Developing a Storm Water Pollution Prevention Plan

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Stormwater is defined by the Environmental Protection Agency as rainfall or snow melt that passes over a land surface before entering a body of water. On undisturbed lands, this water passes through vegetative buffers that provide natural filtration and slow the runoff so that suspended particles can settle out. Much of the water is absorbed into the soil and eventually, after filtering through the rock and soil of the watershed for hundreds or even thousands of years, becomes part of the groundwater reserves.

On developed land, this natural process is disrupted. Stormwater passes over building rooftops, paved streets, concrete sidewalks, parking lots and compacted soil. Automotive oil and grease, trash, loose soil, and chemical residues can accumulate on all of these surfaces. There are few plants to naturally filter or slow the runoff. Water cannot be absorbed through the impermeable paved surfaces of a city. As a result, the stormwater runoff washes these pollutants into curbside storm sewer drains and, directly or indirectly, into rivers, streams and lakes.

Pollution that is discharged through pipes and ditches is known as point source pollution. Pollution gathered by stormwater runoff from diffuse locations is known as nonpoint source pollution. It is usually referred to as NPS pollution.

A Brief History of Stormwater Regulations

The Federal Water Pollution Control Act Amendments of 1972 are commonly referred to as the Clean Water Act or CWA. They are a powerful set of regulations that control the discharge of pollutants into U.S. waters. The national objective of the CWA is the restoration of all waterways, and it prohibits the discharge of pollutants from any point sources into navigable waters without authorization. Nonpoint sources were not regulated by the CWA, but it did require the development of guidelines to identify and evaluate the extent of NPS pollution.

The Federal Water Quality Act of 1987 added specific water quality standard provisions to the CWA. It also added section 402 to the Act. Section 402 required the EPA to develop and implement the National Pollutant Discharge Elimination System for certain categories of stormwater discharges to manage nonpoint source pollution. Prior to the WQA, NPDES permits were not required to discharge stormwater runoff.

The NPDES Stormwater Program was implemented in two phases. In November of 1990, the EPA promulgated final regulations for Phase I of the stormwater program. Phase I required all industrial dischargers, municipalities with populations of more than 100,000, and

construction sites of more than five acres to obtain NPDES permits for stormwater discharges.

In December of 1999, the EPA issued final Phase II regulations. Phase II, which took effect in 2003, tightened the Phase I regulations significantly. Phase II rules increased regulatory coverage to all municipalities, to school districts and other large land owners, and to construction sites where one acre or more of land is disturbed.

The Phase II rules were very controversial. They applied to small operations, and many small contractors and municipalities believed them to be a burden. In order to obtain the discharge permit, owners and operators had to develop a specific plan to minimize stormwater runoff. These plans are known as Stormwater Pollution Prevention Plans.

Stormwater Pollution Prevention Plans

A Stormwater Pollution Prevention Plan describes the actions that will be taken to prevent pollution due to stormwater runoff. At facilities and municipalities, the runoff is typically impounded until it can be treated and discharged. Large properties often impound the water to allow it time to be absorbed into areas of land set aside for such a purpose.

These options are not practical at construction sites, but the runoff from these sites is very detrimental to the environment. Studies have shown that erosion from construction areas allows fine particles of soil to wash into waterways that may be located many miles from the actual construction site. These fine particles remain suspended in the water and contribute to low oxygen levels, turbidity, and poor water quality.

Under Phase II of the stormwater rules, construction sites that disturb between one and five acres of land must take measures to control stormwater runoff. Sites that disturb more than five acres of land are regulated under Phase I rules. Construction activities that disturb less than one acre of land may also be regulated if the construction activity is part of a larger common development plan that will ultimately disturb one acre or more of land.

SWPPPs for construction sites rarely include treatment of impoundment options. Instead, they focus on slowing the rate of runoff, rudimentary filtration, and directing the runoff. Slowing the runoff allows suspended materials to settle out and gives exposed soil more time to absorb water. Rudimentary filtration prevents trash from being swept along with the water, and soil erosion is controlled by directing the flow of the runoff.

The mechanics of applying for and obtaining a stormwater permit are specific to individual jurisdictions. In most cases, owners or operators must submit a Notice of Intent to the state regulatory agency. The NOI describes the work that is to be performed, the location where the work will occur, and a timeframe for initiation and completion of the work.

Most local jurisdictions have a general permit that is issued for construction activities. The general permit is the same for everyone and typically requires adherence to best management practices or BMPs. The BMPs are a collection of measures that have been tried over a period of years and found to be effective at minimizing stormwater runoff pollution.

When construction has been completed, a Notice of Termination is usually required to inform the state agency that the stormwater permit is no longer needed.

Best Management Practices

The BMP requirement often leads to confusion and general permit violations. These practices evolve over time, and the acceptable practices from five years ago are no longer recognized as the best options. Without continuing education on these issues, however, construction contractors often continue to use measures that have been shown to be ineffective.

Straw or hay bales, for instance, were once believed to be effective barriers to soil erosion and silt displacement. Every regulated construction site had staked hay bale baffles across runoff flow paths and around the outer edges of a construction site. Current best practices recommend against using straw bales whenever possible. Silt fences are recommended instead. Many construction contractors, however, continue to use straw bales on every project.

BMPs for construction projects generally incorporate the following elements.

Construction Sequencing: Construction sequencing uses a carefully planned work sequence to complete land-disturbing activities in steps. Each step is coordinated with the installation of erosion control measures in that particular area. The site is disturbed in phases to avoid erosion from areas that are not actively under construction.

Appropriate Grading: Land grading reshapes the project site surface according to a specific grading plan that has been prepared by an engineer. Site grading helps to minimize erosion both during and after construction by creating a designed topography that has been optimized for runoff control.

Maintaining Natural Vegetation: While all SWPPPs involve planting of vegetation to slow stormwater runoff, naturally occurring vegetation is highly desirable and should be maintained if at all possible. Established vegetation provides stormwater detention, bio filtration, erosion control, and usually increases the aesthetic values to a site. It can generally process larger quantities of stormwater than newly seeded vegetation, it is already established, and it usually has denser root structure than newly seeded vegetation. It reduces the impact of rainfall by intercepting precipitation before it strikes the soil and helps hold soil particles together.

Geotextiles: Porous geotextile fabrics are highly effective erosion control materials. They can be obtained in a variety of textures and materials and can be used to reinforce structures, to hold mulches or plantings in place, or to divert or direct water. Contractors often call these materials "road rugs."

Mulching: Mulching is also an effective means of erosion control, especially when used in conjunction with vegetation. Mulching stabilizes the soil, reduces stormwater flow velocity, provides water filtration, and absorbs water. It is of great benefit when establishing vegetation.

Riprap: Riprap is a layer of large stones used to stabilize slopes. It provides excellent drainage characteristics.

Wind Fences: Wind fences are constructed from evenly spaced wooden slats. They reduce wind velocity and impede the passage of blowing sand and dust. Wind fences are necessary perimeter controls at construction sites in arid regions where windborne sand and dust is an issue.

Temporary Slope Drains: Temporary slope drains are flexible pipes that extend along the length of a disturbed slope and divert stormwater. Because the water is directed to the drain, it does not run down the slope in an uncontrolled manner. This greatly reduces the erosion from the slope. These drains are sometimes left in place for up to two years. They are removed when vegetation has become established or when permanent measures have been put into place.

Check Dams: Check dams are also temporary structures. They are placed across channels or swales to break up concentrated stormwater flows. Check dams slow the water. This allows carried sediment to settle out and prevents it from being carried downstream.

Silt Fences: Silt fences are a highly effective means of preventing the erosion of soil from disturbed areas. They interrupt stormwater flows, provide some degree of filtration, and allow soil

particles to settle out of the water before being carried off the site. Straw bales were once used exclusively for this purpose, but new fabric silt fencing has been found to be vastly superior. Silt fencing may be staked to the ground, but a far more effective installation method uses a machine to insert the bottom of the fencing six or more inches below the surface of the spoil. particles to settle out of the water before being carried off the site. Straw bales were once used exclusively for this purpose, but new fabric silt fencing has been found to be vastly superior. Silt fencing may be staked to the ground, but a far more effective installation method uses a machine to insert the bottom of the fencing six or more inches below the surface of the spoil.

Vegetative Buffers: Plants are the most natural and basic impediment to erosion. They slow stormwater runoff, provide a natural filtering effect, and improve the aesthetics of the site. Vegetative buffers offer areas where water can drain into the soil, and reduced water velocity helps suspended particulates settle from the water.

Fast-growing annual grasses are often seeded to form a quick vegetative barrier, but most BMPs require that perennial plants also be mixed with the annuals. Perennials have deeper and denser root systems. While annual grasses provide a quick solution, the risk of erosion returns when they die off each year. The denser roots of perennial plants offer a permanent solution.

Because construction stormwater permits are general permits, a well-prepared SWPPP can be taken from site to site for reuse. It should be updated as BMPs periodically change, but the basic measures stay the same. Many state agencies that issue stormwater permits have an example of a good SWPPP that can be provided to contractors.