6	100.0	100.0	100
63	0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.7	7.8	13.3	15.8	19.9	29.0	46.8	64.7	78.3	88.8	93.9	98.5	100.0	100.0	100.0	100.0	100
64	0	0.0	0.0	0.7	2.8	7.4	12.4	14.4	15.6	17.3	19.4	21.0	24.4	32.3	48.0	61.4	72.1	81.9	87.0	90.1	92.4	98.1	100.0	100.0	100
65	0	3.6	7.0	9.6	11.4	13.0	14.4	16.3	17.7	18.4	19.3	20.5	23.6	32.0	50.0	66.2	77.2	85.4	88.8	90.4	91.3	92.7	94.8	97.0	100
66	0	0.0	0.0	0.0	0.0	0.1	0.5	1.1	2.2	3.6	6.0	7.6	11.1	19.8	38.9	59.7	74.4	83.2	88.1	94.6	97.7	99.4	100.0	100.0	100
67	0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.6	1.9	2.4	5.0	12.1	24.8	48.3	73.6	86.5	92.0	94.3	96.6	97.9	99.5	100.0	100.0	100
68	0	2.3	4.5	7.8	10.4	12.0	13.3	16.3	17.7	18.1	18.2	18.3	18.4	19.9	24.5	35.0	54.4	69.4	78.6	85.7	89.2	91.9	93.9	97.0	100
69	0	2.0	3.7	5.7	7.8	10.5	12.4	13.7	14.3	14.7	15.1	15.7	17.1	22.7	36.7	50.4	63.6	75.0	81.8	87.8	90.8	93.2	94.9	97.5	100
70	0	0.5	0.7	1.0	1.3	1.7	2.2	2.8	3.4	3.9	4.7	5.4	7.4	15.7	36.5	55.8	70.3	80.9	86.4	90.9	93.4	96.4	98.1	99.4	100
71	0	0.7	1.2	1.6	2.1	2.8	3.3	3.6	4.0	4.5	5.6	6.5	9.1	18.5	40.6	59.7	74.0	86.3	91.7	94.7	96.0	96.7	97.3	98.8	100
72	0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.8	1.3	3.5	9.9	24.7	51.4	71.5	83.6	93.8	97.7	99.2	99.8	99.9	99.9	100.0	100
73	0	0.0	0.1	0.1	0.2	0.2	0.3	0.6	1.3	4.1	11.5	18.1	28.3	40.2	54.1	67.0	77.2	87.7	93.3	97.5	99.1	99.6	99.8	100.0	100
74	0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	1.2	2.7	6.4	10.2	18.4	31.0	50.7	68.7	81.2	91.6	96.1	98.4	99.2	99.8	100.0	100.0	100
75	0	0.1	0.1	0.1	0.2	0.5	1.3	1.9	3.0	4.1	6.6	10.0	17.6	28.3	44.7	59.4	71.6	83.9	90.3	94.7	96.7	98.8	99.6	99.9	100

Month	Jan	Jan	Jan	Feb	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec	
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI/Zone																									
76	0	0.0	0.0	0.0	0.0	0.1	0.2	0.6	1.3	2.0	3.5	4.9	8.4	17.4	37.3	57.5	72.9	83.7	89.5	95.8	98.4	99.6	100.0	100.0	100
77	0	0.2	0.3	0.3	0.4	0.8	1.5	2.0	2.8	3.9	5.9	7.2	10.3	21.5	46.5	66.3	78.3	86.5	90.8	96.0	98.2	99.1	99.5	99.8	100
78	0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.6	3.8	8.9	13.2	21.8	35.8	56.6	75.4	86.0	92.9	95.9	98.2	99.2	99.8	100.0	100.0	100
79	0	0.0	0.0	0.0	0.0	0.2	0.7	1.3	2.7	5.8	12.7	18.8	28.8	41.6	58.4	75.7	86.5	94.2	97.3	98.9	99.5	99.9	100.0	100.0	100
80	0	0.6	1.2	1.6	2.1	2.5	3.3	4.5	6.9	10.1	15.5	19.7	26.6	36.4	51.7	67.5	79.4	88.8	93.2	96.1	97.3	98.2	98.7	99.3	100
81	0	0.1	0.1	0.2	0.4	0.5	0.8	0.9	1.5	3.9	9.9	12.8	18.2	30.7	54.1	77.1	89.0	94.9	97.2	98.7	99.3	99.6	99.7	99.9	100
82	0	0.0	0.1	0.1	0.2	0.2	0.5	1.2	3.1	6.7	14.4	20.1	29.8	44.5	64.2	83.1	92.2	96.4	98.1	99.3	99.7	99.8	99.8	99.9	100
83	0	0.0	0.1	0.1	0.1	0.3	0.9	1.6	3.5	8.3	19.4	30.0	44.0	59.2	72.4	84.6	91.2	96.5	98.6	99.5	99.8	99.9	100.0	100.0	100
84	0	0.0	0.1	0.1	0.2	0.3	0.6	1.7	4.9	9.9	19.5	27.2	38.3	52.8	68.8	83.9	91.6	96.4	98.2	99.2	99.6	99.8	99.8	99.9	100
85	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	3.0	6.0	11.0	23.0	36.0	49.0	63.0	77.0	90.0	95.0	98.0	99.0	100.0	100.0	100.0	100.0	100
86	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	3.0	6.0	11.0	23.0	36.0	49.0	63.0	77.0	90.0	95.0	98.0	99.0	100.0	100.0	100.0	100.0	100
87	0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	3.0	6.0	10.0	17.0	29.0	43.0	55.0	67.0	85.0	91.0	96.0	98.0	99.0	99.0	100.0	100.0	100
88	0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	3.0	6.0	13.0	23.0	37.0	51.0	61.0	69.0	85.0	91.0	94.0	96.0	98.0	99.0	99.0	100.0	100
89	0	1.0	1.0	2.0	3.0	4.0	7.0	12.0	18.0	27.0	38.0	48.0	55.0	62.0	69.0	76.0	83.0	90.0	94.0	97.0	98.0	99.0	100.0	100.0	100
90	0	1.0	2.0	3.0	4.0	6.0	8.0	13.0	21.0	29.0	37.0	46.0	54.0	60.0	65.0	69.0	74.0	81.0	87.0	92.0	95.0	97.0	98.0	99.0	100
91	0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	6.0	16.0	29.0	39.0	46.0	53.0	60.0	67.0	74.0	81.0	88.0	95.0	99.0	99.0	100.0	100.0	100
92	0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	6.0	16.0	29.0	39.0	46.0	53.0	60.0	67.0	74.0	81.0	88.0	95.0	99.0	99.0	100.0	100.0	100
93	0	1.0	1.0	2.0	3.0	4.0	6.0	8.0	13.0	25.0	40.0	49.0	56.0	62.0	67.0	72.0	76.0	80.0	85.0	91.0	97.0	98.0	99.0	99.0	100
94	0	1.0	2.0	4.0	6.0	8.0	10.0	15.0	21.0	29.0	38.0	47.0	53.0	57.0	61.0	65.0	70.0	76.0	83.0	88.0	91.0	94.0	96.0	98.0	100
95	0	1.0	3.0	5.0	7.0	9.0	11.0	14.0	18.0	27.0	35.0	41.0	46.0	51.0	57.0	62.0	68.0	73.0	79.0	84.0	89.0	93.0	96.0	98.0	100
96	0	2.0	4.0	6.0	9.0	12.0	17.0	23.0	30.0	37.0	43.0	49.0	54.0	58.0	62.0	66.0	70.0	74.0	78.0	82.0	86.0	90.0	94.0	97.0	100
97	0	1.0	3.0	5.0	7.0	10.0	14.0	20.0	28.0	37.0	48.0	56.0	61.0	64.0	68.0	72.0	77.0	81.0	86.0	89.0	92.0	95.0	98.0	99.0	100
98	0	1.0	2.0	4.0	6.0	8.0	10.0	13.0	19.0	26.0	34.0	42.0	50.0	58.0	63.0	68.0	74.0	79.0	84.0	89.0	93.0	95.0	97.0	99.0	100
99	0	0.0	0.0	1.0	1.0	2.0	3.0	5.0	7.0	12.0	19.0	33.0	48.0	57.0	65.0	72.0	82.0	88.0	93.0	96.0	98.0	99.0	100.0	100.0	100
100	0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	5.0	9.0	15.0	27.0	38.0	50.0	62.0	74.0	84.0	91.0	95.0	97.0	98.0	99.0	99.0	100.0	100
101	0	0.0	0.0	1.0	2.0	3.0	4.0	6.0	9.0	14.0	20.0	28.0	39.0	52.0	63.0	72.0	80.0	87.0	91.0	94.0	97.0	98.0	99.0	100.0	100
102	0	0.0	1.0	2.0	3.0	4.0	6.0	8.0	11.0	15.0	22.0	31.0	40.0	49.0	59.0	69.0	78.0	85.0	91.0	94.0	96.0	98.0	99.0	100.0	100
103	0	1.0	2.0	3.0	4.0	6.0	8.0	10.0	14.0	18.0	25.0	34.0	45.0	56.0	64.0	72.0	79.0	84.0	89.0	92.0	95.0	97.0	98.0	99.0	100
104	0	2.0	3.0	5.0	7.0	10.0	13.0	16.0	19.0	23.0	27.0	34.0	44.0	54.0	63.0	72.0	80.0	85.0	89.0	91.0	93.0	95.0	96.0	98.0	100
105	0	1.0	3.0	6.0	9.0	12.0	16.0	21.0	26.0	31.0	37.0	43.0	50.0	57.0	64.0	71.0	77.0	81.0	85.0	88.0	91.0	93.0	95.0	97.0	100
106	0	3.0	6.0	9.0	13.0	17.0	21.0	27.0	33.0	38.0	44.0	49.0	55.0	61.0	67.0	71.0	75.0	78.0	81.0	84.0	86.0	90.0	94.0	97.0	100
107	0	3.0	5.0	7.0	10.0	14.0	18.0	23.0	27.0	31.0	35.0	39.0	45.0	53.0	60.0	67.0	74.0	80.0	84.0	86.0	88.0	90.0	93.0	95.0	100
108	0	3.0	6.0	9.0	12.0	16.0	20.0	24.0	28.0	33.0	38.0	43.0	50.0	59.0	69.0	75.0	80.0	84.0	87.0	90.0	92.0	94.0	96.0	98.0	100
109	0	3.0	6.0	10.0	13.0	16.0	19.0	23.0	26.0	29.0	33.0	39.0	47.0	58.0	68.0	75.0	80.0	83.0	86.0	88.0	90.0	92.0	95.0	97.0	100
110	0	1.0	3.0	5.0	7.0	9.0	12.0	15.0	18.0	21.0	25.0	29.0	36.0	45.0	56.0	68.0	77.0	83.0	88.0	91.0	93.0	95.0	97.0	99.0	100
111	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	11.0	15.0	20.0	28.0	41.0	54.0	65.0	74.0	82.0	87.0	92.0	94.0	96.0	97.0	98.0	99.0	100
112	0	0.0	0.0	1.0	2.0	3.0	4.0	5.0	7.0	12.0	17.0	24.0	33.0	42.0	55.0	67.0	76.0	83.0	89.0	92.0	94.0	96.0	98.0	99.0	100
113	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	13.0	17.0	22.0	31.0	42.0	52.0	60.0	68.0	75.0	80.0	85.0	89.0	92.0	96.0	98.0	100
114	0	1.0	2.0	4.0	6.0	8.0	11.0	13.0	15.0	18.0	21.0	26.0	32.0	38.0	46.0	55.0	64.0	71.0	77.0	81.0	85.0	89.0	93.0	97.0	100
115	0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	14.0	19.0	26.0	34.0	45.0	56.0	66.0	76.0	82.0	86.0	90.0	93.0	95.0	97.0	99.0	100

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI/Zone																									
116	0	1.0	3.0	5.0	7.0	9.0	12.0	15.0	18.0	21.0	25.0	29.0	36.0	45.0	56.0	68.0	77.0	83.0	88.0	91.0	93.0	95.0	97.0	99.0	100
117	0	1.0	2.0	3.0	4.0	5.0	7.0	9.0	11.0	14.0	17.0	22.0	31.0	42.0	54.0	65.0	74.0	83.0	89.0	92.0	95.0	97.0	98.0	99.0	100
118	0	1.0	2.0	3.0	5.0	7.0	10.0	14.0	18.0	22.0	27.0	32.0	37.0	46.0	58.0	69.0	80.0	89.0	93.0	94.0	95.0	96.0	97.0	97.0	100
119	0	2.0	4.0	6.0	8.0	12.0	16.0	20.0	25.0	30.0	35.0	41.0	47.0	56.0	67.0	75.0	81.0	85.0	87.0	89.0	91.0	93.0	95.0	97.0	100
120	0	1.0	2.0	4.0	6.0	7.0	9.0	12.0	15.0	18.0	23.0	31.0	40.0	48.0	57.0	63.0	72.0	78.0	88.0	92.0	96.0	97.0	98.0	99.0	100
121	0	8.0	16.0	25.0	33.0	41.0	46.0	50.0	53.0	54.0	55.0	56.0	56.5	57.0	57.8	58.0	58.8	60.0	61.0	63.0	66.5	72.0	80.0	90.0	100
122	0	7.0	14.0	20.0	25.5	33.5	38.0	43.0	46.0	50.0	52.5	54.5	56.0	58.0	59.0	60.0	61.5	63.0	65.0	68.0	72.0	79.0	86.0	93.0	100
123	0	4.0	8.0	12.0	17.0	23.0	29.0	34.0	38.0	44.0	49.0	53.0	56.0	59.0	62.0	65.0	69.0	72.0	75.0	79.0	83.0	88.0	93.0	96.0	100
124	0	4.0	9.0	15.0	23.0	29.0	34.0	40.0	44.0	48.0	50.0	51.0	52.0	53.0	55.0	57.0	60.0	62.0	64.0	67.0	72.0	80.0	88.0	95.0	100
125	0	7.0	12.0	17.0	24.0	30.0	39.0	45.0	50.0	53.0	55.0	56.0	57.0	58.0	59.0	61.0	62.0	63.0	64.0	66.0	70.0	77.0	84.0	92.0	100
126	0	9.0	16.0	23.0	30.0	37.0	43.0	47.0	50.0	52.0	54.0	55.0	56.0	57.0	58.0	59.0	60.0	62.0	64.0	67.0	71.0	77.0	86.0	93.0	100
127	0	8.0	15.0	22.0	28.0	33.0	38.0	42.0	46.0	50.0	52.0	53.0	53.0	53.0	53.0	54.0	55.0	57.0	59.0	63.0	68.0	75.0	83.0	92.0	100
128	0	8.0	15.0	22.0	29.0	34.0	40.0	45.0	48.0	51.0	54.0	57.0	59.0	62.0	63.0	64.0	65.0	66.0	67.0	69.0	72.0	76.0	83.0	91.0	100
129	0	9.0	16.0	22.0	27.0	32.0	37.0	41.0	45.0	48.0	51.0	53.0	55.0	56.0	57.0	57.0	58.0	59.0	61.0	64.0	68.0	73.0	79.0	89.0	100
130	0	10.0	20.0	28.0	35.0	41.0	46.0	49.0	51.0	53.0	55.0	56.0	56.0	57.0	58.0	59.0	60.0	61.0	62.0	65.0	69.0	74.0	81.0	90.0	100
131	0	8.0	15.0	22.0	28.0	33.0	38.0	41.0	44.0	47.0	49.0	51.0	53.0	55.0	56.0	58.0	59.0	60.0	63.0	65.0	69.0	75.0	84.0	92.0	100
132	0	10.0	18.0	25.0	29.0	33.0	36.0	39.0	41.0	42.0	44.0	45.0	46.0	47.0	48.0	49.0	51.0	53.0	56.0	59.0	64.0	70.0	80.0	90.0	100
133	0	8.0	16.0	24.0	32.0	40.0	46.0	51.0	54.0	56.0	57.0	58.0	58.0	59.0	59.0	60.0	60.0	61.0	62.0	64.0	68.0	74.0	83.0	91.0	100
134	0	12.0	22.0	31.0	39.0	45.0	49.0	52.0	54.0	55.0	56.0	56.0	56.0	56.0	57.0	57.0	57.0	57.0	58.0	59.0	62.0	68.0	77.0	88.0	100
135	0	7.0	15.0	22.0	30.0	37.0	43.0	49.0	53.0	55.0	57.0	58.0	59.0	60.0	61.0	62.0	63.0	65.0	67.0	70.0	74.0	79.0	85.0	92.0	100
136	0	11.0	21.0	29.0	37.0	44.0	50.0	55.0	57.0	59.0	60.0	60.0	60.0	60.0	61.0	61.0	61.0	62.0	63.0	64.0	67.0	71.0	78.0	89.0	100
137	0	10.0	18.0	25.0	30.0	39.0	46.0	51.0	54.0	57.0	58.0	59.0	59.0	60.0	60.0	60.0	61.0	62.0	63.0	64.0	67.0	72.0	80.0	90.0	100
138	0	11.0	22.0	31.0	39.0	46.0	52.0	56.0	58.0	59.0	60.0	61.0	61.0	61.0	61.0	62.0	62.0	62.0	63.0	64.0	66.0	71.0	78.0	89.0	100
139	0	8.0	14.0	20.0	25.0	32.0	37.0	42.0	47.0	50.0	53.0	55.0	56.0	58.0	59.0	61.0	63.0	64.0	66.0	68.0	71.0	76.0	85.0	93.0	100
140	0	13.0	18.0	43.0	56.0	65.0	69.0	69.7	70.1	70.4	70.8	71.1	71.1	71.5	71.9	72.2	72.6	73.0	73.3	73.6	74.0	76.0	81.0	89.0	100

INDUSTRIAL NO EXPOSURE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

STORMWATER PHASE II

FINAL RULE



Stormwater Phase II Final Rule

Conditional No Exposure Exclusion for Industrial Activity

Stormwater Phase II Final Rule Fact Sheet Series

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Industrial “No Exposure”

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Why Is the Phase I No Exposure Exclusion Addressed in the Phase II Final Rule?

The 1990 stormwater regulations for Phase I of the Federal stormwater program identify eleven categories of industrial activities that must obtain a National Pollutant Discharge Elimination System (NPDES) permit. Operators of certain facilities within category eleven (xi), commonly referred to as “light industry,” were exempted from the definition of “stormwater discharge associated with industrial activity,” and the subsequent requirement to obtain an NPDES permit, provided their industrial materials or activities were not “exposed” to stormwater. This Phase I exemption from permitting was limited to those facilities identified in category (xi), and did not require category (xi) facility operators to submit any information supporting their no exposure claim.

In 1992, the Ninth Circuit court remanded to EPA for further rulemaking the no exposure exemption for light industry after making a determination that the exemption was arbitrary and capricious for two reasons. First, the court found that EPA had not established a record to support its assumption that light industrial activity that is not exposed to stormwater (as opposed to all other regulated industrial activity not exposed) is not a “stormwater discharge associated with industrial activity.” Second, the court concluded that the exemption impermissibly relied on the unsubstantiated judgment of the light industrial facility operator to determine the applicability of the exemption. These findings resulted in a revised conditional no exposure exclusion, the changes to which are described in this fact sheet.

Who is Eligible to Claim No Exposure?

As revised in the Phase II Final Rule, the conditional no exposure exclusion applies to ALL industrial categories listed in the 1990 stormwater regulations, except for construction activities disturbing 5 or more acres (category (x)).

What Is The Regulatory Definition of “No Exposure”?

The intent of the no exposure provision is to provide facilities with industrial materials and activities that are entirely sheltered from stormwater a simplified way of complying with the stormwater permitting provisions of the Clean Water Act (CWA). This includes facilities that are located within a larger office building, or facilities at which the only items permanently exposed to precipitation are roofs, parking lots, vegetated areas, and other non-industrial areas or activities. The Phase II regulatory definition of “no exposure” follows.

No exposure is defined as all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products.

A storm-resistant shelter is not required for the following industrial materials and activities:

- Drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. “Sealed” means banded or otherwise secured and without operational taps or valves;
- Adequately maintained vehicles used in materials handling; and
- Final products, other than products that would be mobilized in stormwater discharges (e.g., rock salt).

The term “storm-resistant shelter,” as used in the no exposure definition, includes completely roofed and walled buildings or structures, as well as structures with only a top cover but no side coverings, provided material under the structure is not otherwise subject to any run-on and subsequent runoff of stormwater. While the intent of the no exposure provision is to promote a condition of permanent no exposure, EPA understands certain vehicles could become temporarily exposed to rain and snow while passing between buildings. Adequately maintained mobile equipment (e.g., trucks, automobiles, forklifts, trailers, or other such general purpose vehicles found at the industrial site that are not industrial machinery, and that are not leaking contaminants or are not otherwise a source of industrial pollutants) can be exposed to precipitation or runoff. Such activities alone would not prevent a facility from certifying to no exposure. Similarly, trucks or other vehicles awaiting maintenance at vehicle maintenance facilities that are not leaking contaminants or are not otherwise a source of industrial pollutants, are not considered “exposed.”

In addition, EPA recognizes that there are circumstances where permanent no exposure of industrial activities or materials is not possible and, therefore, under such conditions, materials and activities can be sheltered with temporary covers (e.g., tarps) between periods of permanent enclosure. The no exposure provision does not specify every such situation, but NPDES permitting authorities can address this issue on a case-by-case basis.

The Phase II Final Rule also addresses particulate matter emissions from roof stacks/vents that are regulated by, and in compliance with, other environmental protection programs (i.e., air quality control programs) and that do not cause stormwater contamination are considered not exposed. Particulate matter or visible deposits of residuals from roof stacks and/or vents not otherwise regulated (i.e., under an air quality control program) and evident in stormwater outflow are considered exposed. Likewise, visible “track out” (i.e., pollutants carried on the tires of vehicles) or windblown raw materials is considered exposed. Leaking pipes containing contaminants exposed to stormwater are deemed exposed, as are past sources of stormwater contamination that remain onsite. General refuse and trash, not of an industrial nature, is

not considered exposed as long as the container is completely covered and nothing can drain out holes in the bottom, or is lost in loading onto a garbage truck. Industrial refuse and trash that is left uncovered, however, is considered exposed.

What is Required Under the No Exposure Provision?

The Phase II Final Rule represents a significant expansion in the scope of the original no exposure provision in terms of eligibility (as noted above) and responsibilities for facilities claiming the exclusion. Under the original no exposure provision, a light industry operator was expected to make an independent determination of whether there was “exposure” of industrial materials and activities to stormwater and, if not, simply not submit a permit application. An operator seeking to qualify for the revised conditional no exposure exclusion, including light industry operators (i.e., category (xi) facilities), must:

- Submit written certification that the facility meets the definition of “no exposure” to the NPDES permitting authority once every 5 years.
 - The Phase II Final Rule includes a four-page *No Exposure Certification* form that uses a series of yes/no questions to aid facility operators in determining whether they have a condition of no exposure. It also serves as the necessary certification of no exposure provided the operator is able to answer all the questions in the negative. EPA’s *Certification* is for use only by operators of industrial activity located in areas where EPA is the NPDES permitting authority.
 - A copy of the *Certification* can be obtained from the EPA stormwater Web site (<http://www.epa.gov/npdes/stormwater>), the Stormwater Phase II Final Rule published in the *Federal Register* (Appendix 4), or by contacting the appropriate NPDES permitting authority.
- Submit a copy, upon request, of the *Certification* to the municipality in which the facility is located.
- Allow the NPDES permitting authority or, if discharging into a municipal separate storm sewer system, the operator of the system, to: (1) inspect the facility; and (2) make such inspection reports publicly available upon request.

Regulated industrial operators need to either apply for a permit or submit a no exposure certification form to be in compliance with the NPDES stormwater regulations. Any permit held becomes null and void once a certification form is submitted.

Even when an industrial operator certifies to no exposure, the NPDES permitting authority still retains the authority to require the operator to apply for an individual or general permit if the NPDES permitting authority has determined that the discharge is contributing to the violation of, or interfering with the attainment or maintenance of, water quality standards, including designated uses.

Are There Any Concerns Related to Water Quality Standards?

Yes. An operator certifying that its facility qualifies for the conditional no exposure exclusion may, nonetheless, be required by the NPDES permitting authority to obtain permit authorization. Such a requirement would follow the permitting authority's determination that the discharge causes, has a reasonable potential to cause, or contributes to a violation of an applicable water quality standard, including designated uses. Designated uses can include use as a drinking water supply or for recreational purposes.

Many efforts to achieve no exposure can employ simple good housekeeping and contaminant cleanup activities such as moving materials and activities indoors into existing buildings or structures. In limited cases, however, industrial operators may make major changes at a site to achieve no exposure. These efforts may include constructing a new building or cover to eliminate exposure or constructing structures to prevent run-on and stormwater contact with industrial materials and activities. Major changes undertaken to achieve no exposure, however, can increase the impervious area of the site, such as when a building with a smooth roof is placed in a formerly vegetated area. Increased impervious area can lead to an increase in the volume and velocity of stormwater

runoff, which, in turn, can result in a higher concentration of pollutants in the discharge, since fewer pollutants are naturally filtered out.

The concern of increased impervious area is addressed in one of the questions on the *Certification* form, which asks, "Have you paved or roofed over a formerly exposed, pervious area in order to qualify for the no exposure exclusion? If yes, please indicate approximately how much area was paved or roofed over." This question has no affect on an operator's eligibility for the exclusion. It is intended only to aid the NPDES permitting authority in assessing the likelihood of such actions interfering with water quality standards. Where this is a concern, the facility operator and its NPDES permitting authority should take appropriate actions to ensure that water quality standards can be achieved.

What Happens if the Condition of No Exposure Is Not Maintained?

Under the Phase II Final Rule, the no exposure exclusion is conditional and not an outright exemption. Therefore, if there is a change in circumstances that causes exposure of industrial activities or materials to stormwater, the operator is required to comply immediately with all the requirements of the NPDES Stormwater Program, including applying for and obtaining a permit.

Failure to maintain the condition of no exposure or obtain coverage under an NPDES stormwater permit can lead to the unauthorized discharge of pollutants to waters of the United States, resulting in penalties under the CWA. Where a facility operator determines that exposure is likely to occur in the future due to some anticipated change at the facility, the operator should submit an application and acquire stormwater permit coverage prior to the exposed discharge to avoid such penalties.

For Additional Information

Contacts

- ☞ U.S. EPA Office of Wastewater Management
<http://www.epa.gov/npdes/stormwater>
Phone: 202-564-9545
- ☞ Your NPDES Permitting Authority. Most States and Territories are authorized to administer the NPDES Program, except the following, for which EPA is the permitting authority:
- | | |
|----------------------|--------------------------|
| Alaska | Guam |
| District of Columbia | Johnston Atoll |
| Idaho | Midway and Wake Islands |
| Massachusetts | Northern Mariana Islands |
| New Hampshire | Puerto Rico |
| New Mexico | Trust Territories |
| American Samoa | |
- ☞ A list of names and telephone numbers for each EPA Region and State is located at <http://www.epa.gov/npdes/stormwater> (click on “Contacts”).

Reference Documents

- ☞ EPA’s Stormwater Web Site
<http://www.epa.gov/npdes/stormwater>
- Stormwater Phase II Final Rule Fact Sheet Series
 - Stormwater Phase II Final Rule (64 *FR* 68722)
 - National Menu of Best Management Practices for Stormwater Phase II
 - Measurable Goals Guidance for Phase II Small MS4s
 - Stormwater Case Studies
 - And many others