The MS4 Program
(Municipal Separate Storm Sewer Systems)

What is an MS4? (the short answer)

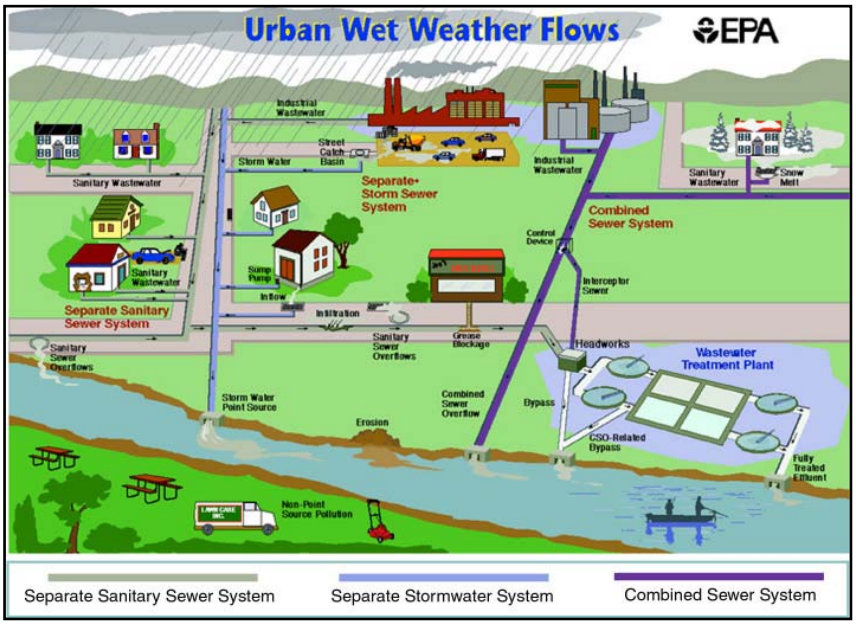
An MS4, a municipal separate storm sewer system, is any stormwater conveyance system (including storm drains, catch basins, gutters, roadways, ditches, channels, etc.) that is owned by a public body and discharges to waters of the United States. These systems cannot be part of combined sewer systems or publicly owned treatment works.

The Longer Answer:

The NPDES (National Pollutant Discharge Elimination System) Phase II Program is administered by the Environmental Protection Agency (EPA) as a method to implement provisions of the Clean Water Act. Stormwater is now recognized as a significant source of water pollution, so starting in 1990, EPA began the Phase I Program to regulate stormwater as a non-point source pollutant for large municipal separate storm sewer systems in cities with more than 250,000 people, and for medium systems in cities with more than 100,000 people. While these programs made progress, it was clear that the amount of pollutants coming from smaller communities was huge, so these sources also required regulations to address these problems.

Based upon the 2000 census figures, the small MS4 Phase II Program covers "urbanized" areas with populations under 100,000 and over 10,000 (or that will fall into that category within ten years). Political boundaries are not the only standard – MS4 areas can cover two or more governmental entities when appropriate, and they can cover entities such as universities, hospitals, etc. Very small communities or very rural communities can apply for waivers from the program.

Community MS4 operators must protect water quality, satisfy the Clean Water Act, and reduce pollutant discharges to the maximum extent practicable. In implementing their programs, there are six major MS4 provisions that communities must implement. Annual permitting is required. These permits allow each municipality individual latitude based upon existing conditions, resources, etc. Plans for improving provision compliance in the coming year must be defined and progress meeting last year's goals must be documented.



Definitions:

Combined – both storm water and waste water flow into the same set of pipes, and they end up at the same treatment facility

Separate Sewer – only waste water flows into one set of pipes that end up at a sanitary treatment facility

Separate Storm Sewer – only rain or melted snow runoff flows into a series of gutters, drains, pipes, etc. that end up at the closest stream or river

Background of the Clean Water Act:

www.fws.gov

While our waterways had been used to dispose of industrial, agricultural, and human wastes for decades, the post-World War II economic expansion brought some changes. More toxic substances were being produced, used, and disposed of than ever before. This was considered "progress" by our society. However, more of these substances were getting into drinking water supplies and food chains than ever before. Consequently, more health and environmental effects of these toxins were being seen.

As the middle class grew, and had the time and education to identify and understand the risks of this situation, a backlash slowly developed. With publication of works such as *Silent Spring* by Rachel Carson in the 1960s, the backlash grew. People demanded that government address these risks.

Some state actions were taken to protect water bodies and water quality, but for the most part, these were vague and weakly enforced. People turned to the federal government for help. In the early 1970s, laws known as the Clean Air Act (1970) and Federal Water Pollution Control Act (1972) were passed by Congress. These set water quality goals – especially for point sources of pollution into a navigable waterway, but not the means to achieve them. The Environmental Protection Agency was created to determine the best methods to set regulatory standards and to enforce them.

With the 1977 amendments to the Federal Water Pollution Control Act, the legislation became known as the Clean Water Act. Its overall goals were to insure our nation's surface waters were "fishable and swimable" by 1983 and that additional pollutants were eliminated by 1985. More than 20 years and several more amendments later, we are running a bit behind schedule. Approximately 80% of the United States' population lives within ten miles of an impaired waterway.

Key Functional Aspects of the Clean Water Act:

- The **NPDES permit program** covers both point and non-point sources of pollution discharging into a surface waterbody.
- **Section 303** establishes water quality standards and the Total Maximum Daily Loads.
- **Section 319** addresses non-point sources of pollution, such as farming and forestry, largely through federal grants administered by state agencies.
- **Section 401** requires federal agencies to obtain certification from the state, territory, or Indian tribes before issuing permits that would result in increased pollutant loads to a waterbody. The certification is issued only if such increased loads would not cause or contribute to exceedances of water quality standards.
- **Section 404** regulates the placement of dredged or fill materials into wetlands and other waters of the United States.
- **State Revolving Funds** (SRF) provide large amounts of money in the form of loans for municipal point sources, non-point sources, and other activities.

Technology vs. Water Quality Standards:

In order to get the significant water and air pollution of the 1970s under control as fast as possible, technology-based standards were EPA's instrument of choice. By requiring certain types of technology be used for specific types of industrial processes, improvements in air and water quality resulted. However, there were drawbacks to this approach.

One lesson learned was mandatory use of technological standards rather than meeting mandatory water quality standards demanded huge cash investments in that technology, in effect saddling an industrial plant with it for decades – even when better technology was developed. Another lesson was that incentives to create better technology were missing.

Consequently, gains in air and water quality have been slower than originally anticipated. The MS4 Program relies upon the principle of steady progress to reduce non-point source pollution, to the maximum extent practicable, made using the best options possible. In other words, MS4 communities have some latitude in defining their annual goals and in choosing the ways they will achieve them.

Another EPA water protection program, Total Maximum Daily Loads (TMDL), focuses upon the connections among water quality standards*, the total amounts of allowable pollutants that a waterbody can carry while meeting those standards, and the allocation of pollutants from each contributing source. The combined effect of TMDLs and MS4 requirements upon municipalities is expected to force improvements on the local level – often the origin of many non-point source pollution problems.

www.epa.gov

* As per Section 303 of the Clean Water Act, states are directed by EPA to set water quality standards based upon designated uses of the water body (drinking water, recreation, fisheries, etc.), scientific means to establish water quality criteria, and other factors. Designated use determination may include economic factors, but the water quality standards to protect those uses may not. Anti-degradation policies must be included. Section 303 is also the basis of the TMDL Program.

Section 90 of the Pennsylvania Code also addresses water quality, designated use, and anti-degradation.

MS4 Requirements:

MS4 operators must set up their own program so that it reduces pollutant discharges, protects water quality, and satisfies the appropriate water quality requirements of the Clean Water Act. The framework for accomplishing these goals is the Six Minimum Control Measures provision:

1. Public education and outreach
2. Public participation and involvement
3. Construction site runoff control
4. Post-construction runoff management
5. Illicit discharge detection and elimination
6. Pollution prevention and municipal good housekeeping

(More detailed information about the Phase II regulations, the MS4 program, and the Six Minimum Control Measures can be found at the links back at the TCWA website.)

To comply with the MS4 permit regulations, communities determine how they can best comply with the control measures, set annual goals, develop a series of objectives to meet those goals, then execute their plans. At the end of each year, municipalities must review the outcomes of their efforts, identify their strengths and weaknesses, and strategize for the coming year.

EPA and DEP encourage the use of best management practices (BMPs) to achieve operator goals for compliance with the Six Minimum Control Measures. There are many, many definitions of water quality BMPs. Many communities must revise their development, excavating, grading, and timbering ordinances to allow and insure proper use of these methods. Shown below are a cluster development, a curbless street, and an alternate site plan that preserves open space and natural infrastructure to manage stormwater, enhances neighborhood ambiance, and increases property values.

Cluster Development

www.mapc.org

Curbless Street

www.builtgreenwashington.org

Alternate Site Plan

www.mapc.org

Stormwater Best Management Practices:

Best management practices (BMPs) are methods or structures most effective at increasing infiltration to the water table, reducing or preventing non-point source pollutants from entering streams and rivers, and decreasing the chances for high water events and flooding.

In our region, there are a number of traditional BMPs in use that encourage immediate stormwater runoff, collecting it as a waste product in a series of pipes, then quickly transporting it to the nearest stream. Their biggest drawback is that they do not allow adequate infiltration. However, they are supported by local ordinances.

More innovative BMPs that allow for infiltration are now recommended by EPA and either required or recommended by every state environmental protection agency. Our DEP has recently completed its Stormwater BMP Manual, but for now its provisions are only recommendations. With pressure from EPA, these will become requirements within the next few years.

In the meantime, here in Pennsylvania our communities are reluctant to change their ordinances to allow these recommended methods for fear of legal challenges by developers and consultants who perceive potential losses. Our state laws are vague enough that many of these challenges succeed. Municipalities need to work with their legislators to insure state laws will uphold ordinance revisions.

There are two basic types of BMPs, structural and non-structural. As the name implies, structural BMPs are built. As the list below shows, these can promote either runoff or infiltration. Recognized as the better choices are those that promote infiltration. For the most part, non-structural BMPs are planning and design elements that must be incorporated at the outset of a project.

Structural:

- Curb and gutter systems (traditional means to drain runoff to catch basins, pipes, and/or streams – being replaced by vegetated swales, bio-retention cells, etc.)
- Dry ponds (traditional method; detention/retention ponds that empty in 12 to 24 hours – being replaced by wet ponds and other infiltration methods)
- Wet ponds (never fully empty – allow slow infiltration and recreation)
- Underground storage tanks (often used under parking lots)
- Constructed wetlands (without proper planning and execution, these become little more than stagnant puddles – with proper planning and execution, they improve water quality, hold stormwater runoff, reduce flood potential, and become valuable healthy habitats)
- Constructed channels (often made with impervious materials preventing infiltration)
- Pervious pavement (asphalt or concrete mixes that incorporate spaces that allow drainage to subsurface materials which infiltrate precipitation runoff)
- Curbless streets (allow precipitation to flow to the edges where infiltration channels of various designs capture the water)
- Green roofs (hold at least the first one half inch of rain fall – designs incorporate growth medium and hardy plants able to withstand extreme conditions)
- Vegetated swales (subsurface materials allow healthy plant growth and infiltration)
- Bio-retention cells (also known as rain gardens; landscaped areas to which rainfall drains from roofs, pavement, etc. – have subsurface materials that allow healthy plant growth and infiltration)
- Dry wells and cisterns (underground downspout storage that slowly infiltrates or stores water for future use)

Vegetated Swale

www.lcrep.org

Rain Barrel

www.montgomeryconservatrion.org

Wet Pond

www.stormcon.

Non-structural:

- Cluster development (reduces overall land disturbance by clustering both developed sections and natural sections of a site – lot sizes will decrease, but total number of buildings allowed by a site's zoning limits will not)

- Alternative site design (reduce the length of roads, utility lines and pipes, and other infrastructure – as well as the costs of future maintenance; less total site disturbance)
- Preserve natural infrastructure that increase rainfall and snowmelt infiltration (wetlands, streams, riparian areas, vegetated slopes, soils, etc. are cost-effective alternatives to pipes, culverts, catch basins, etc., plus they are simpler to maintain in the future: integrated water management)
- Slope consideration (extent of any site disturbance is proportional to the site slopes and terrain)
- Reduced set-back requirements (reduce lengths of impervious walkways and driveways)
- Shared driveways (reduce the total amount of pervious surfaces)
- Reduced street widths (wide enough for emergency equipment, but less impervious surface to install and maintain)
- Reduced parking space requirements (use the appropriate number of spaces per square footage of commercial building to reduce impervious surface)
- Conservation easements (rewards preservation of natural infrastructure and open space by offering tax incentives and other benefits in exchange for permanent protection)
- Tree planting (mature trees transpire between 35 and 105 gallons of water per day – depending upon weather conditions)
- Rain barrels (can be combined with soaker hoses to automatically water landscaping or gardens)

www.landscaping.about.com/

www.purdue.edu

www.nps.gov

Conclusion:

"We're from the government, and we're here to help," normally translates into "Run as fast as you can in the opposite direction." The best way to improve any situation does not typically include government leading the charge. It takes grass roots efforts. The MS4 Program is no different, which is one reason it requires community education and involvement.

When most people understand the basics of an issue, they are less likely to listen to officials who do not, or to be manipulated by those with personal agendas. The common sense and creativity needed to solve our water quality and water quantity problems stem from knowledge.

TCWA urges all 193,000 watershed residents to take the following steps:

- Learn all you can about the water-related issues we face –
  - Abandoned mine drainage (AMD)

- Stormwater
    - CSO (combined sewer overflows)
    - SSO (sanitary sewer overflows)
    - Drinking water source contamination
    - Erosion
    - Flooding
    - Habitat destruction
    - Low water tables
    - Sedimentation
    - Streambank destabilization
    - Stormwater management planning
- Water quality monitoring
- Expenses we pay as:
    - Individuals who are now directly affected by flooding
    - Insurance carriers and rate payers
    - Municipalities who have growing costs for labor, materials, and equipment used in storm and flood cleanup
    - Water and sewer authorities who face the same costs
    - Counties who face the same costs
    - Taxpayers who ultimately absorb these government expenses

- Learn what steps you can take to improve things
    - Never put any substances into stormdrain (catch basins) – they lead to a nearby stream, lake, or river
    - Use only the recommended amounts and application timings of fertilizers, herbicides, and pesticides – these toxins tend to wash off with the next rainfall, extra amounts increase contamination (and the amount you pay) without benefiting your yard or garden
    - Install rain barrels, dry wells, or cisterns to harvest rainfall from your roof – this is an economical way to water landscaping or gardens while infiltrating the rain rather than letting it run off and contribute to downstream flooding (See the Rain Barrel link at the *What We Do – Multi-municipal Cooperation* section of the TCWA website for more information.)
    - Make a rain garden to directly capture and use roof runoff while enhancing your home's landscaping – real estate studies show that good landscaping increases a house's value by at least 10% and its curb appeal by more (See the Rain Garden link at the *What We Do – Multi-municipal Cooperation* section of the TCWA website for more information.)
    - Encourage your scout troop, garden club, or civic group to start a cooperative project with your municipality to stencil stormdrains, clean litter along streambanks, plant deer-proof native trees and shrubs along riparian areas, or start a campaign to raise awareness of local water quality and quantity issues (See the Stormdrain Stenciling link of the *What We Do – Multi-municipal Cooperation* section of the TCWA website.)
    - Encourage your local officials to amend ordinances to allow or require use of a wide selection of best management practices for new development, redevelopment, or retro-fitting